CRE

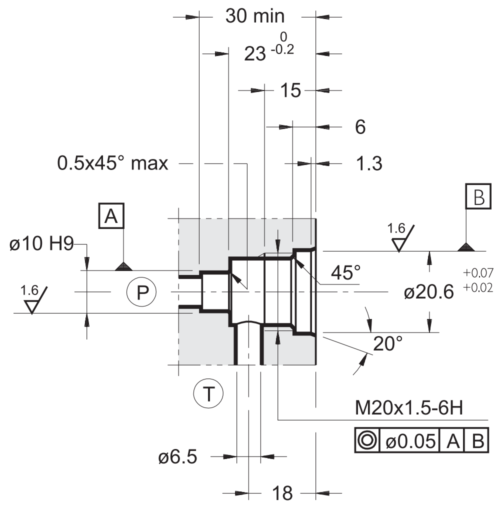
DIRECT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 20

CARTRIDGE TYPE

p max **350** bar
Q max **1,5** l/min

SEAT DIMENSIONS: D-10A



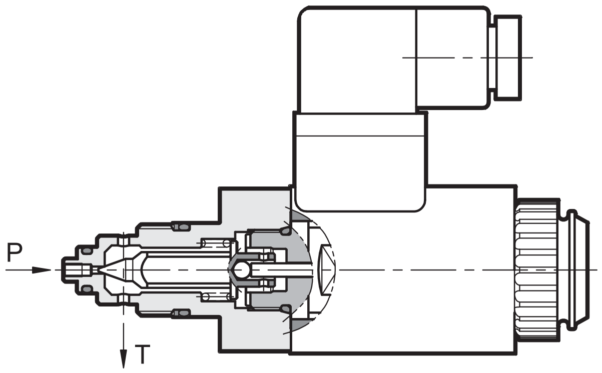
NOTE: Provide seat for optional restrictor in T line

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

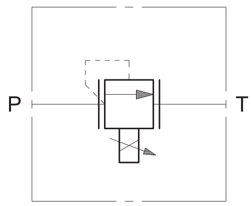
Maximum operating pressure: - P port - T port	bar	350 2
Minimum controlled pressure	see Δp-Q diagram	
Nominal flow Maximum flow	l/min	0,5 1,5
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 4	
Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass:	kg	0,54

OPERATING PRINCIPLE



- The CRE valve is a direct operated pressure control valve with electric proportional control with cartridge execution which can be used in blocks and panels with type D-10A seat.
- The valve is suitable as a pilot stage for remote control of two stage pressure control and reducing valves.
- Pressure adjustment can be continuous in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control power supply unit or by means of the relative electronic control units to exploit valve performance to the full (see paragraph 8).
- The valve is available in three pressure control ranges up to 250 bar.

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

C R E -   / 20   -   K1

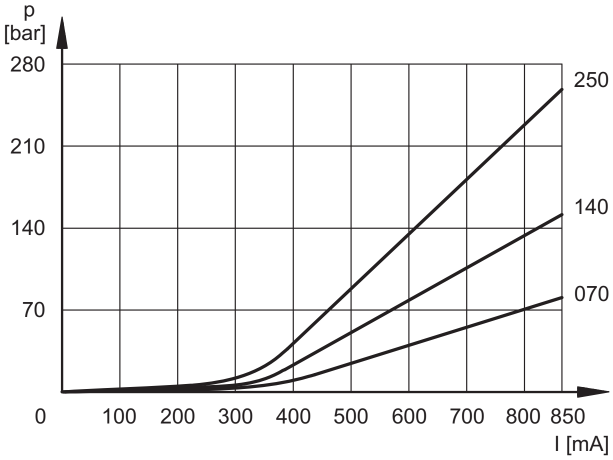
- C R = Pressure control valve cartridge type
- E = Electrical proportional control
- Pressure control range
  - **070** = up to 70 bar
  - **140** = up to 140 bar
  - **250** = up to 250 bar
- 20 = Series No. (from 20 to 29 sizes and mounting dimensions remain unchanged)
- Seals:
  - **N** = NBR seals for mineral oil (**standard**)
  - **V** = FPM seals for special fluids
- **D12** = Nominal solenoid voltage 12 VCC
- **D24** = Nominal solenoid voltage 24 VCC
- K1 = Coil electrical connection: plug for connector type DIN 43650 (**standard**)

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

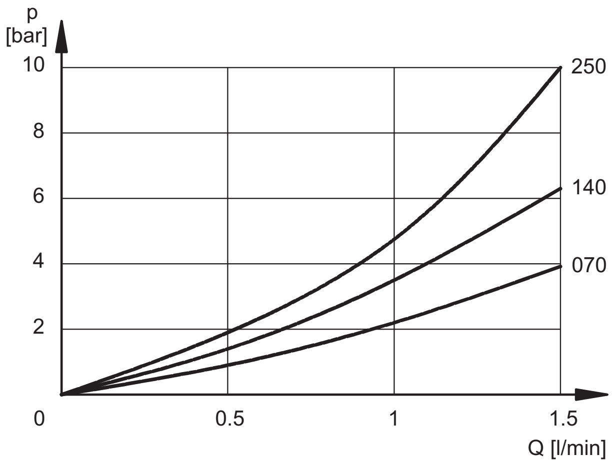
Typical control curves according to the current supplied to the solenoid, measured with input flow rate Q=0,5 l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T.

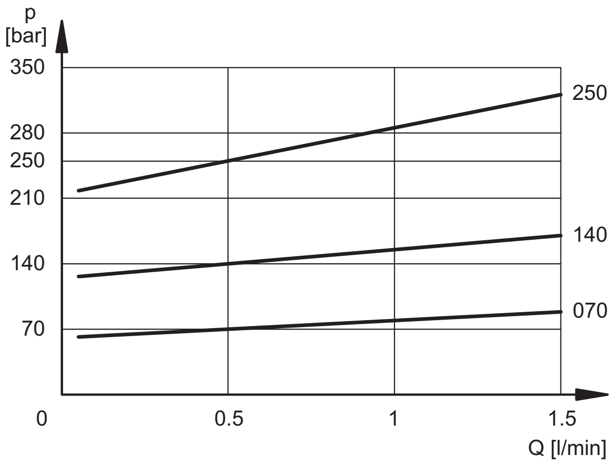
PRESSURE CONTROL p = f (I)



MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N).
For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	16.6
MAXIMUM CURRENT	A	1.9	0.85
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CEE		
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65		

5 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a valve of pressure range up to 140 bar and with input flow rate Q = 0,5 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

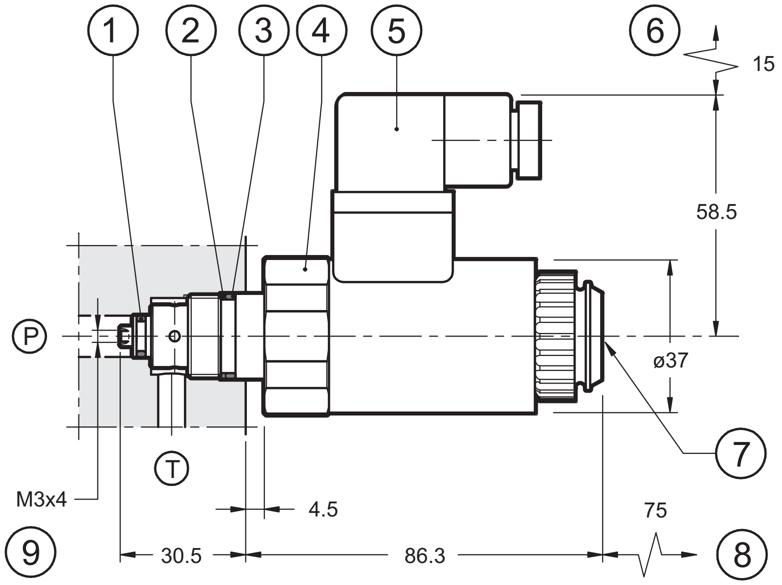
6 - INSTALLATION

We recommend to install the CRE valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil (see par. 7). At the end of the operation, make sure of having screwed correctly the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

7 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	OR type 2025 (6.07x1.78)
2	PARBAK type 8-017 (18.01x1.14x1.35)
3	OR type 2068 (17.17x1.78)
4	Hex: spanner 36, torque 45 ÷ 50 Nm
5	DIN 43650 electric connector
6	Connector removal space
7	Breather (male hexagonal spanner 4)
8	Coil removal space
9	Seat for optional calibrated flow restrictor

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (7) placed at the end of the solenoid tube.

* The measurement 4,5 mm can be reduced to 0,5 mm by increasing the axial dimensions of the D-10A, seat by 4 mm.

8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

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PRED3

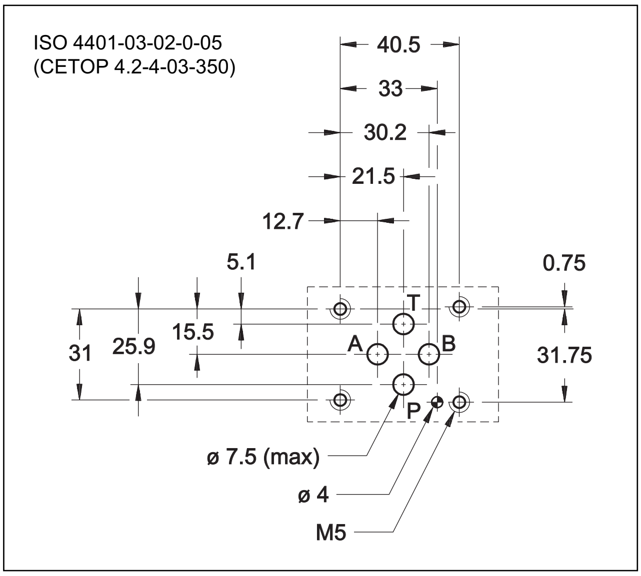
DIRECT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 10

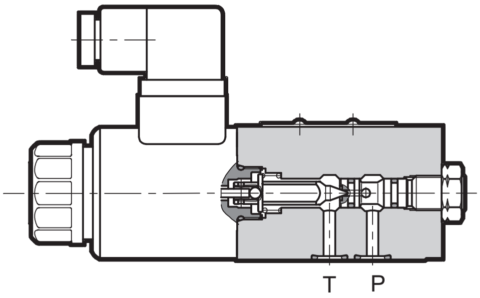
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **3** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



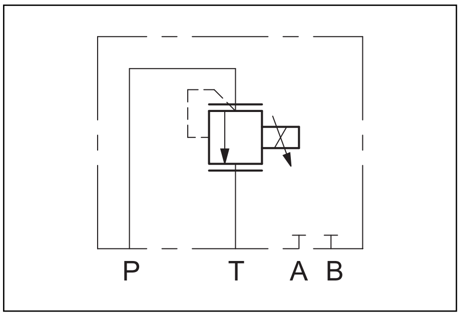
- The PRED3 valve is a direct operated pressure control valve with electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.
- It is suitable to pilot two-stage valves, or for pressure control in hydraulic circuits.
- Pressure can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 8).
- The valve is available in four pressure control ranges up to 350 bar.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure: - P port - T port	bar	350 2
Minimum controlled pressure	see p min = f(Q) diagram	
Nominal flow Maximum flow (see p min = f(Q) diagram)	l/min	1 3
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E	D	3	-		/	10		-		K1

Pressure control valve

Electrical proportional control

direct operated

Size ISO 4401-03 (CETOP 03)

Pressure control range
070 = 0,7 - 70 bar **210** = 1,8 - 210 bar
140 = 1,1 - 140 bar **350** = 2,8 - 350 bar

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
plug for connector type
DIN 43650 (**standard**)

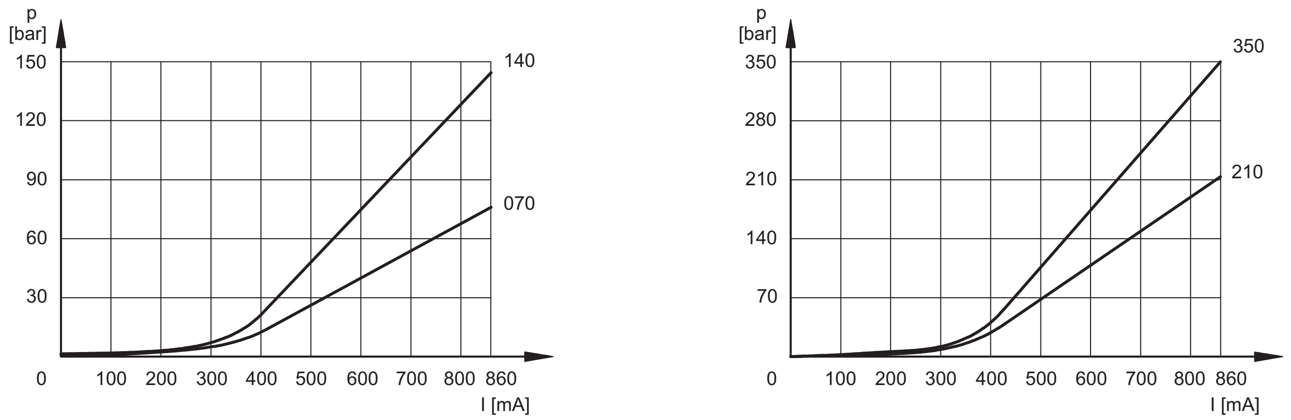
2 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

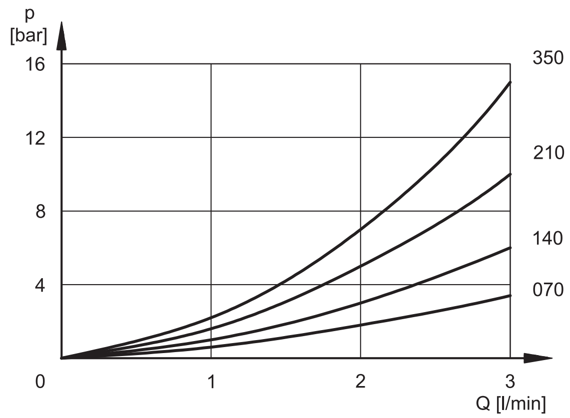
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q =1 l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

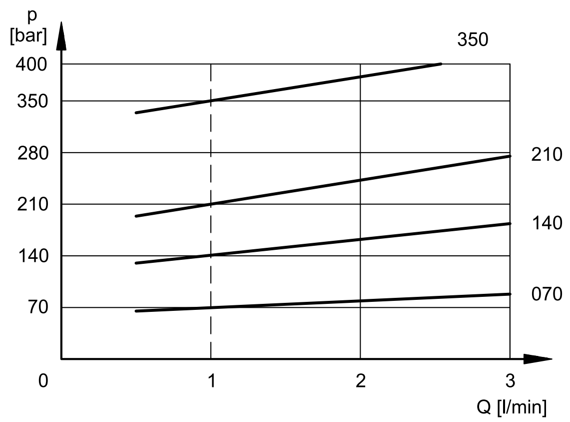
PRESSURE CONTROL p = f(I)



MINIMUM CONTROLLED PRESSURE p min = f (Q)



PRESSURE VARIATION p max = f (Q)



Q = 1 lt/min
factory setting

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/EC		
CLASS OF PROTECTION: atmospheric agents (CEI EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a valve of pressure range up to 140 bar and with an input flow rate of Q = 2 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

6 - INSTALLATION

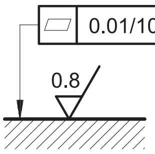
We recommend to install the PRED3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil (see par. 7). At the end of the operation, make sure of having screwed correctly the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

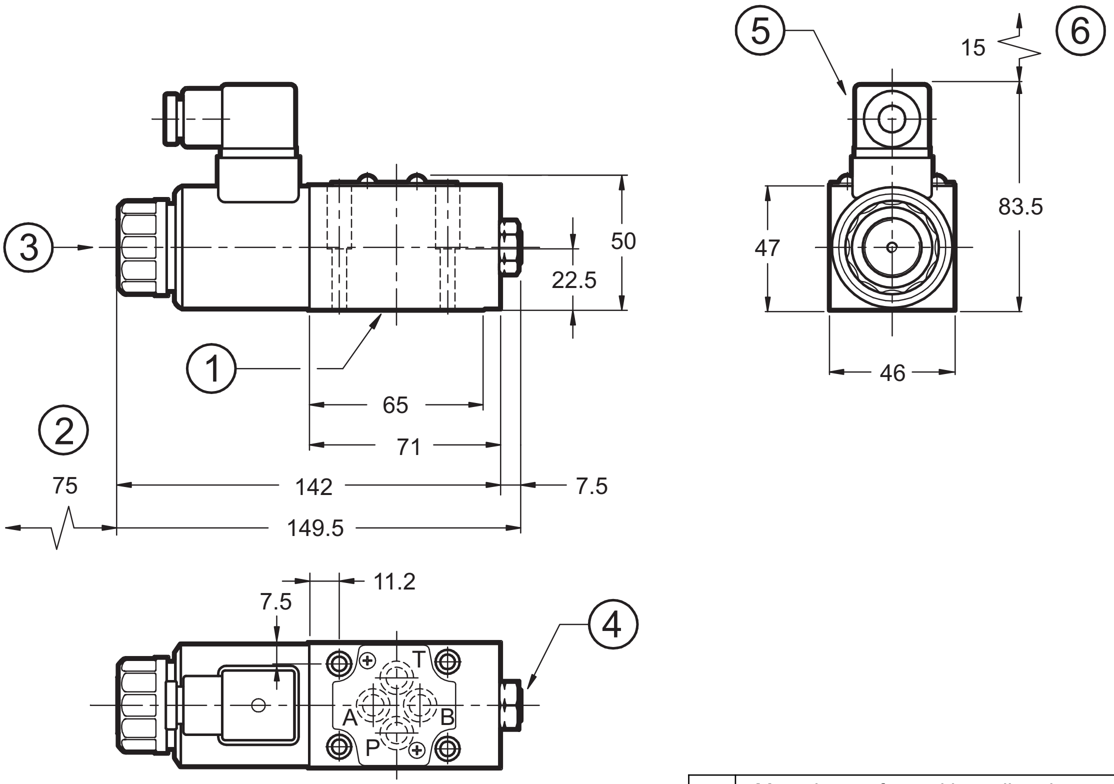
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Coil removal space
3	Breather (Allen key 4)
4	Factory setting sealing (we recommend not unscrewing the nut)
5	DIN 43650 electric connector (included in the delivery)
6	Connector removal space

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Valve fastening: 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

9 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions: P, T, A, B: 3/8” BSP thread

PRED3G

PRESSURE CONTROL VALVE WITH PROPORTIONAL CONTROL AND INTEGRAL ELECTRONICS

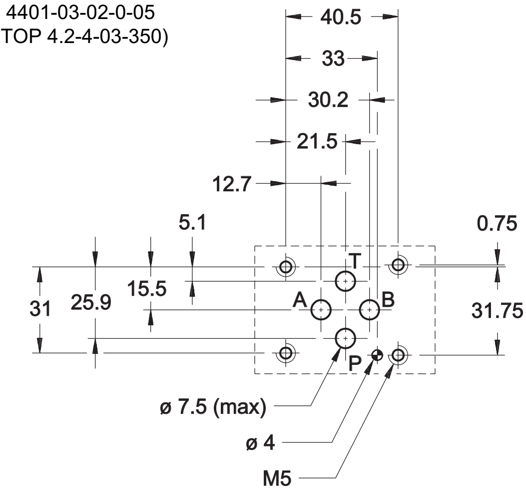
SERIES 30

SUBPLATE MOUNTING
ISO 4401-03

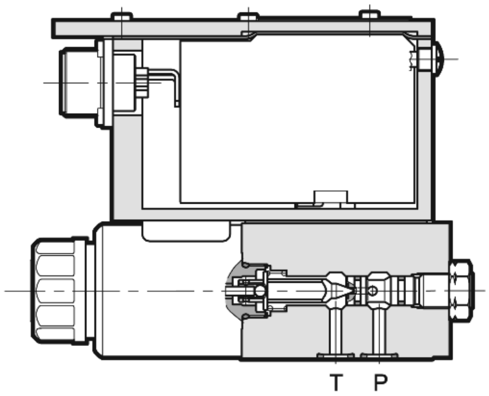
p max **350** bar
Q max **3** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The PRED3G valve is a direct operated pressure control valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.

— The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

— They are available in four pressure control ranges, up to 350 bar.

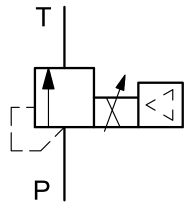
— Some parameters are customizable using the appropriate kit for start-up.

PERFORMANCES

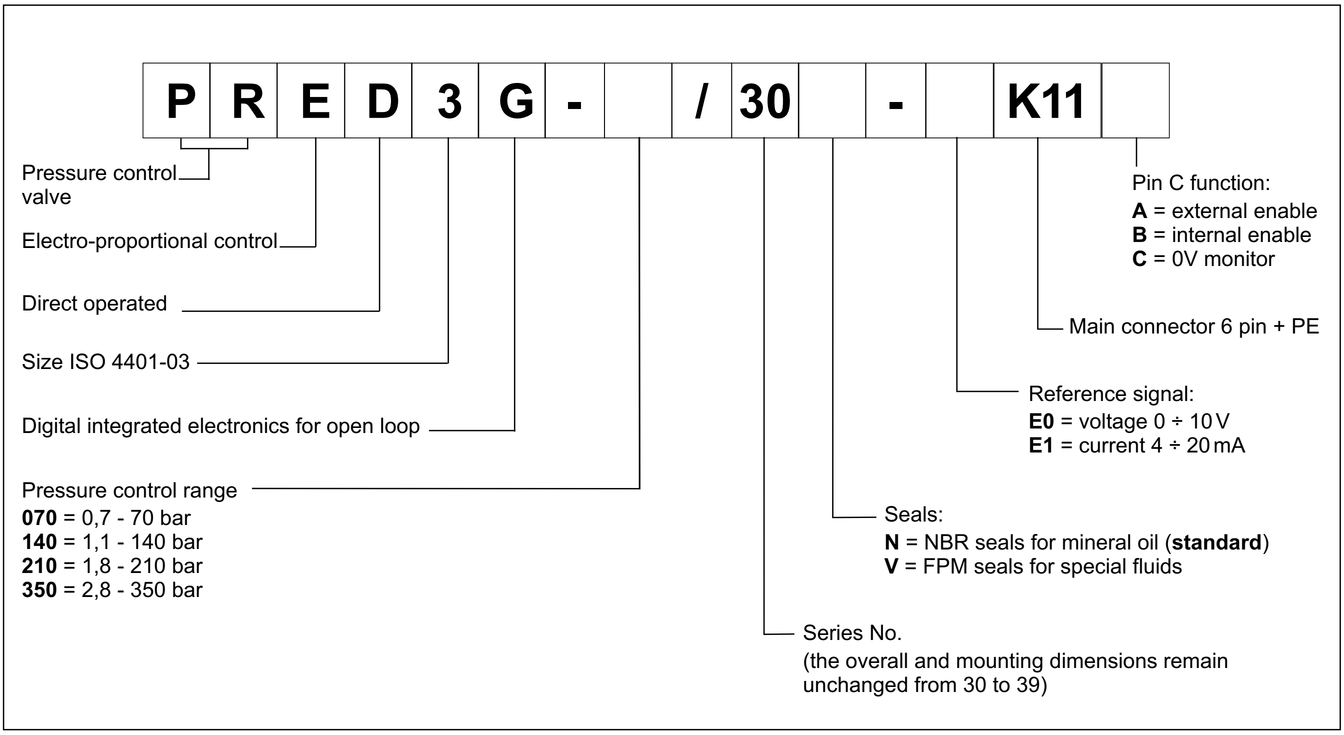
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	350 2
Nominal flow Maximum flow (see diagram p min = f(Q))	l/min	1 3
Step response	see paragraph 6	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



P R E D 3 G - ☐ / 30 ☐ - ☐ K11 ☐

Pressure control valve

Electro-proportional control

Direct operated

Size ISO 4401-03

Digital integrated electronics for open loop

Pressure control range
070 = 0,7 - 70 bar
140 = 1,1 - 140 bar
210 = 1,8 - 210 bar
350 = 2,8 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

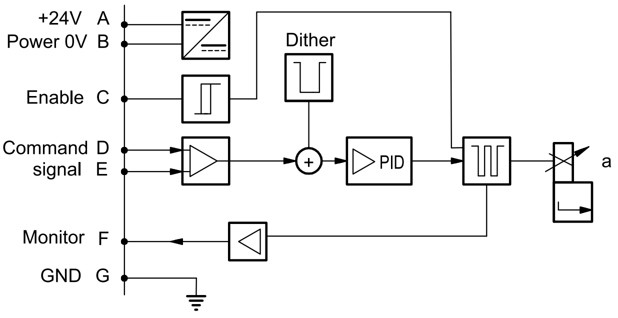
2 - ELECTRICAL CHARACTERISTICS

2.1 - Electrical on board electronics

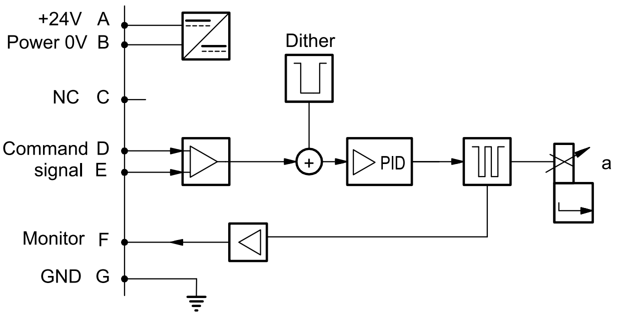
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

2.2 - On-board electronics diagrams

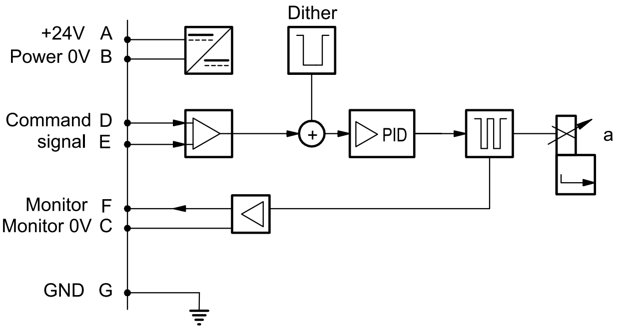
VERSION **A** - External Enable



VERSION **B** - Internal Enable

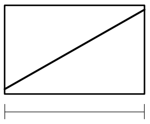


VERSION **C** - 0V Monitor

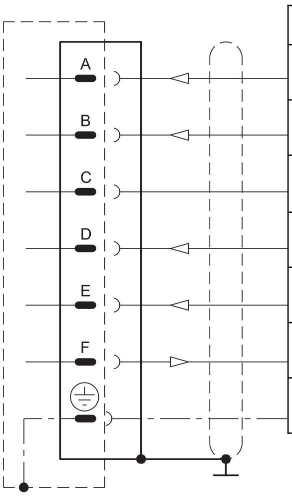


3 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0…10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**

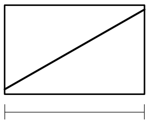


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

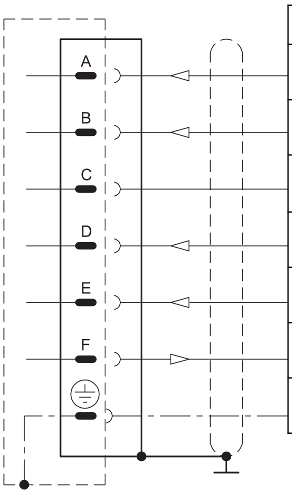
4 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

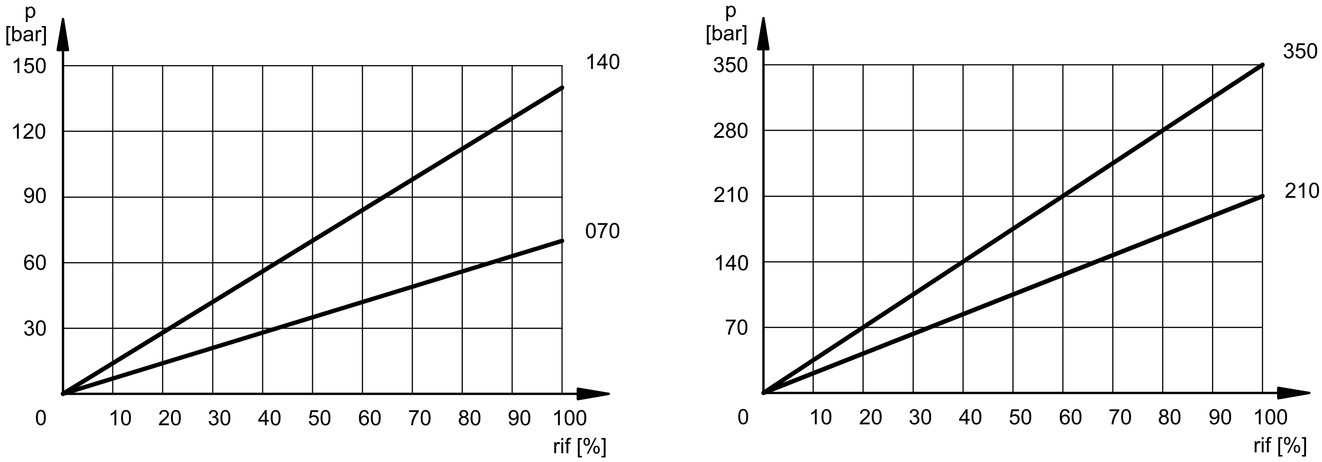
5 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

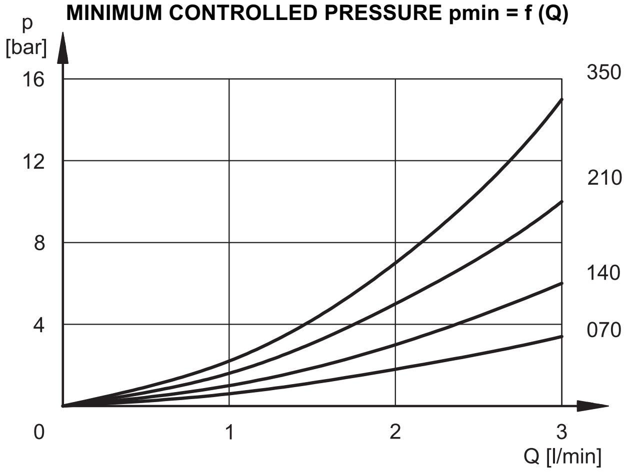
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q = 1 l/min. The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier, and they are measured without any backpressure in T.

The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably. See diagram pmax = f (Q).

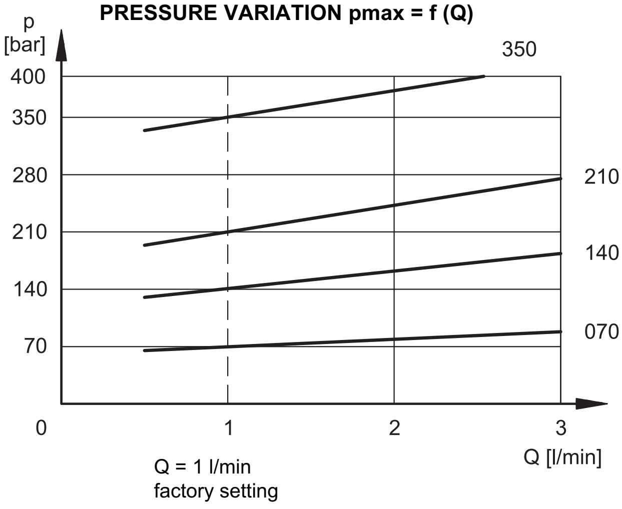
PRESSURE CONTROL p=f (I)



MINIMUM CONTROLLED PRESSURE pmin = f (Q)



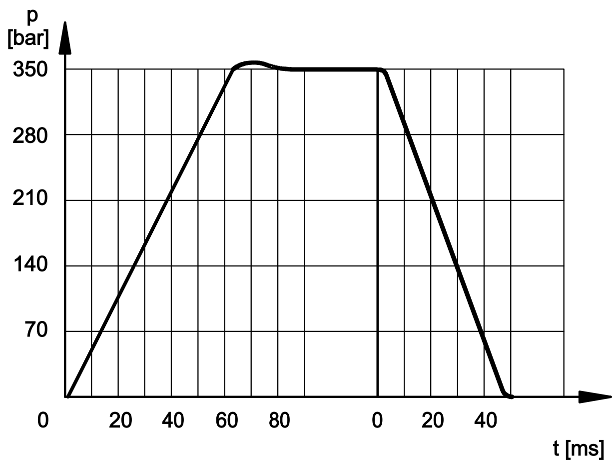
PRESSURE VARIATION pmax = f (Q)



6 - RESPONSE TIMES

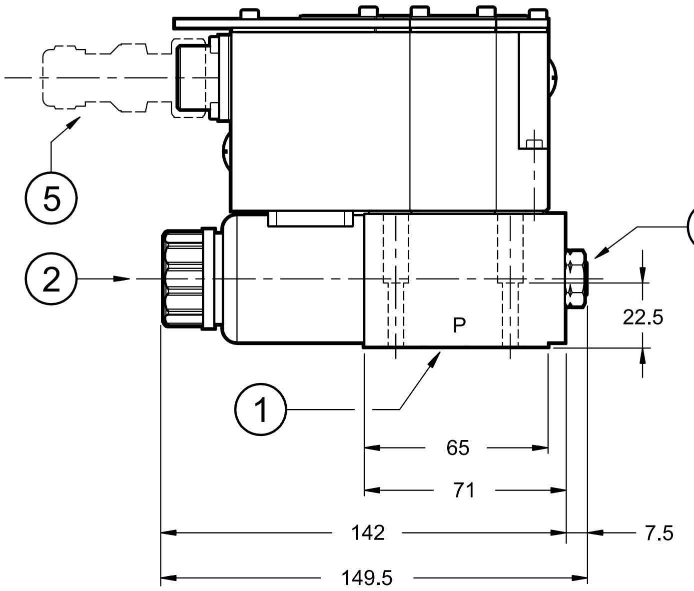
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

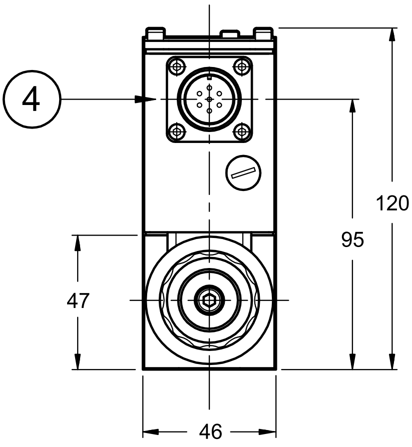
Response times are obtained by using valves with a full scale of 350 bar, with an input flow rate of 2 l/min and a pressure oil volume of 0,5 lt. The response time is affected both by the flow rate and the oil volume in the pipework.

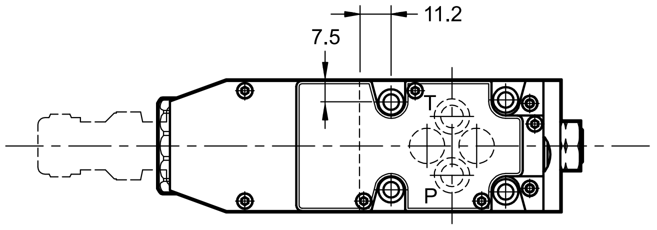


7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Breather: Allen key 4
3	Factory sealing setting (we recommend not unscrewing the nut)
4	Main connection
5	Mating electrical connector **to be ordered separately**. See at section 10

8 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

9 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 5.

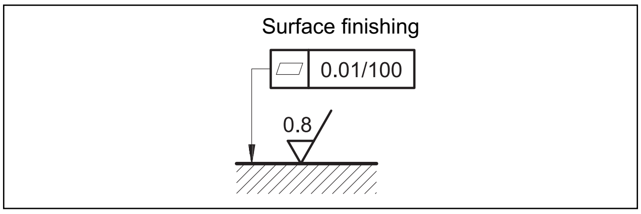
Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.


Surface finishing

10 - ACCESSORIES

(to be ordered separately)

10.1 Mating connector

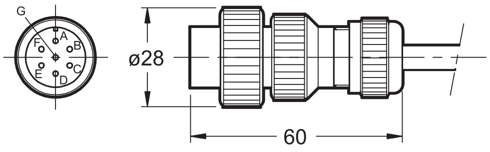
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



10.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

10.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

11 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRED3J

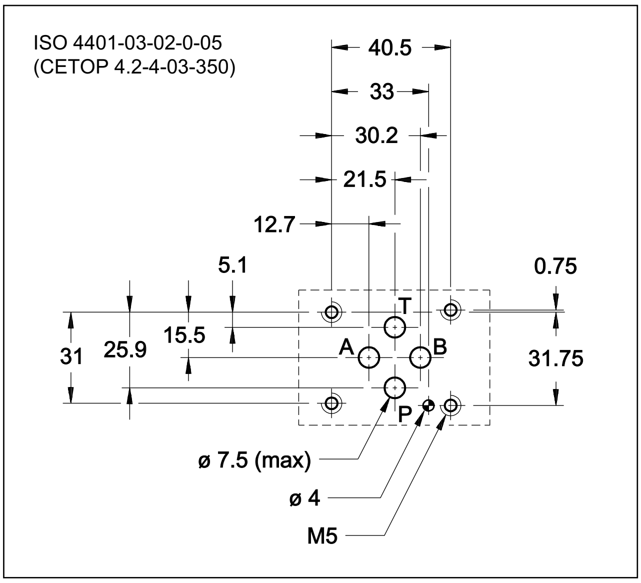
DIRECT OPERATED PRESSURE CONTROL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS IN CLOSED LOOP

SERIES 30

SUBPLATE MOUNTING
ISO 4401-03

p max **350** bar
Q max **3** l/min

MOUNTING INTERFACE

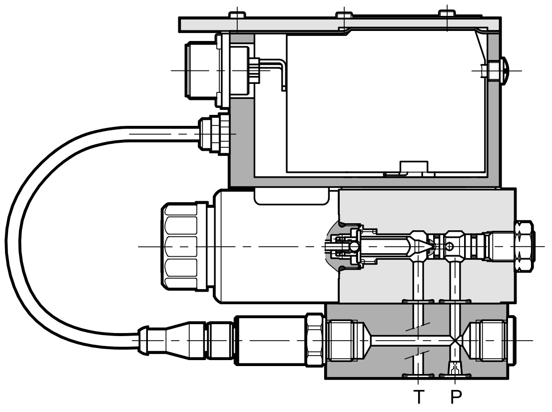


PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	350 2
Nominal flow Maximum flow (see p min= f(Q) diagram)	l/min	1 3
Step response	see paragraph 6	
Hysteresis	% of p nom	< 1%
Repeatability	% of p nom	< ±0,5%
Electrical characteristic	see paragraph 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2,5

OPERATING PRINCIPLE



— The PRED3J valve is a direct operated pressure control valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 standards.

— It is suitable to pilot two-stage valves, for pressure control in hydraulic circuits.

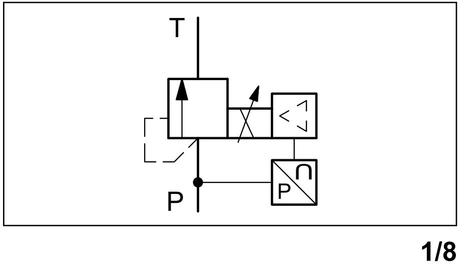
— The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.

— The monitoring of the value detected by the pressure transmitter is available on pin F.

— Some parameters are customizable using the appropriate kit for start-up.

— Three pressure adjustment ranges are available up to 350 bar .

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E	D	3	J	-		/	30		-		K11	

Pressure control valve

Electro-proportional control

Direct operated

Size ISO 4401-03

Digital integrated electronics for pressure control

Pressure control range
140 = 1,1 - 140 bar
210 = 1,8 - 210 bar
350 = 2,8 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

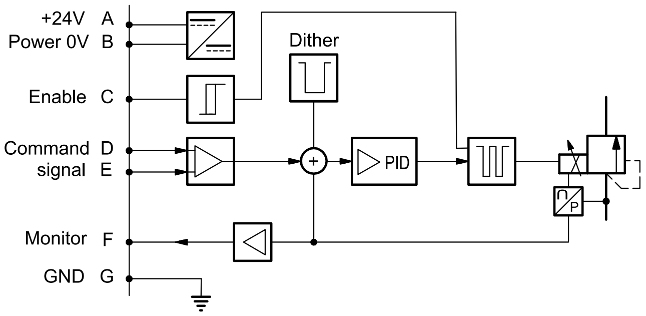
2 - ELECTRICAL CHARACTERISTICS

2.1 - Electrical on board electronics

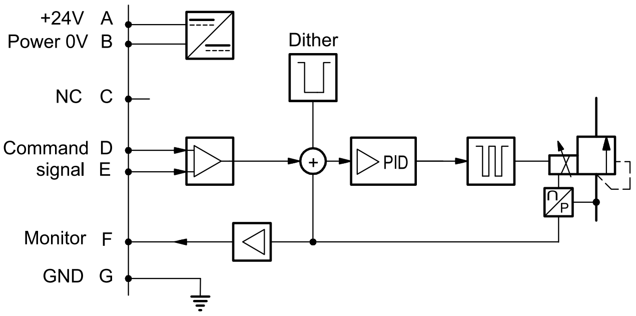
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

2.2 - On-board electronics diagrams

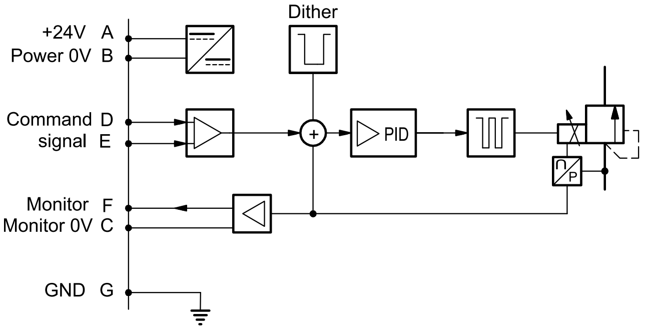
VERSION **A** - External Enable



VERSION **B** - Internal Enable

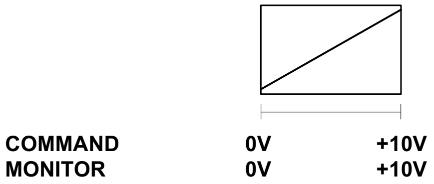


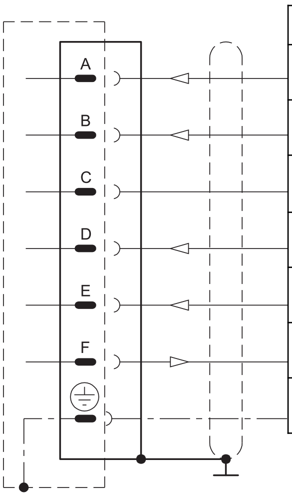
VERSION **C** - 0V Monitor



3 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0…10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



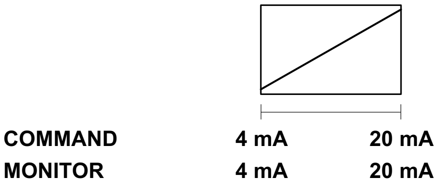


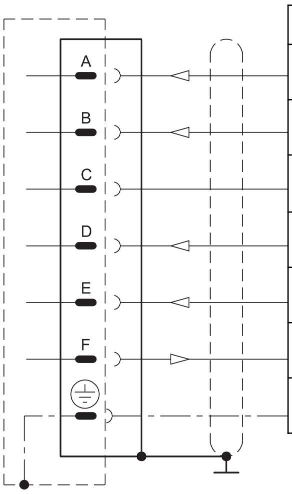
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





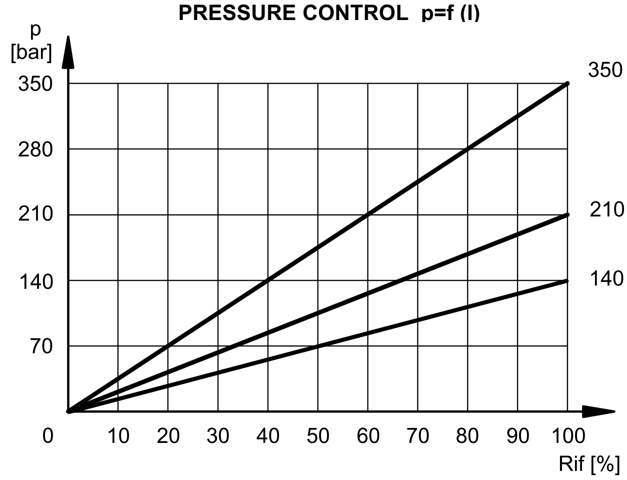
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

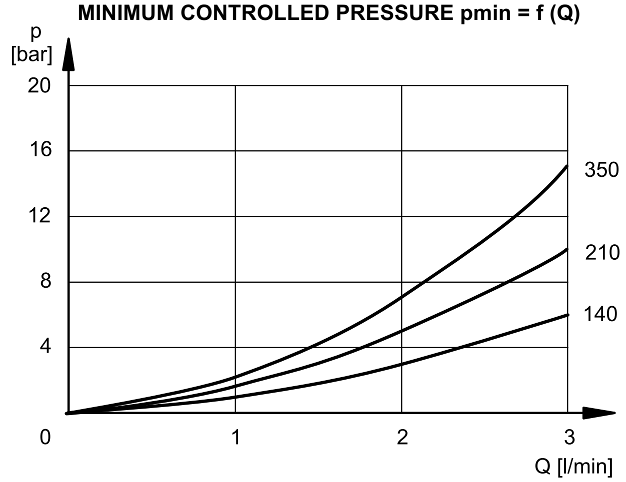
5 - CHARACTERISTIC CURVES

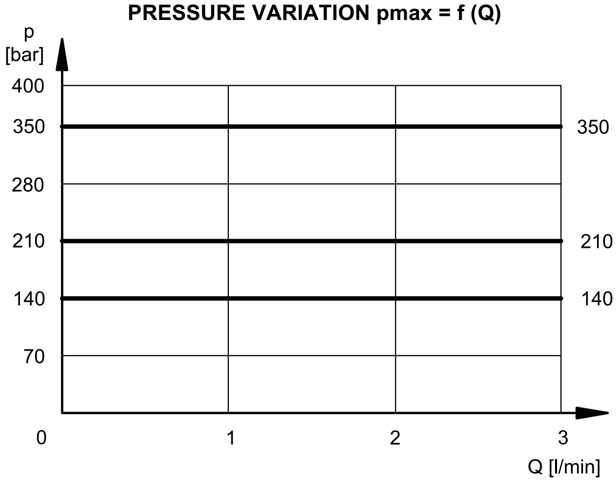
(measured with viscosity of 36 cSt at 50°C)

Typical control curves according to the current supplied to the solenoid for pressure control ranges: 140, 210 and 350, measured with input flow rate Q = 1 l/min.

The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier, and they are measured without any backpressure in T.



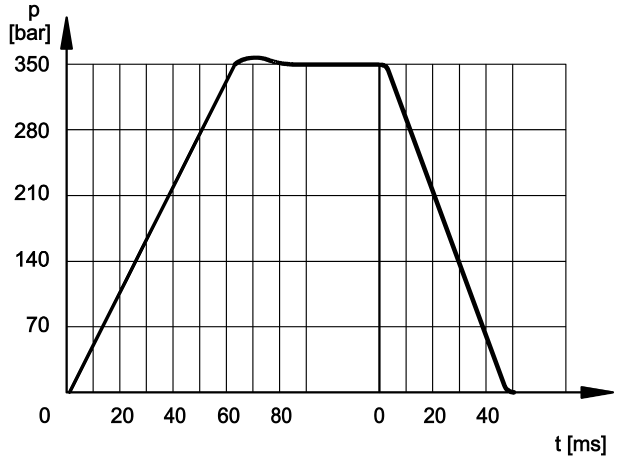




6 - STEP RESPONSE

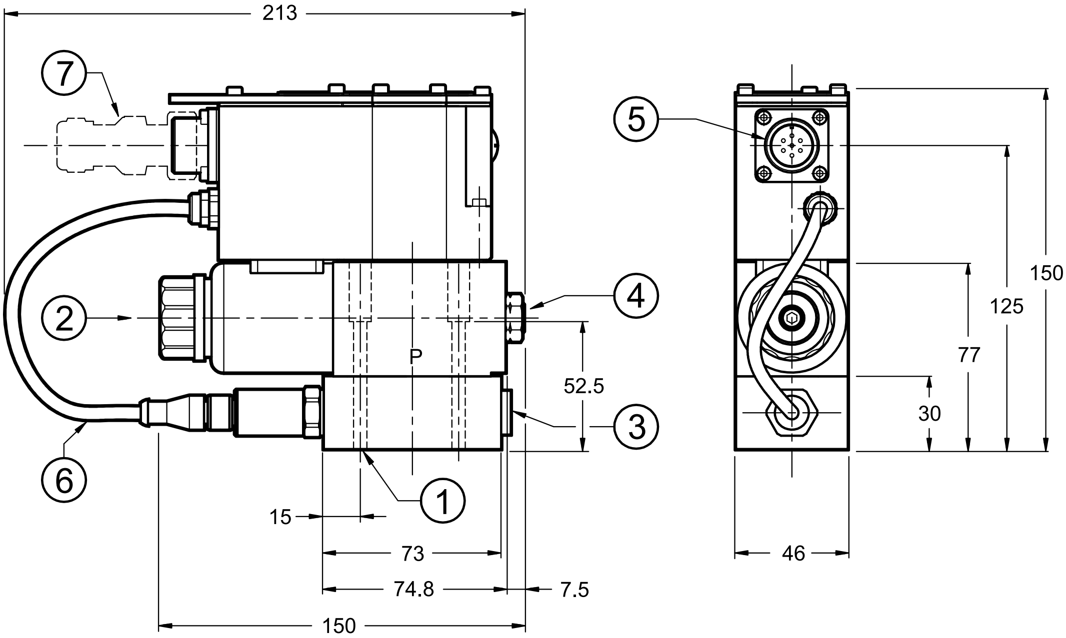
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

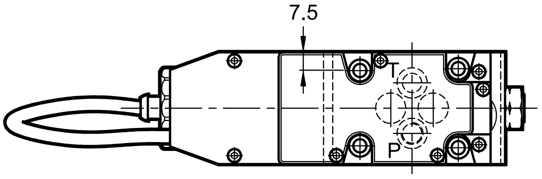
Response time obtained by using valves with con PRED3J-350, with an input flow rate of 2 l/min and a pressure oil volume of 0,5 lt. The response time is affected both by the flow rate and the oil volume in the pipework.



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





1	Mounting surface with sealing rings: 4 OR type 108 - 90 shore (8.73 x 1.78)
2	Breather: Allen key 4
3	Pressure gauge port 1/4” BSP
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Cable with connector for pressure transducer
7	Mating electrical connector **to be ordered separately.** See at section 10

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M5x60 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

8 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

9 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 5.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

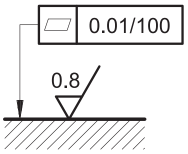
Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



10 - ACCESSORIES

(to be ordered separately)

10.1 Mating connector

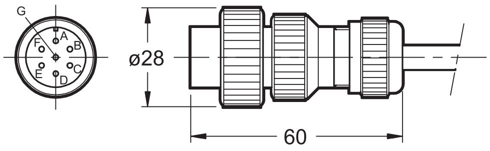
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



10.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

10.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

11 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

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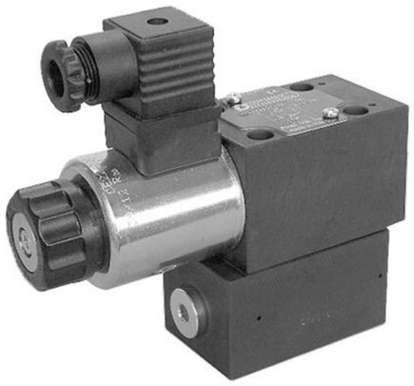
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

PRE3

PILOT OPERATED PRESSURE CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 12

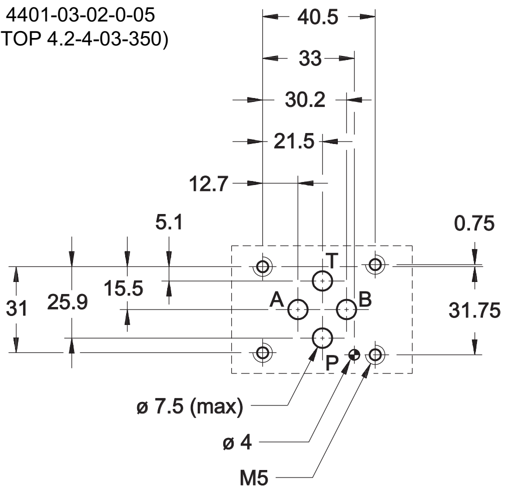


SUBPLATE MOUNTING
ISO 4401-03

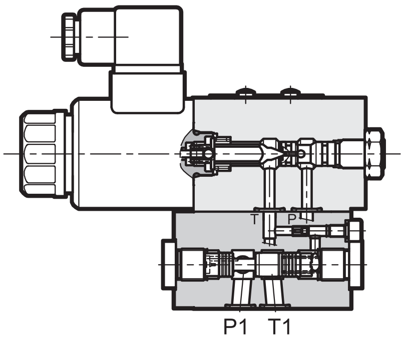
p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



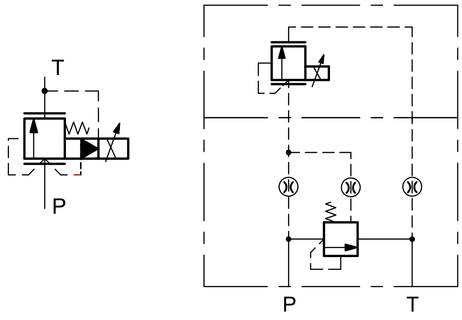
- The PRE3 is a pilot operated pressure control valve with electric proportional control and mounting interface in compliance with ISO 4401 standards.
- It is suitable to modulate the pressure in hydraulic circuits.
- The valve can be controlled directly by a current control supply unit or by an electronic control unit to exploit valve performance to the full (see at paragraph 8).
- Pressure adjustment can be continuous in proportion to the current supplied to the solenoid.
- Four pressure control ranges up to 350 bar are available.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure: - P port - T port	bar	350 2
Minimum controlled pressure	see p min = f(Q) diagram	
Minimum flow Maximum flow (see graph p max= f(Q))	l/min	2 40
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 5%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 4	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3,5

HYDRAULIC SYMBOL



simplified

detailed

1 - IDENTIFICATION CODE

P	R	E	3	-		/	12		-		K1

Pressure control valve

Electrical proportional control

Size ISO 4401-03

Pressure control range
070 = 7 - 70 bar **210** = 8 - 210 bar
140 = 7 - 140 bar **350** = 10 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

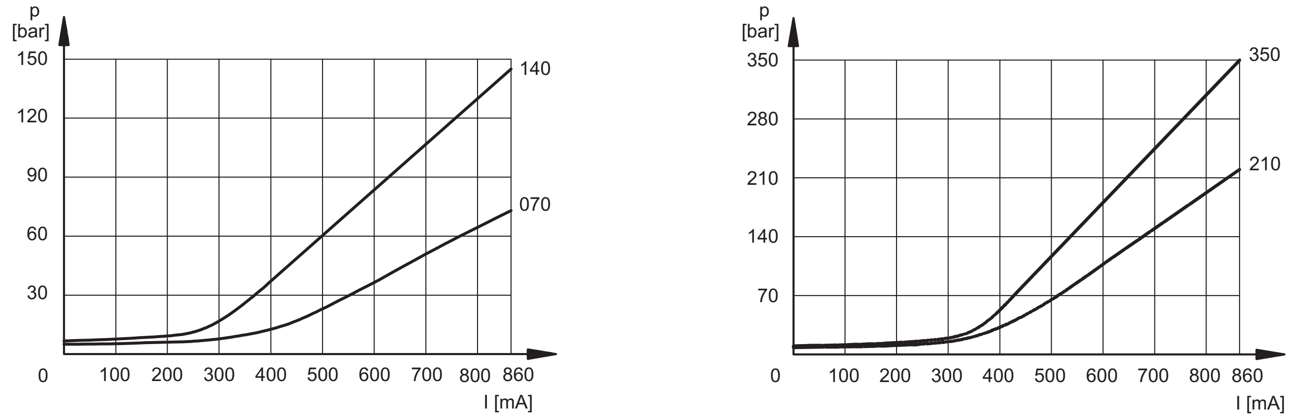
Coil electrical connection:
for connector type DIN 43650
(**standard**)

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

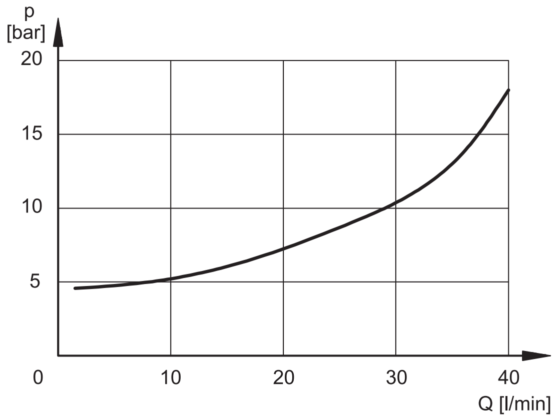
Typical control curves according to the current supplied to the solenoid (D24 version with maximum current 860 mA) for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q=10 l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T.
The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

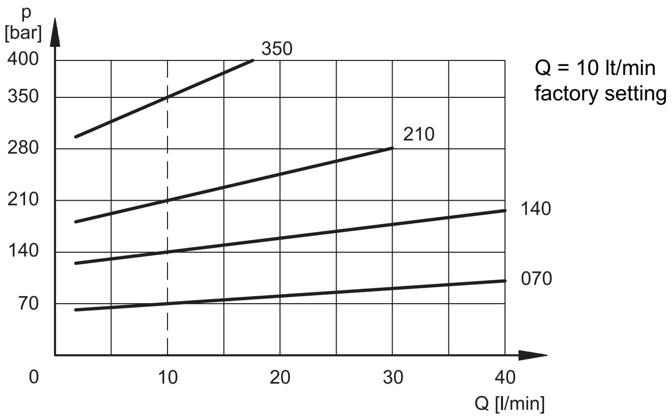
PRESSURE CONTROL p=f (I)



MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid
The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
PROTECTION FROM: Atmospheric agents (CEI EN 60529)	IP 65		
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	class H class F		

5 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a valve of pressure range up to 140 bar and with input flow rate Q = 10 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	80	40

6 - INSTALLATION

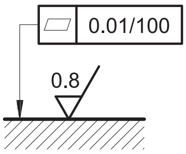
We recommend to install the PRE3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil (see par. 7). At the end of the operation, make sure of having screwed correctly the drain screw.

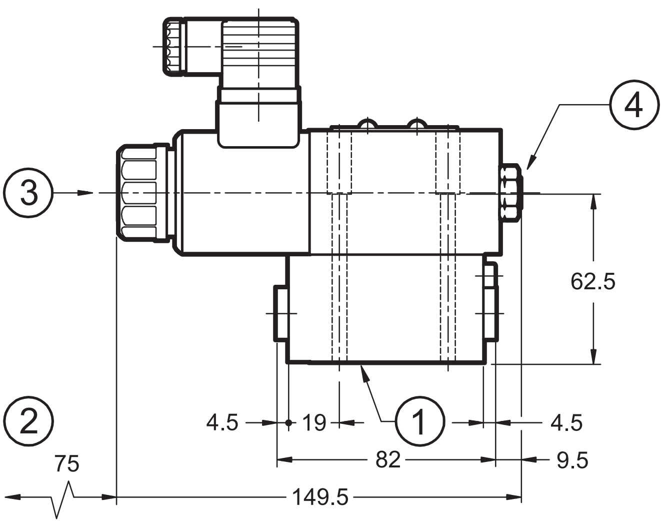
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

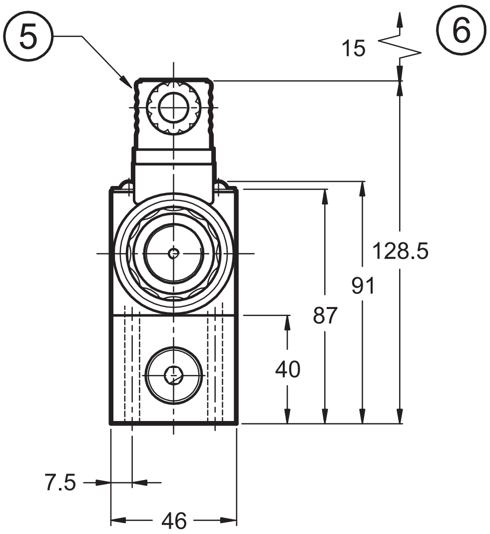
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

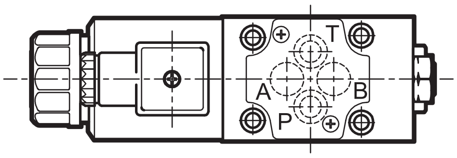
Surface finishing



7 - OVERALL AND MOUNTING DIMENSIONS







dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	Factory setting sealing (we recommend not unscrewing the nut)
5	DIN 43650 electric connector (included in the delivery)
6	Connector removal space

Fastenings bolts: 4 screws SHC M5x70 - ISO 4762
Tightening torque: 5 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

9 - SUBPLATES (see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8” BSP thread

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Fax +39 0331.895.339
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PRE3G

PILOT OPERATED PRESSURE CONTROL VALVE WITH PROPORTIONAL CONTROL AND INTEGRAL ELECTRONICS

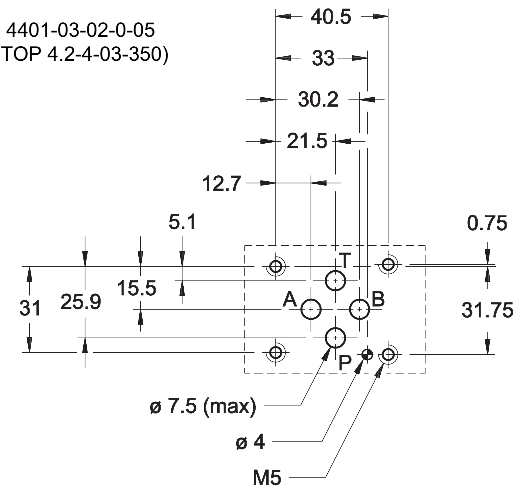
SERIES 30

SUBPLATE MOUNTING
ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)

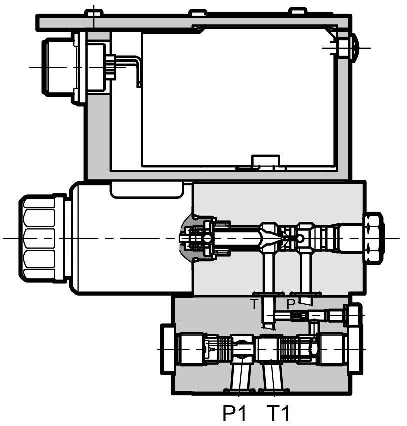


PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	350 2
Minimum controlled pressure	see p min= f(Q) diagram	
Minimum flow Maximum flow (see p max = f(Q) diagram)	l/min	2 40
Step response	see paragraph 6	
Hysteresis	% of p nom	< 3%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	3,8

OPERATING PRINCIPLE



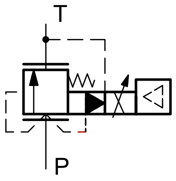
— The PRE3G valve is a pilot operated pressure control valve with electric proportional control and mounting surface in compliance with ISO 4401 standards, controlled by an integral digital amplifier.

— It is suitable to modulate the pressure in hydraulic circuits.

— The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C. A solenoid current monitoring signal is available.

— Valves are easy to install. The driver directly manages digital settings.

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P R E 3 G - ☐ / 30 ☐ - ☐ K11 ☐

Pressure control valve

Electrical proportional control

Size ISO 4401-03 (CETOP 03)

Digital integrated electronics for open loop

Pressure control range
070 = 7 - 70 bar
140 = 7 - 140 bar
210 = 8 - 210 bar
350 = 10 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

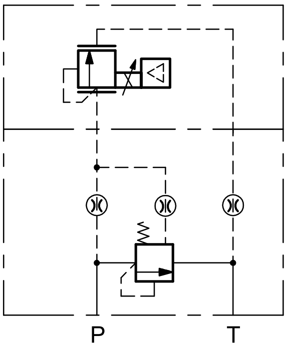
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - DETAILED SYMBOL



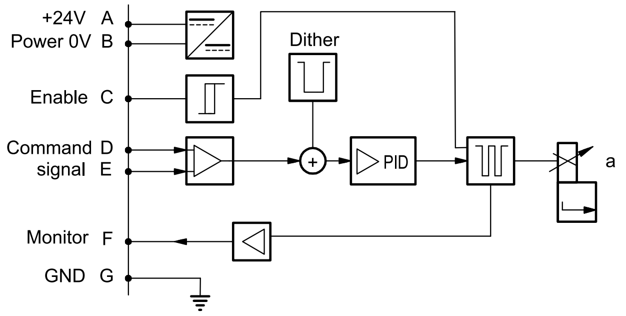
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

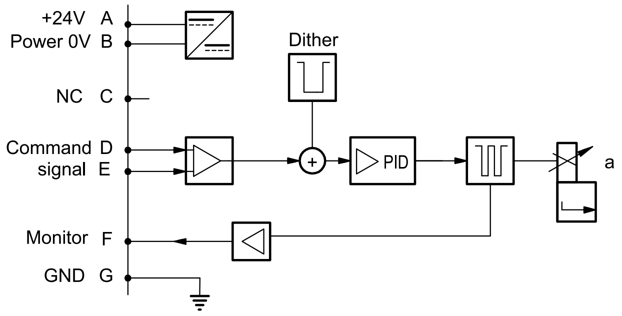
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

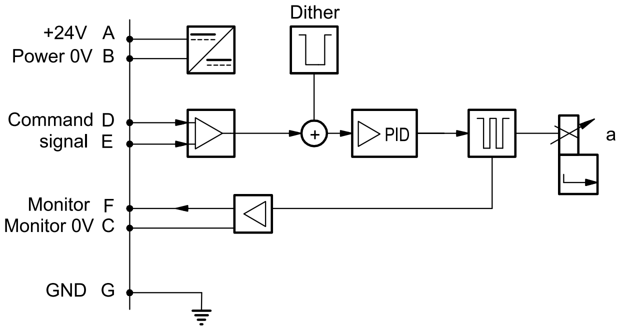
VERSION **A** - External Enable



VERSION **B** - Internal Enable

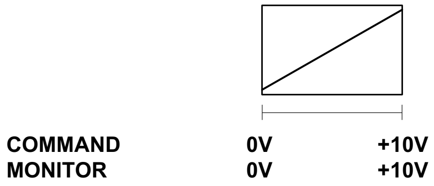


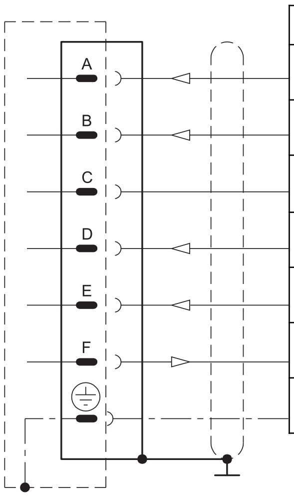
VERSION **C** - 0V Monitor



4 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



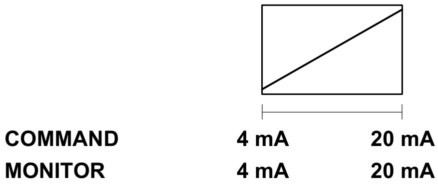


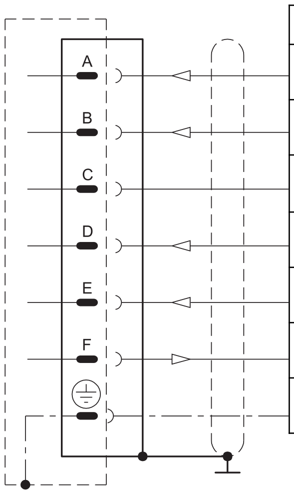
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

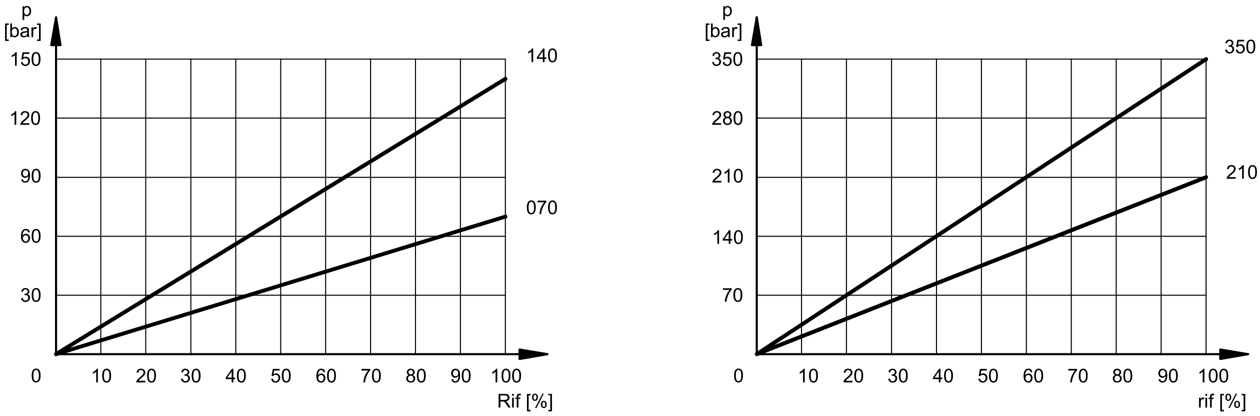
6 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

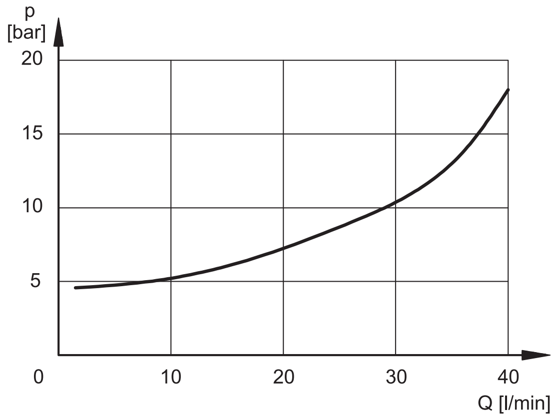
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q = 10 l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 10 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

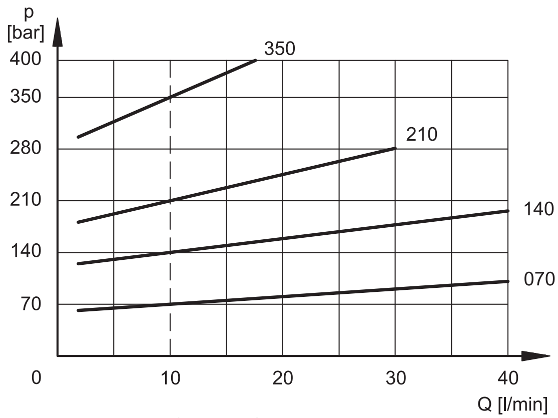
PRESSURE CONTROL p = f (I)



MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE VARIATION pmax = f (Q)

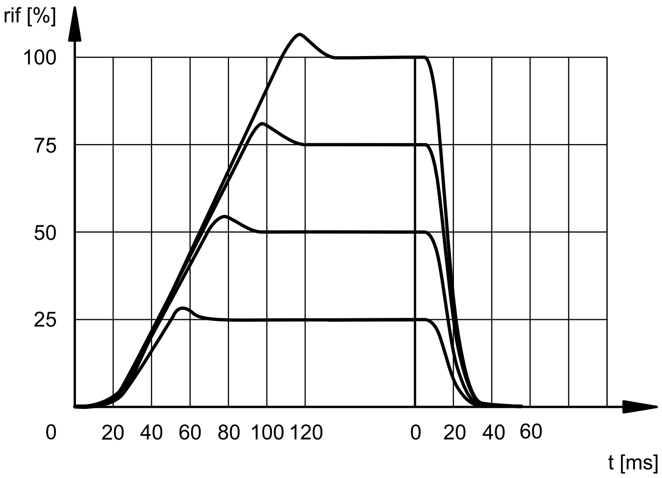


Q = 10 lt/min
factory setting

7 - RESPONSE TIMES

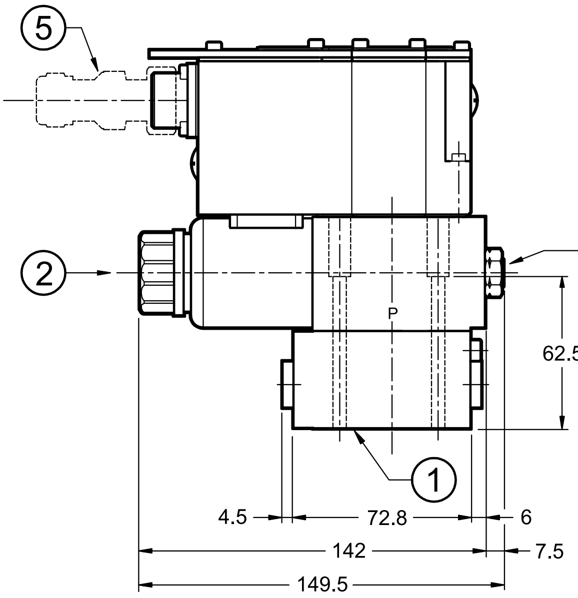
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

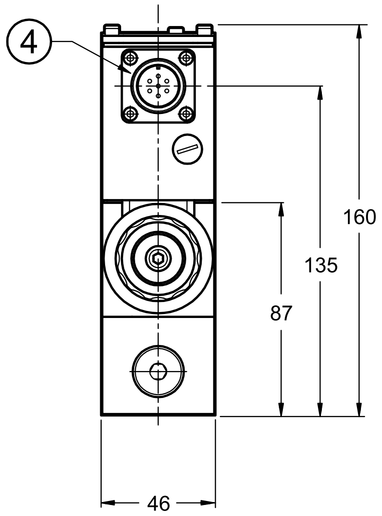
Response times are obtained by using a PRE3G-210, with an input flow rate of 10 l/min and a pressure oil volume of 0,5 litres. The response time is affected both by the flow rate and the oil volume in the pipework.

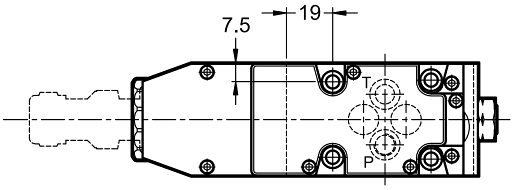


8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







Fastenings bolts: 4 SHC screws M5x70 - ISO 4762
Tightening torque: 5 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Breather: Allen key 4
3	Factory sealing setting (we recommend not unscrewing the nut)
4	Main connection
5	Mating electrical connector **to be ordered separately**. See at section 10

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 6.

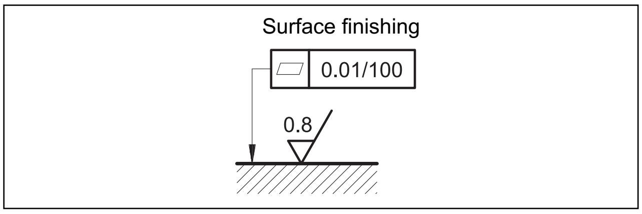
Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



11 - ACCESSORIES

(to be ordered separately)

11.1 Mating connector

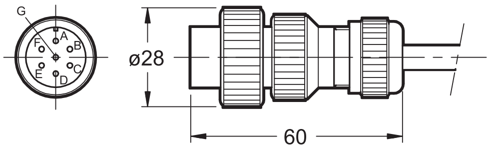
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



11.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

11.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

12 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A, B: 3/8” BSP thread

DUPLOMATIC OLEODINAMICA

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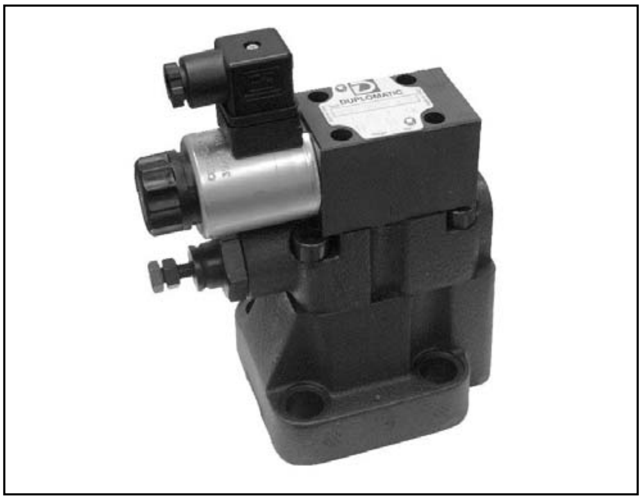


PRE*

PILOT OPERATED PRESSURE RELIEF VALVES WITH PROPORTIONAL CONTROL

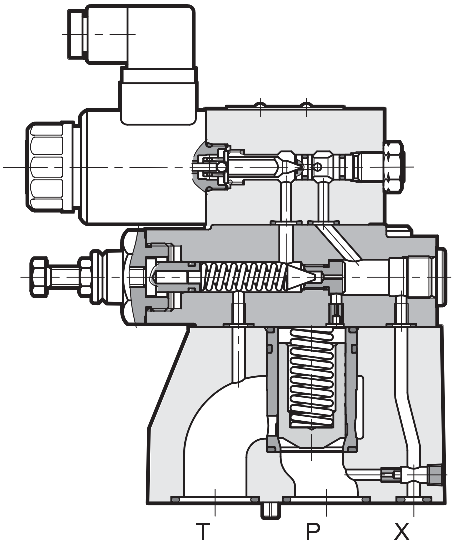
SERIES 10

SUBPLATE MOUNTING

p max **350** bar

Q max (see table of performances)

OPERATING PRINCIPLE



— PRE* valves are pilot operated pressure relief valves with electric proportional control and mounting interface in compliance with ISO 6264 standards (CETOP RP 121H).

— These valves are normally used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.

— The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.

— Pressure can be modulated continuously in proportion to the current supplied to the solenoid.

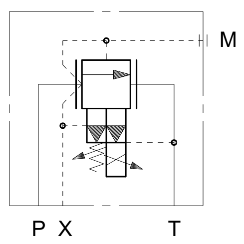
— These valves can be controlled directly by a current control supply unit or by means of the relevant electronic control units to exploit valve performance to the full (see par. 10).

— They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.

— They are available in three sizes for flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)		**PRE10**	**PRE25**	**PRE32**
Maximum operating pressure:	bar	350		
Minimum controlled pressure		see Δp-Q diagram		
Maximum flow	l/min	200	400	500
Step response		see paragraph 5		
Hysteresis	% of p nom	< 5%		
Repeatability	% of p nom	< ±1,5%		
Electrical characteristic		see paragraph 7		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass:	kg	5	5,8	8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E		-		/	10		-		K1

Pilot operated pressure relief valve

Electric proportional control

Size:
10 = ISO 6264-06 (CETOP R06)
25 = ISO 6264-08 (CETOP R08)
32 = ISO 6264-10 (CETOP R10)

Pressure control range:
070 = up to 70 bar
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

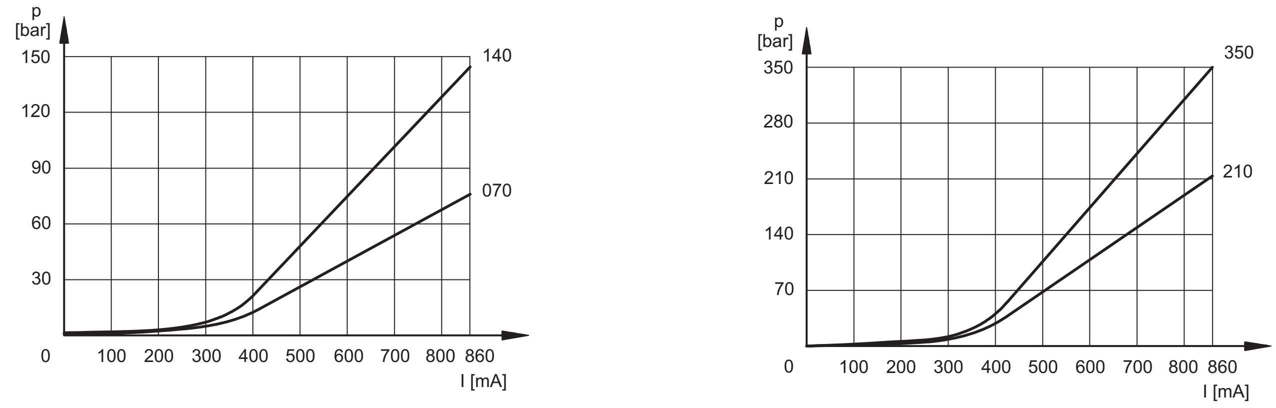
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

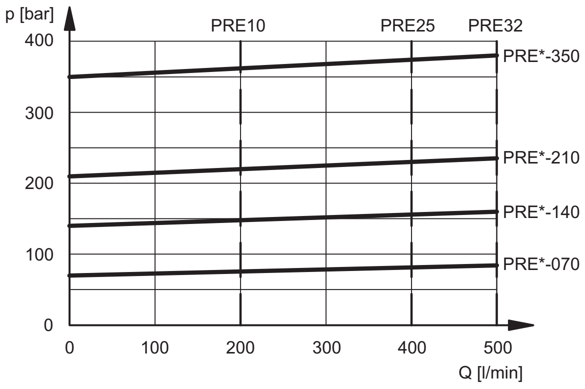
Coil electrical connection: plug for connector type DIN 43650 (**standard**)

2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

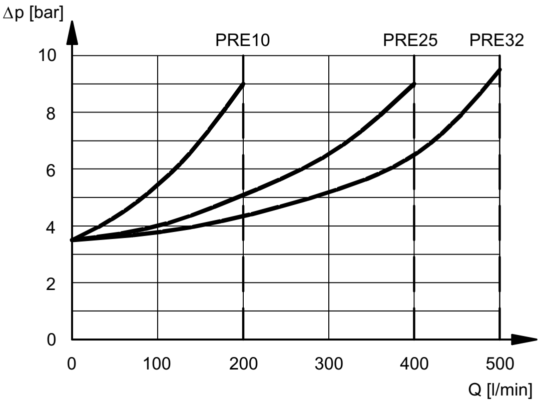
PRESSURE CONTROL p=f (I)



PRESSURE CONTROL p=f (Q)



PRESSURE DROP Δp = f(Q)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: atmospheric agents (CEI EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

5 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with input flow rate of Q = 50 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	120	90

6 - INSTALLATION

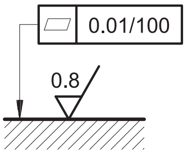
We recommend to install the PRE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube (see par. 4 - 5 - 6). At the end of the operation, make sure of having correctly screwed the drain screw.

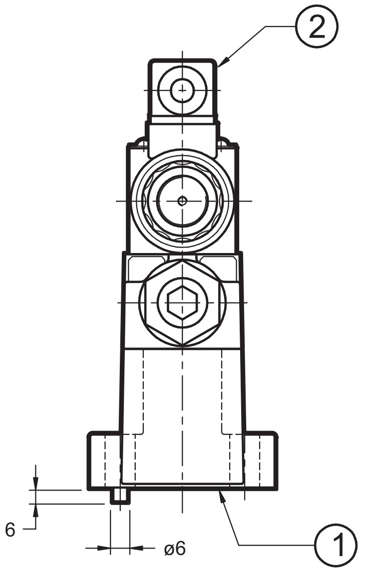
Connect the T port on the valve directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

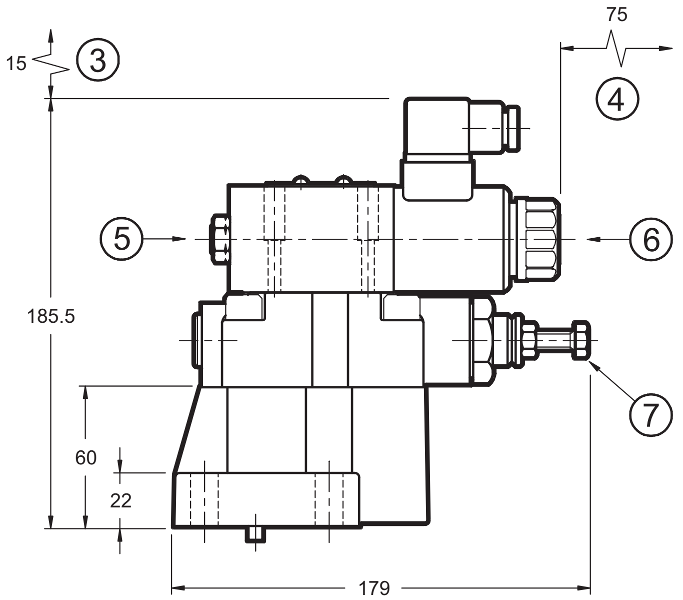
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

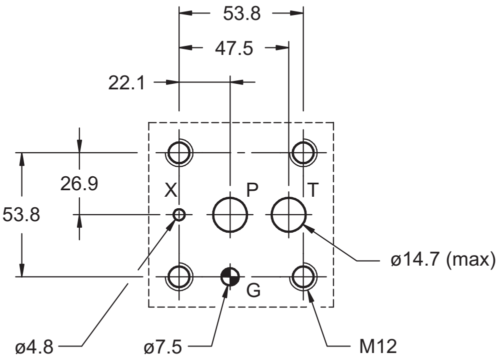
Surface finishing

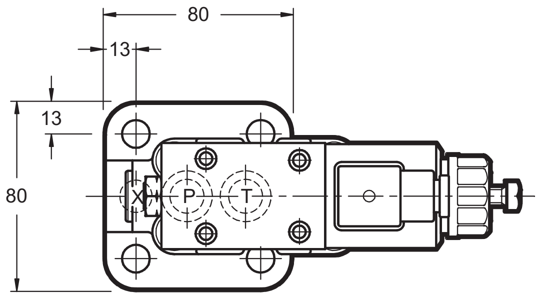


7 - PRE10 OVERALL AND MOUNTING DIMENSIONS









Mounting interface: ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

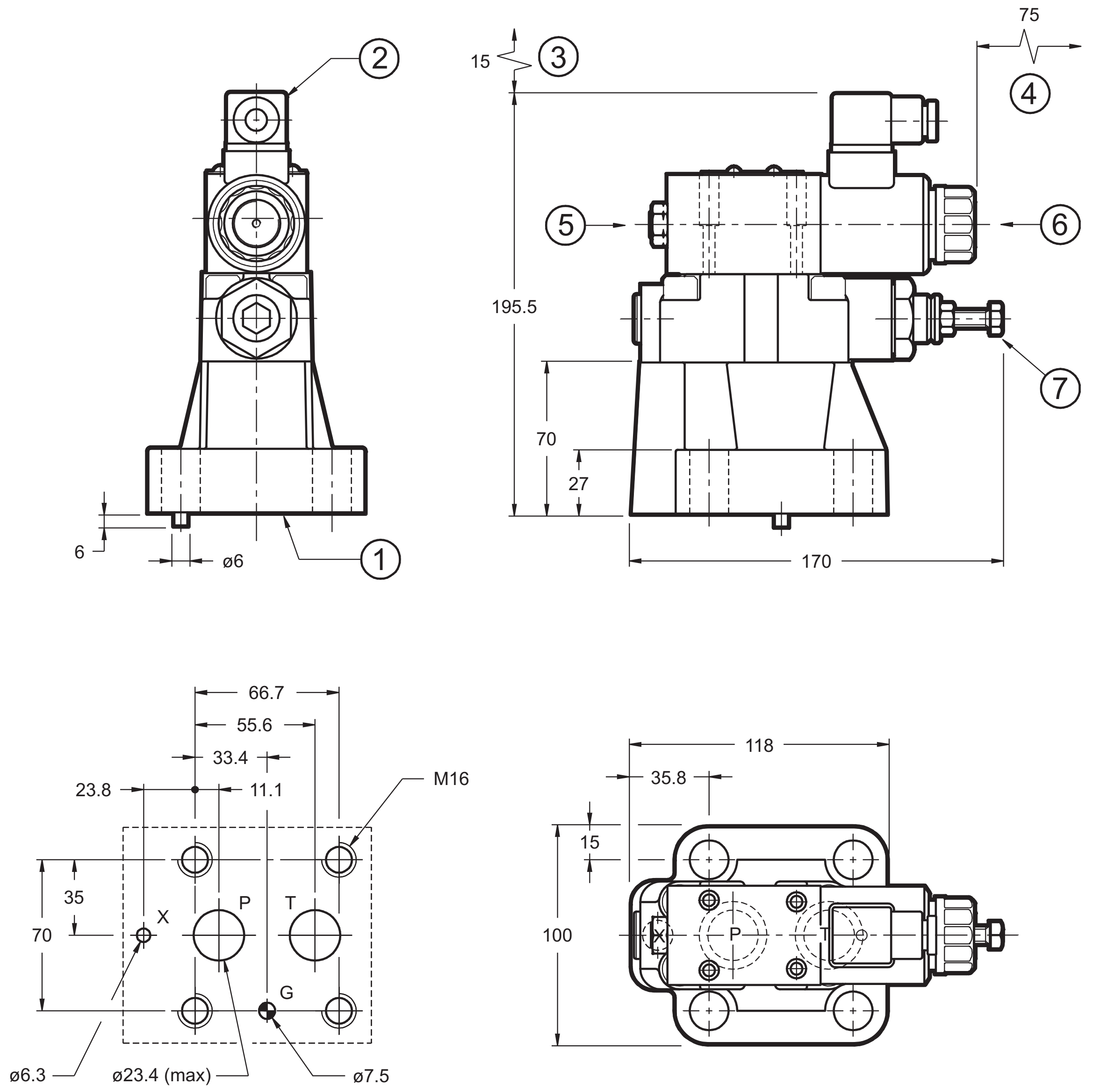
dimensions in mm

1	Mounting surface with sealing rings: n° 2 OR type 123 - 90 shore (17.86 x 2.62) n° 1 OR type 109 - 90 shore (9.13 x 2.62)
2	DIN 43650 electric connector
3	Connector removal space
4	Coil removal space
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Breather (male hexagonal spanner 4)
7	Pressure relief valve (factory set)

Fastening bolts: 4 bolts M12x40 - ISO 4762
Torque: 69 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (6) placed at the end of the solenoid tube.

8 - PRE25 OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

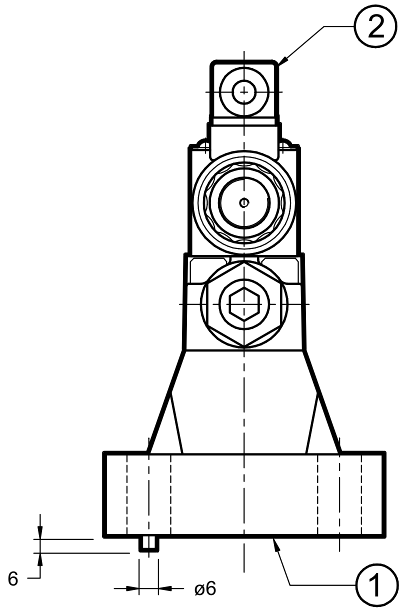
Mounting interface: ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

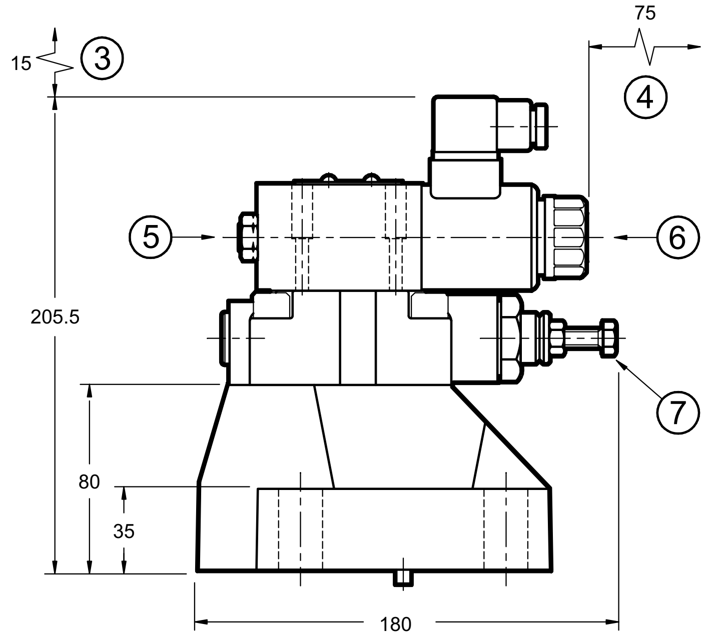
Fastening bolts: 4 bolts M16x50 - ISO 4762
Torque: 170 Nm

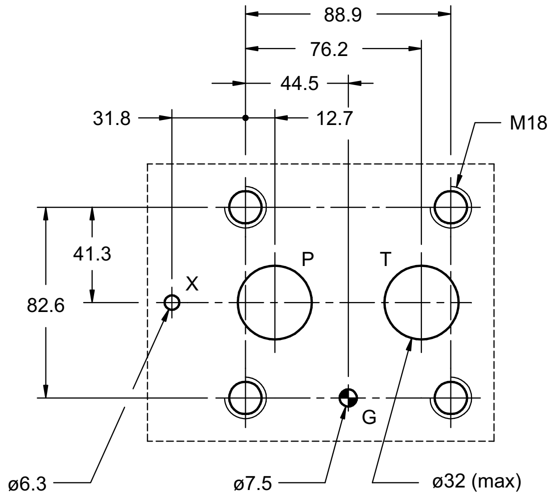
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (6)placed at the end of the solenoid tube.

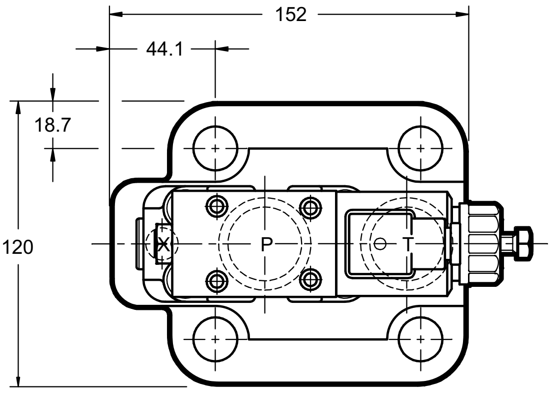
1	Mounting surface with sealing rings: 2 OR type 3118 - 90 shore (29.82 x 2.62) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	DIN 43650 electric connector
3	Connector removal space
4	Coil removal space
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Breather (male hexagonal spanner 4)
7	Pressure relief valve (factory set)

9 - PRE32 OVERALL AND MOUNTING DIMENSIONS









dimensions in mm

Mounting interface: ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)

Fastening bolts: N. 4 bolts M18x60 - ISO 4762
Torque: 235 Nm

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (6) placed at the end of the solenoid tube.

1	Mounting surface with sealing rings: 2 OR type 4137 - 90 shore (34.52 x 3.53) 1 OR type 109 - 90 shore (9.13 x 2.62)
2	DIN 43650 electric connector
3	Connector removal space
4	Coil removal space
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Breather (male hexagonal spanner 4)
7	Pressure relief valve (factory set)

10 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

11 - SUBPLATES (see cat. 51 000)

	PRE10	**PRE25**	**PRE32**
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, T ports dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP

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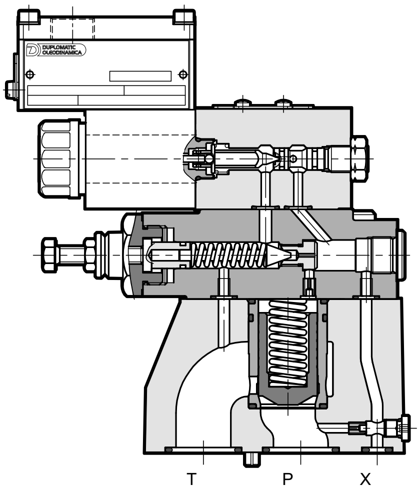
PRE(D)*K*

EXPLOSION-PROOF PROPORTIONAL PRESSURE RELIEF VALVE, PILOT OPERATED ATEX, IECEx, INMETRO

SERIES 10

PRED3K*	**ISO 4401-03**
PRE3K*	**ISO 4401-03**
PRE10K*	**ISO 6264-06**
PRE25K*	**ISO 6264-08**
PRE32K*	**ISO 6264-10**

OPERATING PRINCIPLE



— PRED3K* and PRE*K* are explosion-proof pressure relief valves with proportional control.

— They are compliant with ATEX, IECEx and INMETRO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

— The valves can be controlled directly by a current power supply or by means of an electronic control unit, to exploit valve performance to the full (see par. 19).

— Upon request, these valves can be supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours.

— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

			PRED3K*	PRE3K*	PRE10K*	PRE25K*	PRE32K*
Maximum operating pressure	- P port - T port	bar	350 2				
Minimum flow Nominal flow Maximum flow		l/min	- 1 3	2 10 40	- - 200	- - 400	- - 500
Step response			see paragraph 8				
Hysteresis		% of p nom	< 5%				
Repeatability		% of p nom	< ±1,5%				
Electrical characteristic			see paragraph 9				
Operating temperatures (ambient and fluid)			see data sheet 02 500				
Fluid viscosity range		cSt	10 ÷ 400				
Fluid contamination degree			According to ISO 4406:1999 class 18/16/13				
Recommended viscosity		cSt	25				
Mass		kg	1,8	3,8	5,3	6,1	8,3

1 - IDENTIFICATION CODE OF DIRECT OPERATED PROPORTIONAL VALVE PRED3K*

P	R	E	D	3		-		/	10		-		K9			

Pressure control valve

Electrical proportional control

Direct operated

Size ISO 4401-03

Explosion-proof certification:
See table 1.1

Pressure control range
070 = 0,7 - 70 bar
140 = 1,1 - 140 bar
210 = 1,8 - 210 bar
350 = 2,8 - 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Option:
surface treatment not standard.
Omit if not required
(see **NOTE**)

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
S03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Coil electrical connection:
by terminal block

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

NOTE: the valves are supplied with standard surface treatment of phosphating black.

Upon request we can supply these valves with full zinc-nickel surface treatment, suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

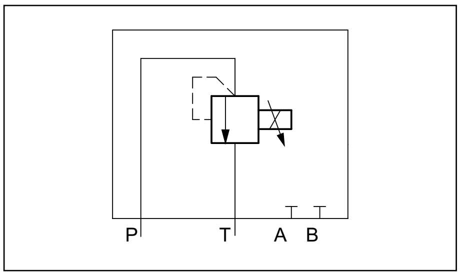
For full zinc-nickel surface treatment add **/W7** at the end of the identification code.

1.1 - Names of valves per certification

	ATEX		IECEx		INMETRO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - HYDRAULIC SYMBOL



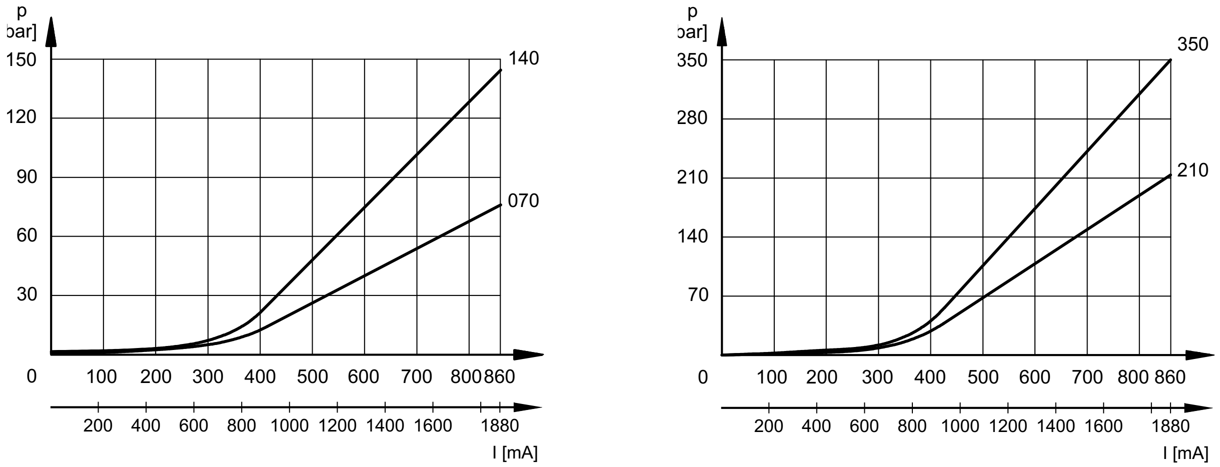
3 - CHARACTERISTIC CURVES FOR DIRECT OPERATED PROPORTIONAL VALVE PRED3K*

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

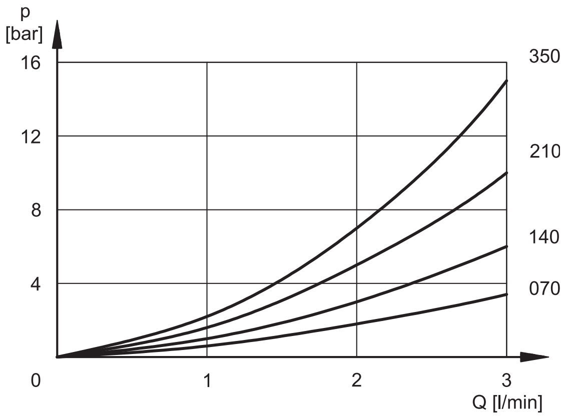
Typical control curves according to the current supplied to the solenoid for pressure control ranges: 070, 140, 210, 350, measured with input flow rate Q =1 l/min.

The curves are obtained without any hysteresis and linearity compensation and they are measured without any backpressure in T. The full scale pressure is set in factory with a flow rate of 1 l/min. In case of higher flow rate, the full scale pressure will increase considerably (see diagram pmax = f (Q)).

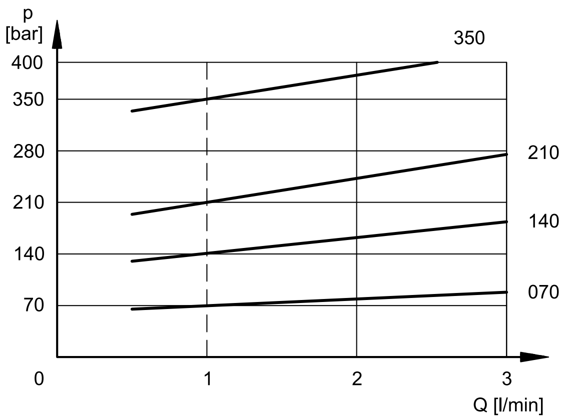
PRESSURE CONTROL p = f(I)



MINIMUM CONTROLLED PRESSURE p min = f (Q)



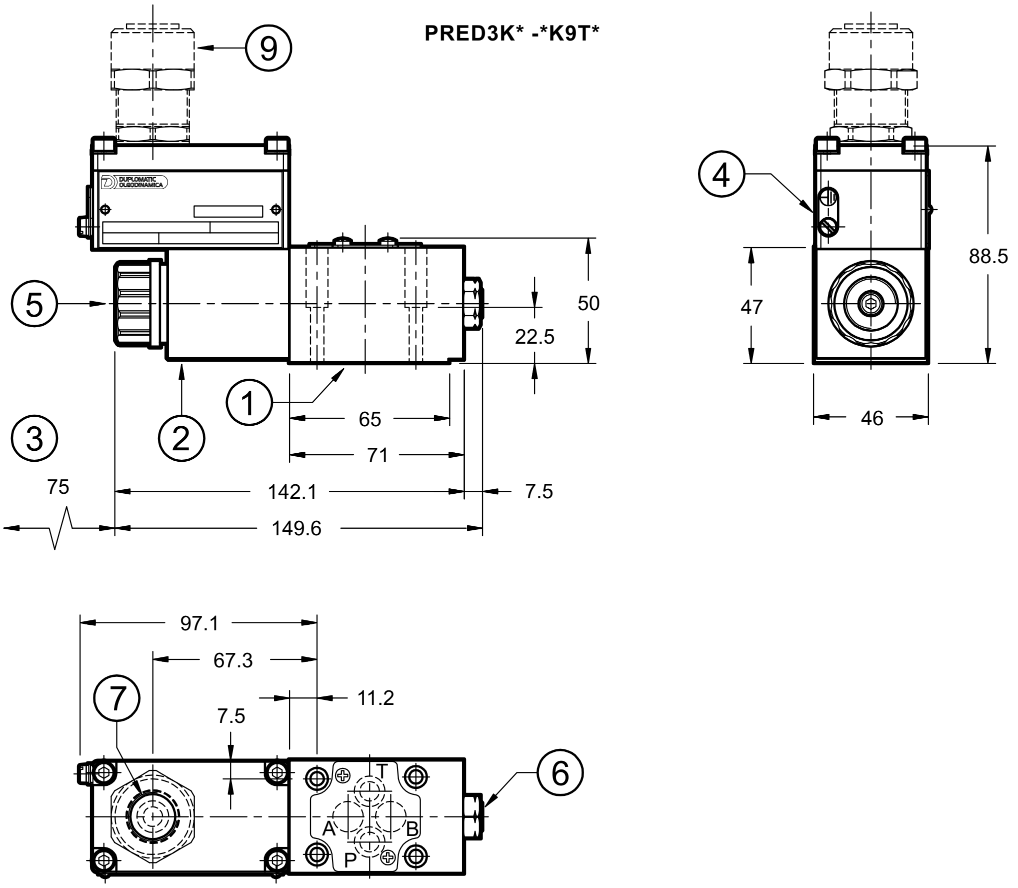
PRESSURE VARIATION p max = f (Q)



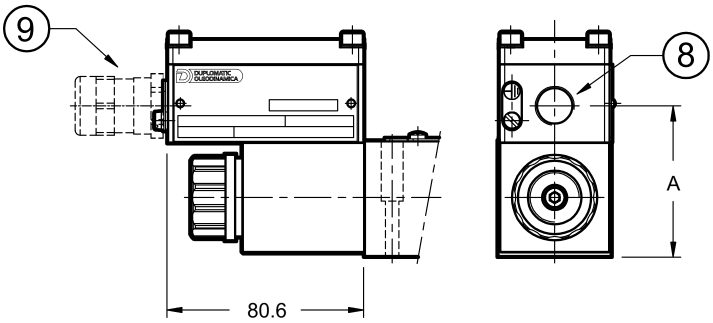
4 - PRED3K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRED3K* -*K9T*



PRED3K* -*K9S*



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Terminal for supplementary GND connection
5	Breather (Allen key 4)
6	Factory setting sealing (we recommend not unscrewing the nut)
7	Upper port for cable gland
8	Side port for cable gland
9	Cable gland To be ordered separately, see par.18

Side port type	**A**
S01, S04	60.5
S02, S03	60

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

Fastening of single valve: 4 SHC screws M5x30 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

5 - IDENTIFICATION CODE OF PILOT OPERATED PROPORTIONAL VALVES PRE*K*

P	R	E			-		/	10		-		K9			

Pilot operated pressure relief valve

Electric proportional control

Size: **3** = ISO 4401-03
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Explosion-proof certification:
See table 1.1

Pressure control range:

PRE3K*:	PRE10K*, PRE25K* and PRE32K*
070 = 3.5 - 70 bar	**070** = up to 70 bar
140 = 4 - 140 bar	**140** = up to 140 bar
210 = 4 - 210 bar	**210** = up to 210 bar
350 = 5 - 350 bar	**350** = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Option:
surface treatment not standard.
Omit if not required
(see **NOTE**)

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
S03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Coil electrical connection: by terminal block

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

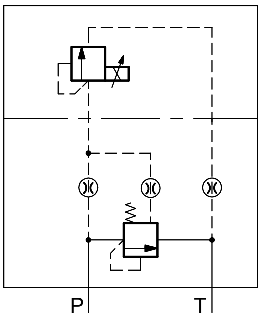
NOTE: the valves are supplied with standard surface treatment of phosphating black.

Upon request we can supply these valves with full zinc-nickel surface treatment, suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

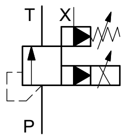
For full zinc-nickel surface treatment add **/W7** at the end of the identification code.

6 - HYDRAULIC SYMBOLS

PRE3K*



PRE10K*, PRE25K* and PRE32K*

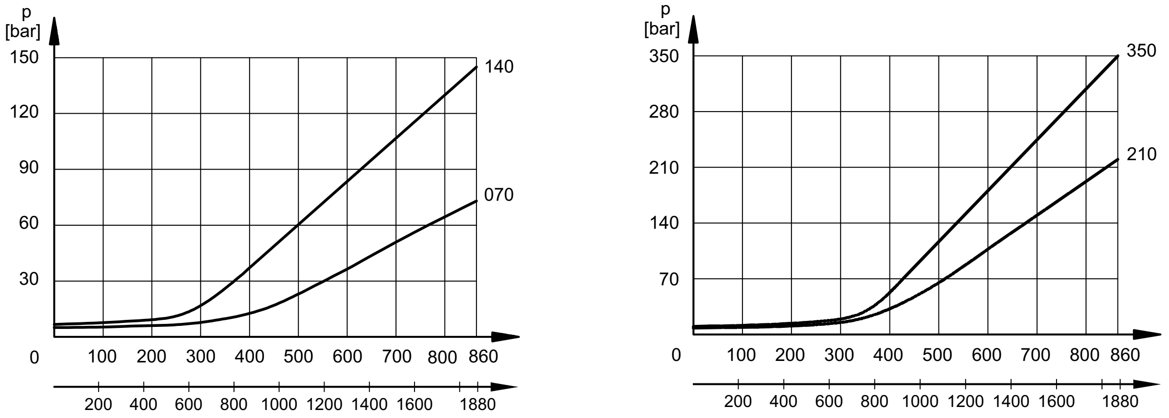


7 - CHARACTERISTIC CURVES OF PILOT OPERATED PROPORTIONAL VALVES

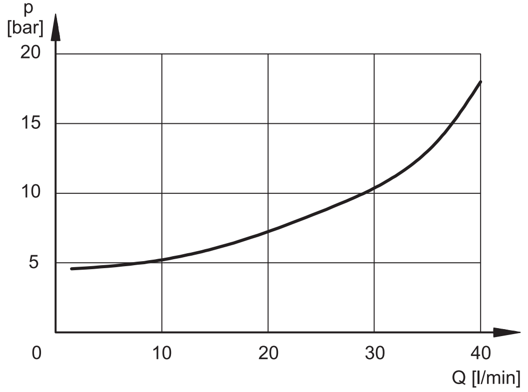
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

7.1 - PRE3K*

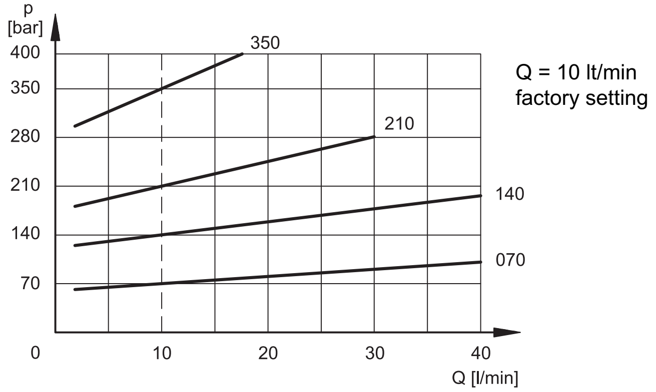
PRESSURE CONTROL p=f (I)



MINIMUM CONTROLLED PRESSURE pmin = f (Q)

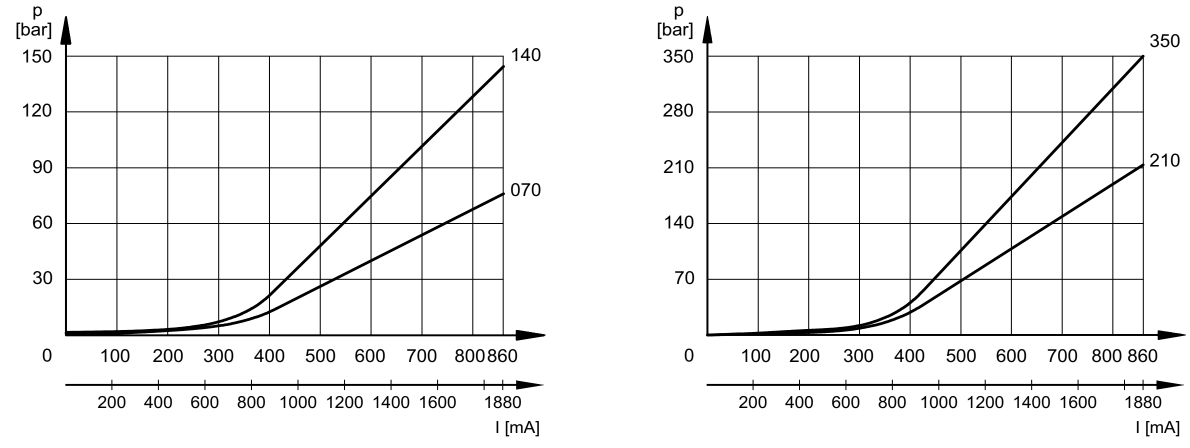


PRESSURE VARIATION pmax = f (Q)

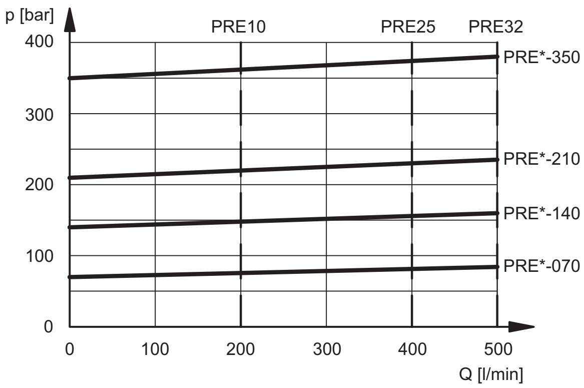


7.2 - PRE10K*, PRE25K* and PRE32K*

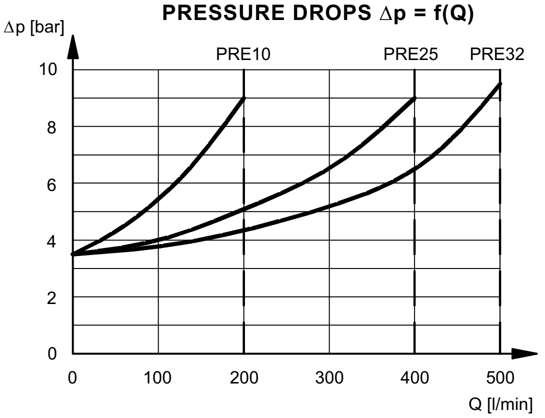
PRESSURE CONTROL p=f (I)



PRESSURE CONTROL p=f (Q)



PRESSURE DROPS Δp = f(Q)



8 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with a valve of pressure range up to 140 bar and with input flow rate of Q = 2 l/min for PRED3K*, Q = 10 l/min for PRE3K* and Q = 50 l/min for PRE10K*, PRE25K* and PRE32K*.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
PRED3K*	80	40
PRE3K*	80	40
PRE10K*, PRE25K* and PRE32K*	120	90

9 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3,4	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	IP66 / IP68 class H

9.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

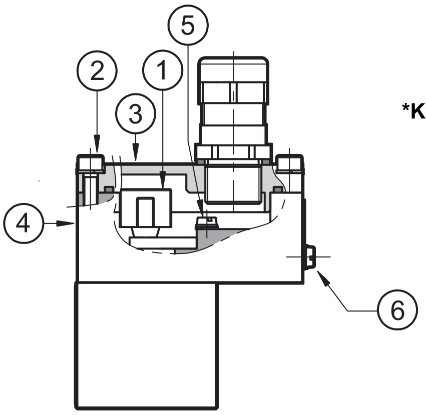
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

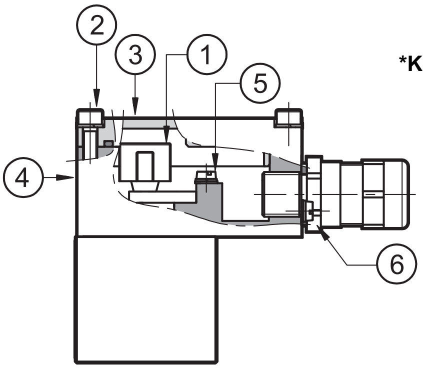
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9 ÷ 6 Nm.

Electrical wiring must be done following the instructions of the rules in compliance with standard about protection against explosion hazards.



K9T



K9S

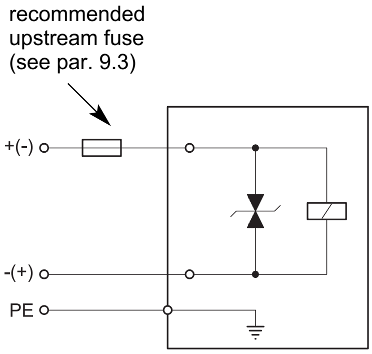
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	**Cable section**
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see paragraph 18) allow to use cables with external diameter between 8 and 10 mm.

9.2 - Electrical diagrams



9.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

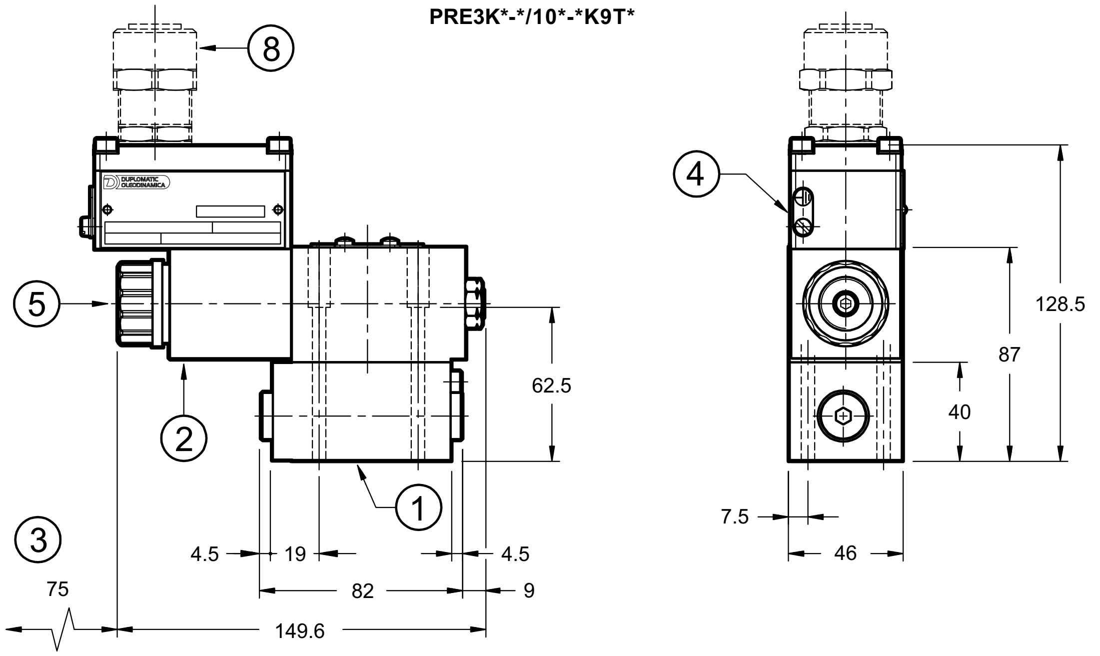
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

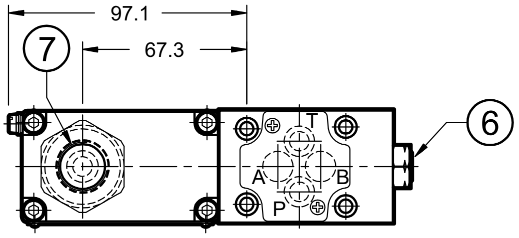
Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

10 - PRE3K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE3K*-*/10*-*K9T*





NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (5) placed at the end of the solenoid tube.

NOTE 2: for side connections see paragraph 14.

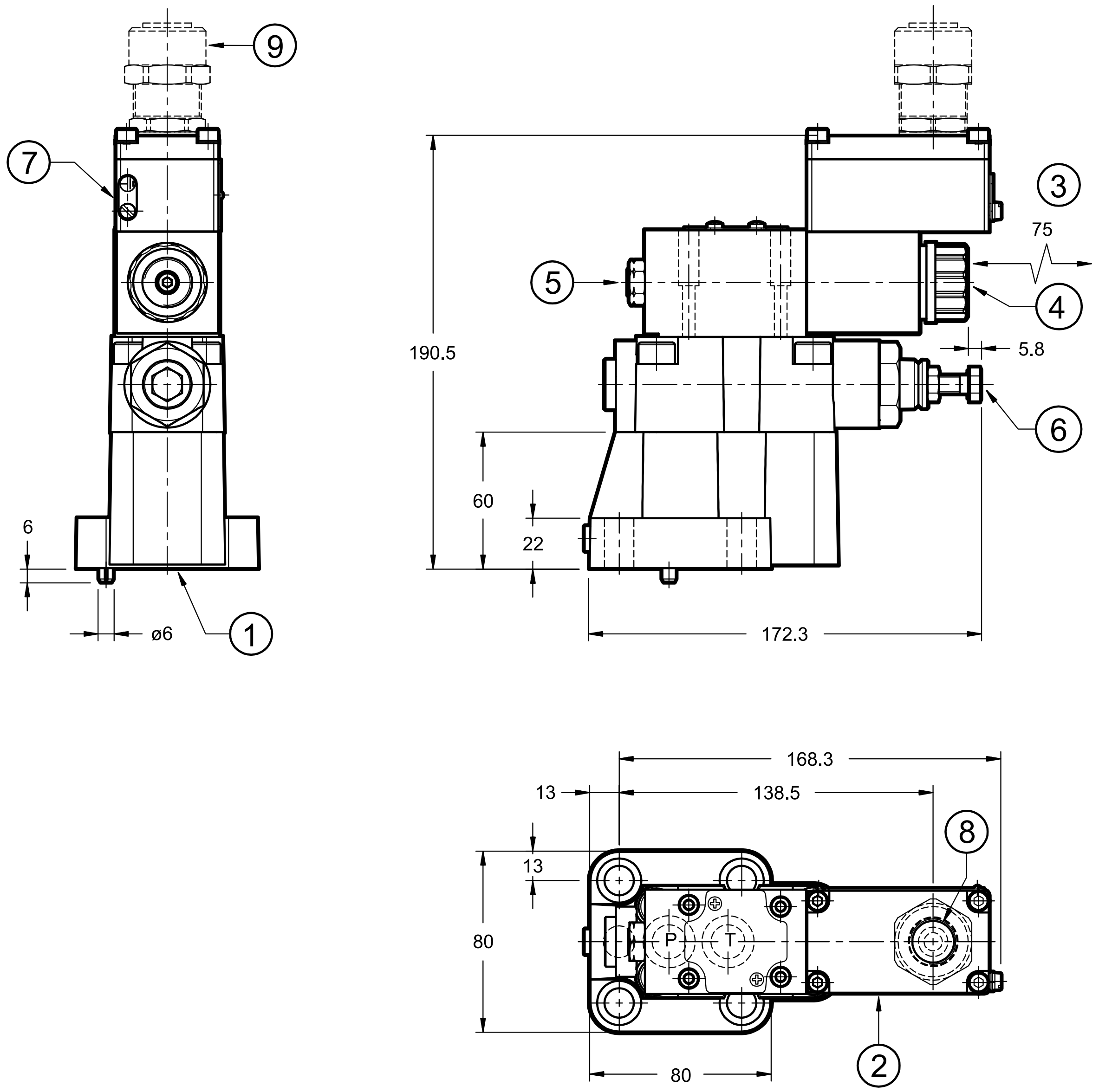
Fastening of single valve: 4 screws SHC M5x70 - ISO 4762
Tightening torque: 5 Nm (A 8.8 screws)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Terminal for supplementary GND connection
5	Breather (Allen key 4)
6	Factory setting sealing (we recommend not unscrewing the nut)
7	Upper port for cable gland
8	Cable gland. To be ordered separately, see paragraph 18

11 - PRE10K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE10K*-*/10*-*K9T*



1	Mounting surface with sealing rings: N. 2 OR type 123 (17.86 x 2.62) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Pressure relief valve (factory set)
7	Terminal for supplementary GND connection
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 18

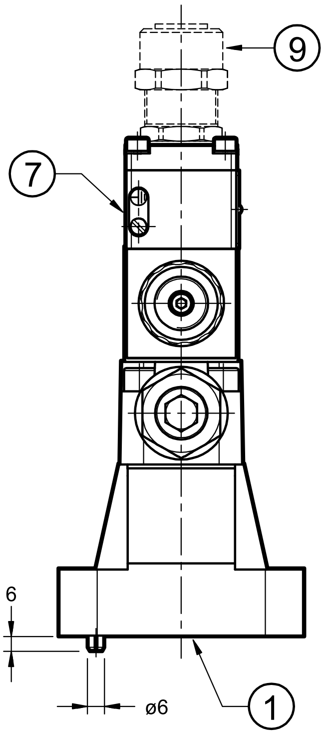
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.
NOTE 2: for side connections see paragraph 15.

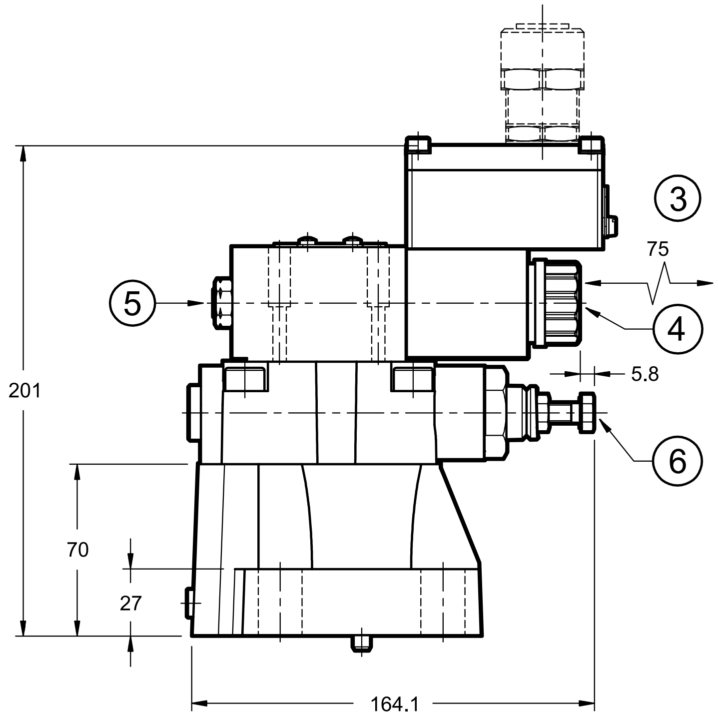
Fastening of single valve: 4 screws M12x40 - ISO 4762
Tightening torque: 69 Nm (A 8.8 screws)
Threads of mounting holes: M12x20

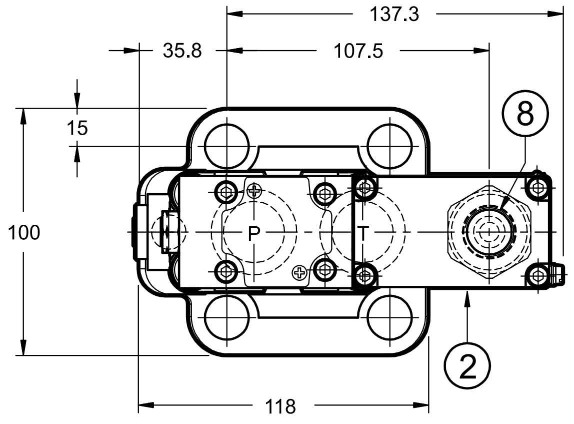
12 - PRE25K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE25K*-*/10*-*K9T*







1	Mounting surface with sealing rings: N. 2 OR type 3118 (29.82 x 2.62) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Pressure relief valve (factory set)
7	Terminal for supplementary GND connection
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 18

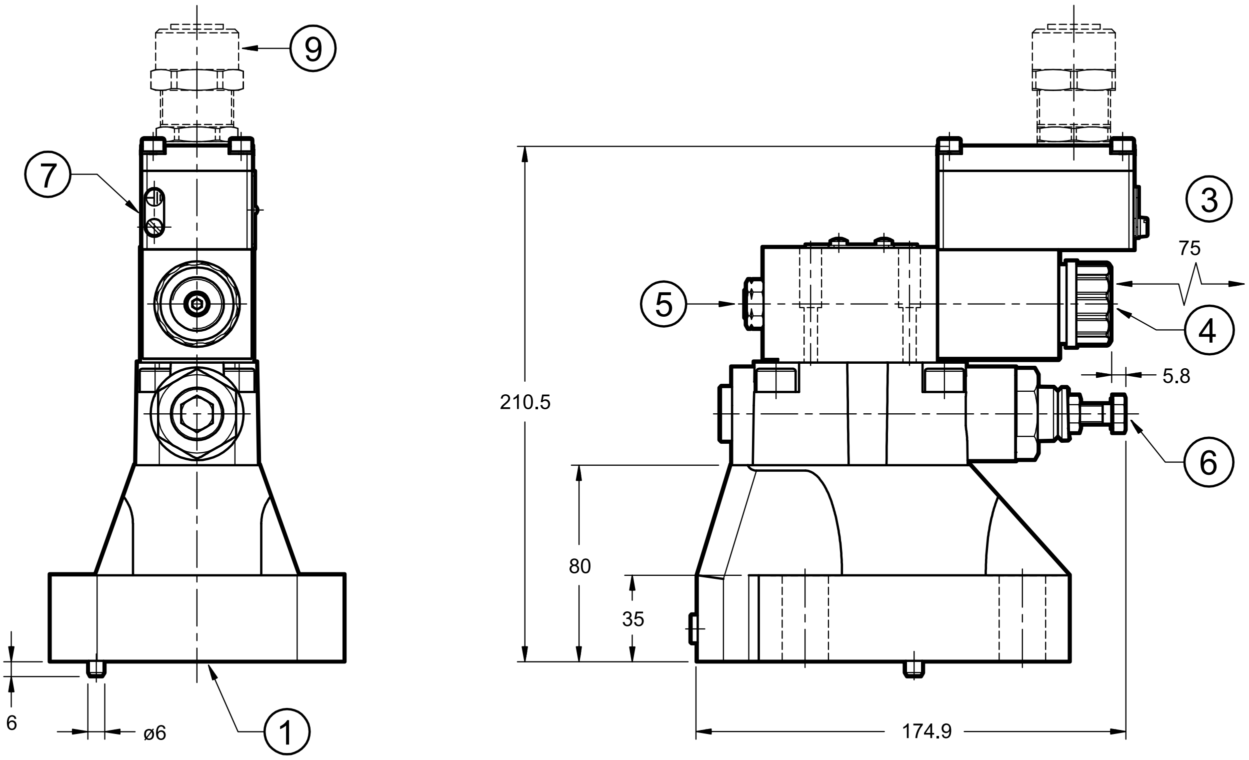
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.
NOTE 2: for side connections see paragraph 15.

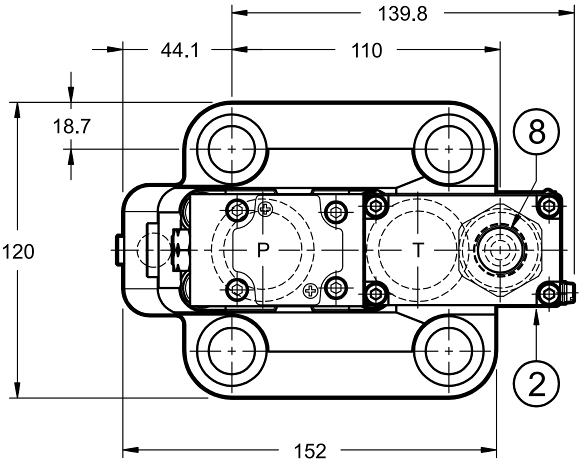
Fastening of single valve: 4 SHC screws M16x50 - ISO 4762
Tightening torque: 170 Nm (A 8.8 screws)
Threads of mounting holes: M16x25

13 - PRE32K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PRE32K*-*/10*-*K9T*





1	Mounting surface with sealing rings: N. 2 OR type 4137 (34.52 x 3.53) - 90 shore N. 1 OR type 109 (9.13 x 2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Factory setting sealing (we recommend not unscrewing the nut)
6	Pressure relief valve (factory set)
7	Terminal for supplementary GND connection
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 18

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

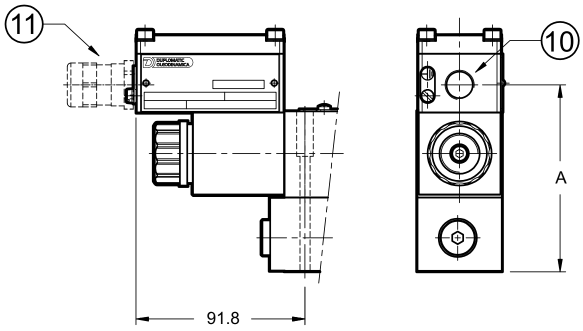
NOTE 2: for side connections see paragraph 14.

Fastening of single valve: N. 4 SHC screws M18x60 - ISO 4762
Tightening torque: 235 Nm (A 8.8 screws)
Threads of mounting holes: M18x27

14 - PRE*K*-*/10*-*K9S* (SIDE CONNECTION) OVERALL AND MOUNTING DIMENSIONS

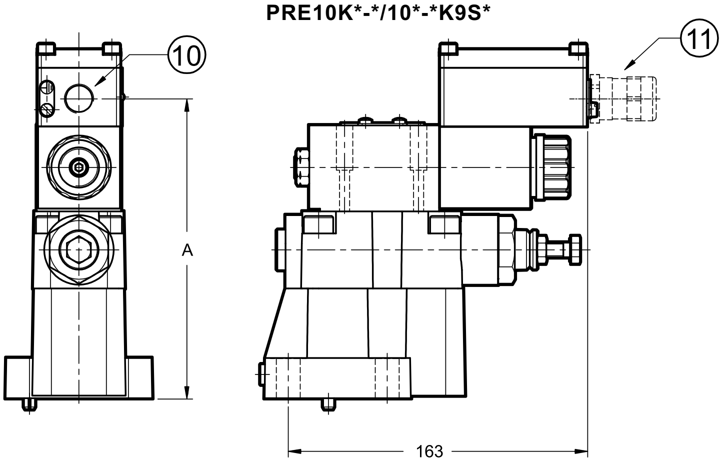
dimensions in mm

PRE3K*-*/10*-*K9S*



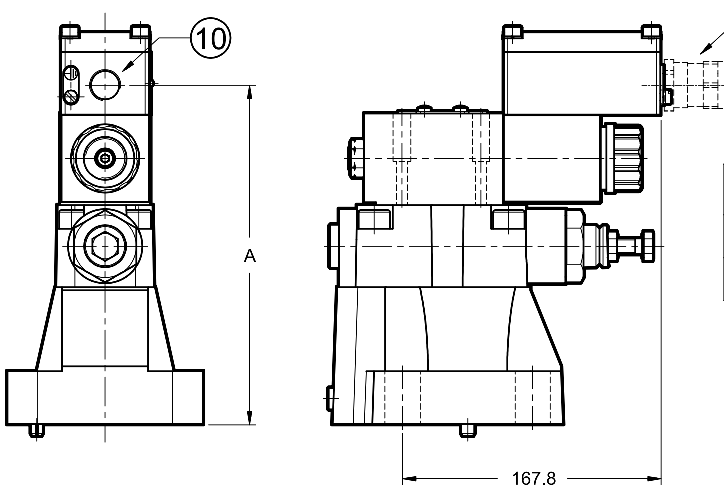
Side port type	A
S01, S04	100.5
S02, S03	100

PRE10K*-*/10*-*K9S*



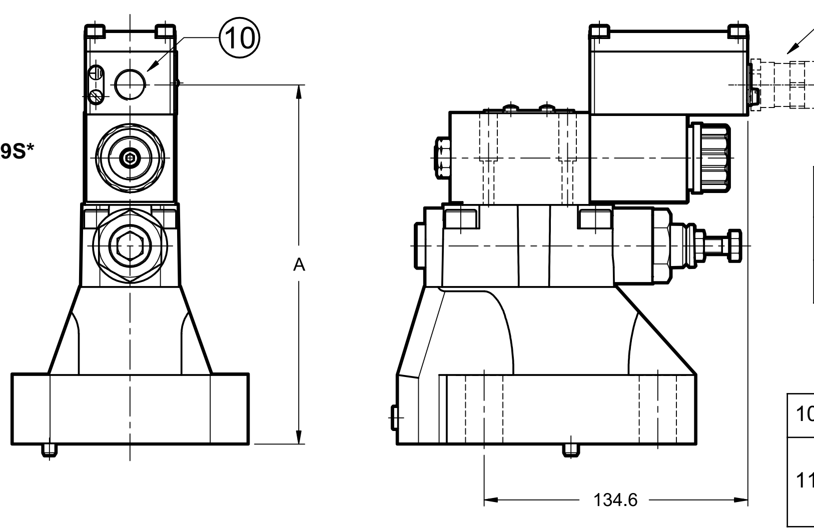
Side port type	A
S01, S04	162.5
S02, S03	162

PRE25K*-*/10*-*K9S*



Side port type	A
S01, S04	172.5
S02, S03	172

PRE32K*-*/10*-*K9S*

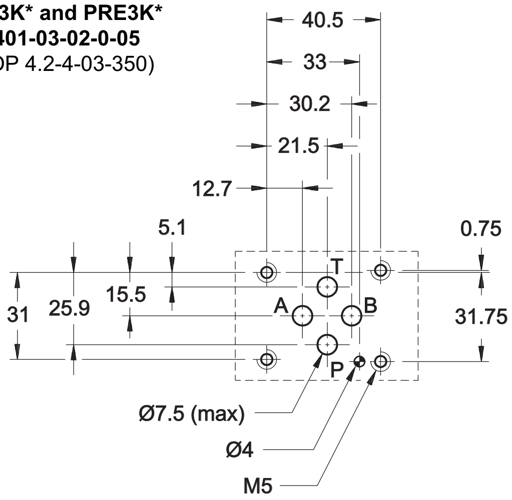


Side port type	A
S01, S04	182.5
S02, S03	182

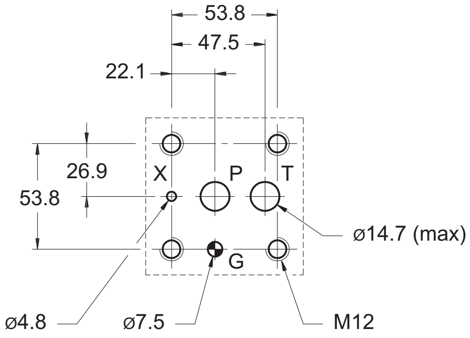
10	Side port for cable gland
11	Cable gland. To be ordered separately, see par. 16

15 - MOUNTING SURFACES

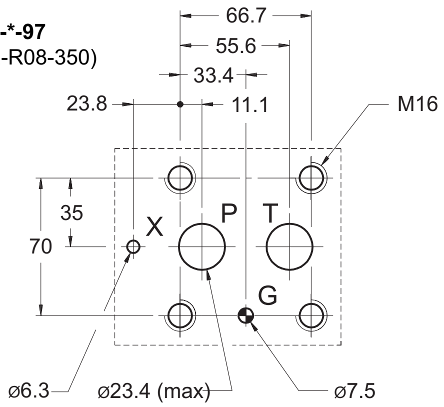
PRED3K* and PRE3K*
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



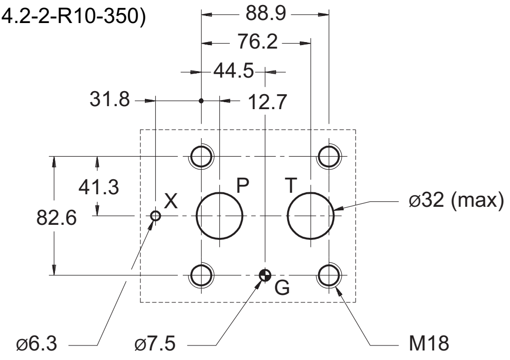
PRE10K*
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



PRE25K*
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



PRE32K*
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



16 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

17 - INSTALLATION

Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

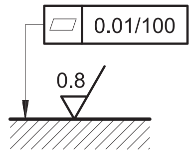
We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraphs 3 and 7.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air, by using the apposite drain screw in the solenoid tube. At the end of the operation, make sure of having correctly screwed the drain screw.

Connect the T port on the valve directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. **Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

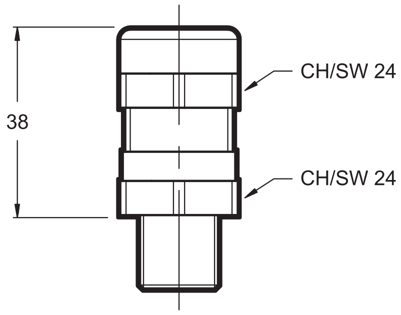
Surface finishing



18 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb; INMETRO Gb, Db, Mb certified
- cable gland material: nickel brass
- rubber tip material: silicone
- ambient temperature range: -70ºC ÷ +220ºC
- protection degree: IP66/IP68
- Tightening torque: 15 Nm



To order, list the description and the code of the version chosen from among those listed below:

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

19 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion-proof certified; therefore, they must be installed outside classified areas.

20 - SUBPLATES

(see catalogue 51 000)

	PRED3K*	**PRE3K***	**PRE10K***	**PRE25K***	**PRE32K***
Type with rear ports	PMMD-AI3G	PMMD-AI3G	PMRQ3-AI4G	PMRQ5-AI5G	PMRQ7-AI7G
Type with side ports	PMMD-AL3G	PMMD-AL3G	-	-	-
P, T ports dimensions	3/8” BSP	3/8” BSP	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	-	-	1/4” BSP	1/4” BSP	1/4” BSP

NOTE: Subplates (to be ordered separately) do not contain neither aluminium nor magnesium at a higher rate than the value allowed by norms according to ATEX directive for categories II 2GD and I M2 .

The user must take care and make a complete assessment of the ignition risk, that can occur from the relative use in potentially explosive environments.

DUPLOMATIC
OLEODINAMICA

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure valves

RQM*K*-P	**21 515**
PRE(D)*K*	**81 315**
ZDE3K*	**81 515**
DZCE*K*	**81 605**

directional valves

D*K*	**41 515**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

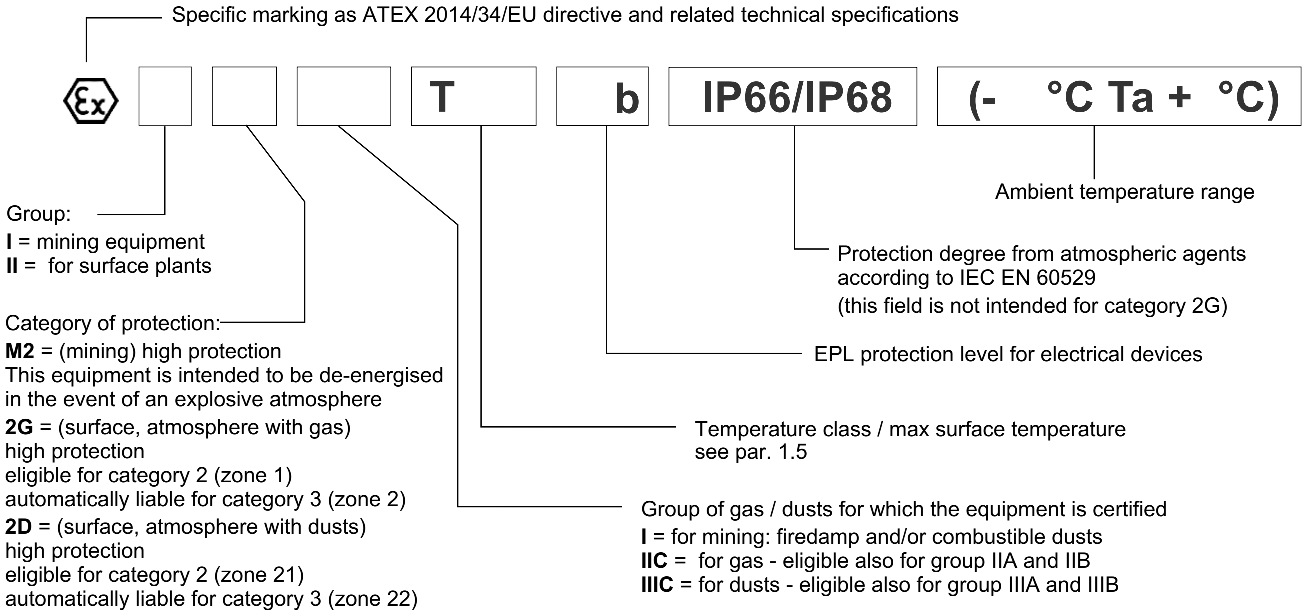
1.1 - ATEX classification for valves

Type examination certificate: CEC 13 ATEX 030-REV.2
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Group:
I = mining equipment
II = for surface plants

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529
(this field is not intended for category 2G)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

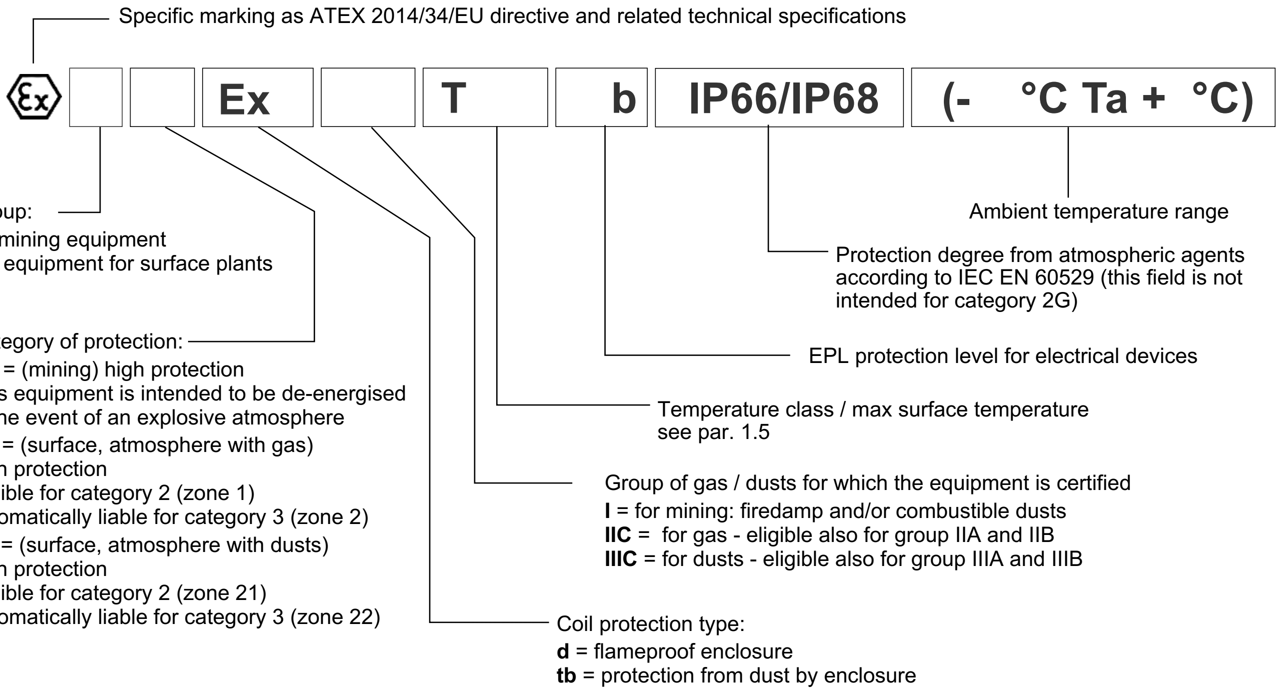
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, carries the relative ATEX marking. **The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	Ex II 2G Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ex II 2G Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ex I M2 Ex d I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Group:
I = mining equipment
II = equipment for surface plants

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised
in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for category 2G)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Coil protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEx CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

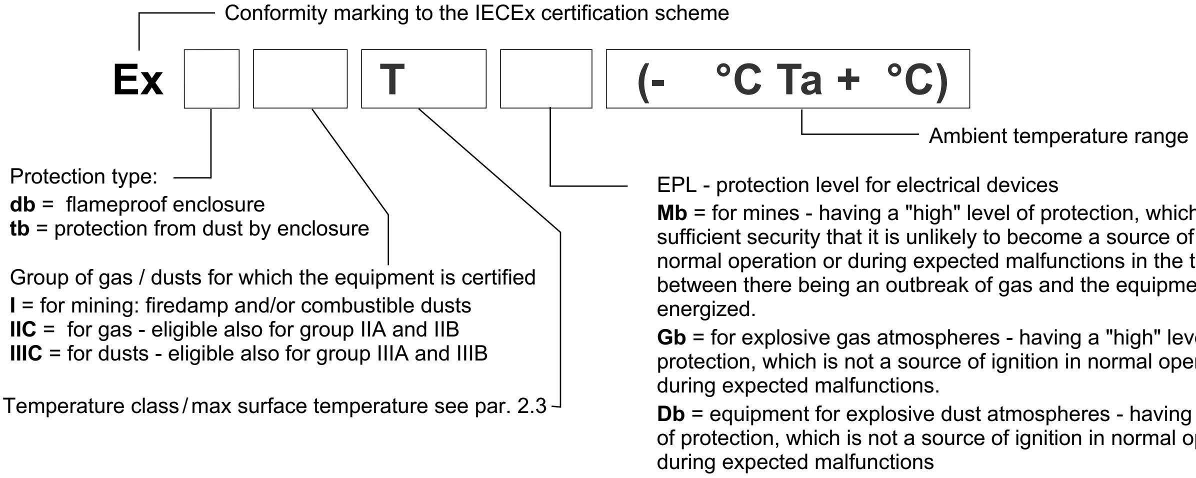
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



Protection type:
db = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 2.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

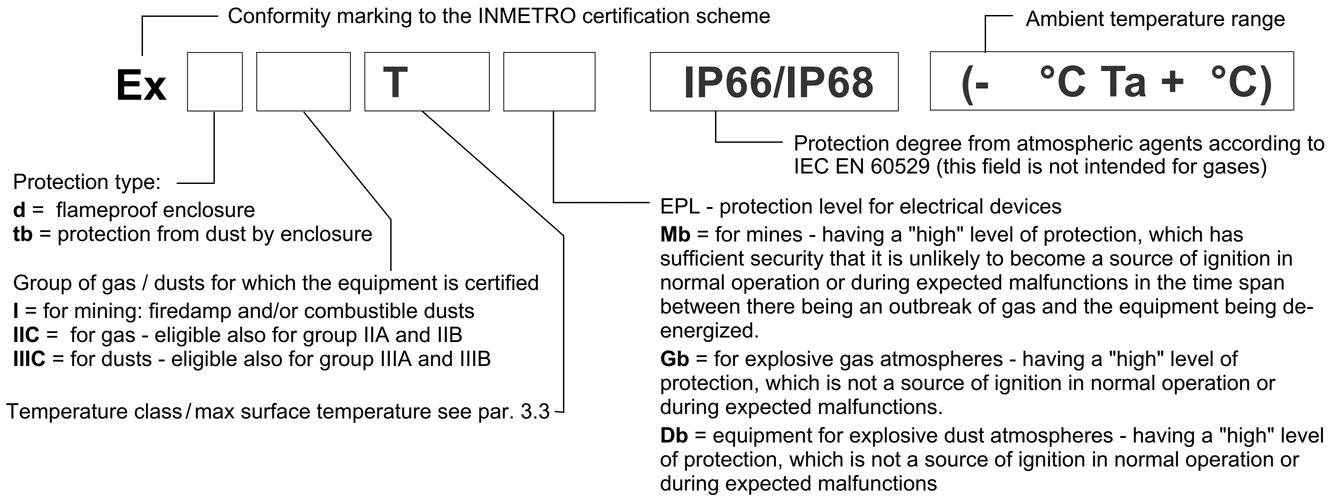
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
INMETRO Mb	***KBDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex d I T150° Mb IP66/IP68 (-40°C Ta +75°C)



Conformity marking to the INMETRO certification scheme

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for gases)

Protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 3.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

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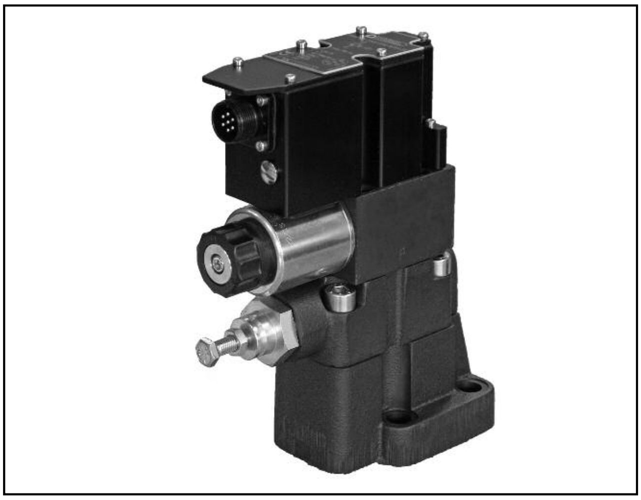


PRE*G

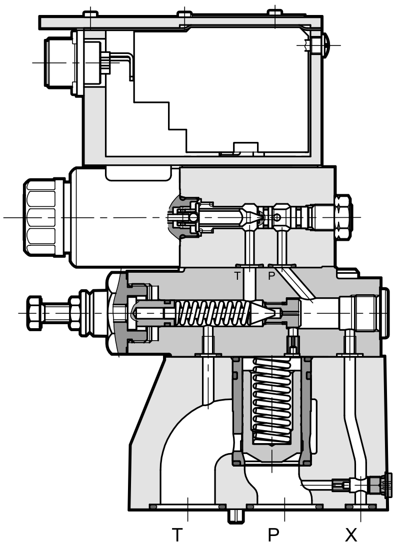
PILOT OPERATED PRESSURE RELIEF VALVES WITH PROPORTIONAL CONTROL AND INTEGRAL ELECTRONICS

SERIES 30

SUBPLATE MOUNTING
ISO 6264

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



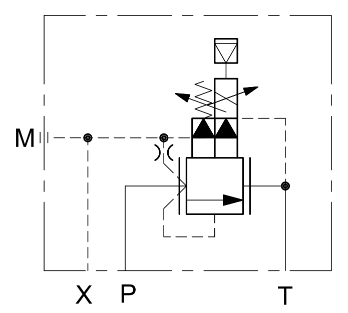
- The PRE*G valves are pilot operated pressure relief valves with integrated electric proportional control and mounting interface in compliance with ISO 6264 standards.
- These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.
- The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.
- They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.
- The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.
- A solenoid current monitoring signal is available.
- The valves are easy to install. The driver directly manages digital settings.
- They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

		PRE10G	PRE25G	PRE32G
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see paragraph 6		
Hysteresis	% of p nom	< 3%		
Repeatability	% of p nom	< ±1%		
Electrical characteristic		see paragraph 2		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13		
Recommended viscosity	cSt	25		
Mass	kg	5,5	6,3	8,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P	R	E		G	-		/	30		-		K11	

Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Digital integrated electronics for open loop

Pressure control range

070 = up to 70 bar	**210** = up to 210 bar
140 = up to 140 bar	**350** = up to 350 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

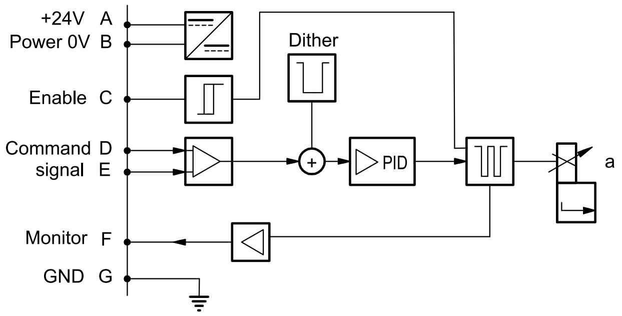
2 - ELECTRICAL CHARACTERISTICS

2.1 - Electrical on board electronics

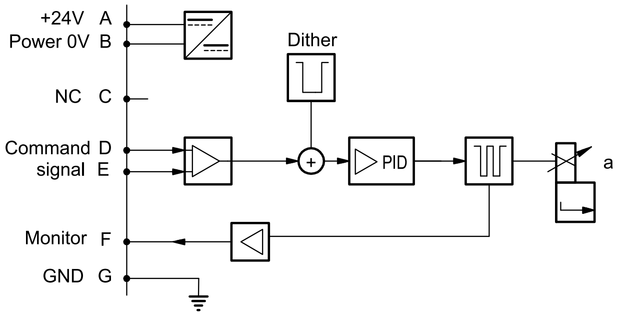
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedence Ri > 11 kOhm) 4 ÷ 20 (Impedence Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedence Ro > 1 kOhm) 4 ÷ 20 (Impedence Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

2.2 - On-board electronics diagrams

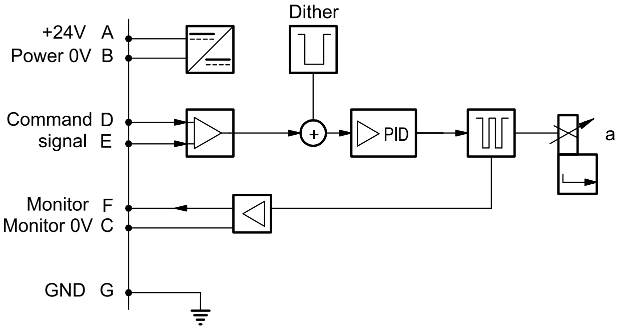
VERSION **A** - External Enable



VERSION **B** - Internal Enable

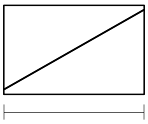


VERSION **C** - 0V Monitor

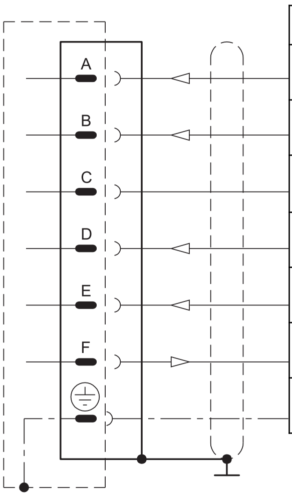


3 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**

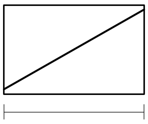


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

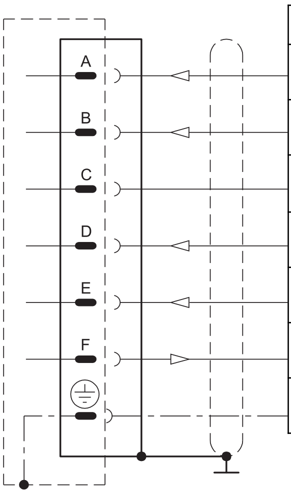
4 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**

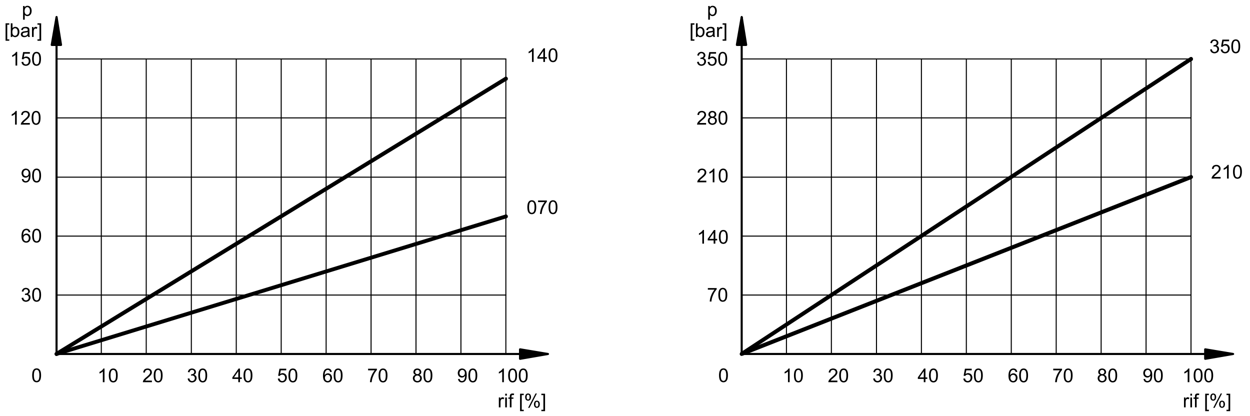


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

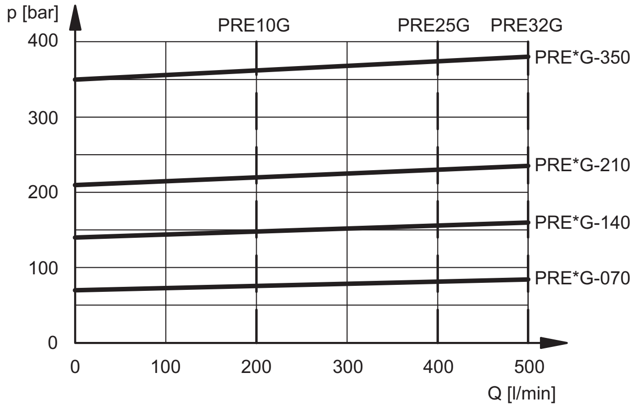
5 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

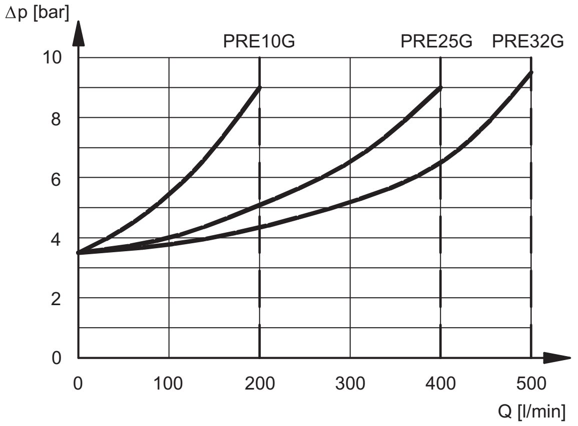
PRESSURE CONTROL p=f (I)



PRESSURE CONTROL p=f (Q)

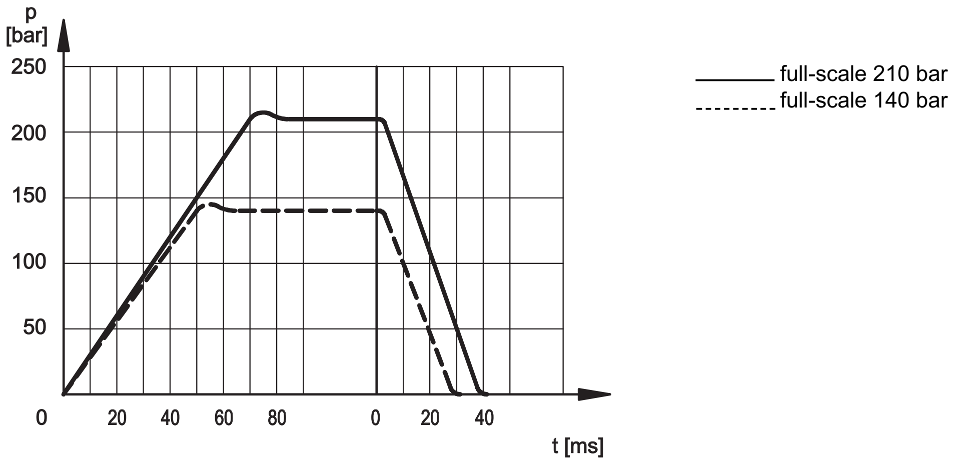


PRESSURE DROPS ∆p = f(Q)



6 - STEP RESPONSE

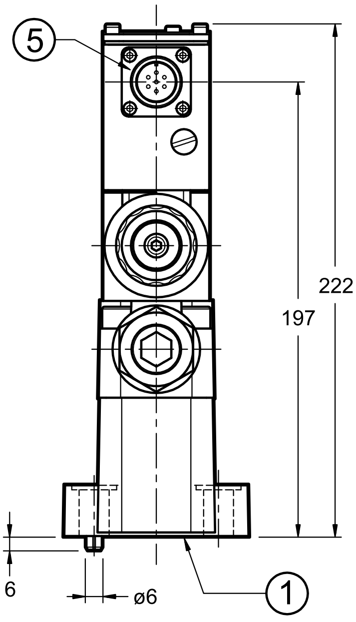
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

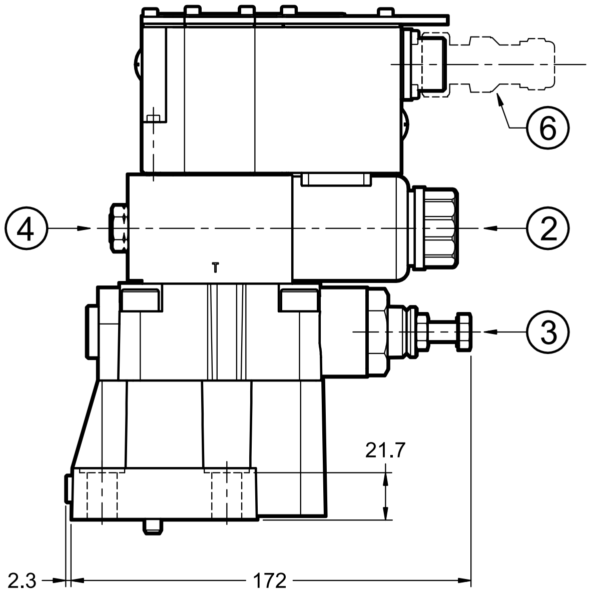


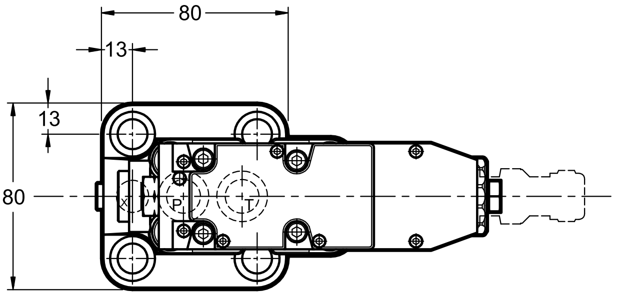
NOTE: Response times are obtained with PRE25G valves.

7 - OVERALL AND MOUNTING DIMENSIONS PRE10G

dimensions in mm





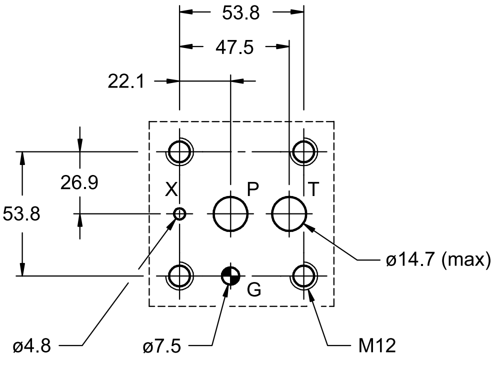


NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

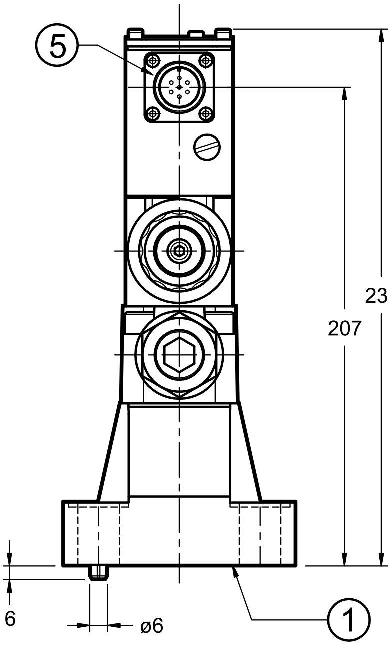
Fastening bolts: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (viti A8.8)
Thread of mounting holes: M12x20

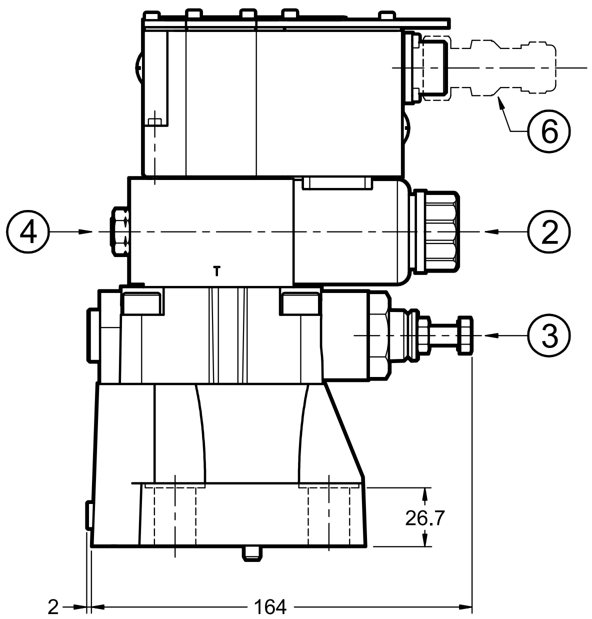
MOUNTING SURFACE:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)

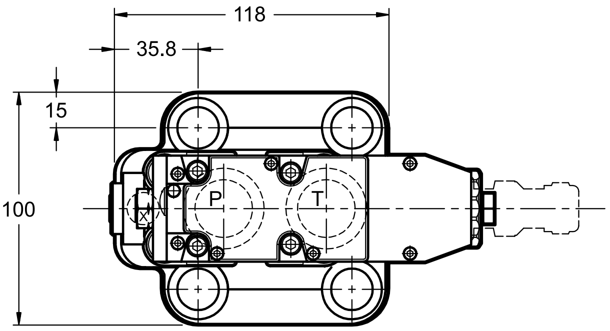
1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Mating electrical connector **to be ordered separately**. See at section 12



8 - OVERALL AND MOUNTING DIMENSIONS PRE25G



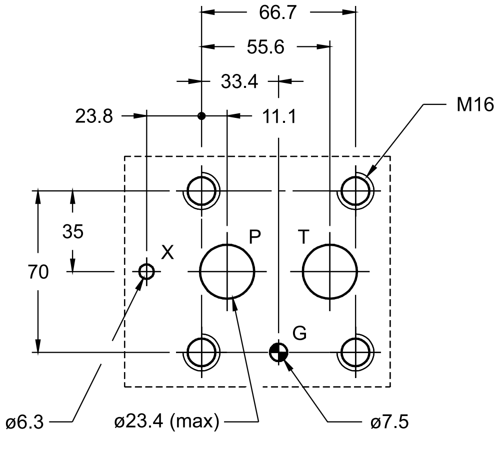




NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (viti A8.8)
Thread of mounting holes: M16x25

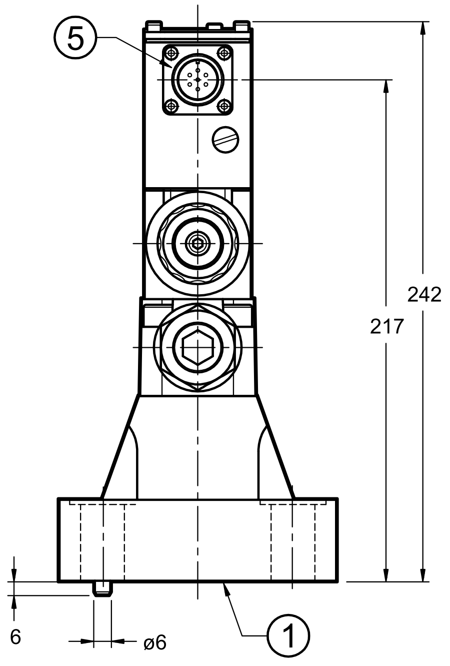
PIANO DI POSA:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)

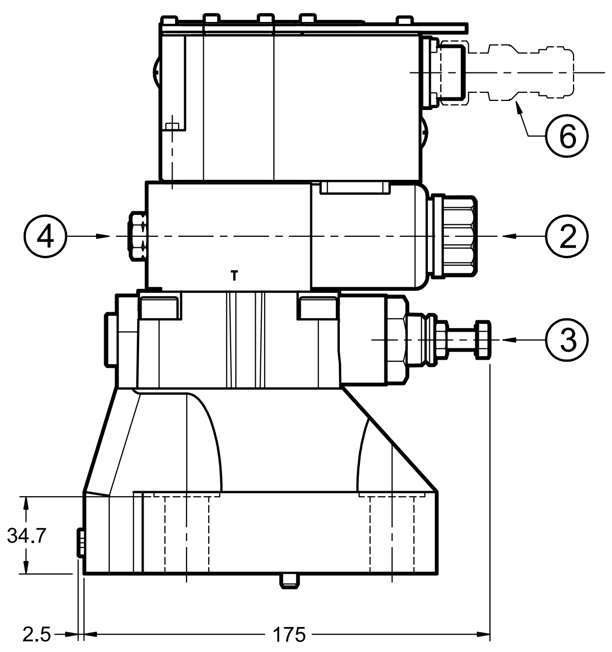


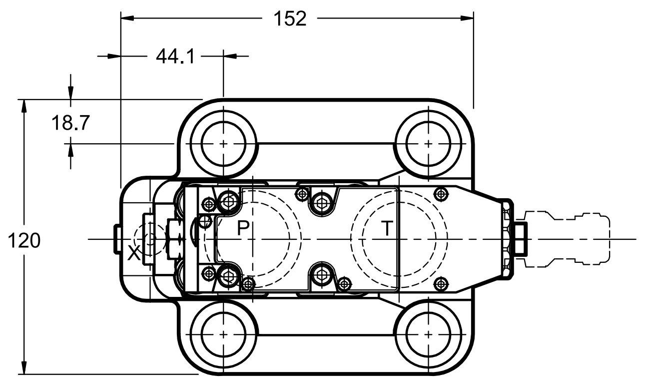
1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Mating electrical connector **to be ordered separately**. See at section 12

9 - OVERALL AND MOUNTING DIMENSIONS PRE32G

dimensions in mm



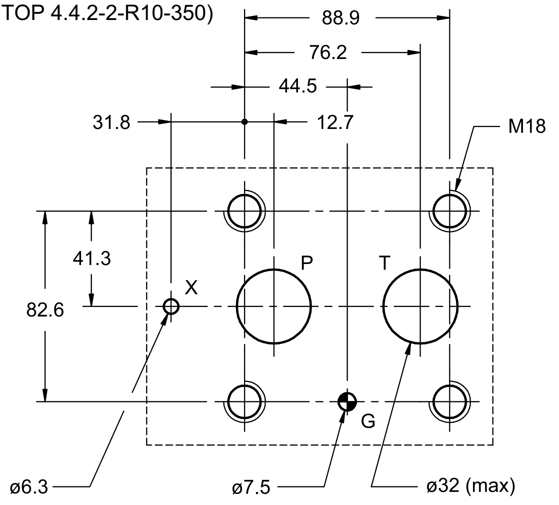




NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M18x60 - ISO 4762
Torque: 235Nm (viti A8.8)
Thread of mounting holes: M18x27

PIANO DI POSA:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Mating electrical connector **to be ordered separately**. See at section 12

10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

11 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 5.

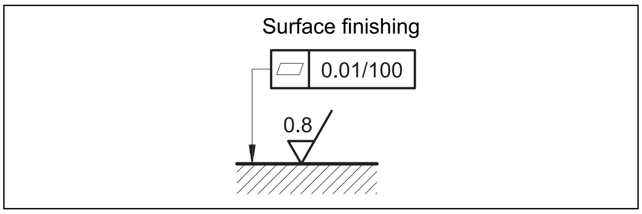
Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



12 - ACCESSORIES

(to be ordered separately)

12.1 Mating connector

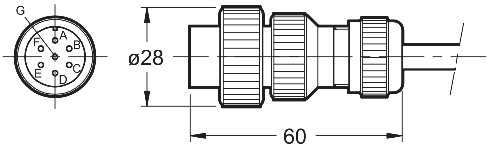
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



12.2 - Connection cables size

Power supply:
- up to 20 m cable lenght : 1,0 mm^2
- up to 40 m cable lenght : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

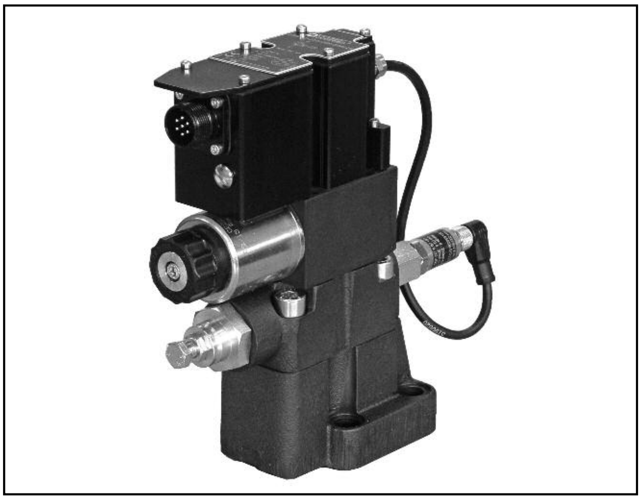
12.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

13 - SUBPLATES

(see catalogue 51 000)

	PRE10G	PRE25G	PRE32G
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, **T** port dimensions	1/2” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP



PRE*J

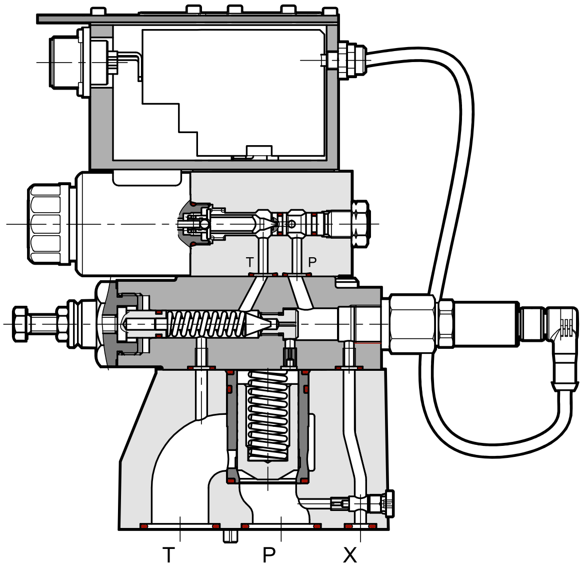
PILOT OPERATED PRESSURE VALVES IN CLOSED LOOP WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 30

SUBPLATE MOUNTING

p max **350** bar
Q max (see table of performances)

OPERATING PRINCIPLE



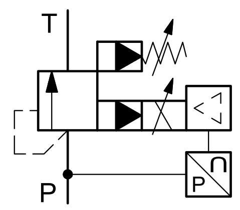
- PRE*J valves are pilot operated pressure relief valves with integrated electric proportional control and mounting interface in compliance with ISO 6264 standard.
- These valves are used to control hydraulic circuit pressure and enable the use of the full flow rate of the pump, even with settings approaching calibrated values.
- The two-stage design and wide passages ensure reduced pressure drops thereby improving the system energy performance.
- They are fitted with a manual pressure relief valve which is factory set to ≥15% of the maximum value in the pressure control range.
- The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.
- The monitoring of the value detected by the pressure transmitter is available on pin F.
- They are available in three sizes with flow rates up to 500 l/min and in four pressure control ranges up to 350 bar.
- The valves are easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 12.3)

PERFORMANCES

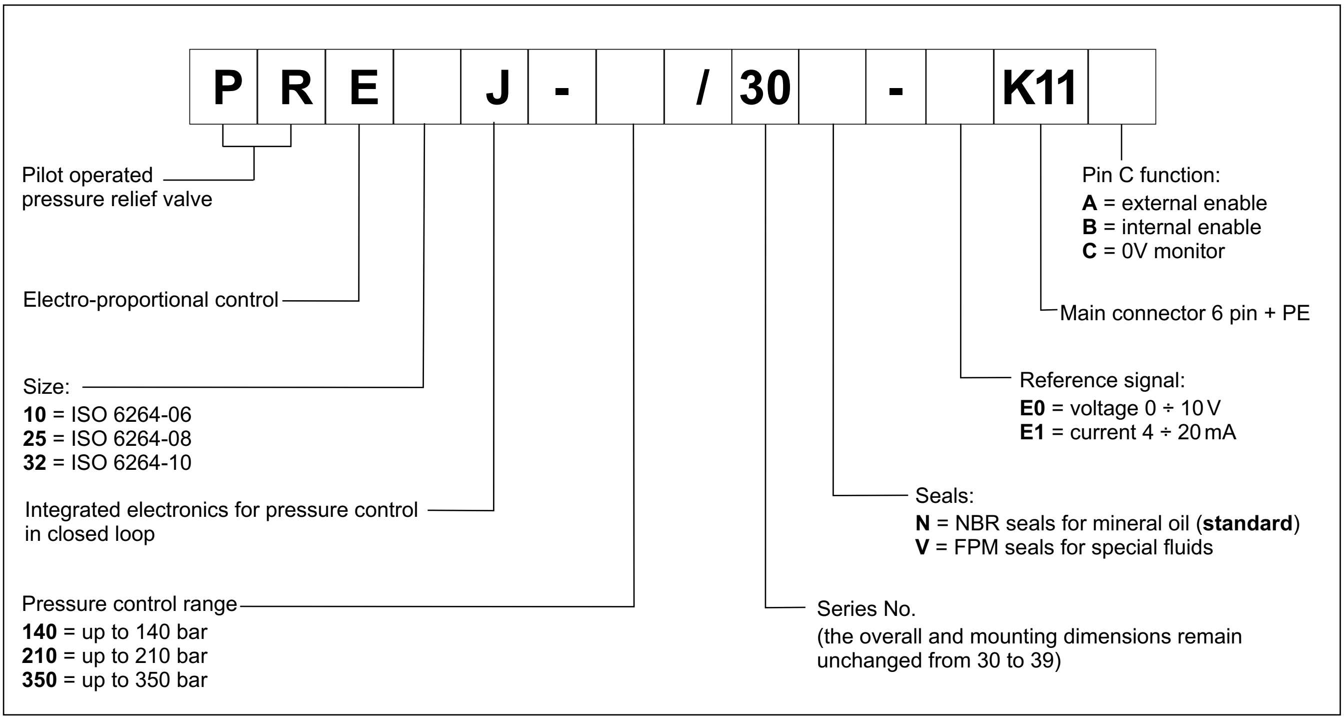
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

		PRE10J	PRE25J	PRE32J
Maximum operating pressure	bar	350		
Maximum flow	l/min	200	400	500
Step response		see paragraph 6		
Hysteresis	% of p nom	< 1%		
Repeatability	% of p nom	< ± 0,5%		
Electrical characteristic		see paragraph 2		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	5,5	6,3	8,5

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE



Pilot operated pressure relief valve

Electro-proportional control

Size:
10 = ISO 6264-06
25 = ISO 6264-08
32 = ISO 6264-10

Integrated electronics for pressure control in closed loop

Pressure control range
140 = up to 140 bar
210 = up to 210 bar
350 = up to 350 bar

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Main connector 6 pin + PE

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

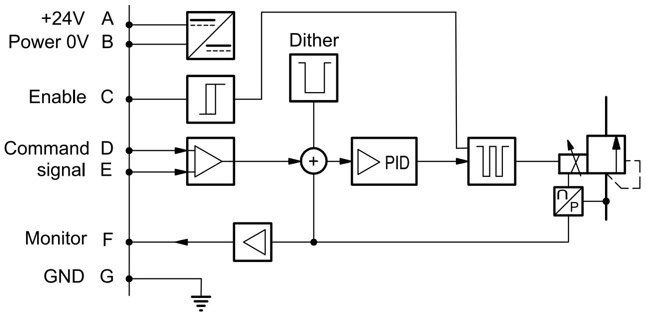
2 - ELECTRICAL CHARACTERISTICS

2.1 - Electrical on board electronics

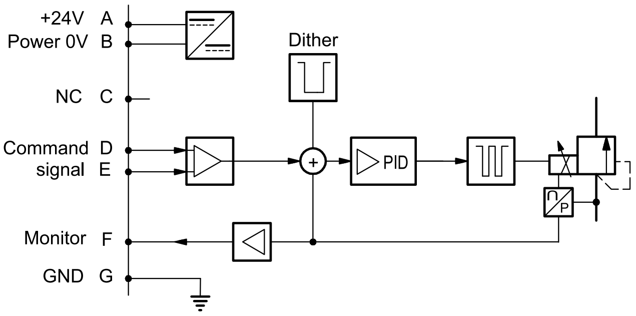
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (pressure at transducer): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

2.2 - On-board electronics diagrams

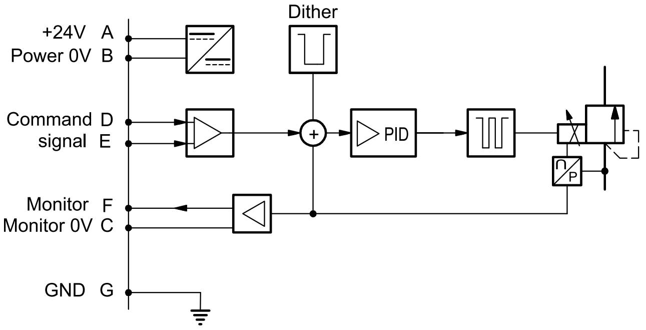
VERSION **A** - External Enable



VERSION **B** - Internal Enable

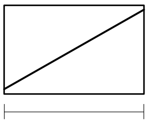


VERSION **C** - 0V Monitor

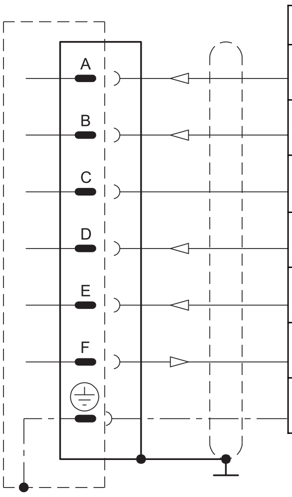


3 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0 ÷ 10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**0V**	**+10V**
MONITOR	**0V**	**+10V**

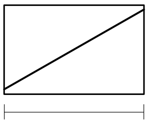


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

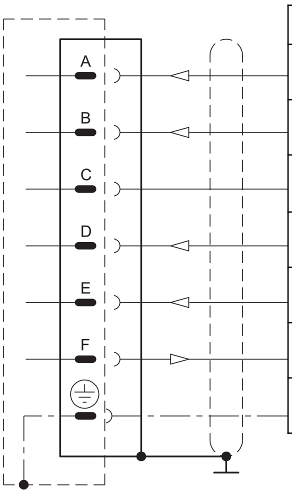
4 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**20 mA**
MONITOR	**4 mA**	**20 mA**

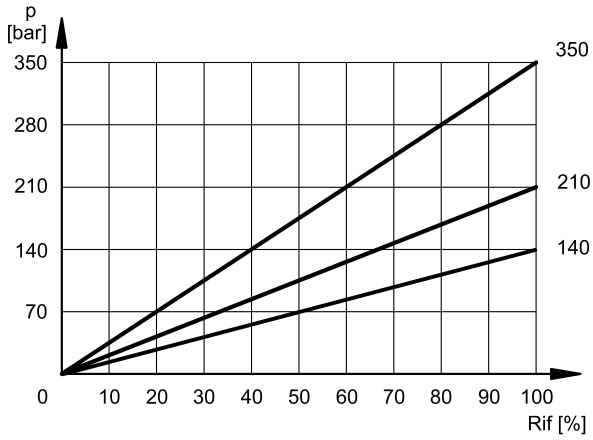


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

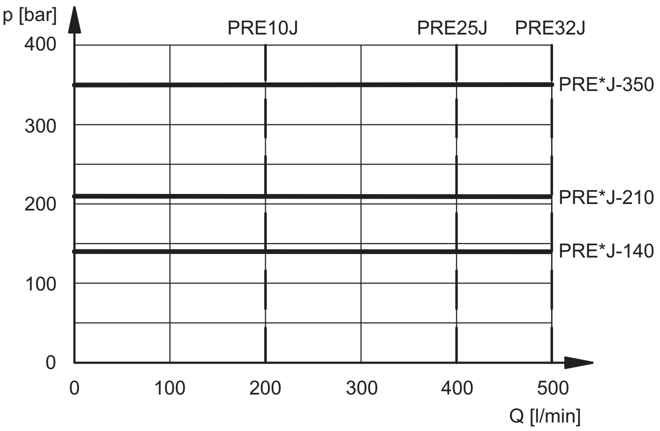
5 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

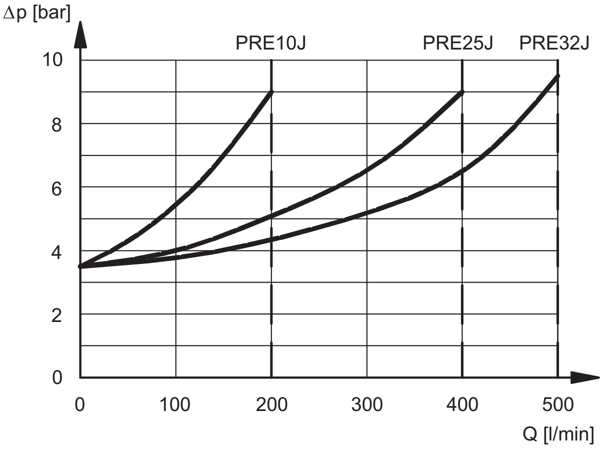
PRESSURE CONTROL p=f (I)



PRESSURE CONTROL p=f (Q)



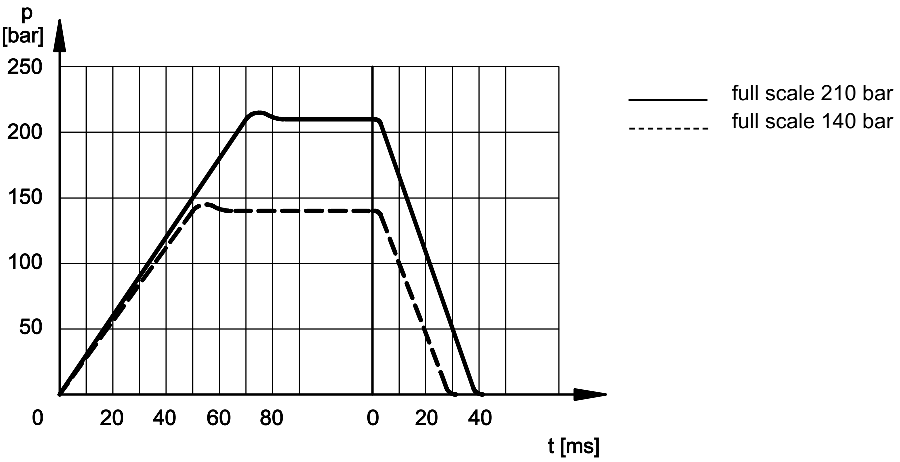
PRESSURE DROPS ∆p = f(Q)



6 - STEP RESPONSE

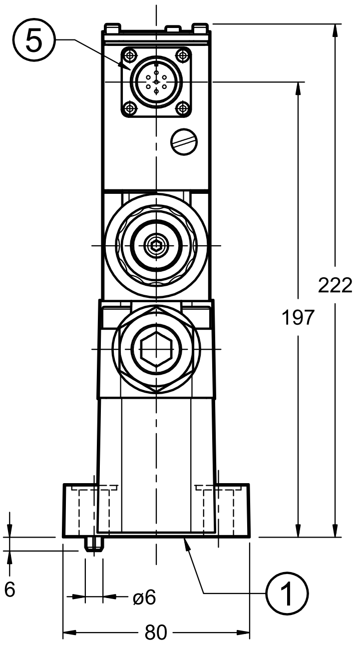
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

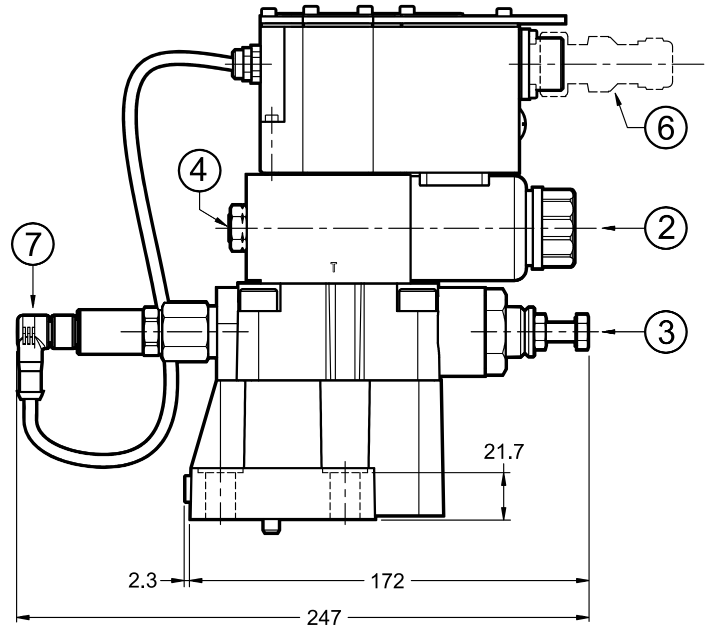
Response times are obtained from PRE25J valves with a full scale of 140 and 210 bar.

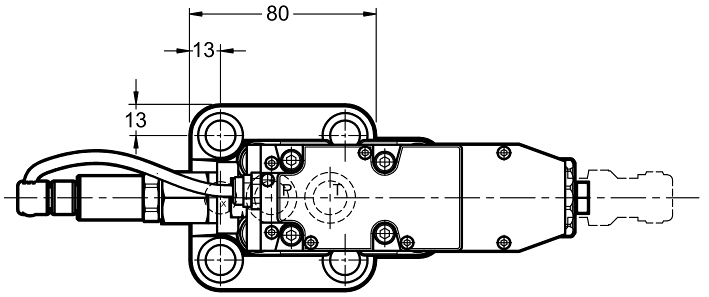


7 - OVERALL AND MOUNTING DIMENSIONS PRE10J

dimensions in mm



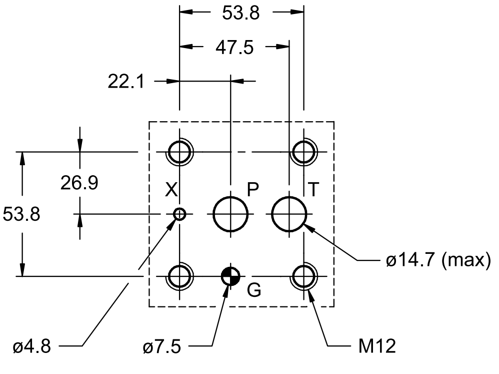




NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

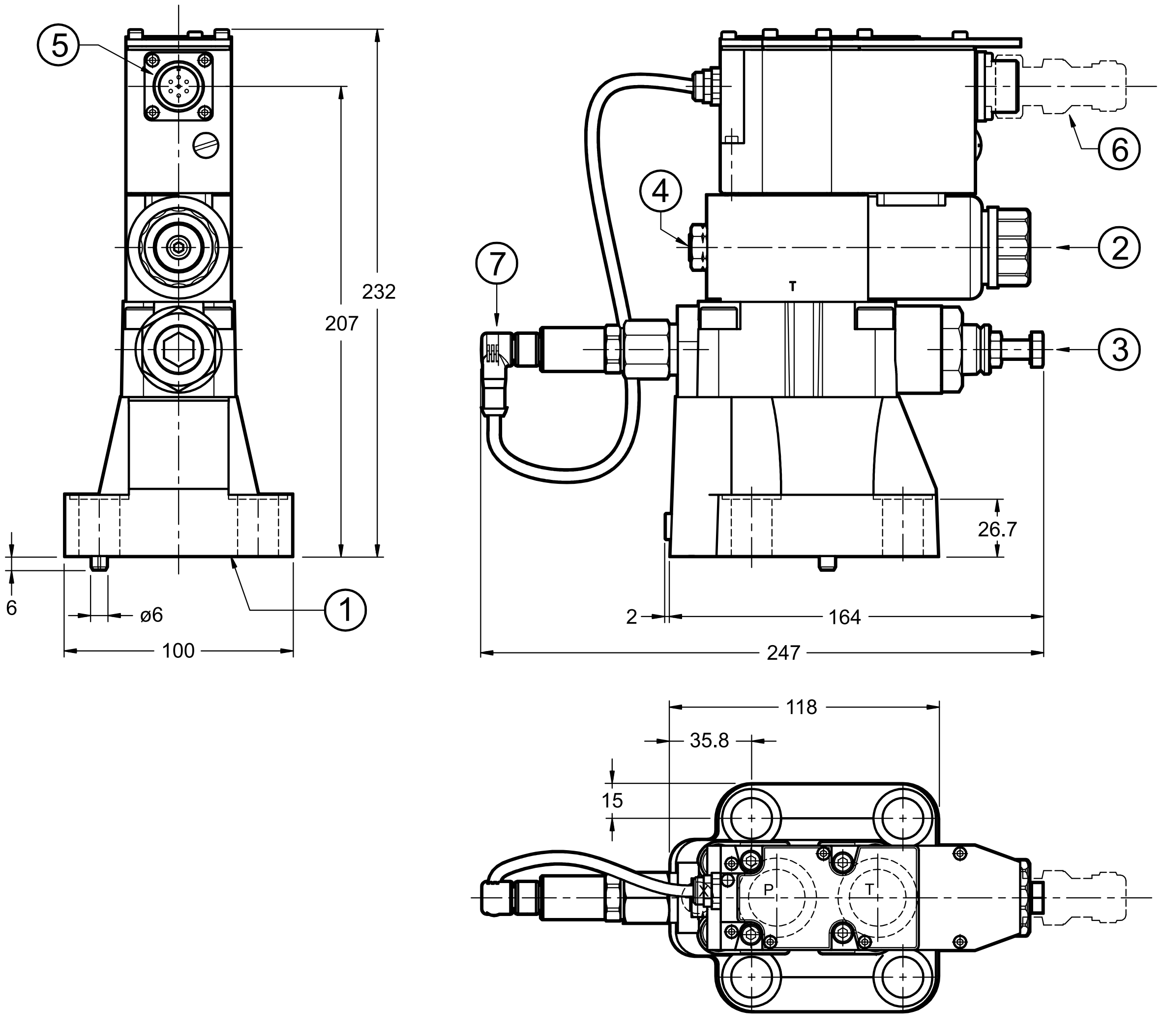
Fastening bolts: 4 SHCS M12x40 - ISO 4762
Torque: 69 Nm (screws A8.8)
Thread of mounting holes: M12x20

MOUNTING SURFACE:
ISO 6264-06-09-*-97
(CETOP 4.4.2-2-R06-350)



1	Mounting surface with sealing rings: 2 OR type 123 (17.86x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Mating electrical connector **to be ordered separately**. See at section 12
7	Connector with cable for pressure transducer

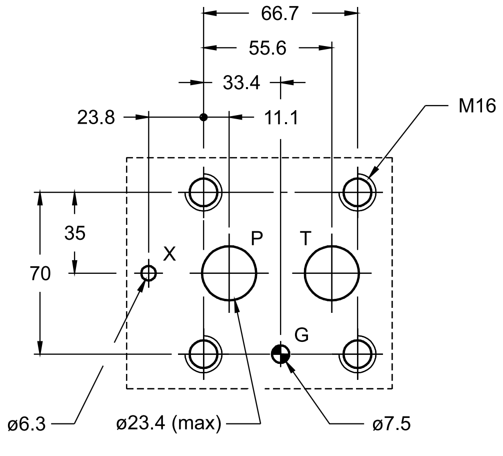
8 - OVERALL AND MOUNTING DIMENSIONS PRE25J



NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M16x60 - ISO 4762
Torque: 170 Nm (screws A8.8)
Thread of mounting holes: M16x25

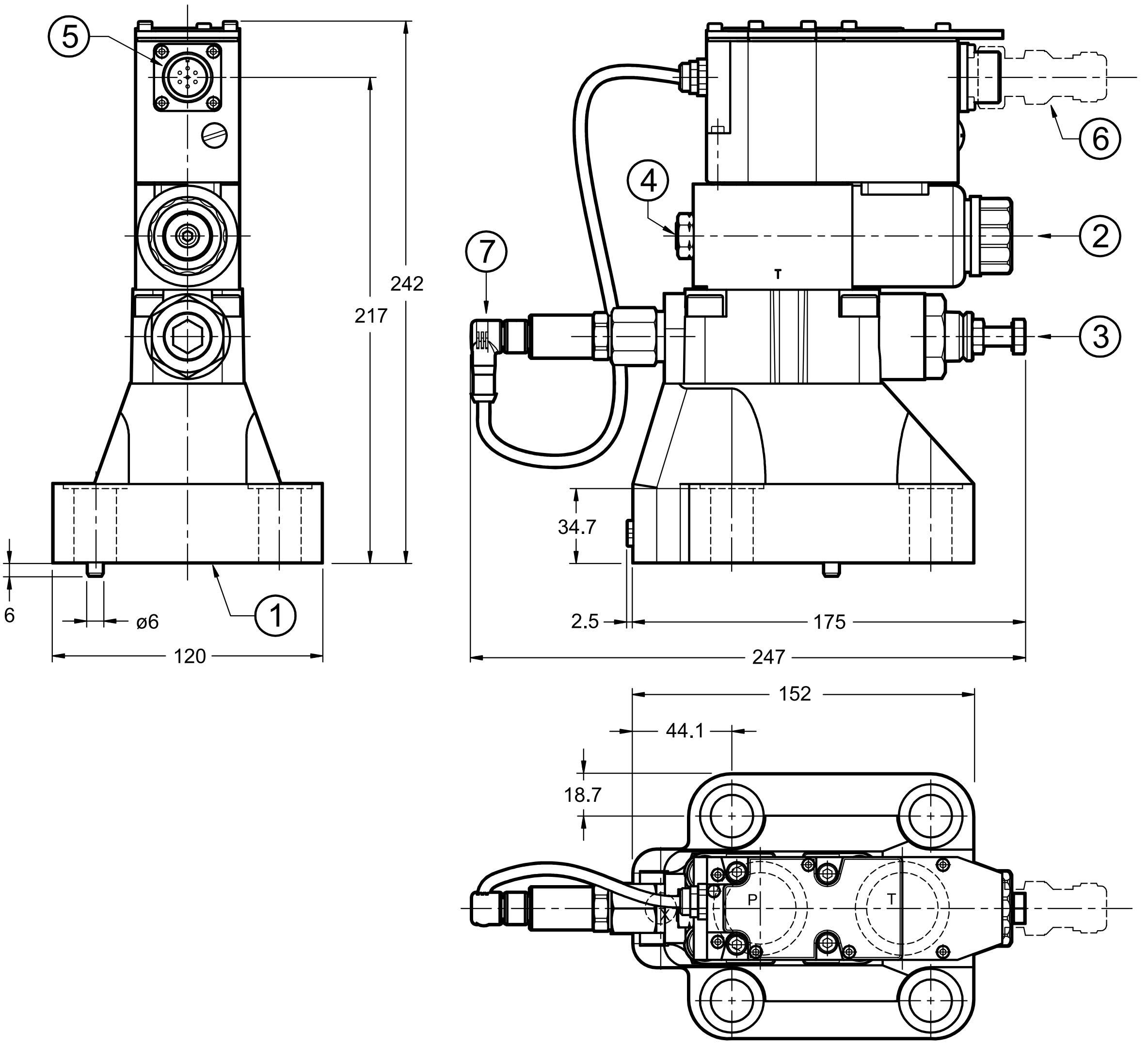
MOUNTING SURFACE:
ISO 6264-08-13-*-97
(CETOP 4.4.2-2-R08-350)



1	Mounting surface with sealing rings: 2 OR type 3118 (29.82x2.62) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Mating electrical connector **to be ordered separately**. See at section 12
7	Connector with cable for pressure transducer

9 - OVERALL AND MOUNTING DIMENSIONS PRE32J

dimensions in mm

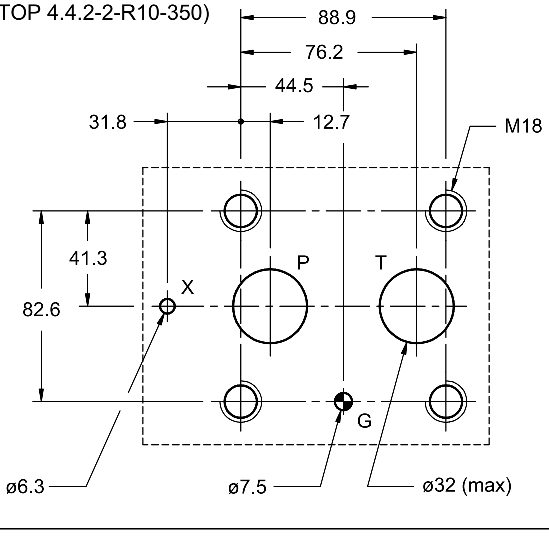


NOTE:
at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

Fastening bolts: 4 SHCS M18x60 - ISO 4762
Torque: 235Nm (screws A8.8)
Thread of mounting holes: M18x27

1	Mounting surface with sealing rings: 2 OR type 4137 (34.52x3.53) - 90 Shore 1 OR type 109 (9.13x2.62) - 90 Shore
2	Breather: Allen key 4
3	Factory-set pressure relief valve
4	Factory sealing setting (we recommend not unscrewing the nut)
5	Main connection
6	Mating electrical connector **to be ordered separately**. See at section 12
7	Connector with cable for pressure transducer

MOUNTING SURFACE:
ISO 6264-10-17-*-97
(CETOP 4.4.2-2-R10-350)



10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

11 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 5.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

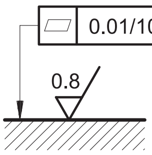
Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



12 - ACCESSORIES

(to be ordered separately)

12.1 Mating connector

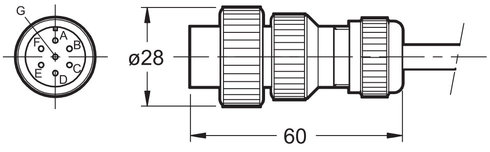
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10**   code **3890000003**



12.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

12.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

13 - SUBPLATES

(see catalogue 51 000)

	PRE10J	PRE25J	PRE32J
Type	PMRQ3-AI4G rear ports	PMRQ5-AI5G rear ports	PMRQ7-AI7G rear ports
P, **T** port dimensions	P: 1/2” BSP T: 3/4” BSP	1” BSP	1” ¼ BSP
X port dimensions	1/4” BSP	1/4” BSP	1/4” BSP

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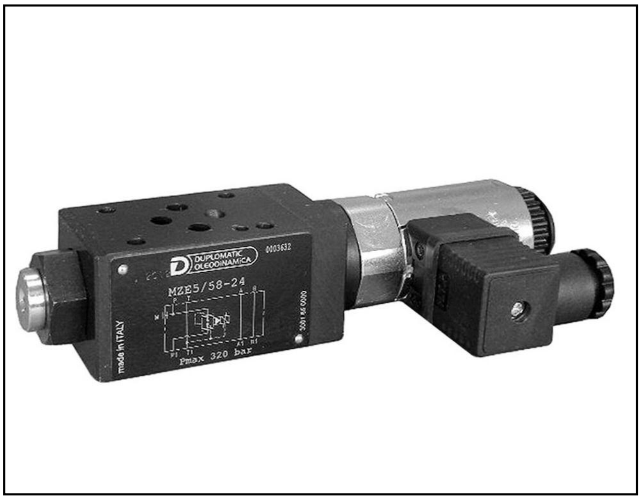


MZE

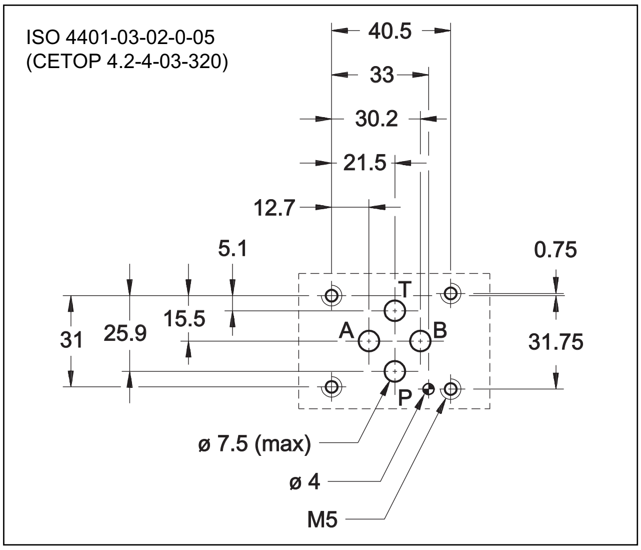
PILOT OPERATED PRESSURE REDUCING VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 58

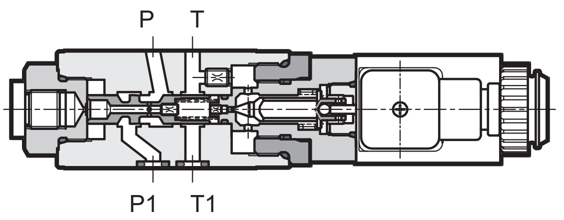
MODULAR VERSION
ISO 4401-03 (CETOP 03)

p max **320** bar
Q max (see table of performances)

MOUNTING SURFACE



OPERATING PRINCIPLE



— MZE valves are 3-way pilot operated pressure reducing valves, with electric proportional control, designed as modular versions with mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.

— The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.

— Pressure can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or by an electronic control unit, to exploit valve performance to the full (see par. 8).

— The valve is available in three different pressure reduction ranges of up to 230 bar.

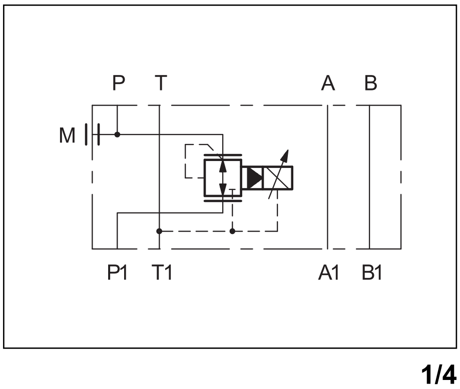
— The valve is available only with internal drain to the T line inside the valve.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Maximum operating pressure: - P-A-B ports - T port	bar	320 2
Minimum controlled pressure	see Δp-Q diagram	
Maximum flow in P line Maximum flow on passing lines Drain flow	l/min	30 50 0,4
Step response	see paragraph 5	
Hysteresis (with PWM 200 Hz)	% of p nom	< 3%
Repeatability	% of p nom	< ±1,5%
Electrical characteristic	see paragraph 4	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	1,8

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

M	Z	E		/	58	-		/	

Size: ISO 4401-03
(CETOP 03)

3-way pressure reducing valve:
Modular version

Electric proportional control

Pressure control range:
3 = 7 ÷ 70 bar
4 = 7.5 ÷ 150 bar
5 = 8 ÷ 230 bar

Series No.
(from 50 to 59 sizes and mounting
dimensions remain unchanged)

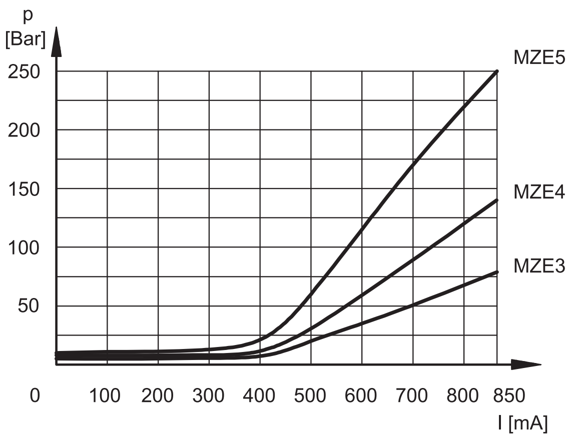
12 = Nominal solenoid voltage 12V DC
24 = Nominal solenoid voltage 24V DC

Seal:
omit for mineral oils
V = FPM seals for special fluids

2 - CHARACTERISTIC CURVES

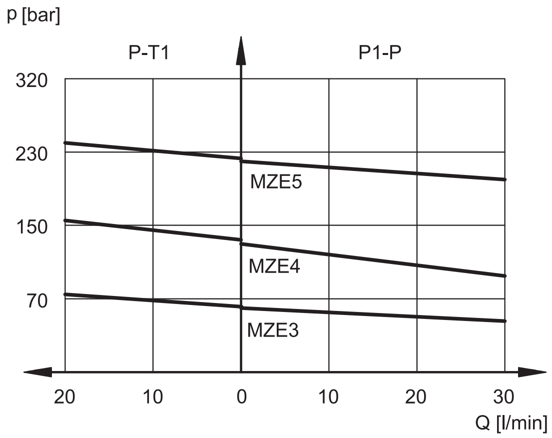
(measured with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)



The curves have been obtained with working lines closed (without flow).

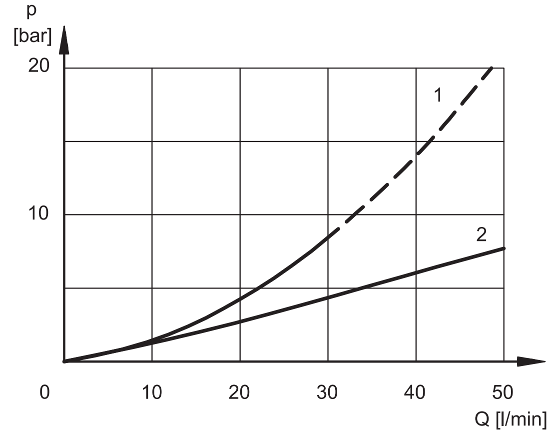
PRESSURE VARIATION p=f(Q)



The curves have been obtained with inlet pressure 50 bar greater than nominal pressure.

Pressure values in P1 greater than 50 bar reduce flow values considerably.

PRESSURE DROP ∆p=f(Q)



1. pressure drops P1→ P
2. pressure drop in passing lines
   (ex. A ↔ A1)

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals.

For fluids HFDR type (phosphate esters) use FPM seals (code V).

For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	16.6
MAXIMUM CURRENT	A	1.9	0.85
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65		

5 - STEP RESPONSE

(with mineral oil with viscosity of 36 cSt at 50°C in conjunction with the relative electronic control unit)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with input flow rate of Q = 25 l/min.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	100	80

6 - INSTALLATION

We recommend to install the MZE valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

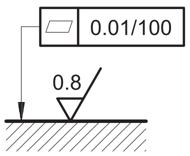
Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil (see par.7). At the end of the operation, make sure of having screwed correctly the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

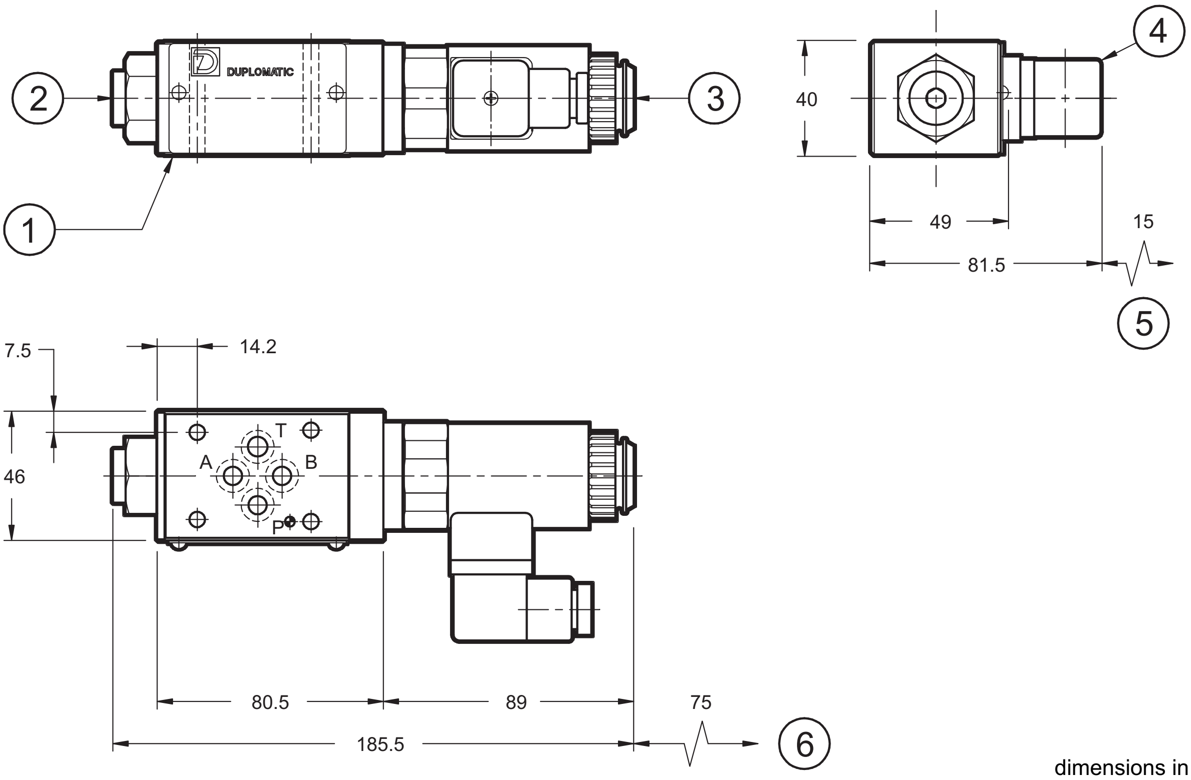
The maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface finishing



7 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25x1.78)
2	Pressure gauge port 1/4” BSP
3	Breather (male hexagonal spanner 4)
4	DIN 43650 electric connector (included in the delivery)
5	Connector removal space
6	Coil removal space

NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

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PZE3

PROPORTIONAL 3-WAY PRESSURE REDUCING VALVE, PILOT OPERATED

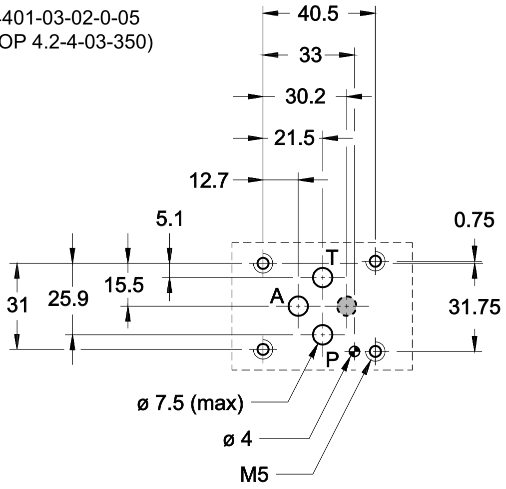
SERIES 10

SUBPLATE MOUNTING
ISO 4401-03

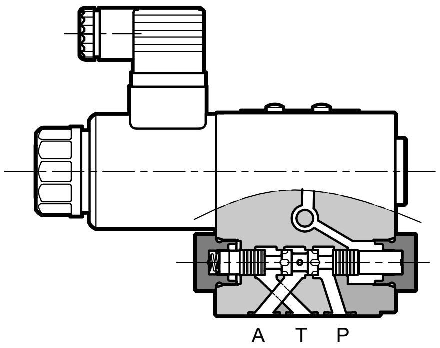
p max **350** bar
Q max **50** l/min

MOUNTING SURFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



— The PZE3 valve is a proportional 3-way pressure reducing valve, pilot operated with mounting surface according to ISO 4401- 03 standards.

— Its main function is to control continuously the outlet pressure on A reducing the inlet pressure P. However, the valve also prevent outlet pressure exceeding its regulated pressure value discharging in T the exceeding flow (a typical case of hydraulic counterweight or load balancing).

— The pressure is modulated continuously in proportion to the current supplied to the solenoid.

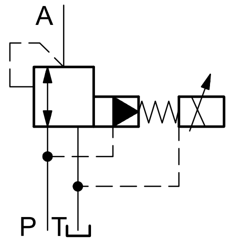
— They can be controlled directly by an amlifier or a proper electronic control unit (par. 12)

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Maximum operating pressure: - P port - T port	bar	350 2
Pilot / drain flow Maximum flow (see p max = f(Q) diagram)	l/min	2 50
Step response	see paragraph 5	
Hysteresis	% of p nom	< 5%
Repeatability	% of p nom	< ±2%
Electrical characteristic	see paragraph 2	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass	kg	2,2

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

P Z E 3 - ☐ / 10 ☐ / ☐ K1

3-way pressure reducing valve, pilot operated

Electrical proportional control

Size ISO 4401-03

Pressure control range:
025 = 0 ÷ 25 bar
070 = 0 ÷ 70 bar
140 = 0 ÷ 140 bar
210 = 0 ÷ 210 bar
310 = 0 ÷ 310 bar

Series No.
(the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

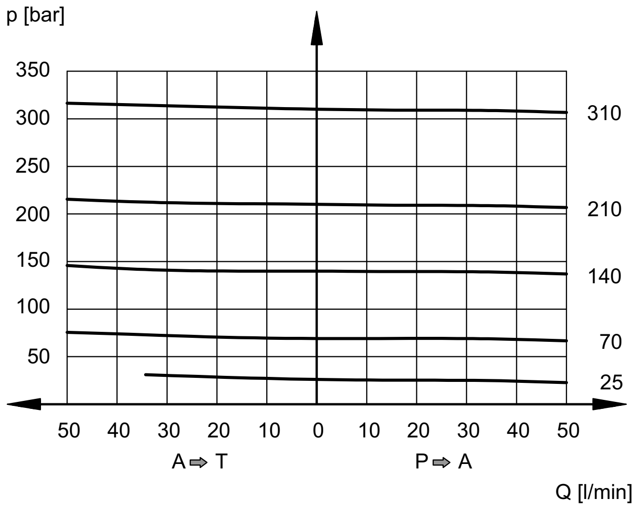
Nominal solenoidy voltage:
D12 = 12 V CC
D24 = 24 V CC

Coil electrical connection:
for connector type DIN 43650
(**standard**)

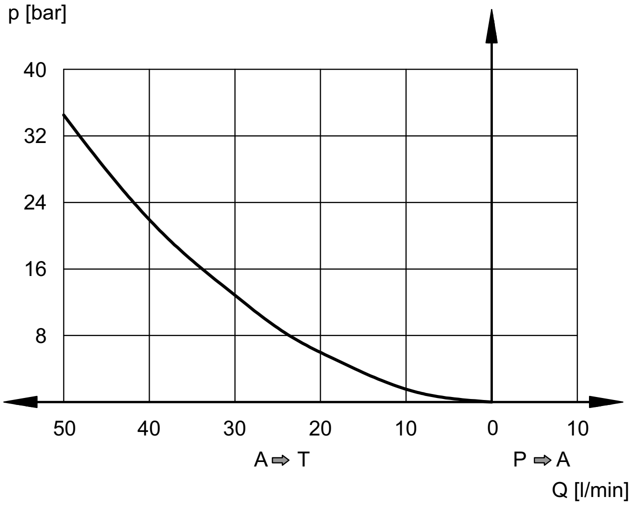
2 - CHARACTERISTIC CURVES

(measured with viscosity of 36 cSt at 50°C)

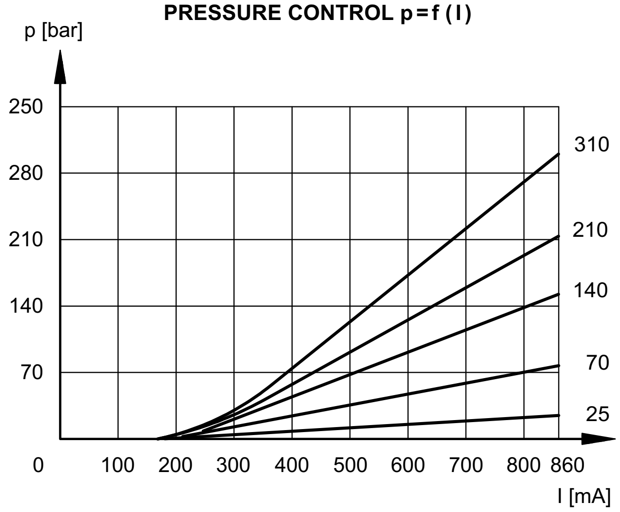
SET PRESSURE



MINIMUM CONTROLLED PRESSURE pmin = f (Q)



PRESSURE CONTROL p = f (I)



3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU		
PROTECTION FROM: Atmospheric agents (EN 60529)	IP 65		
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	class H class F		

5 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	90	90

6 - INSTALLATION

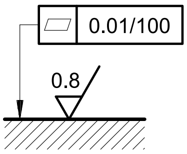
We recommend to install the PZE3 valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what shown in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particular applications, it can be necessary to vent the air entrapped in the solenoid tube, by using the apposite drain screw in the solenoid tube. Ensure that the solenoid tube is always filled with oil. At the end of the operation, make sure of having screwed correctly the drain screw.

Connect the valve T port directly to the tank. **Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.**

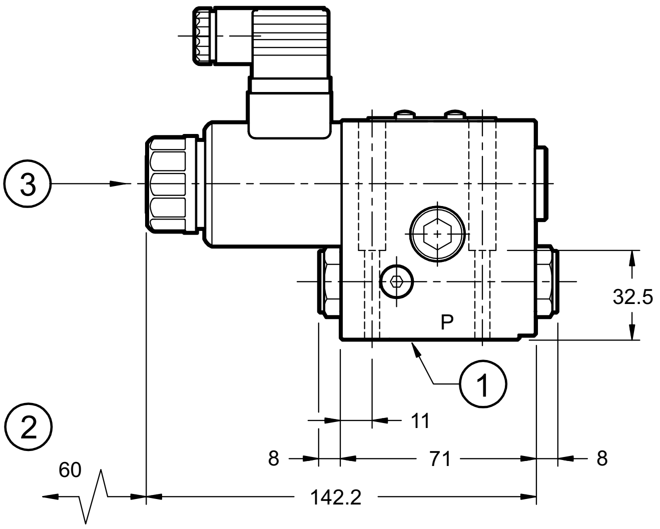
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those shown in the relative symbol. If minimum values are not observed, fluid can easily leaks between valve and support surface.

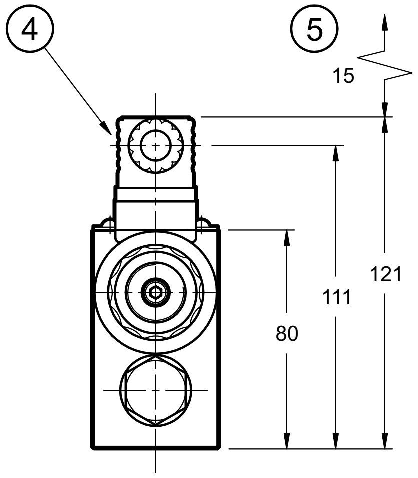
Surface finishing

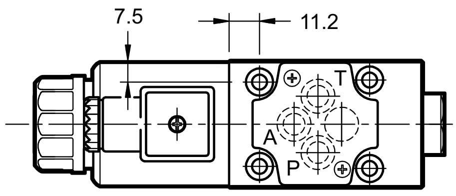


7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







NOTE: at first start up, or after a long period of no use, it is necessary to vent the air through the breather (3) placed at the end of the solenoid tube.

Fastenings bolts: 4 screws SHC M5x40 - ISO 4762
Tightening torque: 5 Nm (A8.8 bolts)
Thread of mounting holes:: M5x10

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Coil removal space
3	Breather (male hexagonal spanner 4)
4	DIN 43650 electric connector (included in the delivery)
5	Connector removal space

8 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

9 - SUBPLATES

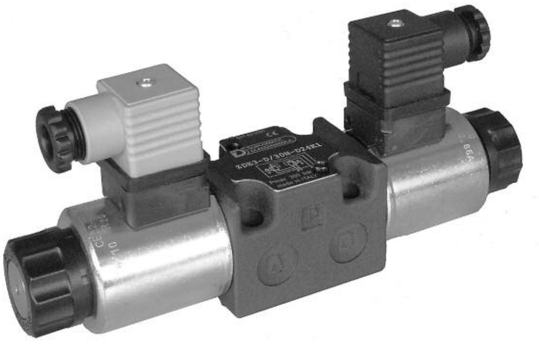
(see catalogue 51 000)

PMMD-AI3G with ports on rear
PMMD-AL3G with side ports
Ports dimensions P, T, A and B: 3/8” BSP thread

ZDE3

DIRECT OPERATED PRESSURE REDUCING VALVE WITH ELECTRIC PROPORTIONAL CONTROL

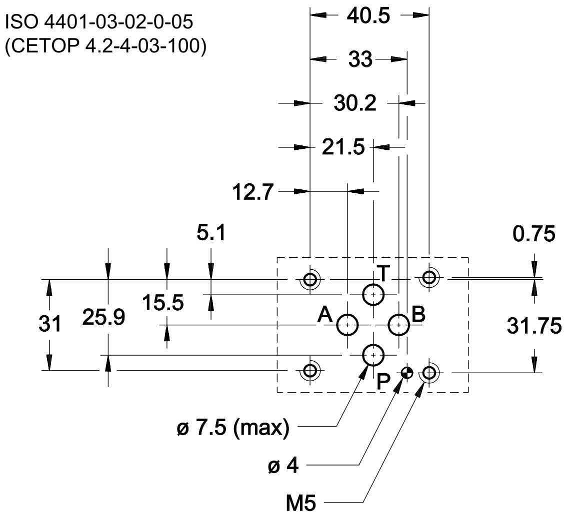
SERIES 30



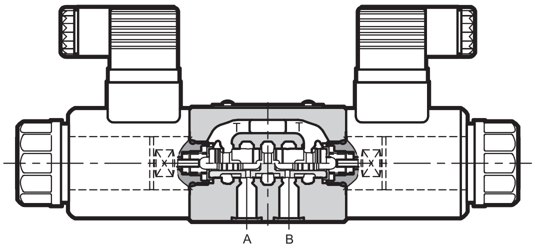
SUBPLATE MOUNTING
ISO 4401-03

p max **100** bar
Q max **15** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



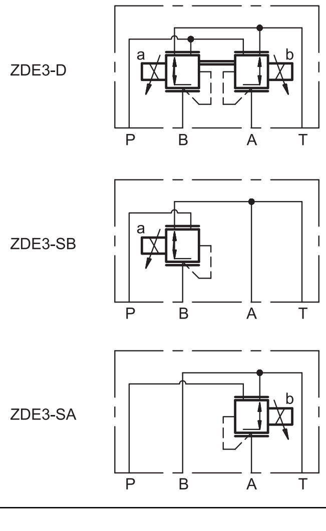
- ZDE3 valves are direct operated pressure reducing valves with electric proportional control, with mounting interface in compliance with ISO 4401 standards.
- The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.
- The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 10).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Pressure allowed on P port	bar	30 ÷ 100
Pressure allowed on T port (see par. 6)	bar	0 ÷ 30
Controlled pressure	bar	23
Minimum controlled pressure	see ∆p-Q diagram	
Maximum flow	l/min	15
Step response	see paragraph 4	
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 3	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,6 2

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

Z	D	E	3	-		/	30		-			/		

Pressure reducing valve

Electric proportional control

Size ISO 4401-03

Solenoids:
D = pressure reduction in A and B ports
SA = pressure reduction in A port (solenoid on side B)
SB = pressure reduction in B port (solenoid on side A)

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
(see paragraph 5)
K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

Manual override (see par. 7)

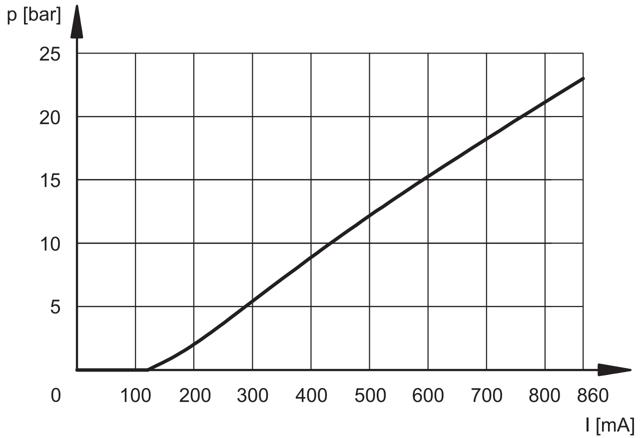
Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

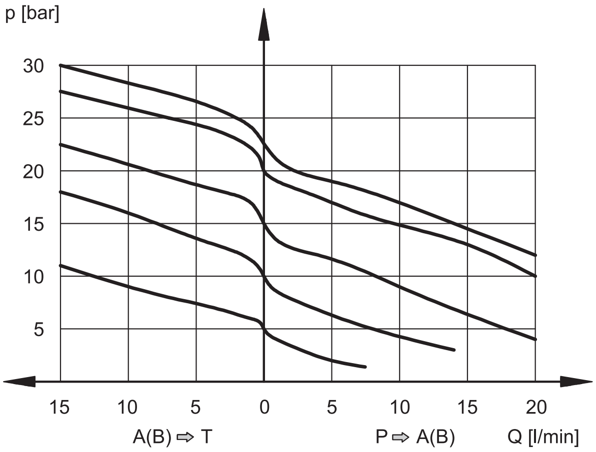
2 - CHARACTERISTIC CURVES (obtained with ZDE3-D/30N-D24K1 and oil with viscosity 36 cSt at 50°C)

PRESSURE CONTROL p=f (I)



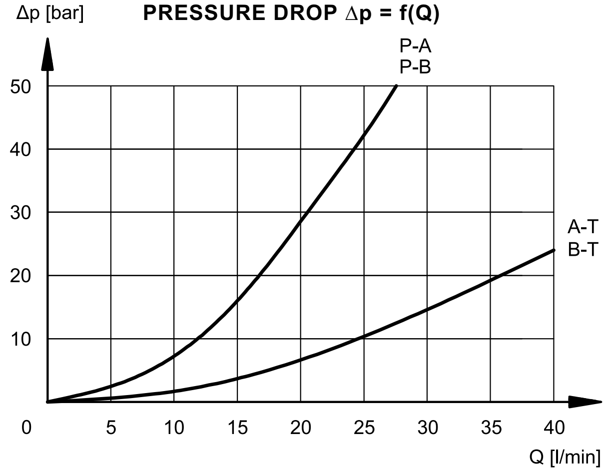
SA and SB versions pressure regulation is less than 0.5 bar.

PRESSURE VARIATION p = f(Q)



The curves have been obtained with inlet pressure 100 bar.

PRESSURE DROP Δp = f(Q)



3 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C) K1 coil K7 coil	Ω	3.66 4	17.6 19
MAXIMUM CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
PWM FREQUENCY	Hz	200	100
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/EC		
PROTECTION FROM: Atmospheric agents (EN 60529)	IP 65		
CLASS OF PROTECTION: Coil insulation (VDE 0580) Impregnation	class H class F		

4 - STEP RESPONSE

(with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

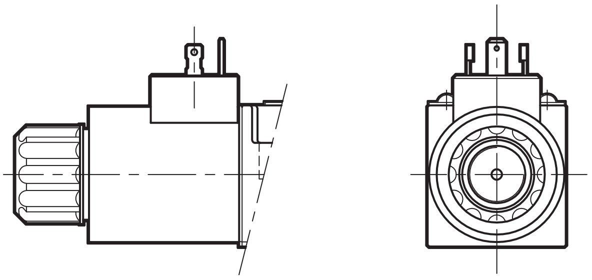
The table illustrates typical step response times measured with input flow rate of Q = 5 l/min and p = 50 bar.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	30	30

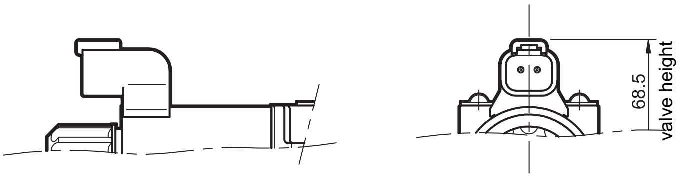
5 - ELECTRIC CONNECTIONS

Connectors for standard K1 connection are always supplied with the valve.

connection for DIN 43650
connector
code **K1** (**standard**)

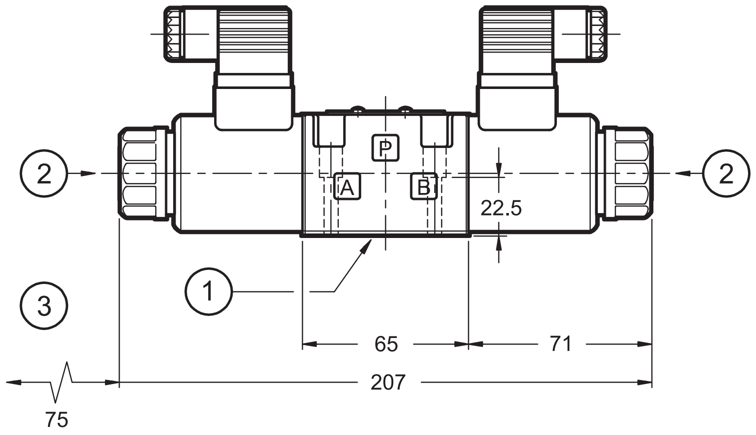


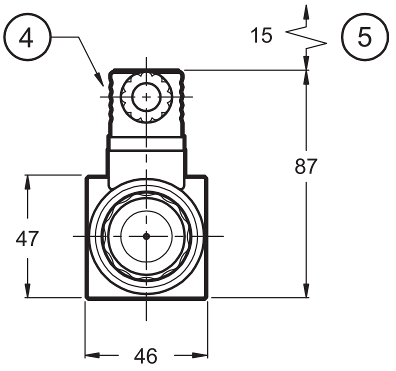
connection for
DEUTSCH DT06-2S male connector
code **K7**

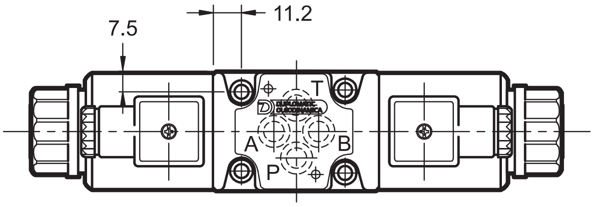


6 - OVERALL AND MOUNTING DIMENSIONS

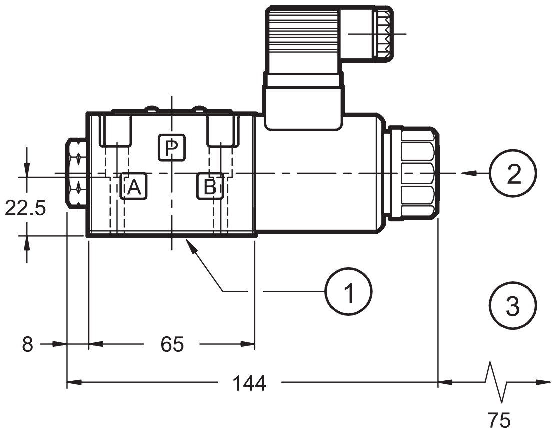
ZDE3-D



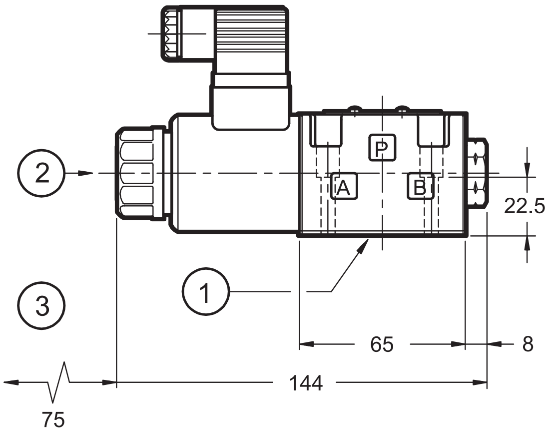




ZDE3-SA



ZDE3-SB



dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25x1.78)
2	Locking ring with boot protected manual override
3	Coil removal space
4	DIN 43650 electrical connector
5	Connector removal space

Fastening bolts: n° 4 bolts A8.8 M5x30

Torque: 5 Nm

Threads of mounting holes: M5x10

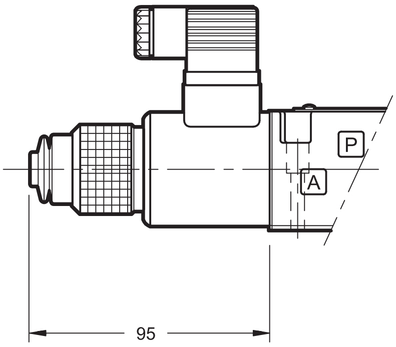
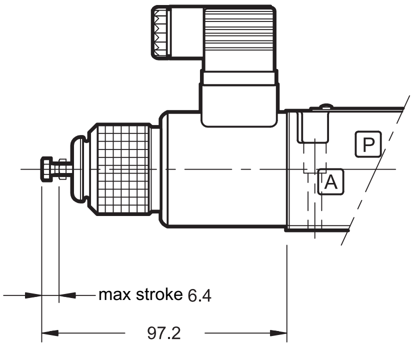
7 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

CAUTION!: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version	**CS Version**
	
Code: 3803210003	Code: 3803210004

8 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

9 - INSTALLATION

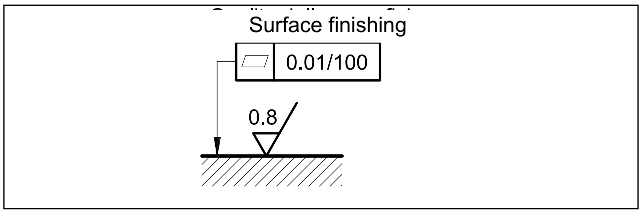
The ZDE3 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 30 bar.



10 - ELECTRONIC CONTROL UNITS

ZDE3-SA* ZDE3-SB*

EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

ZDE3-D*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 250
EDM-M242	for solenoid 12V DC		

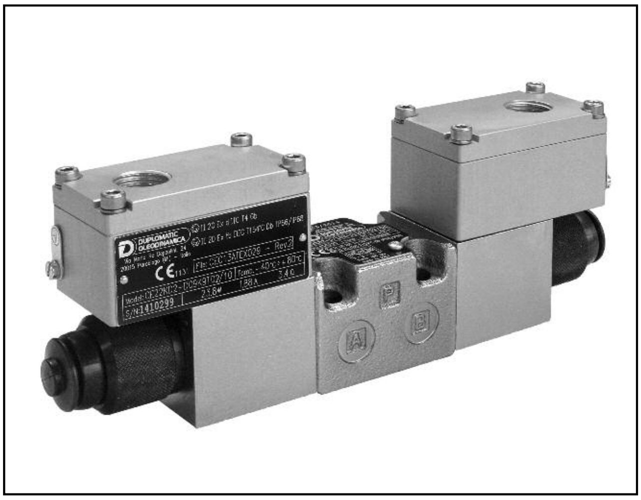
11 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8” BSP

DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



ZDE3K*

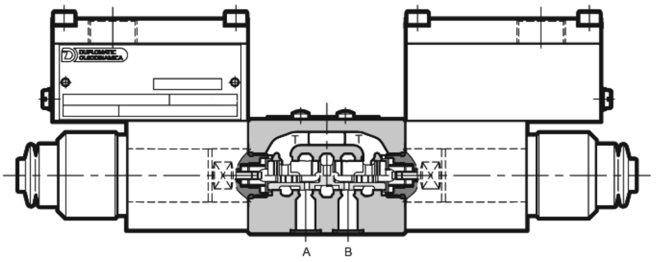
EXPLOSION-PROOF PRESSURE REDUCING VALVES ATEX, IECEx, INMETRO

SERIES 10

SUBPLATE MOUNTING
ISO 4401-03

p max **100** bar
Q max **15** l/min

OPERATING PRINCIPLE



- ZDE3K*are direct operated pressure reducing valves, with electric proportional control, with ISO 4401-03 mounting surface.
- They are compliant with ATEX, IECEx and INMETRO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.
- A low temperature version (up to -40 °C) is also available.
- The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.
- ZDE3K* valves are supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours.
- **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

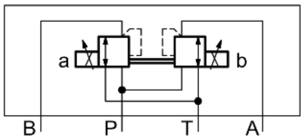
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

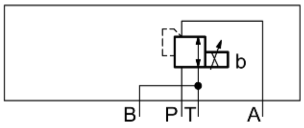
Pressure allowed in P port	bar	30 ÷ 100
Pressure allowed in T port (see par. 3)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Step response	ms	30
Hysteresis (with PWM 200 Hz)	% of p nom	< 4%
Repeatability	% of p nom	< ±1%
Electrical characteristic	see paragraph 4	
Operating temperatures (ambient and fluid)	see data sheet 02 500	
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,8

HYDRAULIC SYMBOLS

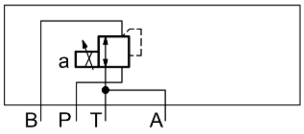
ZDE3K*-D



ZDE3K*-SB



ZDE3K*-SA



1 - IDENTIFICATION CODE

Z	**D**	**E**	**3**		**-**		**/**	**10**		**-**		**K9**		**/**			

Pressure reducing valve:

Electric proportional control

Size ISO 4401-03

Explosion-proof certification: **See table 1.1**

Solenoids:
D = pressure reduction in A and B ports
SA = pressure reduction in A port (solenoid on side B)
SB = pressure reduction in B port (solenoid on side A)

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage
D12 = 12 V DC
D24 = 24 V DC

Coil electrical connection: by terminal block

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
S03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see paragraph 8

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: zinc-nickel standard finishing surface treatment.
Test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards.

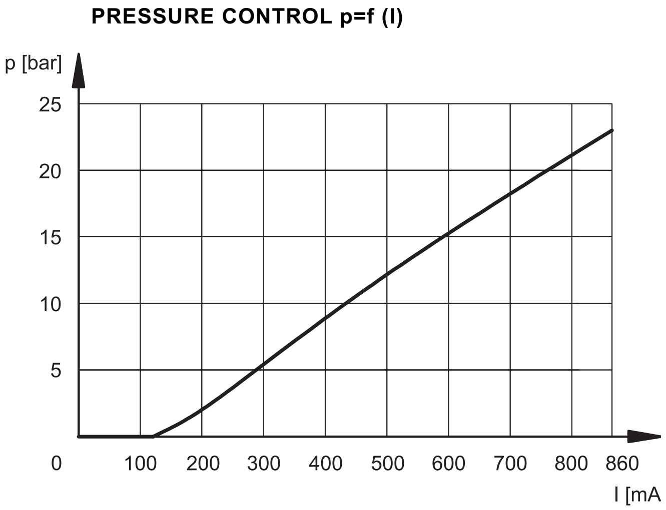
1.1 - Names of valves per certification

	ATEX		IECEx		INMETRO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb

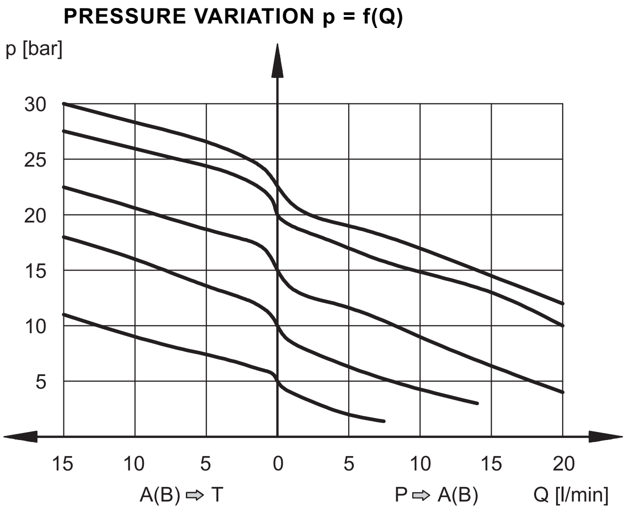
NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - CHARACTERISTIC CURVES

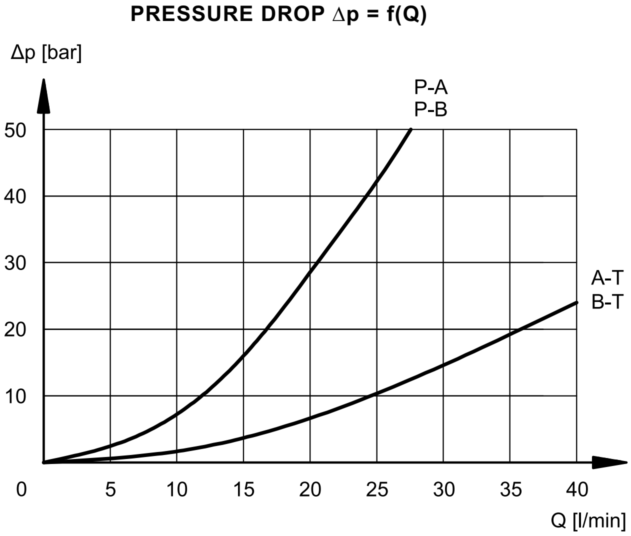
(obtained with ZDE3K*-D/10N-D24K9T01/CM with PWM 100Hz and oil with viscosity 36 cSt at 50°C)



SA and SB versions pressure regulation is less than 0.5 bar.



The curves have been obtained with inlet pressure 100 bar.



3 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical step response times measured with input flow rate of Q = 5 l/min and p = 50 bar.

REFERENCE SIGNAL STEP	0 → 100%	100% → 0
response time [ms]	30	30

4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.4	15.6
NOMINAL CURRENT	A	1.88	0.86
PWM FREQUENCY	Hz	200	100

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	IP66 / IP68 class H

4.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

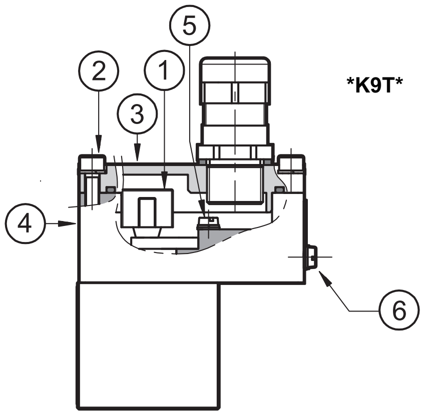
The electrical connection is polarity-independent.

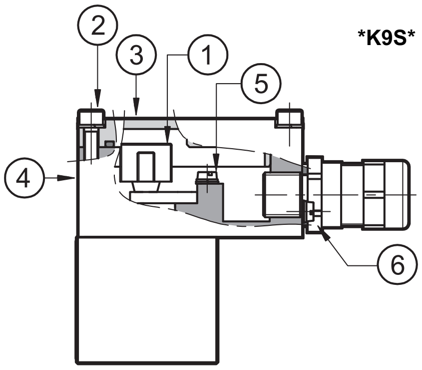
By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9 ÷ 6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards.





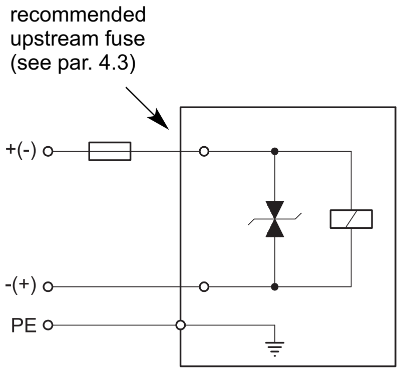
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see paragraph 10) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagram



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source.

The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

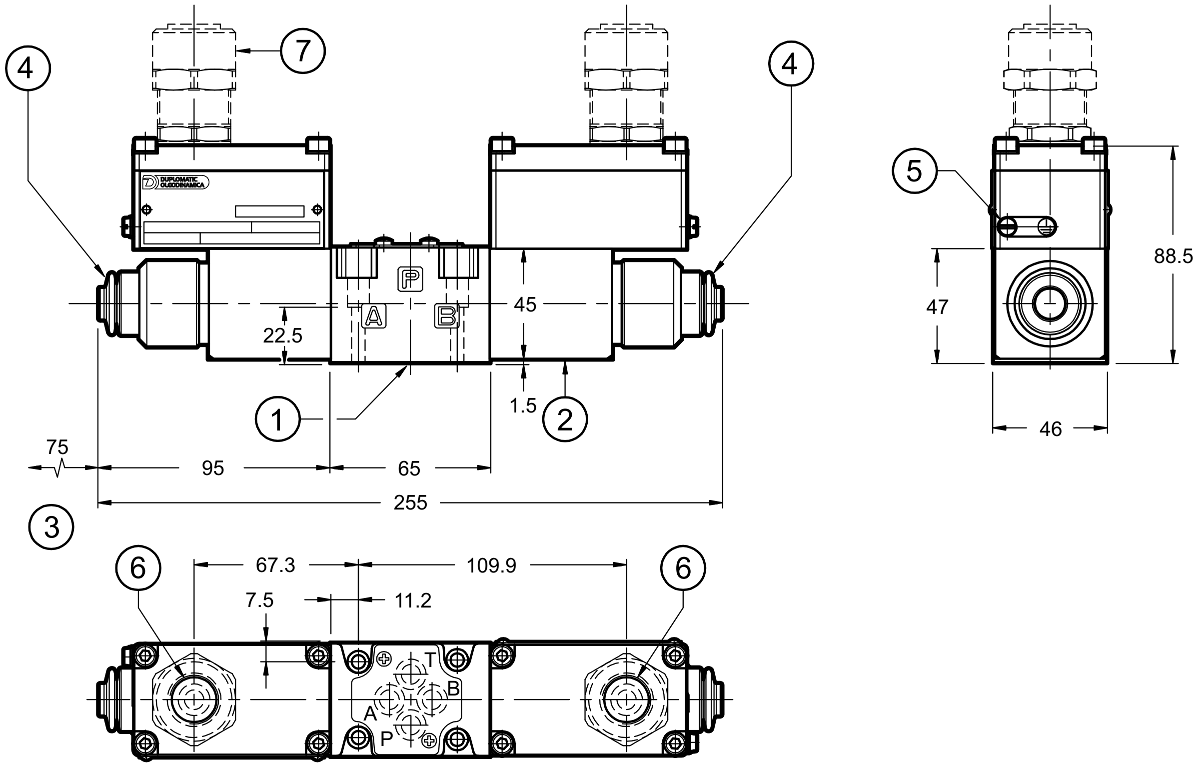
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

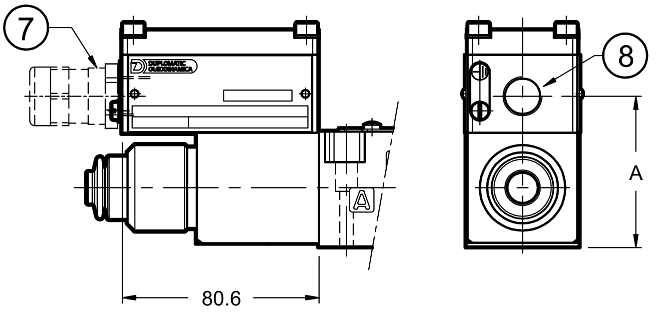
5 - OVERALL AND MOUNTING DIMENSIONS

ZDE3K*- D/10*-*K9T */CM

dimensions in mm



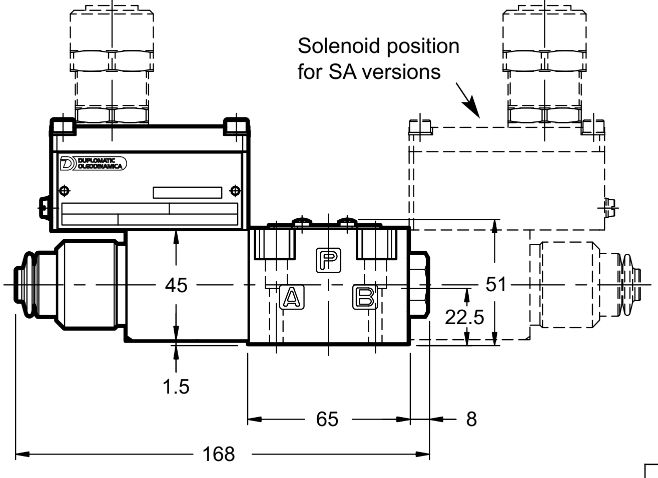
ZDE3K*-*/10*-*K9S*/CM



Side port type	A
S01, S04	60.5
S02, S03	60

ZDE3K*- SB*/10*-*K9T */CM

Solenoid position
for SA versions



1	Mounting surface with sealing rings 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) for blind ring nut dimensions (standard with NL seals) see par. 8
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland To be ordered separately, see par. 9
8	Side port for cable gland

Fastening of single valve: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

6 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

7 - INSTALLATION

Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

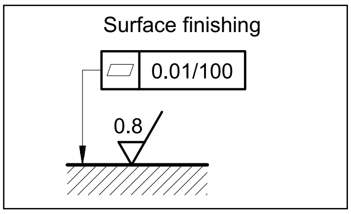
The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

In the T line the maximum admissible backpressure is 30 bar, under operational conditions.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



8 - MANUAL OVERRIDE CB

CB - Blind ring nut

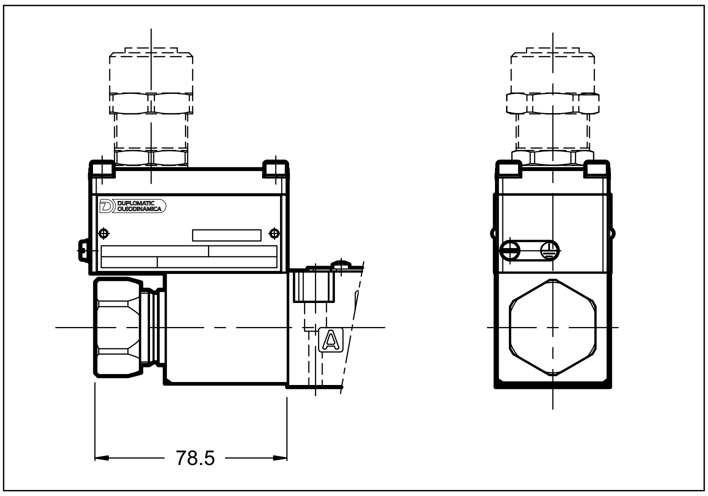
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loose the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.

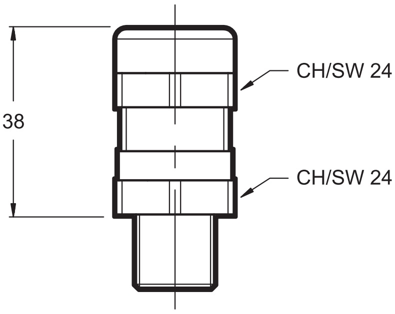
CAUTION!: The manual override doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.



9 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb; INMETRO Gb, Db, Mb certified
- cable gland material: nickel brass
- rubber tip material: silicone
- ambient temperature range: -70ºC ÷ +220ºC
- protection degree: IP66/IP68
- tightening torque: 15 Nm



To order, list the description and the code of the version chosen from among those listed below:

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

10 - ELECTRONIC CONTROL UNITS

ZDE3K*- SA* ZDE3K*- SB*

EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

ZDE3K*- D*

EDM-M211	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M242	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion proof certified; therefore, they must be installed outside the classified area.

11 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G with rear ports
Type PMMD-AL3G with side ports
P, T, A, B port threading: 3/8” BSP

NOTE: Subplates (to be ordered separately) do not contain neither aluminium nor magnesium at a higher rate than the value allowed by norms according to ATEX directive for categories II 2GD and I M2 .

The user must take care and make a complete assessment of the ignition risk, that can occur from the relative use in potentially explosive environments.

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure valves

RQM*K*-P	21 515
PRE(D)*K*	81 315
ZDE3K*	81 515
DZCE*K*	81 605

directional valves

D*K*	41 515
DS(P)E*K*	83 510

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

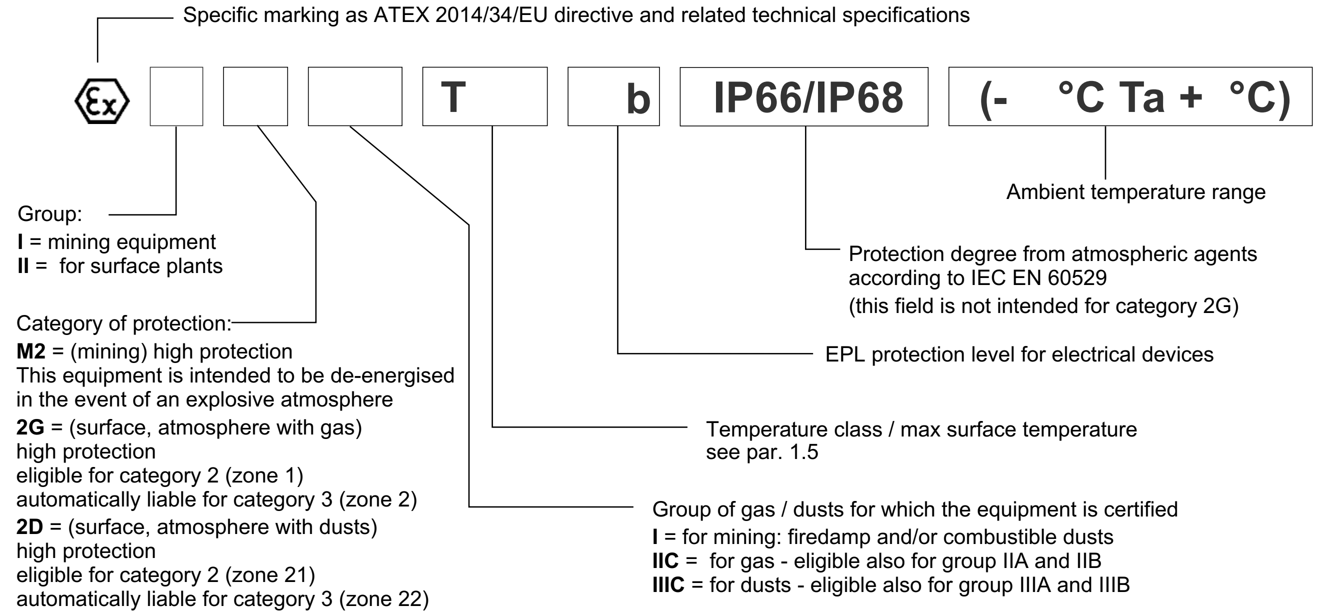
1.1 - ATEX classification for valves

Type examination certificate: CEC 13 ATEX 030-REV.2
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		**N and V seals**	**NL seals**
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Ambient temperature range

Group:
I = mining equipment
II = for surface plants

Protection degree from atmospheric agents according to IEC EN 60529
(this field is not intended for category 2G)

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

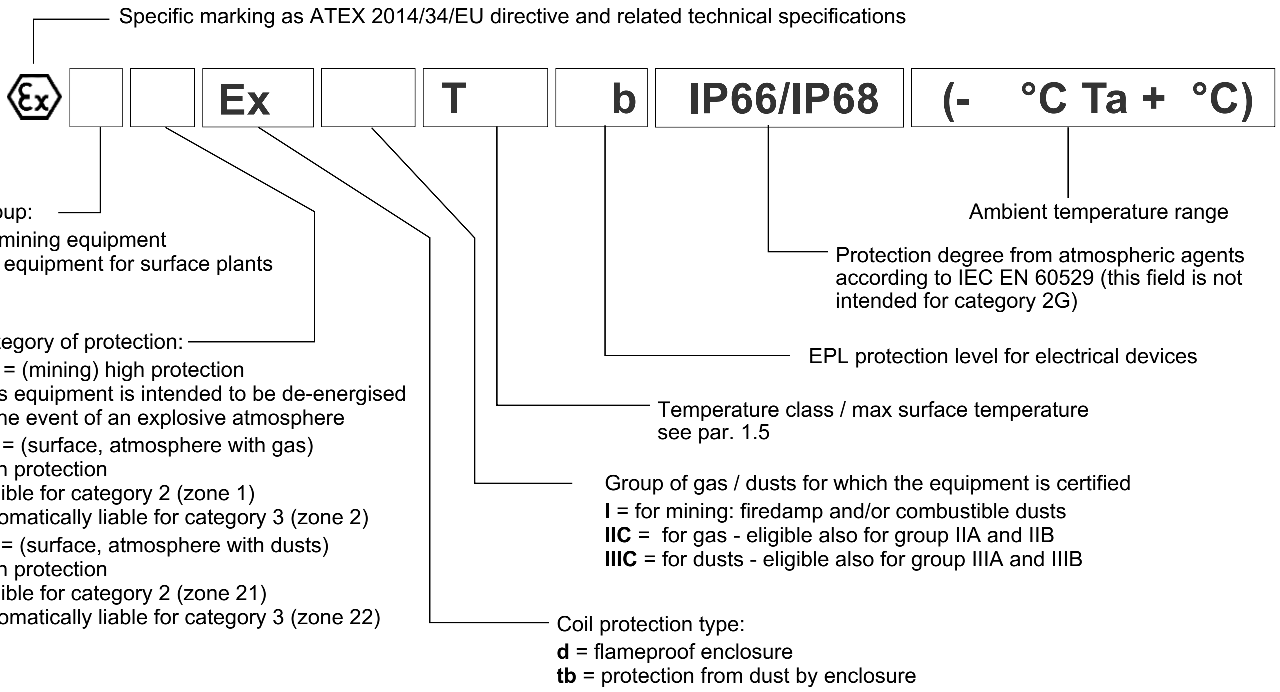
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, carries the relative ATEX marking. **The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	Ex II 2G Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ex II 2G Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ex I M2 Ex d I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Group:
I = mining equipment
II = equipment for surface plants

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for category 2G)

EPL protection level for electrical devices

Temperature class / max surface temperature see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Coil protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEx CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

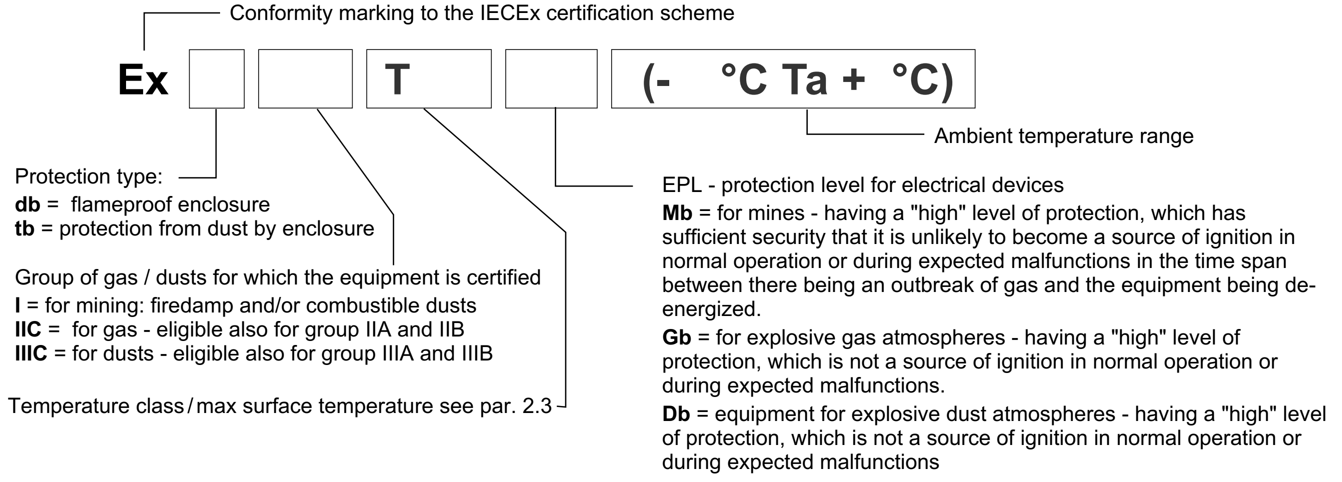
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



Conformity marking to the IECEx certification scheme

Ambient temperature range

Protection type:
db = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 2.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

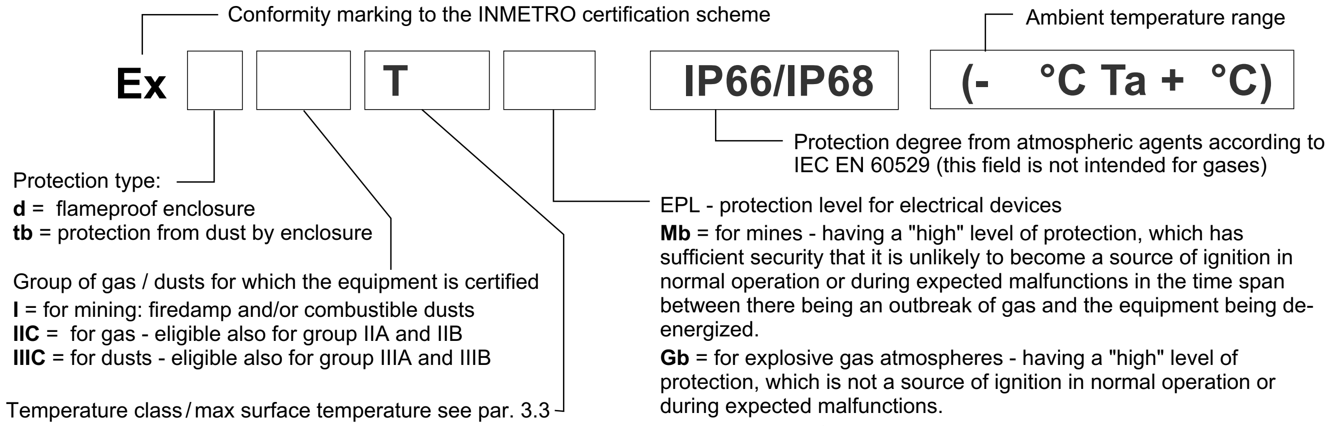
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
INMETRO Mb	***KBDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex d I T150° Mb IP66/IP68 (-40°C Ta +75°C)



Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for gases)

Protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 3.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

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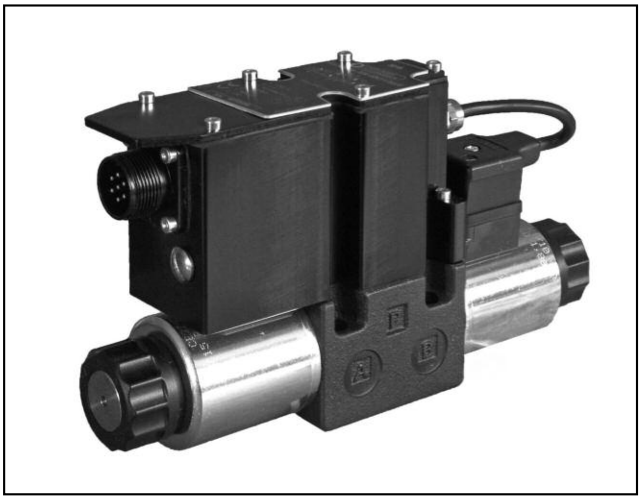
ZDE3G

DIRECT OPERATED REDUCING VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

SERIES 31

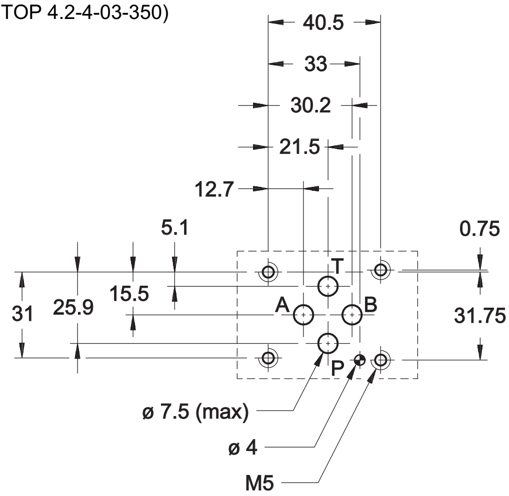
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **100** bar
Q max **15** l/min

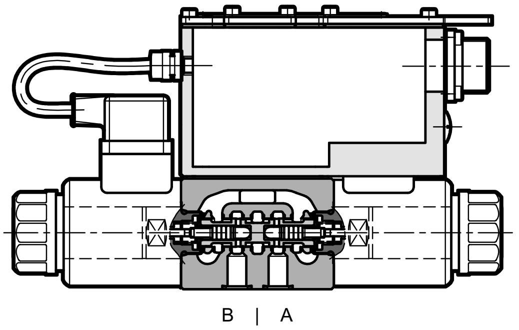


MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



OPERATING PRINCIPLE



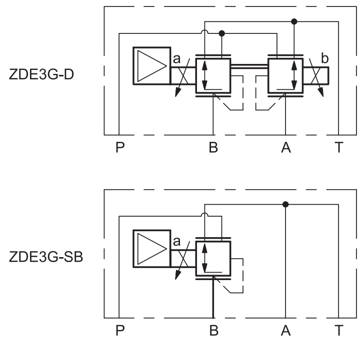
- The ZDE3G are direct operated pressure valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 standards.
- The valves are used to reduce pressure in the secondary circuit branches thus ensuring stability of controlled pressure in the event of variations of the flow rate through the valve.
- The valve are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.
- A solenoid current monitoring signal is available.
- The valve is easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Pressure allowed on P port	bar	30 ÷ 100
Pressure allowed on T port (see par. 5)	bar	0 ÷ 30
Controlled pressure	bar	23
Maximum flow	l/min	15
Hysteresis	% Q max	< 3 %
Repeatability	% Q max	< 1 %
Electrical characteristics	see paragraph 2	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,4

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

Z	D	E	3	G	-		/	31		-		K11		/	

Pressure reducing valve

Electric proportional control

Size ISO 4401-03

Integrated electronics for open loop

Solenoids:
D = pressure reduction in A and B ports
SB = pressure reduction in B port (solenoid on side A)

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage 0 ÷ 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Option:
manual override
(see paragraph 7)

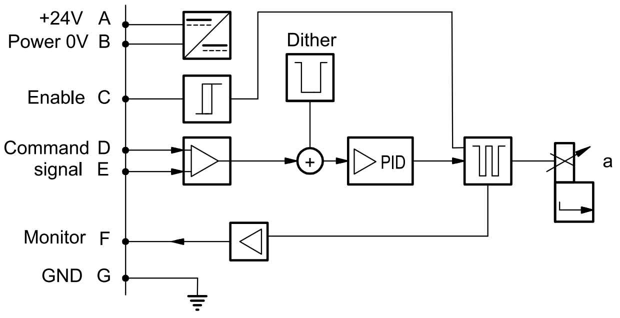
2 - ELECTRICAL CHARACTERISTICS

2.1 - Electrical on board electronics

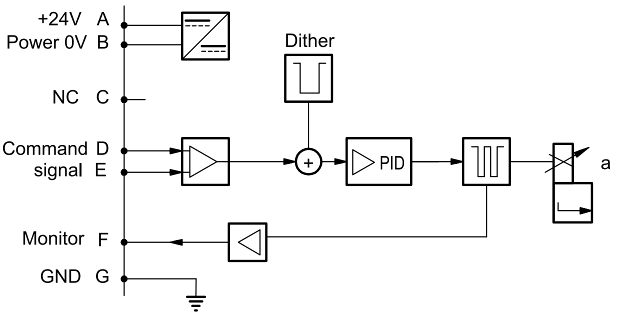
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

2.2 - On-board electronics diagrams

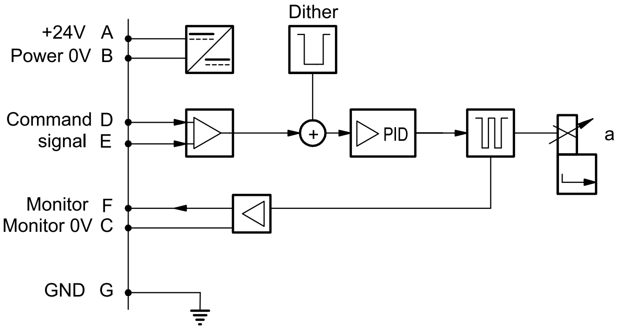
VERSION **A** - External Enable



VERSION **B** - Internal Enable

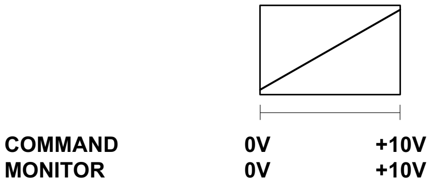


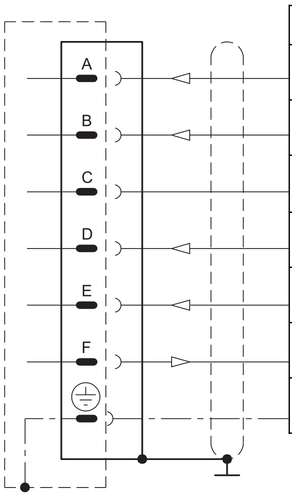
VERSION **C** - 0V Monitor



3 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0…10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



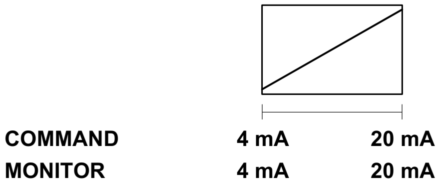


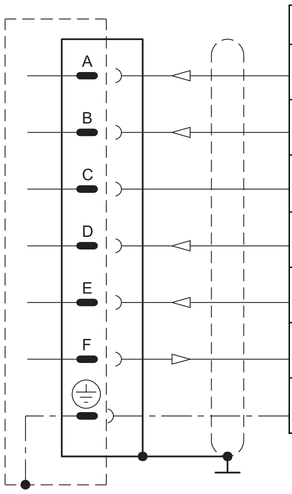
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

4 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





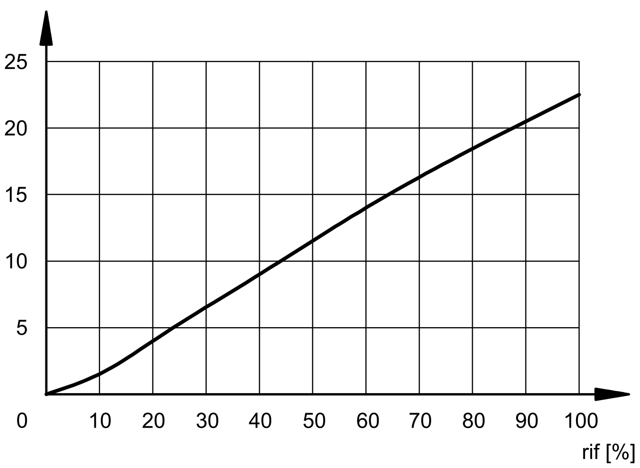
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - CHARACTERISTIC CURVES

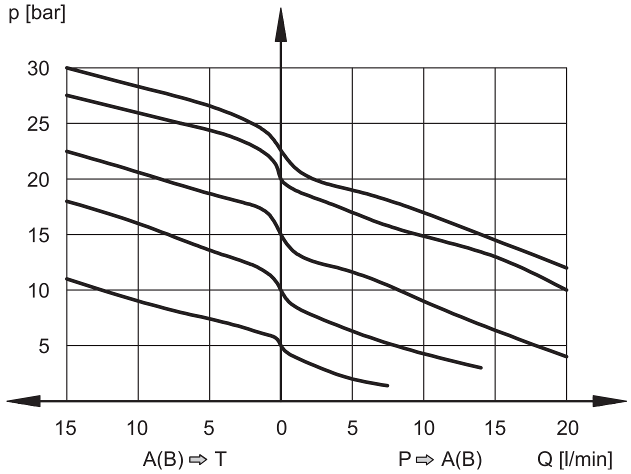
(obtained with oil with viscosity 36 cSt at 50°C)

Adjustment characteristics depending from solenoid current supply, obtained with inlet pressure = 100 bar.

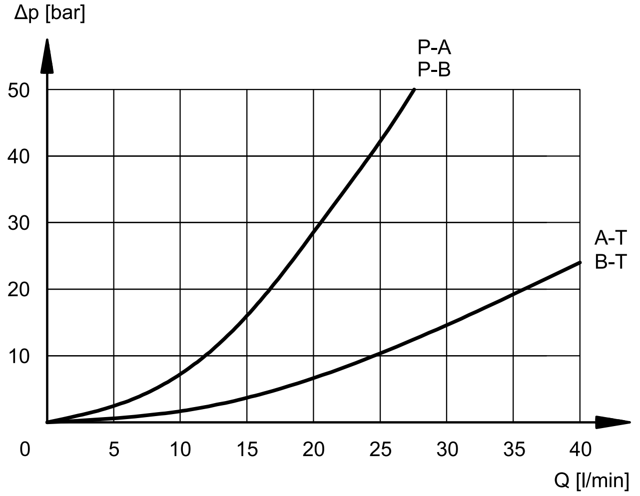
PRESSURE CONTROL p = f (I)



PRESSURE VARIATION p = f(Q)

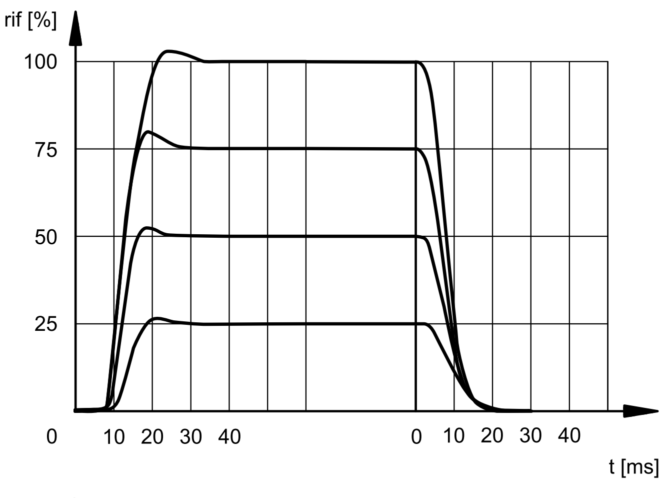


PRESSURE DROP ∆p = f(Q)



6 - STEP RESPONSE

Response times are obtained with an inlet pressure of 100 bar and oil volume of 0,3 litres. The response time is affected both by the flow rate and the oil volume in the pipework.



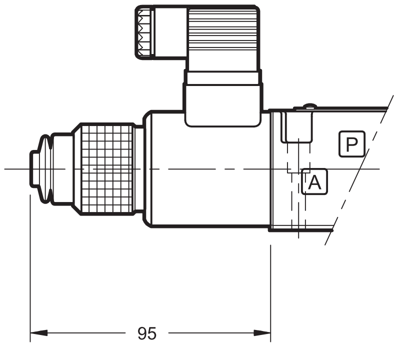
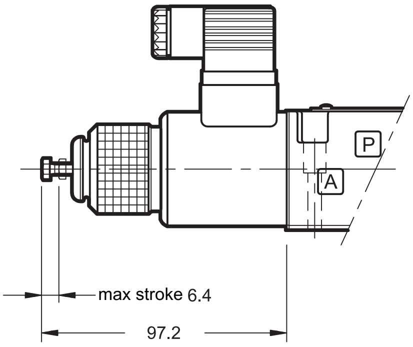
7 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

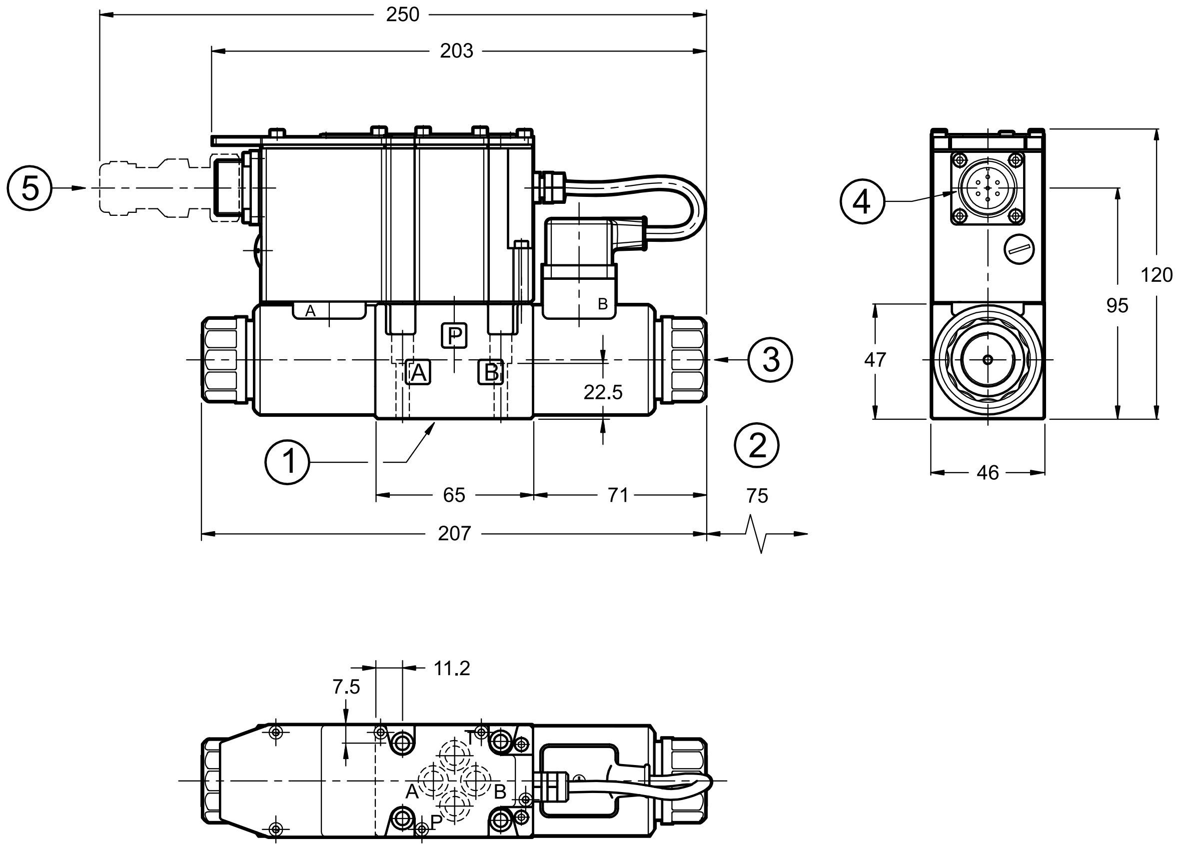
CAUTION!: The manual override use doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.

CM Version	CS Version
	
Code: 3803210003	Code: 3803210004

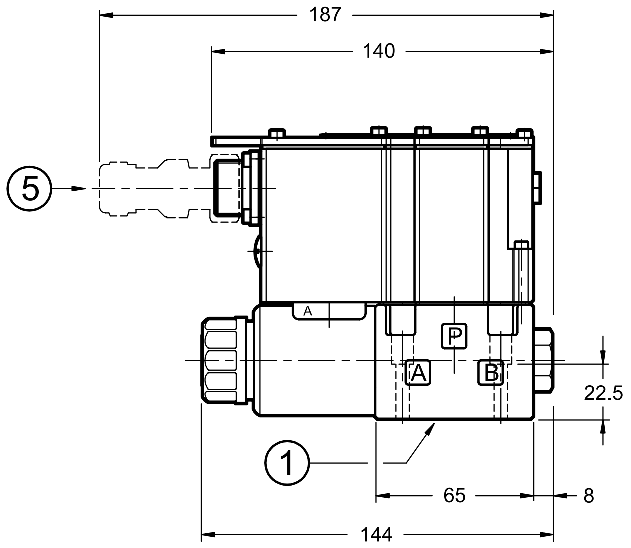
8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

ZDE3G-D



ZDE3G-SB



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Standard manual override embedded in the solenoid tube
4	Main connection
5	Mating connector. **To be ordered separately.** See paragraph 11

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

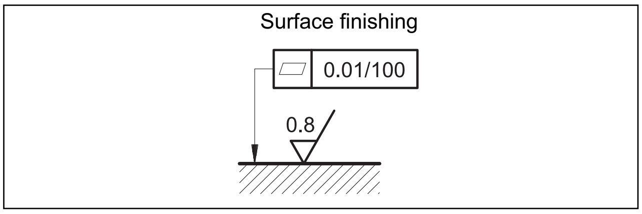
ZDE3G valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the reduced pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 30 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



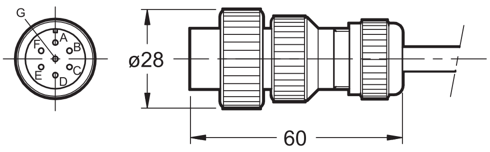
11 - ACCESSORIES

(to be ordered separately)

11.1 - Mating connector

These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.



If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**

11.2 - Connection cables size

Power supply:
- up to 20 m cable lenght : 1,0 mm^2
- up to 40 m cable lenght : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

11.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

12 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

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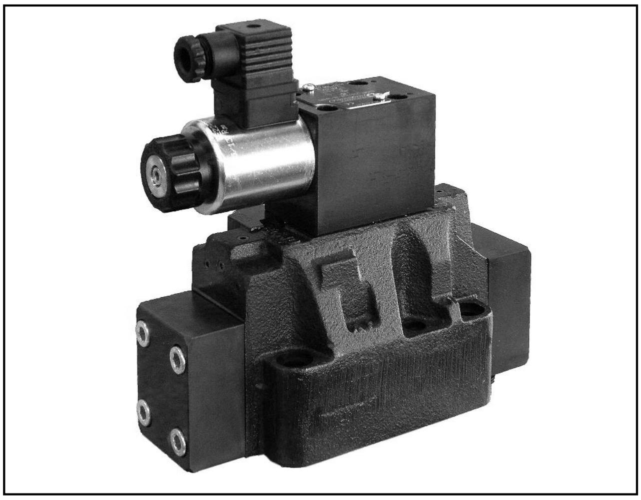
DUPLOMATIC OLEODINAMICA



DZCE*

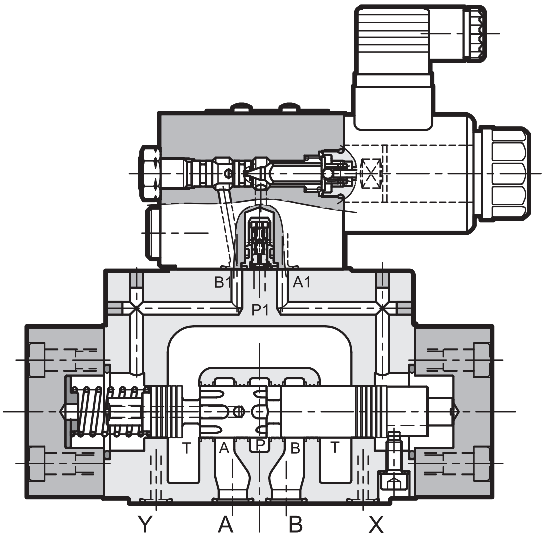
PRESSURE REDUCING VALVE WITH PROPORTIONAL CONTROL

SERIES 11

DZCE5	**CETOP P05**
DZCE5R	**ISO 4401-05** (CETOP R05)
DZCE7	**ISO 4401-07** (CETOP 07)
DZCE8	**ISO 4401-08** (CETOP 08)

p max **350** bar
Q max (see table of performances)

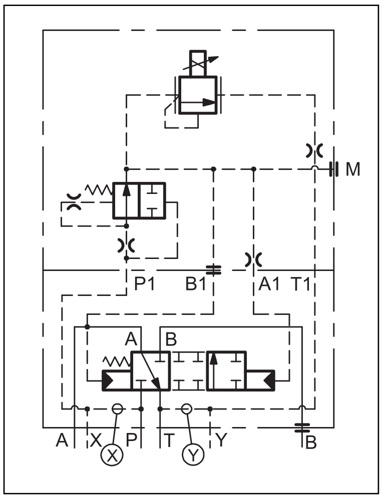
OPERATING PRINCIPLE



- The DZCE* are pressure reducing valves with electric proportional control and mounting interface in compliance with ISO 4401 (CETOP RP121H) standards.
- Those valves, besides reducing the pressure from line P to working line A, allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical case of hydraulic counterweight or load balancing.
- The pressure can be modulated continuously in proportion to the current supplied to the solenoid.
- They can be controlled directly by a current control supply unit or by means of the electronic control units (par. 12) to exploit valve performance to the full .
- They are available in CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07) and ISO 4401-08 (CETOP 08) sizes.
- Every size can be supplied with several controlled flow rates, up to 500 l/min.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)		**DZCE5** **DZCE5R**	**DZCE7**	**DZCE8**
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 6		
Hysteresis (with PWM 200 Hz)	% of p_{max}	< 4%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristic		see paragraph 5		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7	9,2	15,3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	Z	C	E		-		/	11		-			/		K1

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05 (**NOTE**)
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

Pressure control range
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series N. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

Drainage: **I** = internal
E = external

Supply voltage:
D12 = voltage 12V DC
D24 = voltage 24V DC

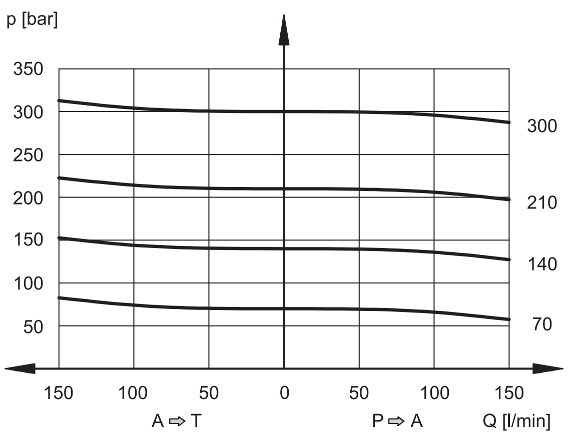
Coil electrical connection:
for connector type
DIN 43650 (**standard**)

NOTE: This version is interchangeable with the model ZCE4 Duplomatic.

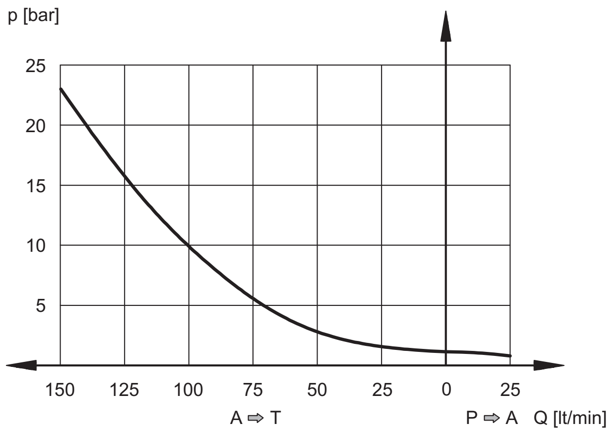
2 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

2.1 - Characteristic curves DZCE5 and DZCE5R

ADJUSTMENT

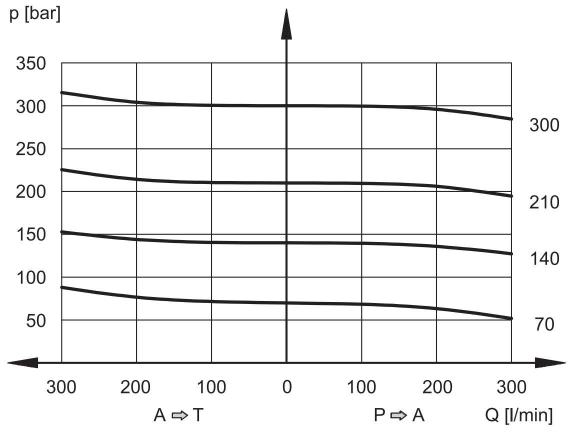


MIN. CONTROLLED PRESSURE p min = f(Q)

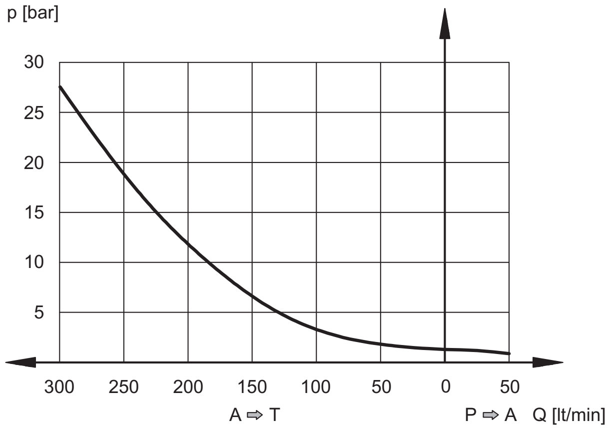


2.2 - Characteristic curves DZCE7

ADJUSTMENT

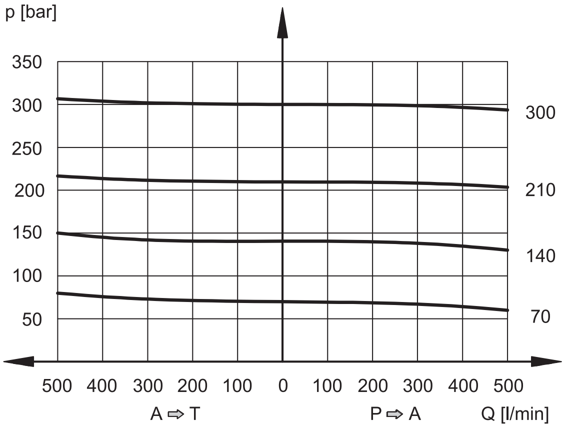


MIN. CONTROLLED PRESSURE p min = f(Q)

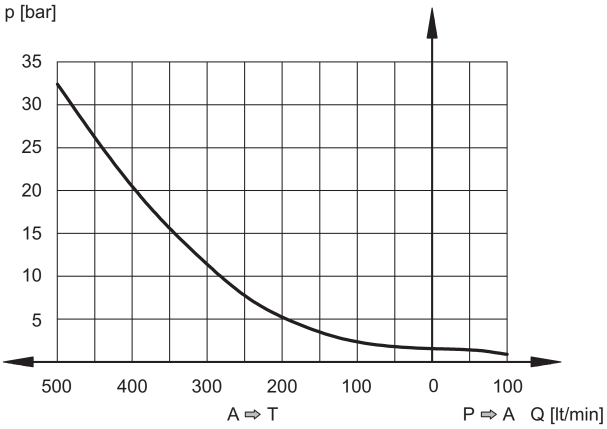


2.3 - Characteristic curves DZCE8

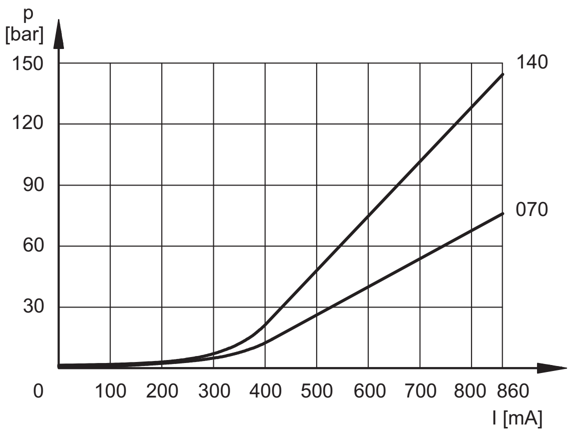
ADJUSTMENT

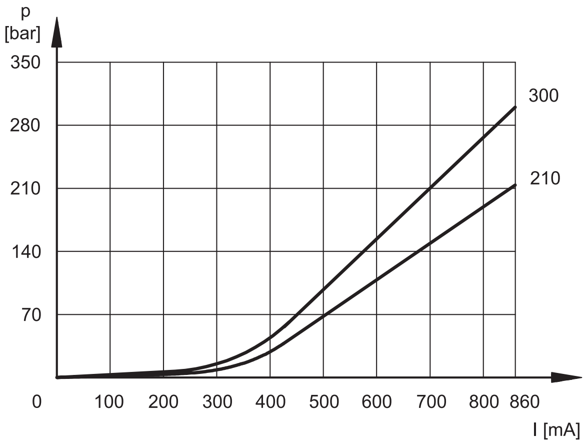


MIN. CONTROLLED PRESSURE p min = f(Q)



2.4 - Pressure control p = f(I) DZCE5, DZCE5R, DZCE7 and DZCE8





3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

6 - PILOTING AND DRAINAGE

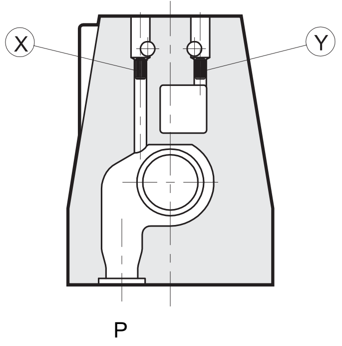
The DZCE* valves are available with piloting and drainage, both internal and external.
We suggest to use the version with external drainage that allows a higher backpressure on the unloading.

VALVE TYPE		Plug assembly	
		X	**Y**
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

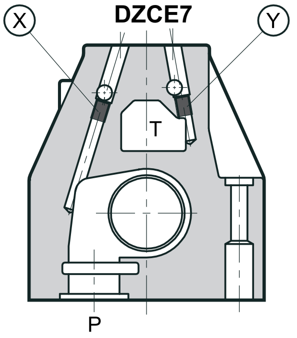
Pressure	MIN	MAX
Piloting pressure on X port	30	350
Pressure on T port with interal drain	–	2
Pressure on T port with external drain	–	250

DZCE5 and DZCE5R



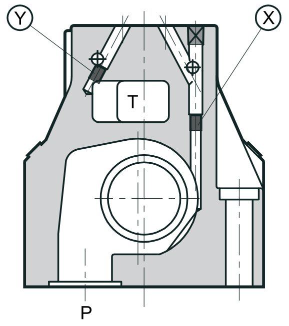
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DZCE8



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.
It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: atmospheric agents (CEI EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

6 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with the relative electronic control units)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

REFERENCE SIGNAL STEP	0 →100%	100→0%
response times [ms]		
DZCE5 and DZCE5R	100	70
DZCE7	100	50
DZCE8	100	50

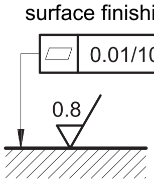
7 - INSTALLATION

We recommend to install the DZCE* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

Ensure that there is no air in the hydraulic circuit. In particulars applications,it can be necessary to vent the air entrapped in the solenoid tube, using the special drain screw and then ensure to screwed it correctly.

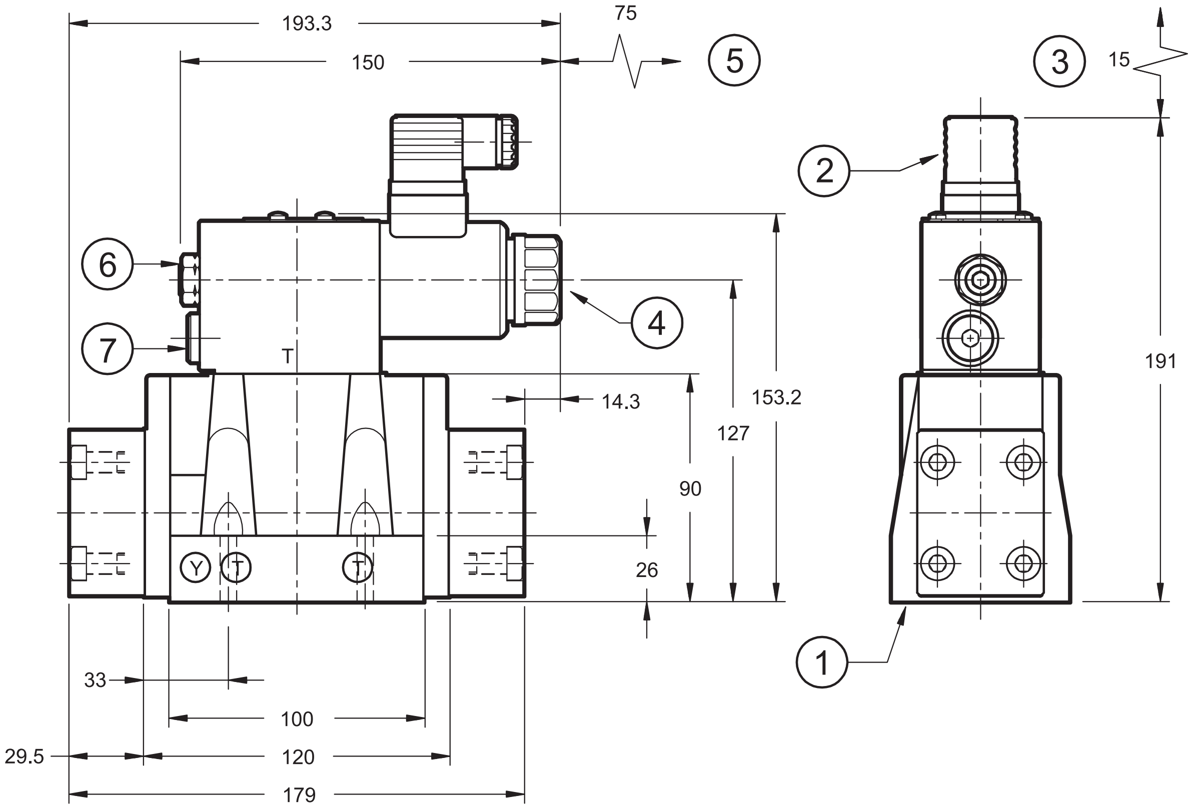
Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value. Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

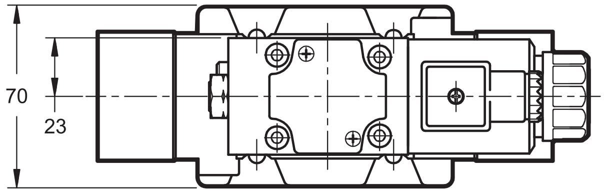
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



8 - DZCE5 and DZCE5R OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





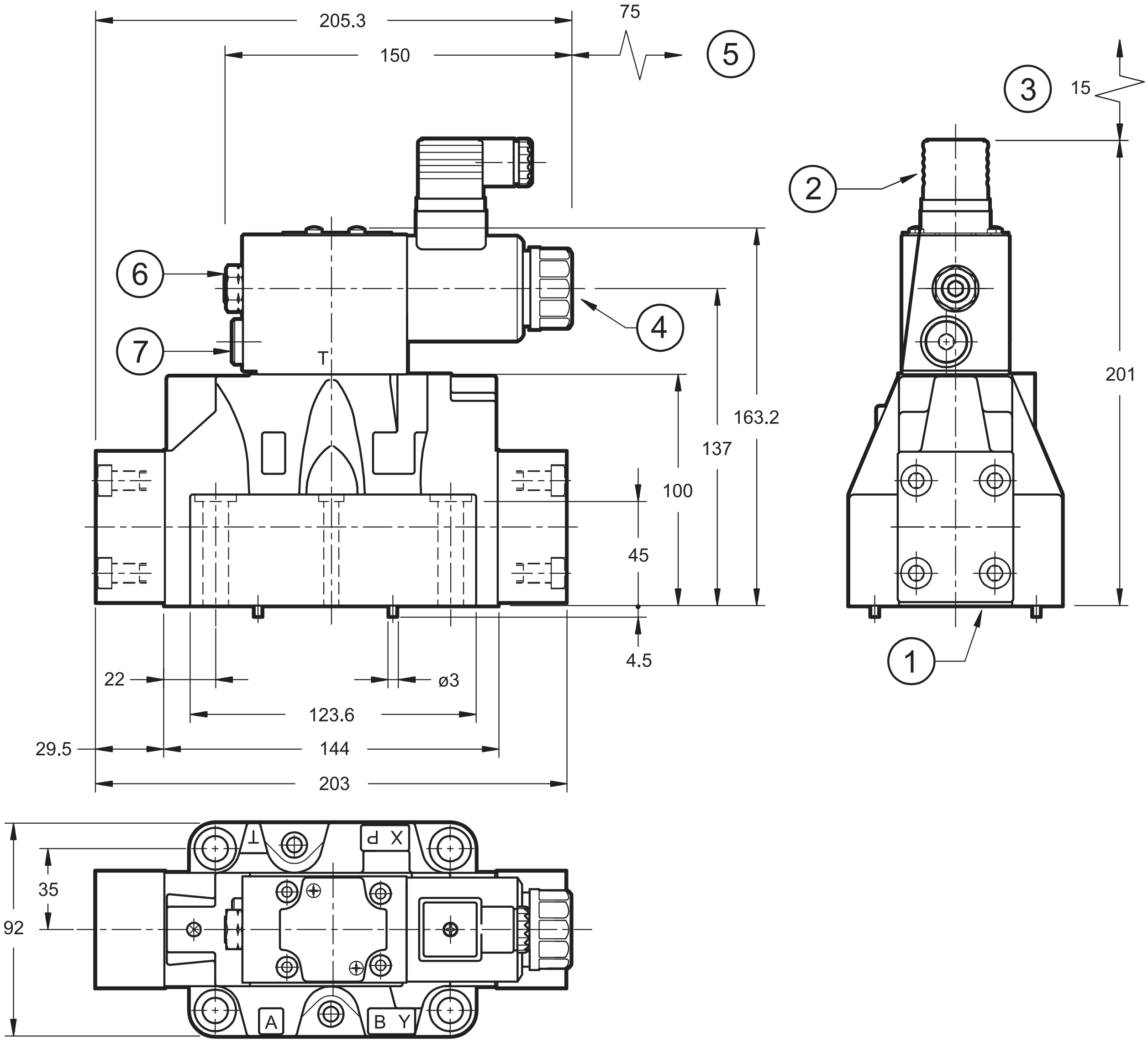
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Valve fastening: N. 4 bolts SHC M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

9 - DZCE7 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

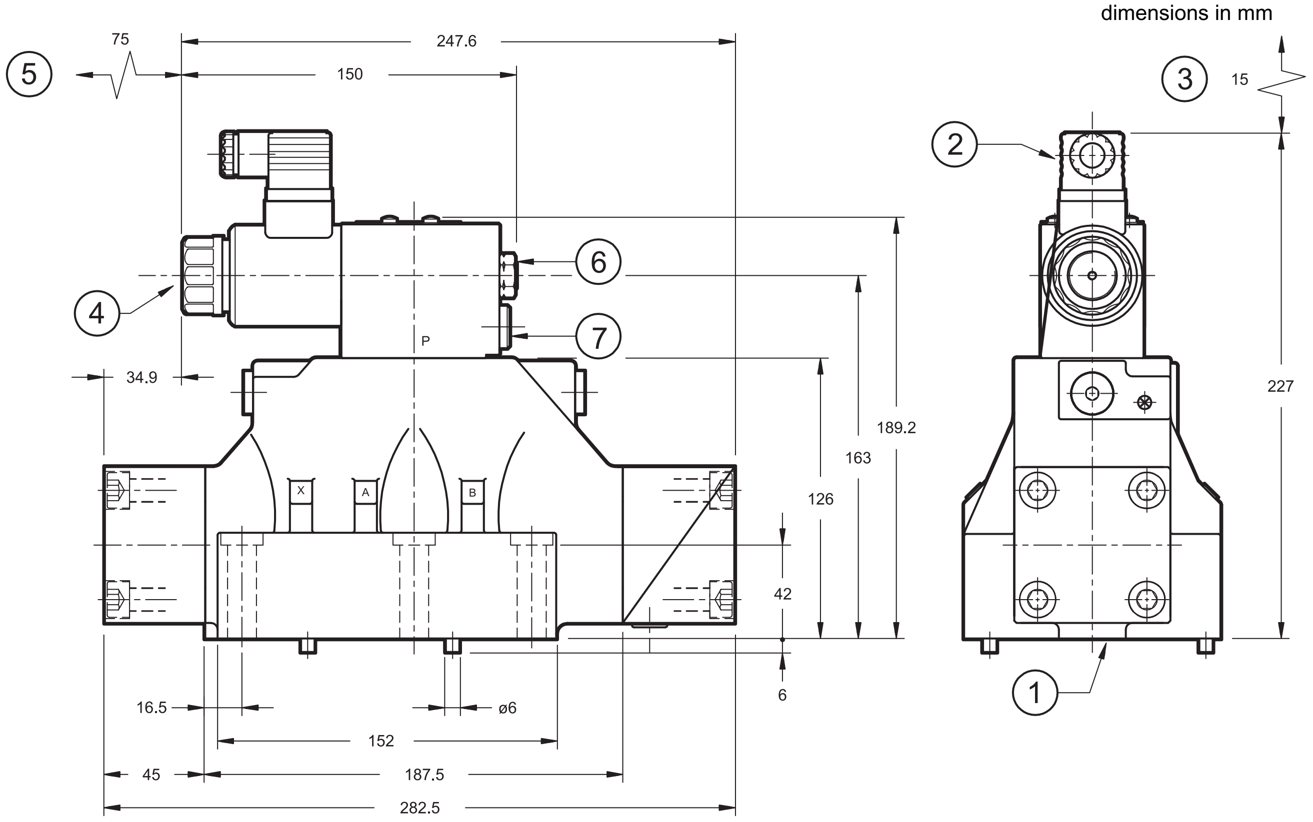


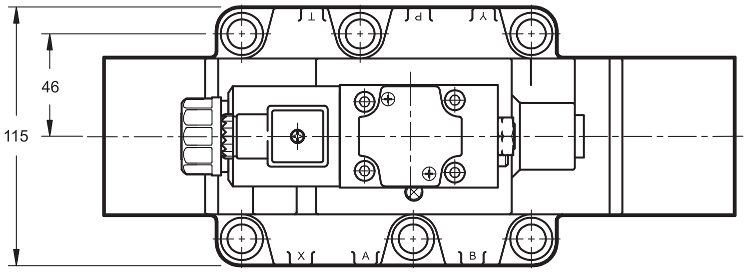
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Single valve fastening:	N. 4 SHC M10x60 bolts - ISO 4762 N. 2 SHC M6x60 bolts - ISO 4762
Tightening torque M10x60: 40 Nm (A 8.8 bolts) M6x60: 8 Nm (A 8.8 bolts)	
Thread of mounting holes: M6x18; M10x18	
Sealing rings:	N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore

1	Mounting surface with sealing rings
2	DIN 43650 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP

10 - DZCE8 OVERALL AND MOUNTING DIMENSIONS





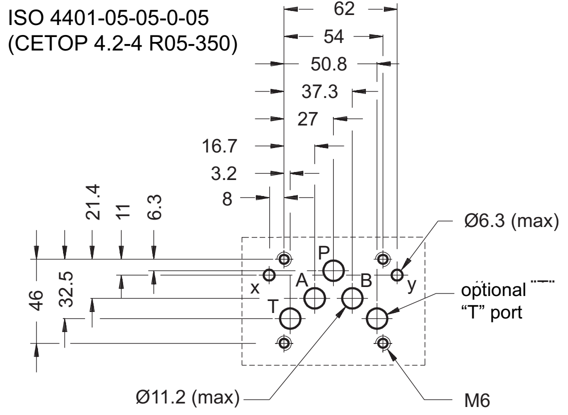
NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

Valve fastening: N. 6 SHC M12x60 screws - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20
Sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N. 2 OR type 3081 (20.24x2.62) - 90 Shore

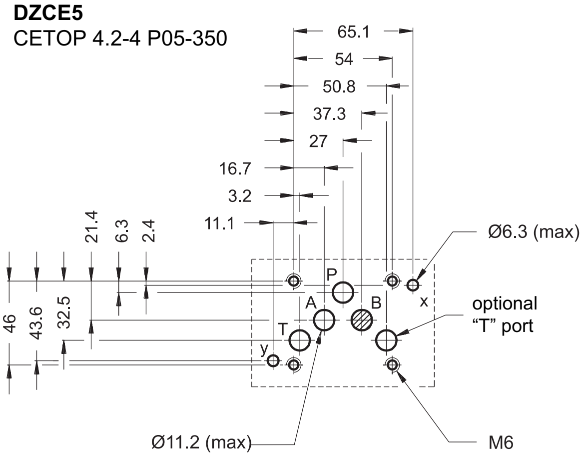
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector (included in the supply)
3	Connector removal space
4	Breather (Allen key 4)
5	Coil removal space
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4" BSP

11 - MOUNTING SURFACES

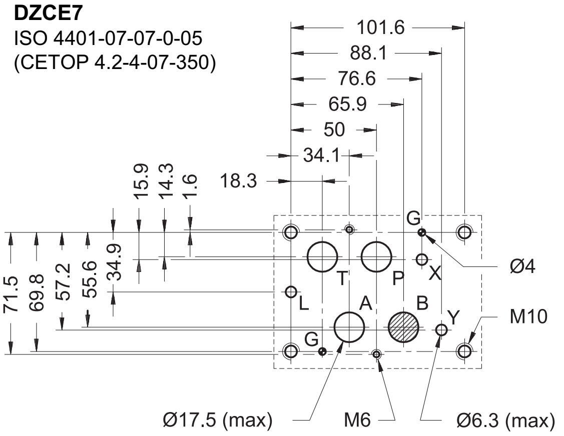
DZCE5R
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



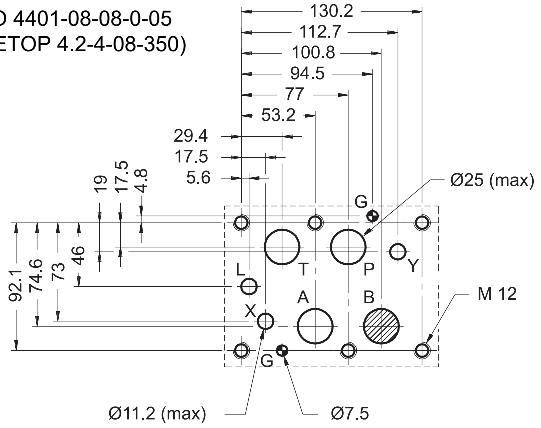
DZCE5
CETOP 4.2-4 P05-350



DZCE7
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



12 - ELECTRONIC CONTROL UNITS

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		
UEIK-11	for solenoid 24V DC	Eurocard type	see cat. 89 300

13 - SUBPLATES (see catalogue 51 000)

		DZCE5	DZCE7	DZCE8
Model with rear ports		PME4-AI5G	PME07-AI6G	-
Model with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4” BSP 1/4” BSP	1½” BSP 1/4” BSP	1” BSP 1/4” BSP

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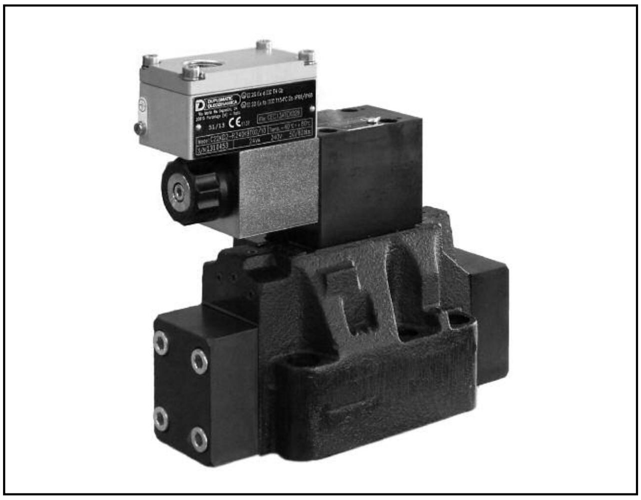
DUPLOMATIC OLEODINAMICA



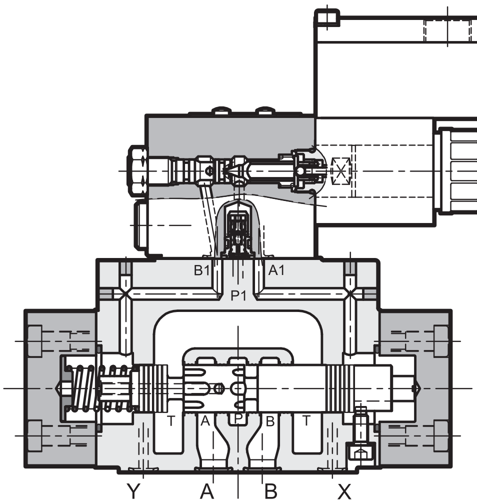
DZCE*K*

EXPLOSION-PROOF PRESSURE REDUCING VALVE WITH PROPORTIONAL CONTROL ATEX, IECEx, INMETRO

SERIES 11

DZCE5K*	**CETOP P05**
DZCE5RK*	**ISO 4401-05**
DZCE7K*	**ISO 4401-07**
DZCE8K*	**ISO 4401-08**

OPERATING PRINCIPLE



— The DZCE*K* are explosion-proof pressure reducing valves, pilot operated, with proportional control, available with CETOP P05, ISO 4401-05, ISO 4401-07 and ISO 4401-08 mounting surfaces.

— They are compliant with ATEX, IECEx and INMETRO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.

— A low temperature version (up to -40 °C) is also available.

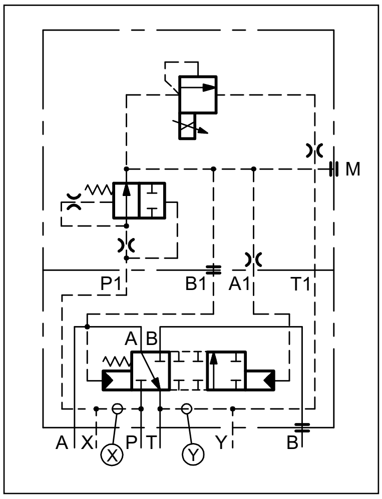
— They can be controlled directly by a current control supply unit or by means of an electronic card to exploit valve performance to the full (see par. 14).

— Upon request, DZCE*K* valves can be supplied with a finishing surface treatment (zinc-nickel) which is suitable to ensure a salt spray resistance up to 600 hours.

— Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 ‘Explosion proof classification’.

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C)		**DZCE5K*** **DZCE5RK***	**DZCE7K***	**DZCE8K***
Maximum operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 4		
Hysteresis (with PWM 200 Hz)	% of p_{max}	< 4%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristic		see paragraph 7		
Temperature ranges (ambient and fluid)		see data sheet 02 500		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7,3	9,5	15,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	Z	C	E			-		/	11		-			/		K9			

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08

Explosion-proof certification:
See table 1.1

Pressure control range
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series N. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Option: surface treatment not standard.
Omit if not required
(see **NOTE)**

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
S03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Coil electrical connection:
by terminal block

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Drainage: **I** = internal
E = external

Piloting: **I** = internal
E = external

NOTE: the valves are supplied with standard surface treatment of phosphating black.

Upon request we can supply these valves with full zinc-nickel surface treatment, suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standard).

For zinc-nickel surface treatment add **/W7** at the end of the identification code.

1.1 - Names of valves per certification

	ATEX		IECEx		INMETRO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb

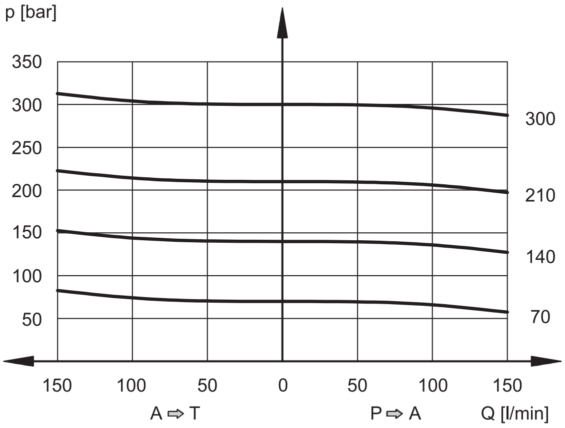
NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

2 - CHARACTERISTIC CURVES

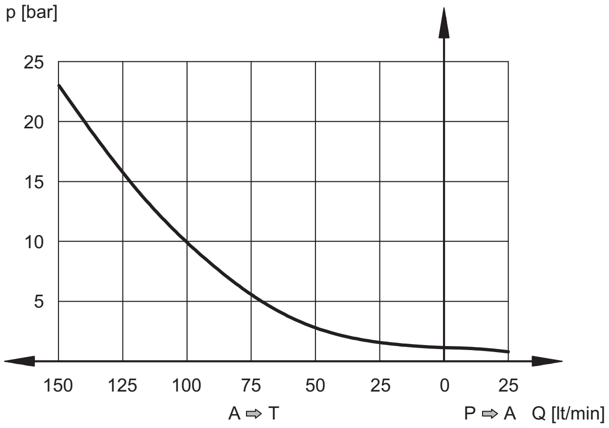
(obtained with mineral oil with viscosity of 36 cSt at 50°C)

2.1 - Characteristic curves DZCE5K* and DZCE5RK*

ADJUSTMENT

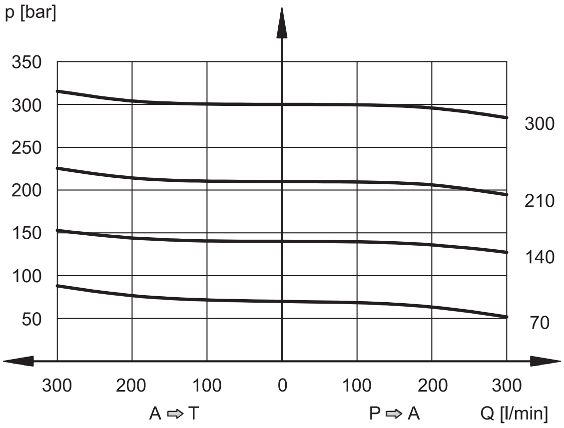


MIN. CONTROLLED PRESSURE p min = f(Q)

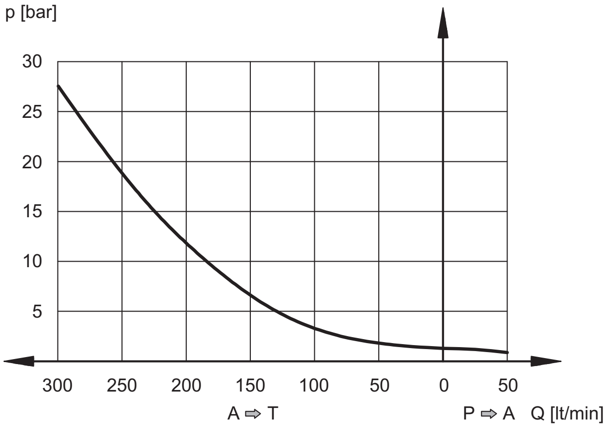


2.2 - Characteristic curves DZCE7K*

ADJUSTMENT

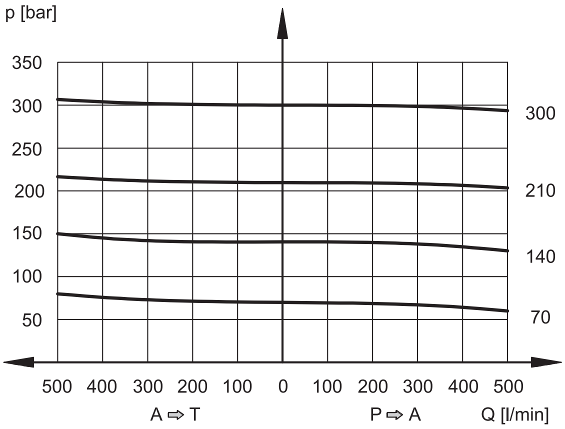


MIN. CONTROLLED PRESSURE p min = f(Q)

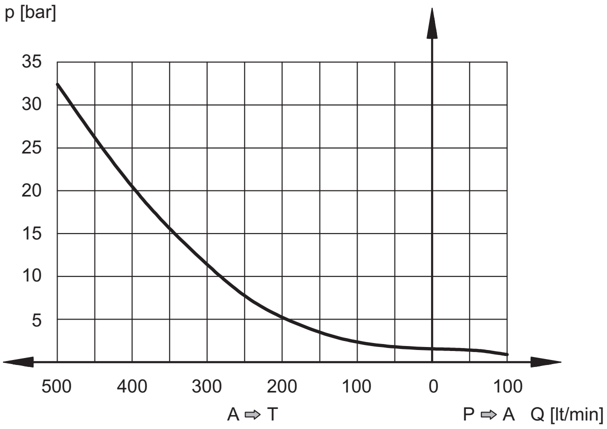


2.3 - Characteristic curves DZCE8K*

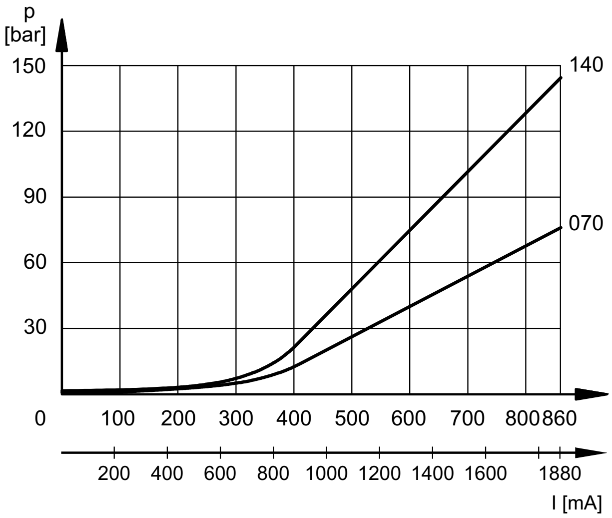
ADJUSTMENT

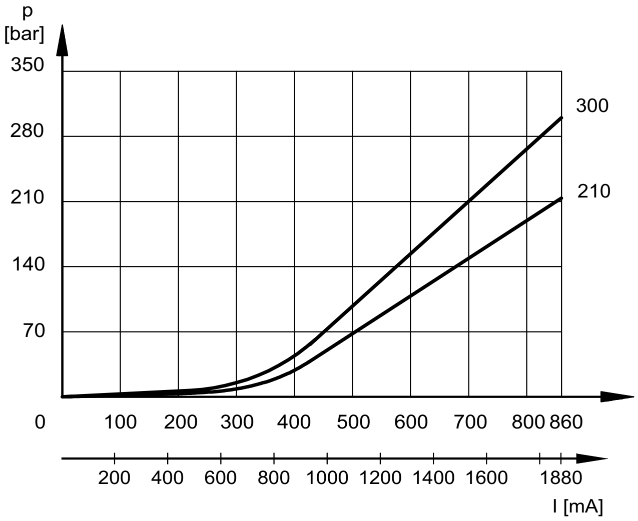


MIN. CONTROLLED PRESSURE p min = f(Q)



2.4 - Pressure control p = f(I) DZCE5K*, DZCE5RK*, DZCE7K* and DZCE8K*





3 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

REFERENCE SIGNAL STEP	0 →100%	100→0%
	Response times [ms]	
DZCE5K* and DZCE5RK*	100	70
DZCE7K*	100	50
DZCE8K*	100	50

4 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3,4	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	IP66 / IP68 class H

4.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

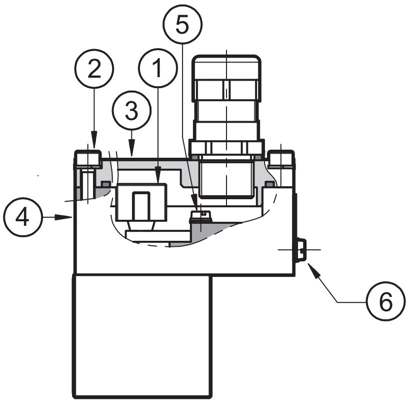
The electrical connection is polarity-independent.

By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

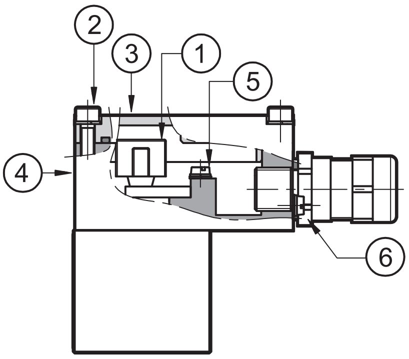
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9÷6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards.



K9T*



K9S*

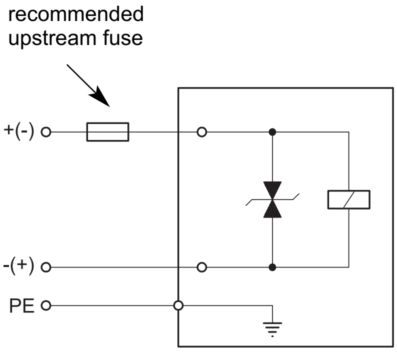
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see paragraph 14) allow to use cables with external diameter between 8 and 10 mm.

4.2 - Electrical diagram



4.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

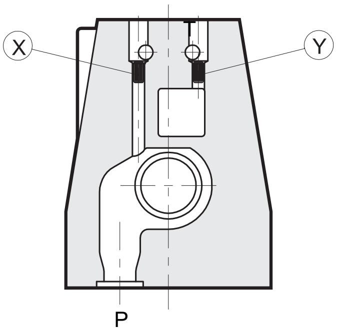
5 - PILOT AND DRAIN

The DZCE*K* valves are available with piloting and drainage, both internal and external.
We suggest to use the version with external drainage that allows a higher backpressure on the unloading.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

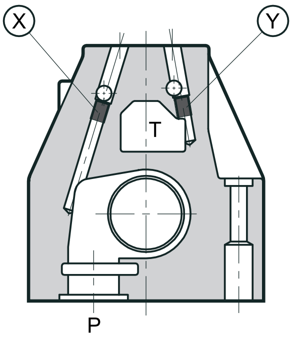
PRESSURES [bar]	MIN	MAX
Piloting pressure on X port	30	350
Pressure in T port with internal drain	-	2
Pressure in T port with external drain	-	250

DZCE5K* and DZCE5RK*



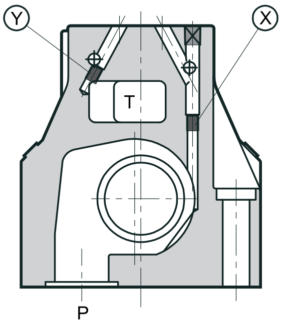
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7K*



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DZCE8K*

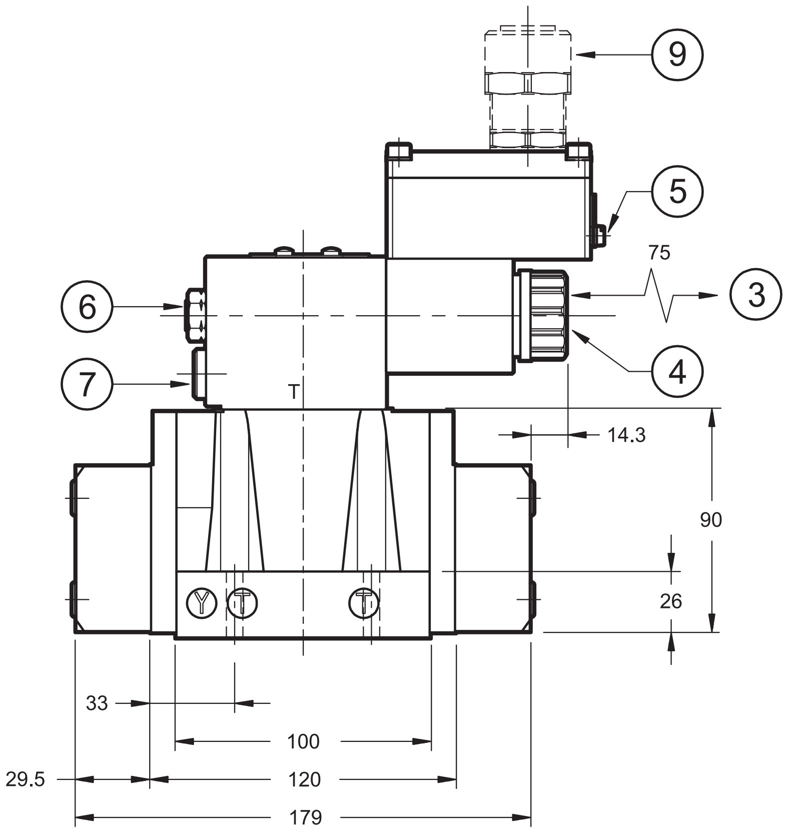


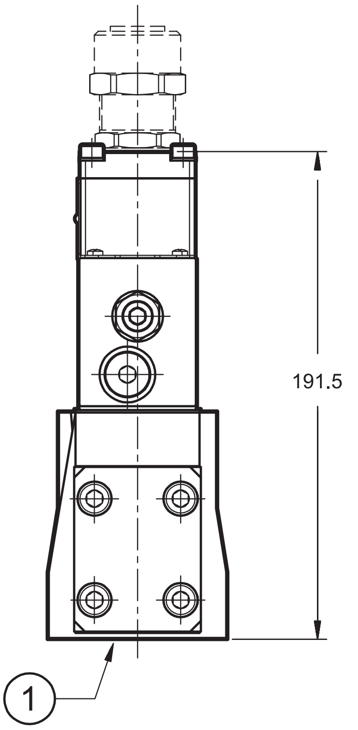
X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

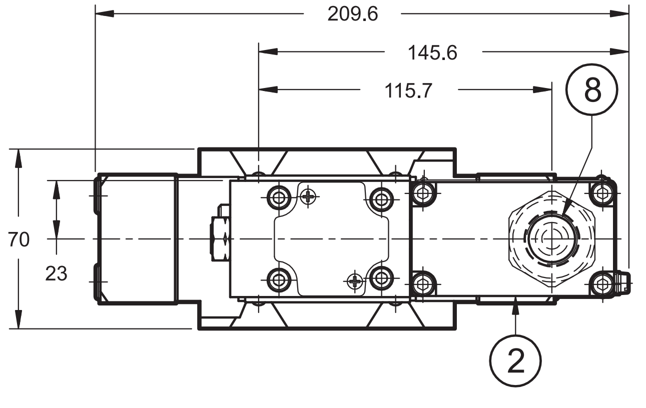
6 - DZCE5K* AND DZCE5RK* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE5K*-*/11*-*/*K9T*
DZCE5RK*-*/11*-*/*K9T*







1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 13

NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

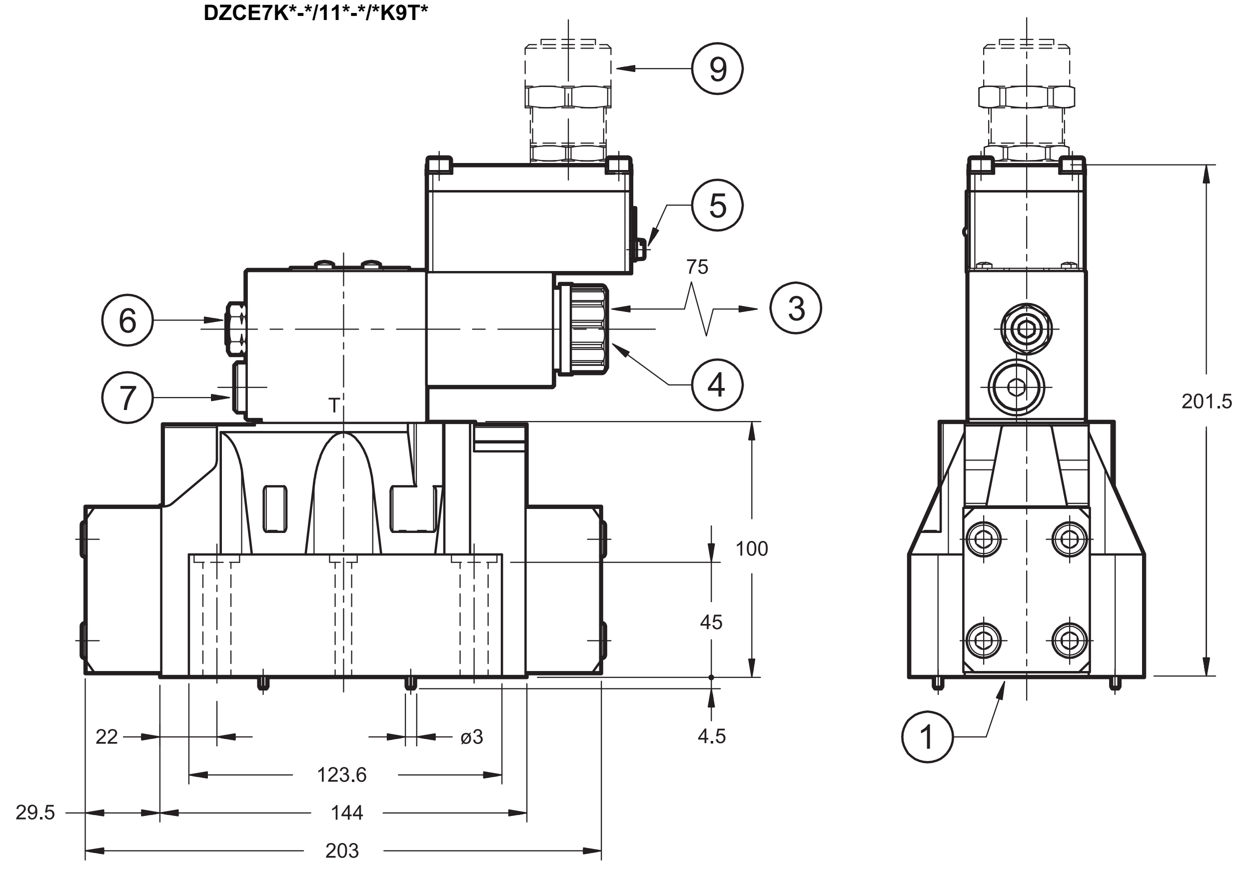
NOTE 2: for side port cable gland see paragraph 9.

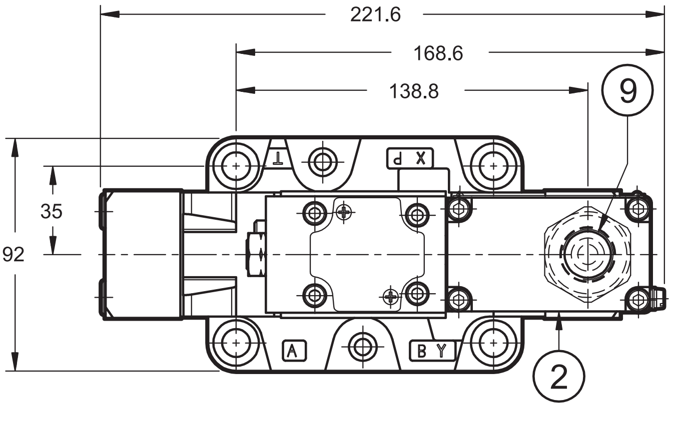
Valve fastening: N. 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 screws)
Thread of mounting holes: M6x10

7 - DZCE7K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE7K*-*/11*-*/*K9T*





NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

NOTE 2: for side port cable gland see paragraph 9.

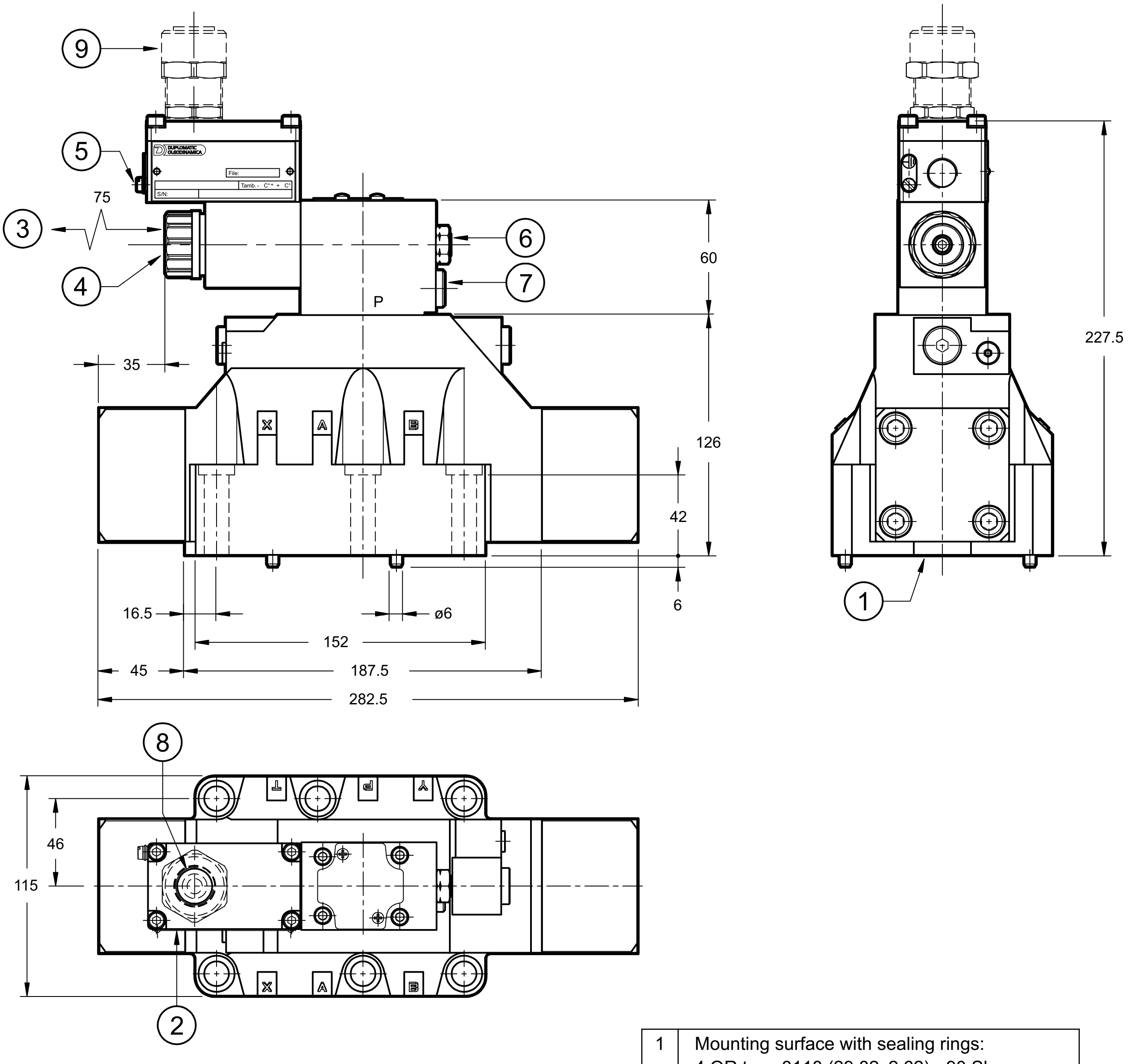
Single valve fastening:	N. 4 SHC screws M10x60 - ISO 4762 N. 2 SHC screws M6x60 - ISO 4762
Tightening torque	M10x60: 40 Nm (A 8.8 screws) M6x60: 8 Nm (A 8.8 screws)
Thread of mounting holes: M6x18; M10x18	

1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 13

8 - DZCE8K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DZCE8K*-*/11*-*/*K9T*



1	Mounting surface with sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Breather (Allen key 4)
5	Terminal for supplementary earth (GND) connection
6	Adjustment sealing made in factory. Do not unscrew the nut.
7	Pressure gauge port 1/4” BSP
8	Upper port for cable gland
9	Cable gland. To be ordered separately, see paragraph 13

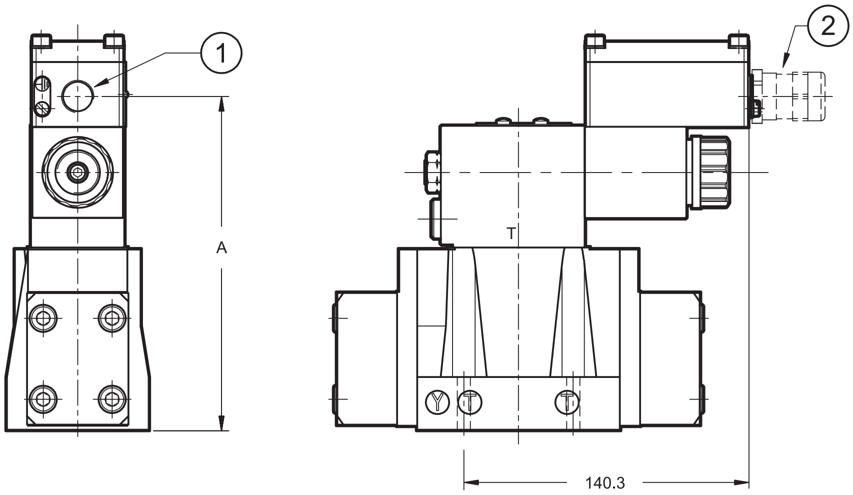
NOTE 1: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (4) placed at the end of the solenoid tube.

NOTE 2: for side port cable gland see paragraph 9.

Valve fastening: N. 6 SHC screws M12x60 - ISO 4762
Tightening torque: 69 Nm (A 8.8 screws)
Thread of mounting holes: M12x20

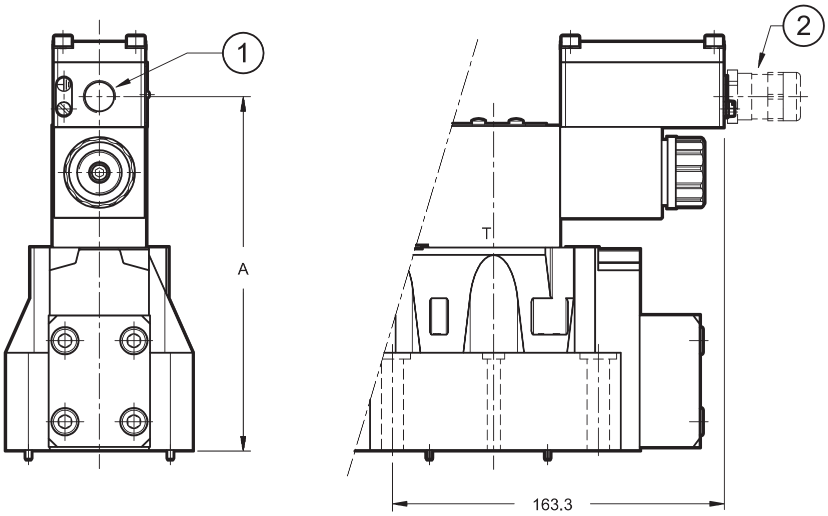
9 - DZCE*K* WITH SIDE CONNECTION OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



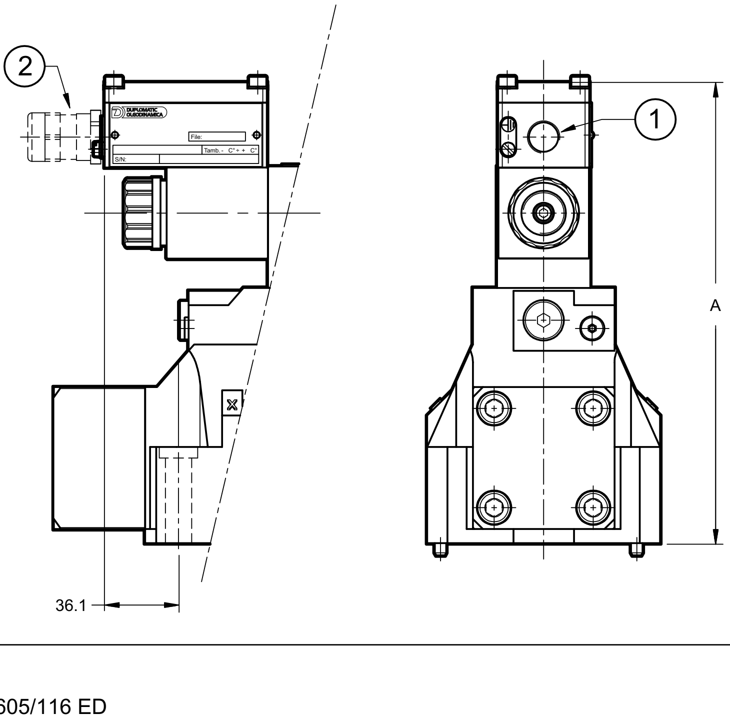
DZCE5K*-*/11*-*/*K9S*
DZCE5RK*-*/11*-*/*K9S*

Side port type	Dimension A
S01, S04	180.5
S02, S03	180



DZCE7K*-*/11*-*/*K9S*

Side port type	Dimension A
S01, S04	190.5
S02, S03	190



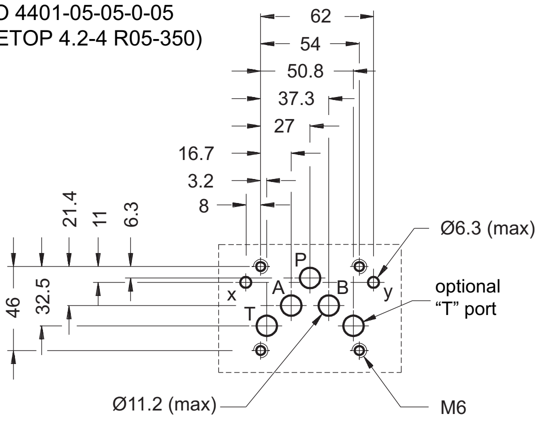
DZCE8K*-*/11*-*/*K9S*

Side port type	Dimension A
S01, S04	226.5
S02, S03	226

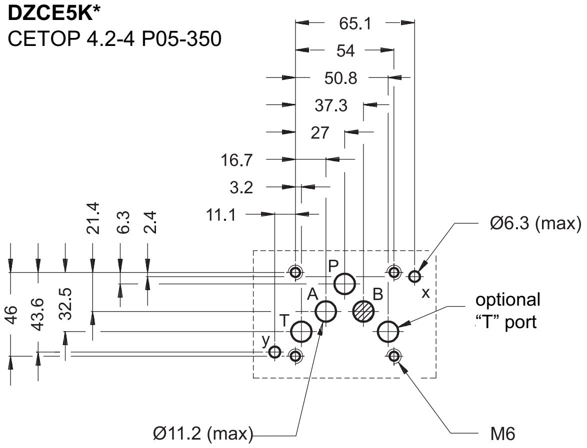
1	Side port for cable gland
2	Cable gland. To be ordered separately, see par. 13

10 - MOUNTING SURFACES

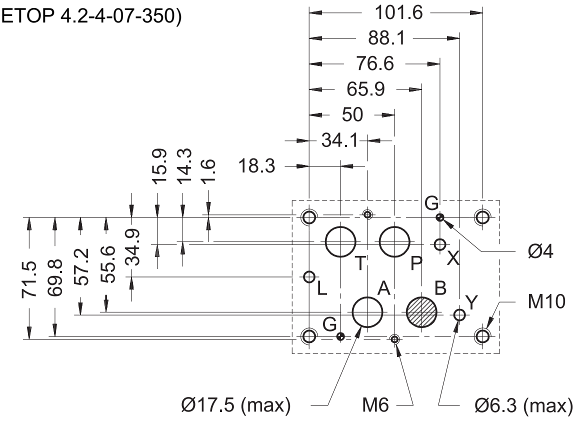
DZCE5RK*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



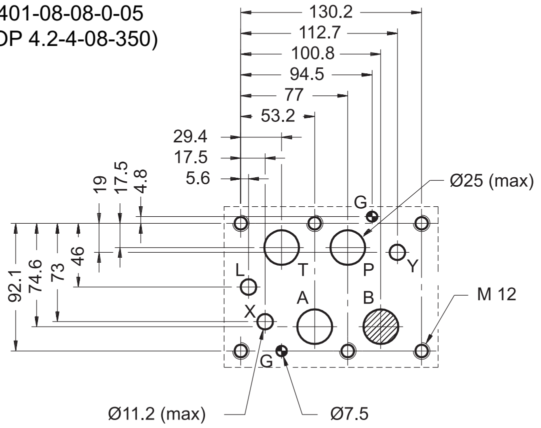
DZCE5K*
CETOP 4.2-4 P05-350



DZCE7K*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8K*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



11 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

12 - INSTALLATION

Installation must adheres to instructions reported in the Use and Maintenance manual, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.

We recommend to install the DZCE*K* valve either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 2.

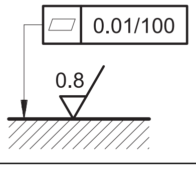
Ensure that there is no air in the hydraulic circuit. In particulars applications,it can be necessary to vent the air entrapped in the solenoid tube, using the special drain screw and then ensure to screwed it correctly.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

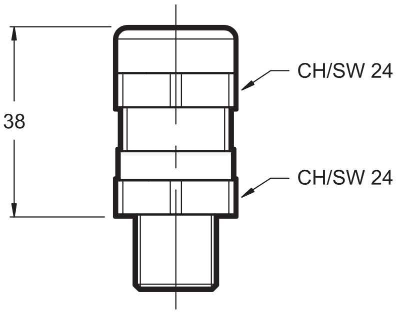
Surface finishing



13 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø 8 ÷ 10 mm cables);
- certified for ATEX II 2GD, ATEX I M2; IECEx Gb, IECEx Db and IECEx Mb
- cable gland material: nickel brass
- rubber tip material: silicone
- ambient temperature range: -70ºC ÷ +220ºC
- protection degree: IP66/IP68
- tightening torque : 15 Nm



To order, list the description and the code of the version chosen from among those listed below:

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

14 - ELECTRONIC CONTROL UNITS

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

NOTE: electronic control units offered are not explosion-proof certified; therefore, they must be installed outside classified areas.

15 - SUBPLATES

(see catalogue 51 000)

		DZCE5K*	DZCE7K*	DZCE8K*
Type with rear ports		PME4-AI5G	PME07-AI6G	-
Type with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports:	P - T - A - B X - Y	3/4” BSP 1/4” BSP	1½” BSP 1/4” BSP	1” BSP 1/4” BSP

NOTE: Subplates (to be ordered separately) do not contain neither aluminium nor magnesium at a higher rate than the value allowed by norms according to ATEX directive for categories II 2GD and I M2.

The user must take care and makes a complete assessment of the ignition risk that can occur from the use in potentially explosive environments.

DUPLOMATIC OLEODINAMICA

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure valves	
RQM*K*-P	21 515
PRE(D)*K*	81 315
ZDE3K*	81 515
DZCE*K*	81 605

directional valves	
D*K*	41 515
DS(P)E*K*	83 510

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

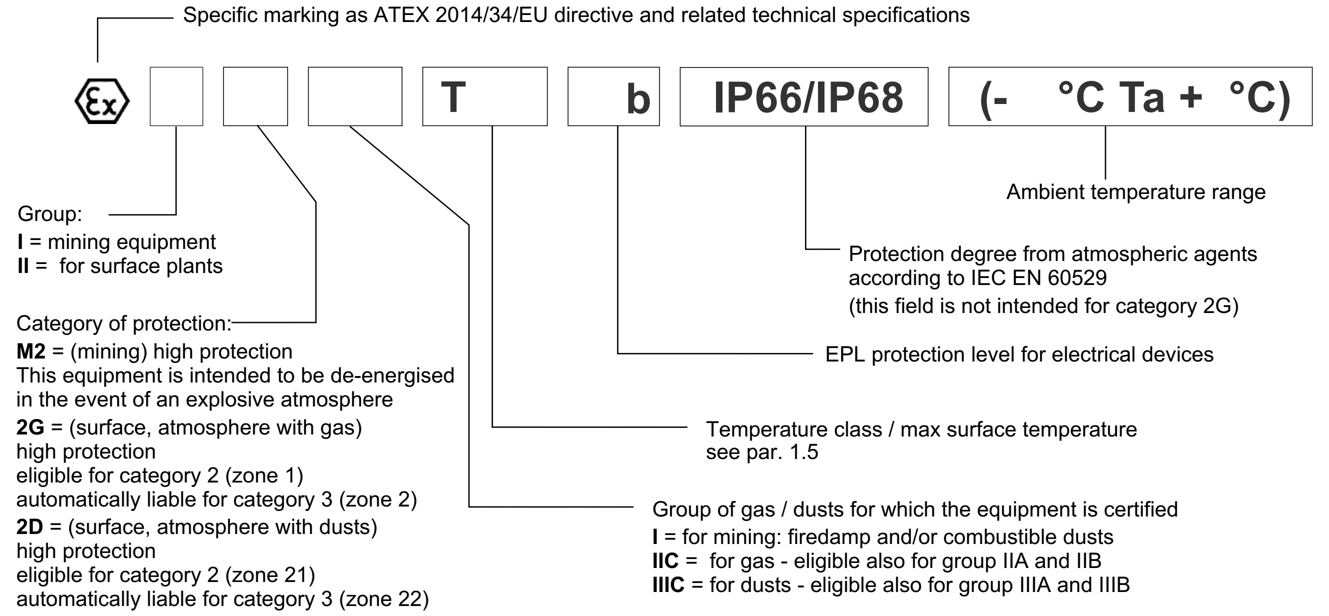
1.1 - ATEX classification for valves

Type examination certificate: CEC 13 ATEX 030-REV.2
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		N and V seals	NL seals
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Group:
I = mining equipment
II = for surface plants

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529
(this field is not intended for category 2G)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

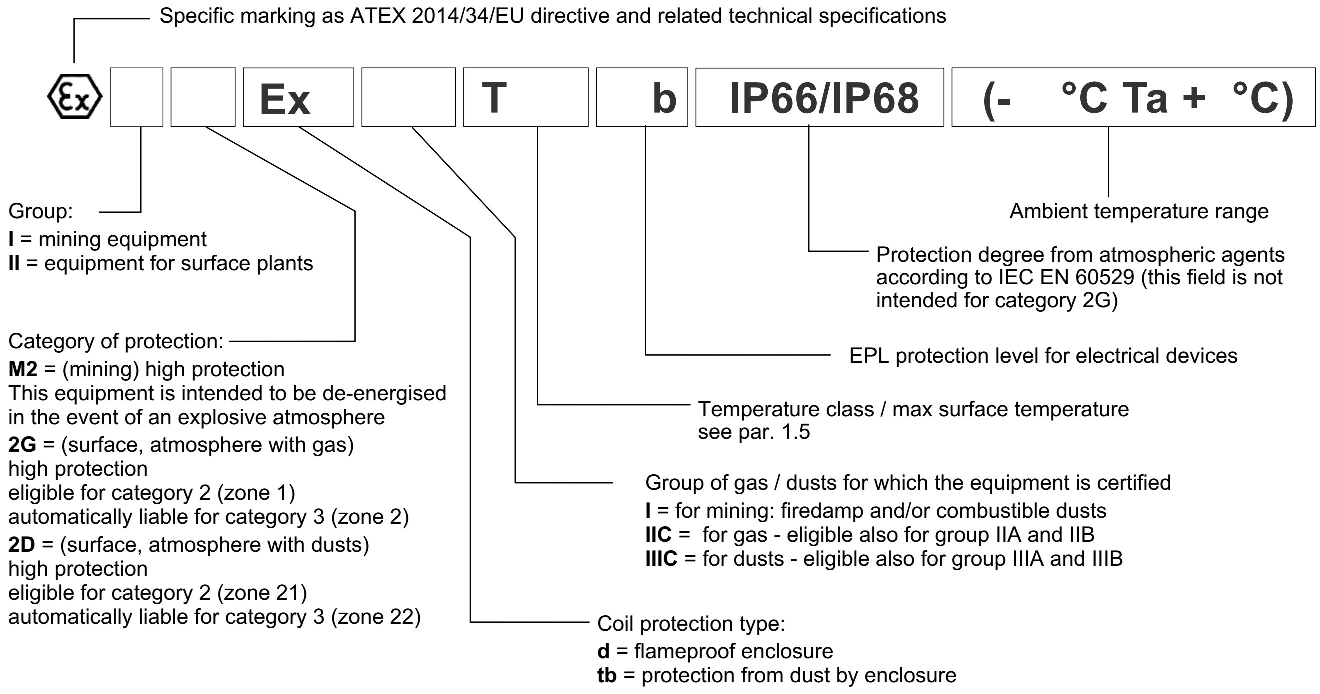
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, carries the relative ATEX marking. **The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	Ex II 2G Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	Ex II 2G Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	Ex I M2 Ex d I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Group:
I = mining equipment
II = equipment for surface plants

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for category 2G)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Coil protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEx CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

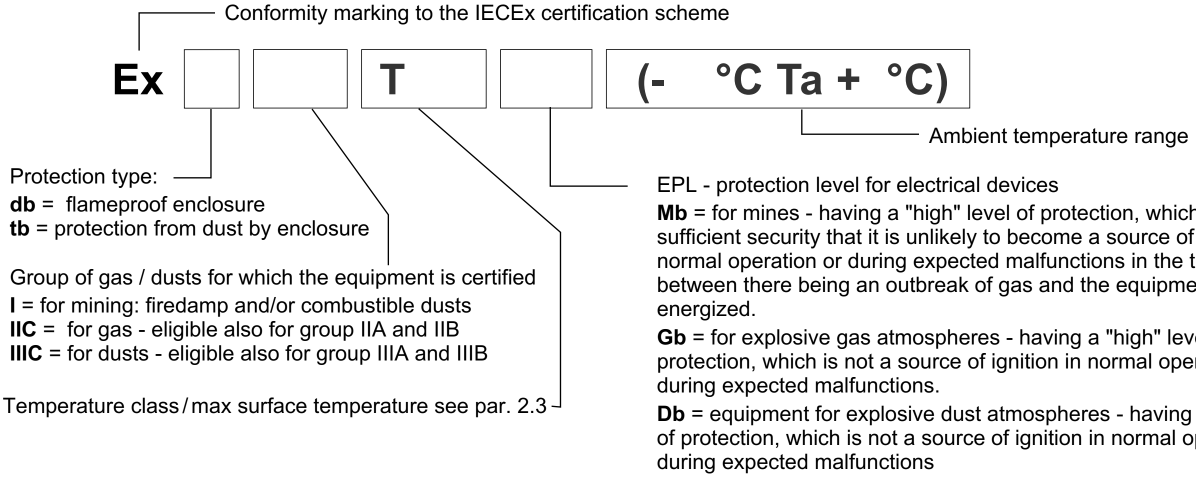
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



Conformity marking to the IECEx certification scheme

Ambient temperature range

Protection type:
db = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 2.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

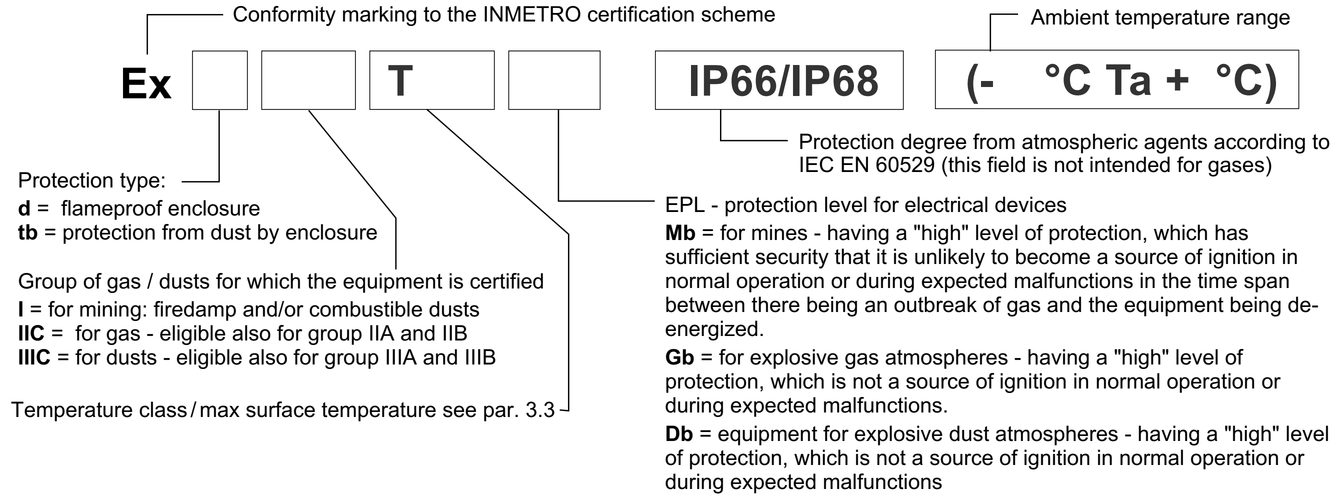
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
INMETRO Mb	***KBDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex d I T150° Mb IP66/IP68 (-40°C Ta +75°C)



Conformity marking to the INMETRO certification scheme

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for gases)

Protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 3.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

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DZCE*G

PRESSURE REDUCING VALVES WITH PROPORTIONAL CONTROL AND INTEGRAL ELECTRONICS

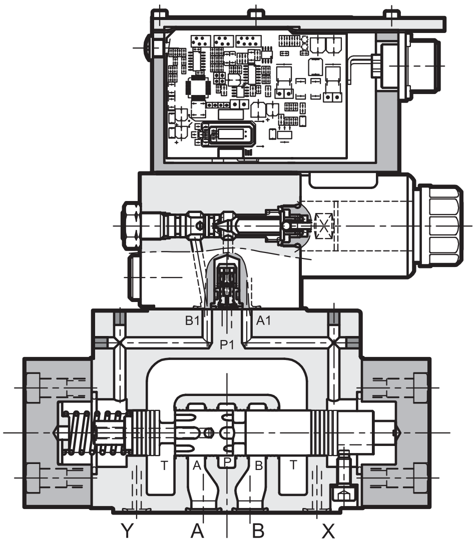
SERIES 30

DZCE5G	**CETOP P05**
DZCE5RG	**ISO 4401-05** (CETOP R05)
DZCE7G	**ISO 4401-07** (CETOP 07)
DZCE8G	**ISO 4401-08** (CETOP 08)

p max **350** bar

Q max (see performance table)

OPERATING PRINCIPLE



— The DZCE*G are pressure reducing valves with electric proportional control with integrated electronics, with mounting interface in compliance with ISO 4401 standards.

— Those valves, besides reducing the pressure from line P to working line A, allow the flow to return from the line A to the return line T when a pressure greater than the set value is generated in the downstream circuit (flow path A): a typical case of hydraulic counterweight or load balancing.

— The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

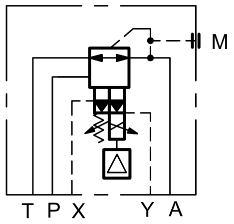
— The valves are easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 15.3)

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C p = 140 bar)

		DZCE5G DZCE5RG	DZCE7G	DZCE8G
Max operating pressure	bar	350		
Maximum flow	l/min	150	300	500
Step response		see paragraph 7		
Hysteresis	% of p_{max}	< 2%		
Repeatability	% of p_{max}	< ±2%		
Electrical characteristics		see paragraph 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13			
Recommended viscosity	cSt	25		
Mass	kg	7,3	9,5	15,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	**Z**	**C**	**E**		**G**	**-**		**/**	**30**		**-**			**/**		**K11**		

Pressure reducing valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

Integrated electronics for open loop

Pressure control range:
070 = 1 ÷ 70 bar
140 = 1 ÷ 140 bar
210 = 1 ÷ 210 bar
300 = 1 ÷ 300 bar

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

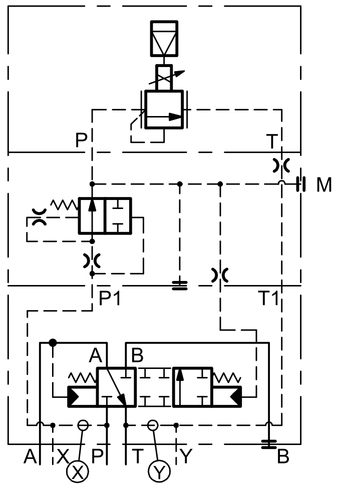
Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage 0÷10 V
E1 = current 4÷20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - DETAILED SYMBOL



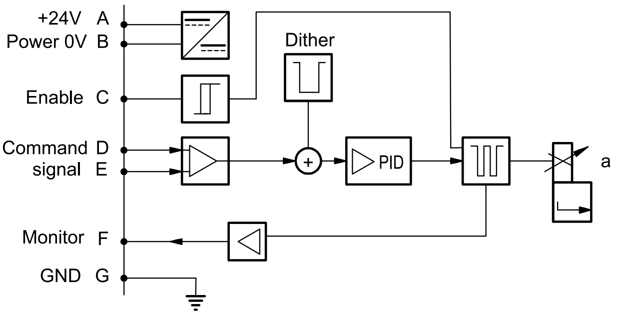
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

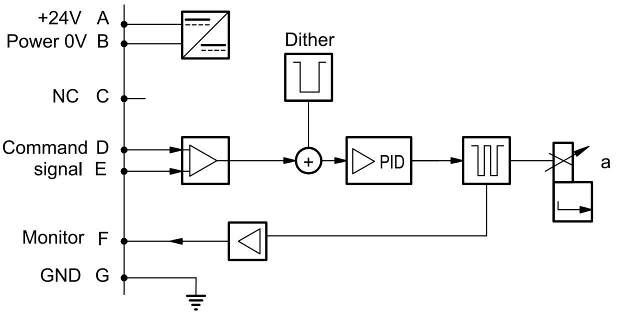
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		2A time lag
Command signals: voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	0 ÷ 10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

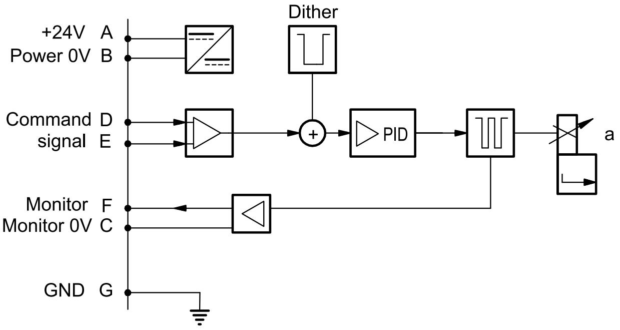
VERSION **A** - External Enable



VERSION **B** - Internal Enable

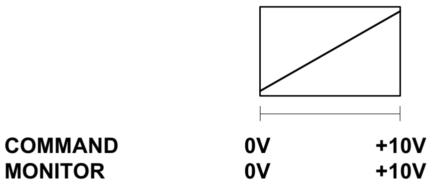


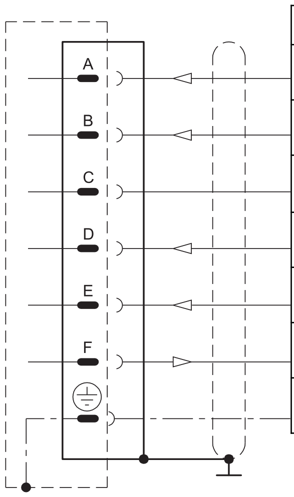
VERSION **C** - 0V Monitor



4 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal is between 0…10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



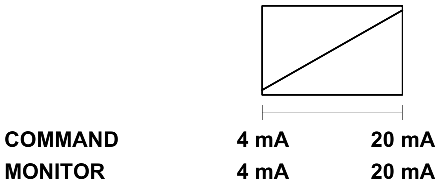


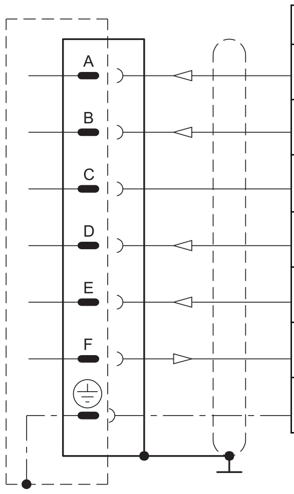
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	0 ÷ 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	0 ÷ 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





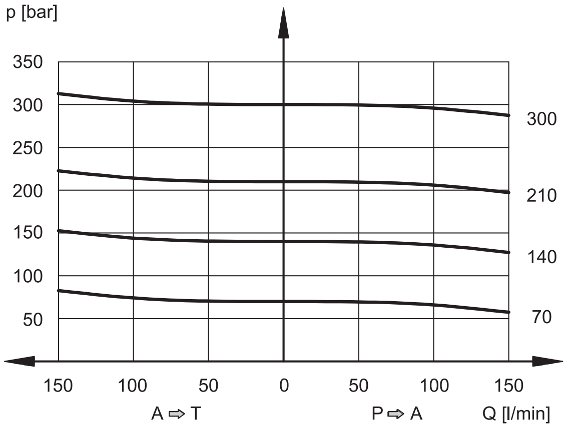
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - CHARACTERISTIC CURVES

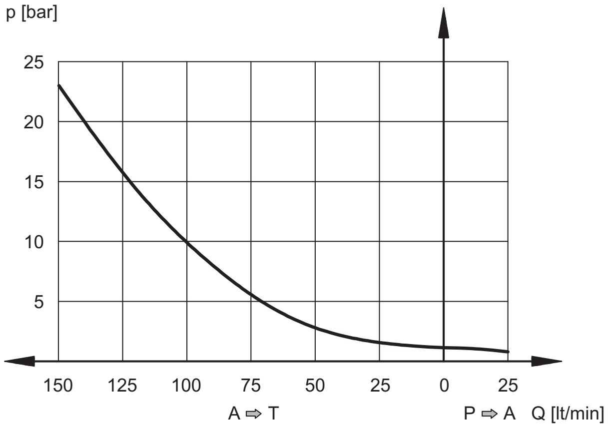
(with mineral oil with viscosity of 36 cSt at 50°C)

6.1 - Characteristic Curves of DZCE5G and DZCE5RG

ADJUSTMENT

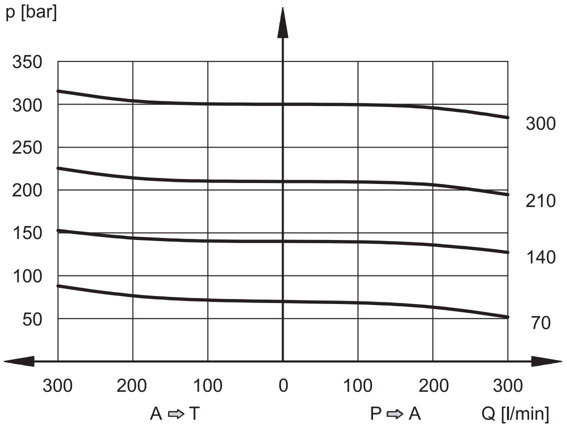


MIN. CONTROLLED PRESSURE p min = f(Q)

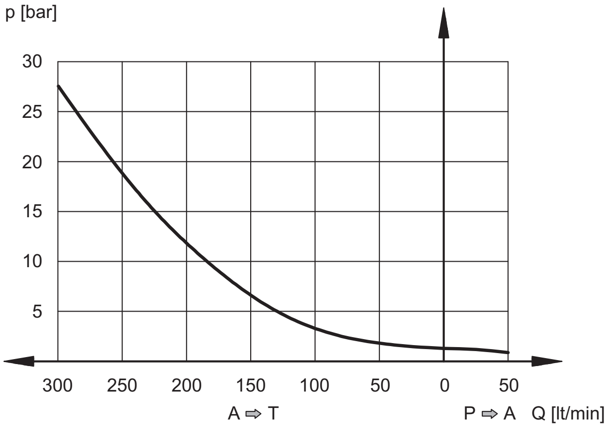


6.2 - Characteristic Curves of DZCE7G

ADJUSTMENT

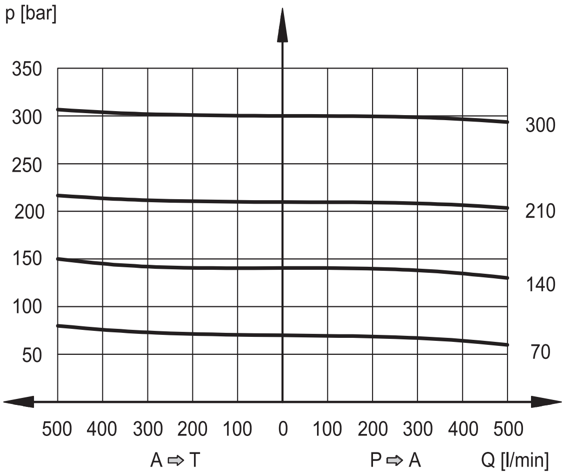


MIN. CONTROLLED PRESSURE p min = f(Q)

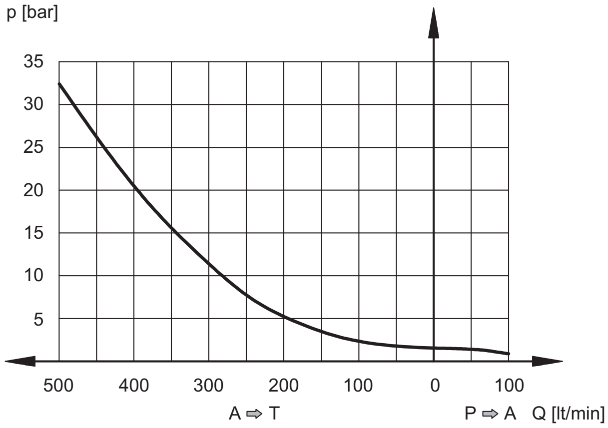


6.3 - Characteristic Curves of DZCE8G

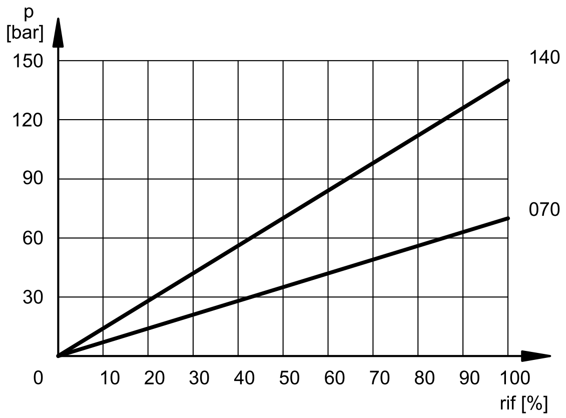
ADJUSTMENT

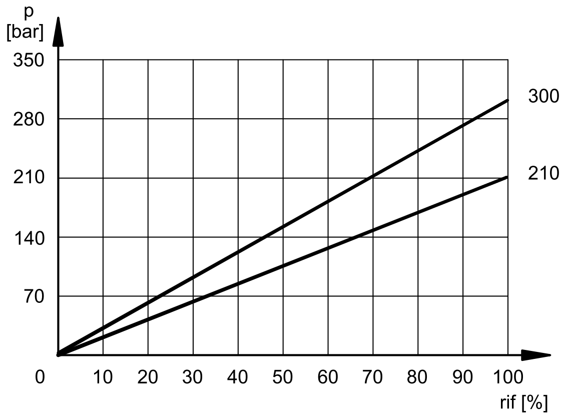


MIN. CONTROLLED PRESSURE p min = f(Q)



6.4 - CONTROLLED PRESSURE p = f(I)

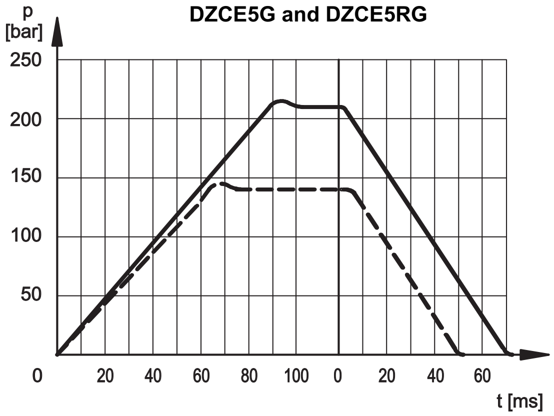


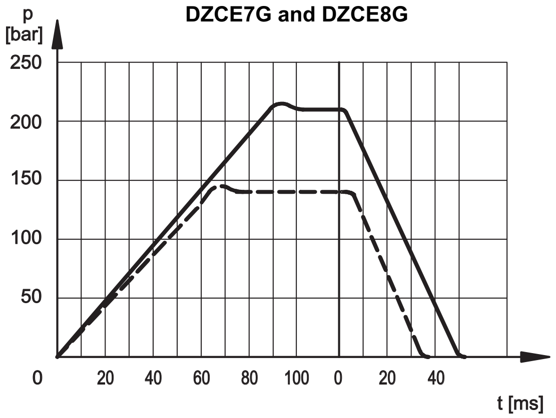


7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

The graphs show the typical step response tested with static pressure 100 bar.



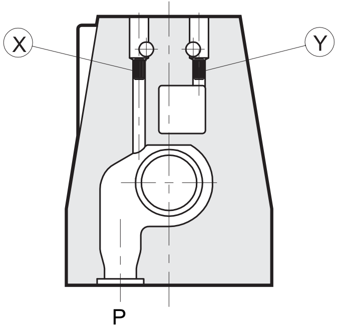


8 - PILOTING AND DRAINAGE

The valves are available with piloting and drainage, both internal and external. The version with external drainage allows a higher backpressure on the unloading.

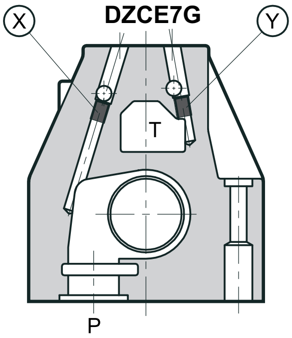
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

DZCE5 and DZCE5RG



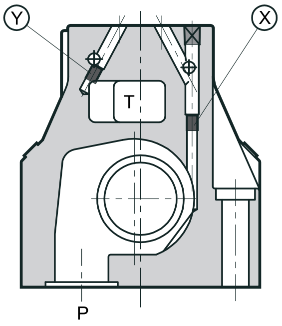
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DZCE7G



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

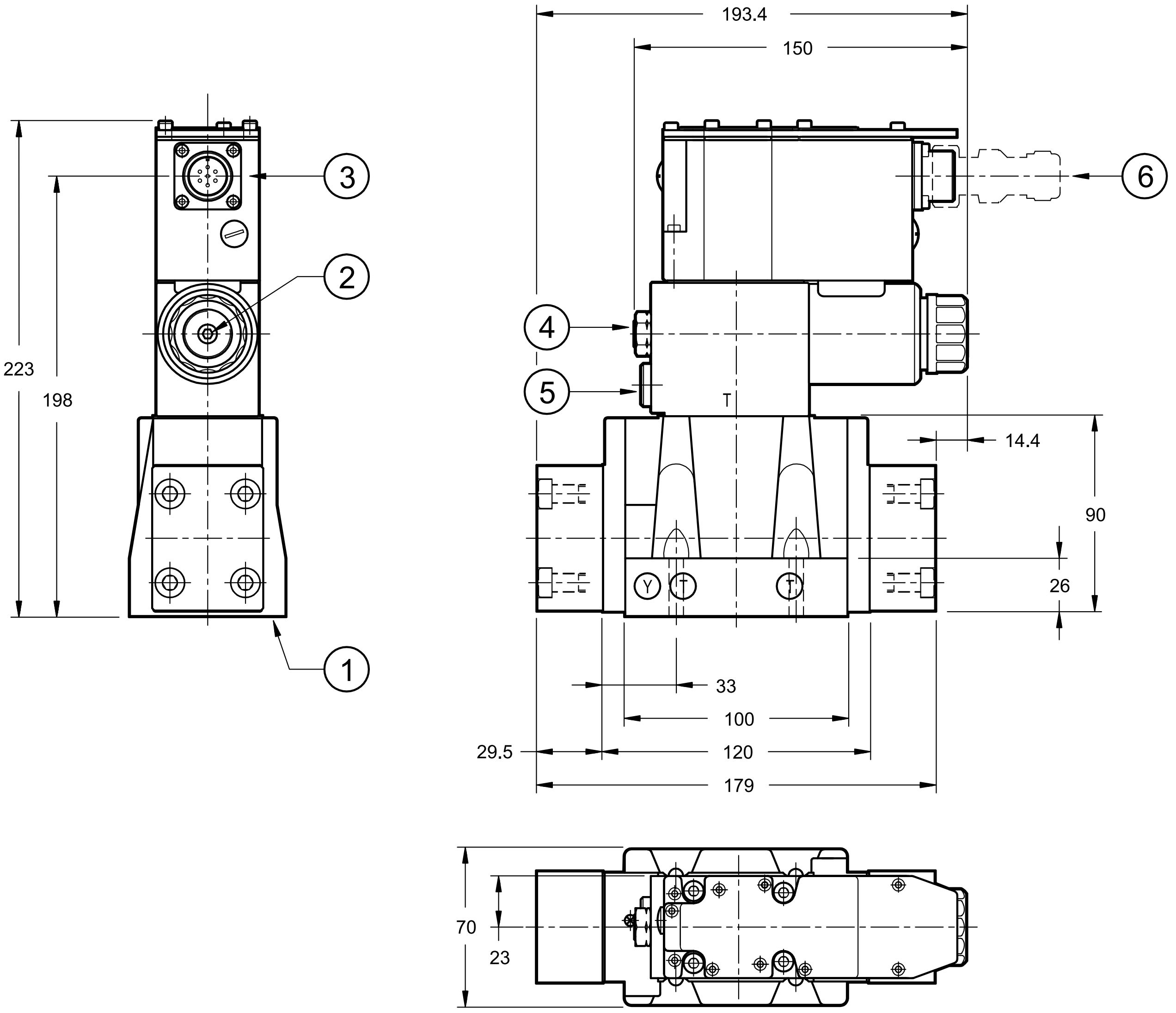
DZCE8G



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

9 - OVERALL AND MOUNTING DIMENSIONS DZCE5G AND DZCE5RG

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

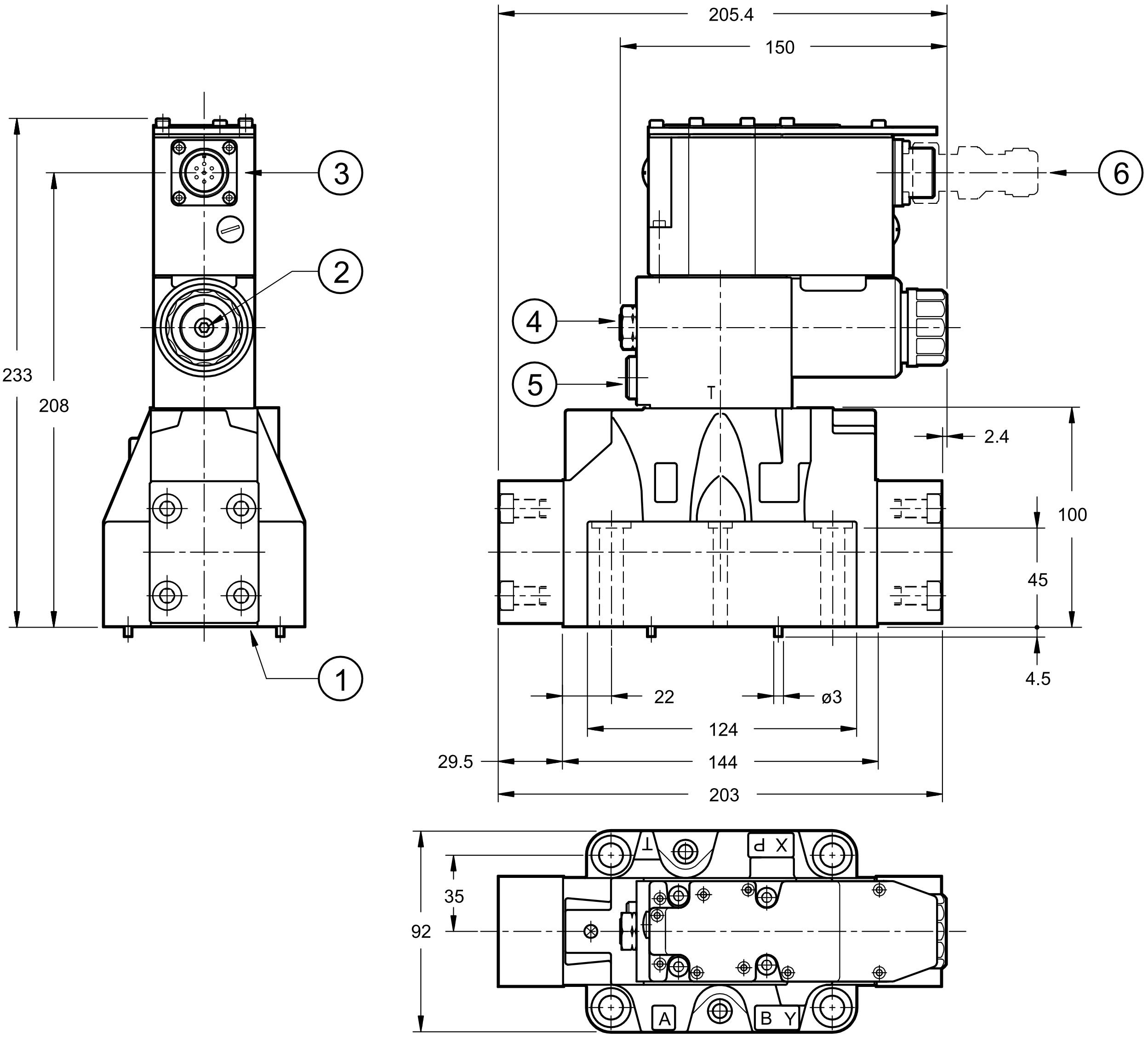
Mounting surface shown at paragraph 12.

Valve fastening: N. 4 bolts SHC M6x35 - ISO 4762
Tightening torque: 8 Nm (bolts A 8.8)
Thread of mounting holes: M6x10

1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Breather (Allen key 4)
3	Main connection
4	Adjustment seal, set in factory. It is recommended not to unscrew the nut.
5	Pressure gauge port 1/4 BSP”
6	Mating electrical connector **to be ordered separately.** See at section 15

10 - OVERALL AND MOUNTING DIMENSIONS DZCE7G

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

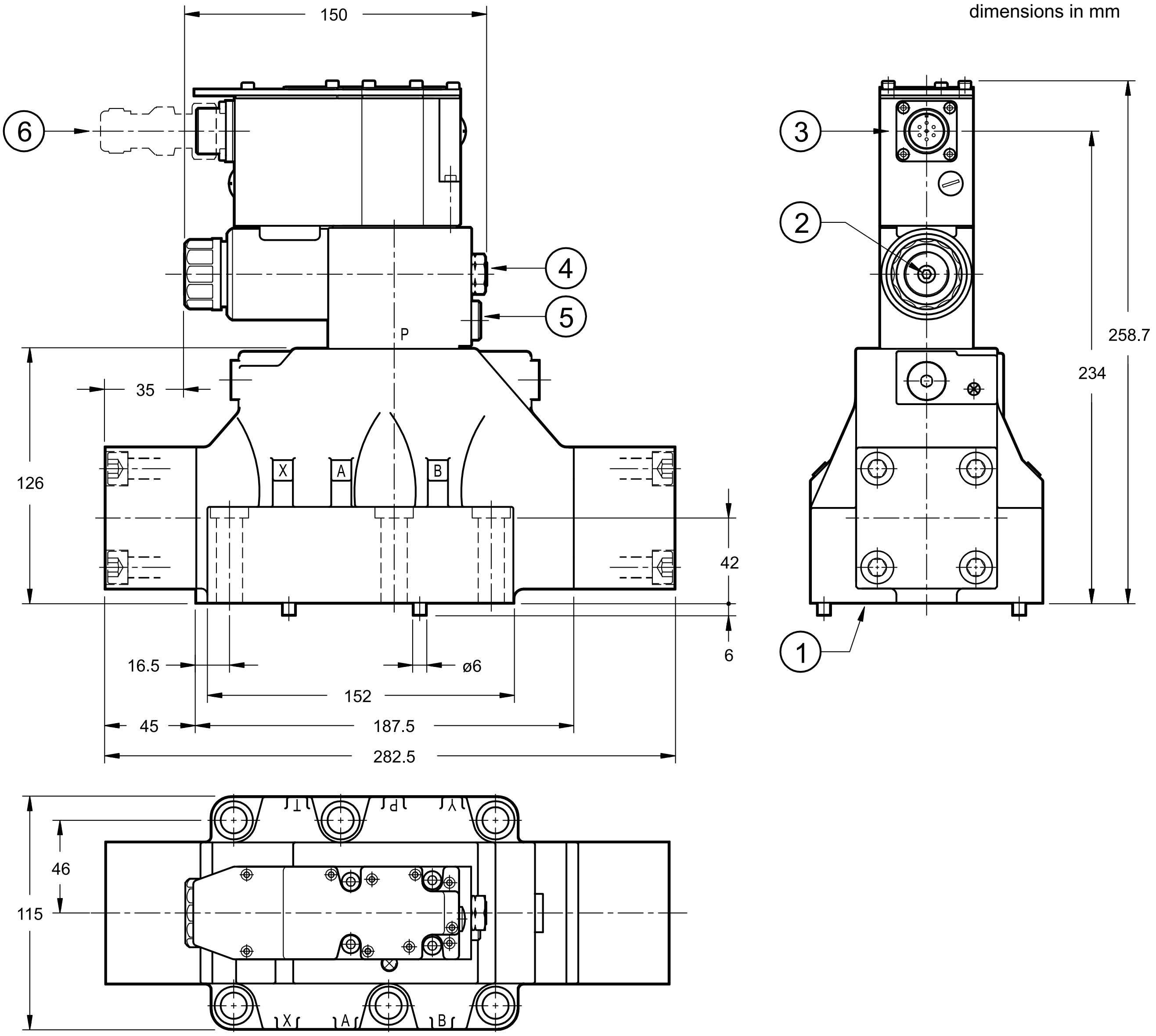
Mounting surface shown at paragraph 12.

1	Mounting surface with sealing rings: N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Breather (Allen key 4)
3	Main connection
4	Adjustment seal, set in factory. It is recommended not to unscrew the nut.
5	Pressure gauge port 1/4 BSP”
6	Mating electrical connector **to be ordered separately.** See at section 15

Valve fastening:	N. 4 bolts SHC M10x60 - ISO 4762 N. 2 bolts SHC M6x60 - ISO 4762
Tightening torque:	M10x60: 40 Nm (bolts A 8.8) M6x60: 8 Nm (bolts A 8.8)
Thread of mounting holes:	M6x18; M10x18

11 - OVERALL AND MOUNTING DIMENSIONS DZCE8G

dimensions in mm



NOTE: at the first start up, or after a long period of no use, it is necessary to vent the air through the breather (2) placed at the end of the solenoid tube.

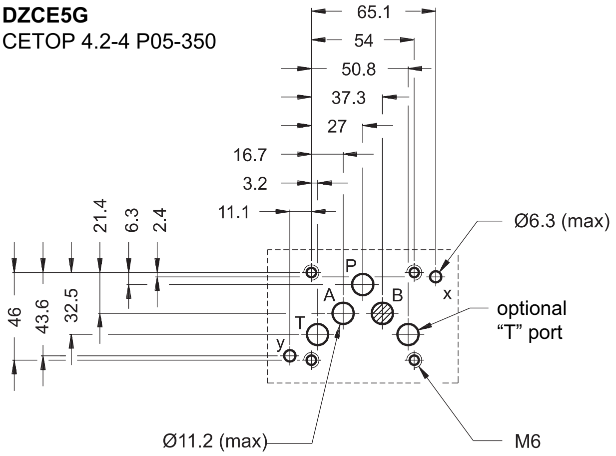
Mounting surface shown at paragraph 12.

1	Mounting surface with sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Breather (Allen key 4)
3	Main connection
4	Adjustment seal, set in factory. It is recommended not to unscrew the nut.
5	Pressure gauge port 1/4 BSP”
6	Mating electrical connector **to be ordered separately.** See at section 15

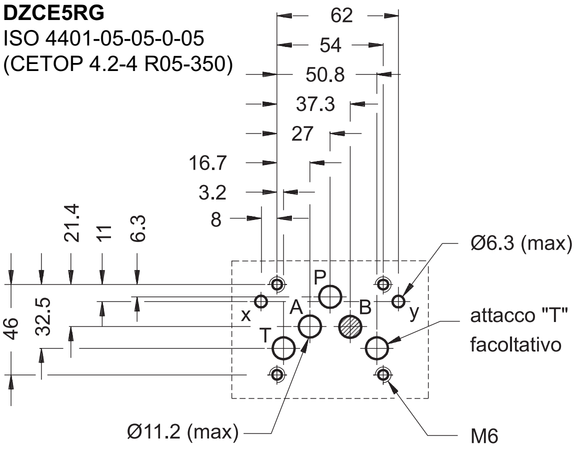
Valve fastening: N. 6 bolts SHC M12x60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Thread of mounting holes: M12x20

12 - MOUNTING SURFACES

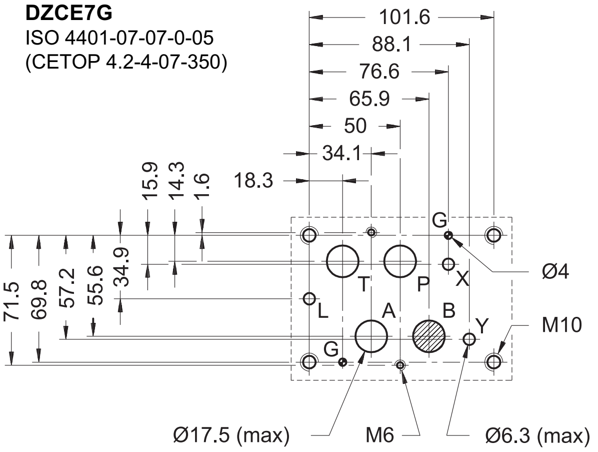
DZCE5G
CETOP 4.2-4 P05-350



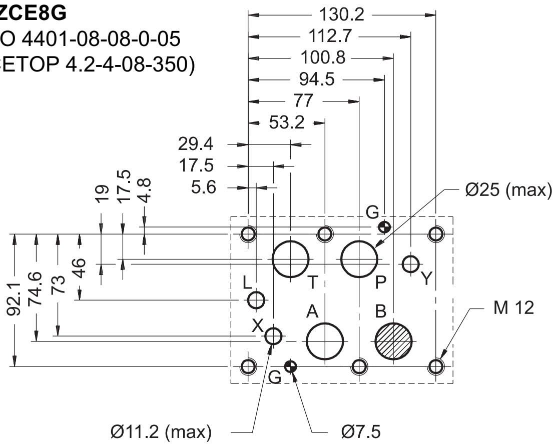
DZCE5RG
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



DZCE7G
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DZCE8G
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

14 - INSTALLATION

We recommend to install the valves either in horizontal position, or vertical position with the solenoid downward. If the valve is installed in vertical position and with the solenoid upward, you must consider possible variations of the minimum controlled pressure, if compared to what is indicated in paragraph 5.

Ensure that there is no air in the hydraulic circuit. In particular applications, can be necessary to vent the air entrapped in the solenoid tube, by using the appropriate drain screw in the solenoid tube.

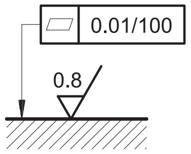
Ensure the solenoid tube is always filled with oil. At the end of the operation, make sure of having correctly replaced the drain screw.

Connect the valve T port directly to the tank. Add any backpressure value detected in the T line to the controlled pressure value.

Maximum admissible backpressure in the T line, under operational conditions, is 2 bar.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



15 - ACCESSORIES

(to be ordered separately)

15.1 Mating connector

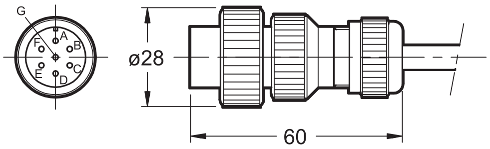
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



15.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

15.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

16 - SUBPLATES

(see catalogue 51 000)

	DZCE5G	DZCE7G	DZCE8G
Type with rear ports	PME4-AI5G	PME07-AI6G	-
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G
Thread of ports: P - T - A - B X - Y	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1½” BSP 1/4” BSP

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RPCED1

DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

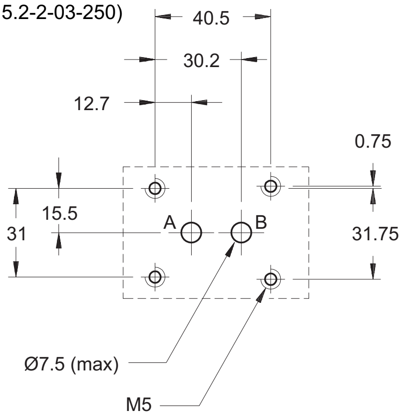
SERIES 52

SUBPLATE MOUNTING ISO 6263-03

p max **250** bar
Q max (see table of performances)

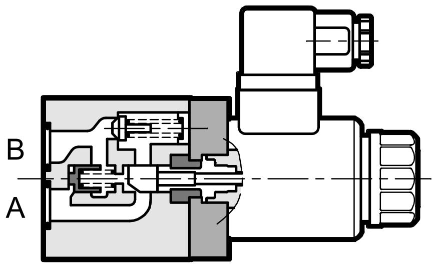
MOUNTING INTERFACE

ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)



NOTE: The RPCED1 mounting interface, with ISO 6263-03 holes, must not have P and T ports or must have the 0113388 subplate (to be ordered separately).

OPERATING PRINCIPLE



— The RPCED1 valve is a two-way flow control valve with pressure and thermal compensation, electric proportional control, and mounting interface in compliance with ISO 6263 standards.

— It is normally used for flow rate control in hydraulic circuit branches or for speed control of hydraulic actuators.

— Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 10).

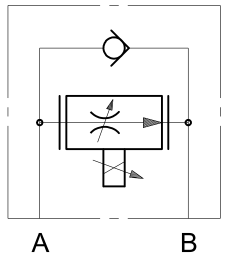
— It is available in five flow rate control ranges up to 25 l/min.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure Minimum Δp between A and B port	bar	250 10
Maximum controlled flow Min. controlled flow (for 1 and 4 l/min. reg.) Maximum free-reverse flow	l/min	1,5 - 4 - 8 - 16 - 25 0,025 40
Step response	see paragraph 7	
Hysteresis (with PWM 100 Hz)	% of p nom	< 6%
Repeatability	% of p nom	< ±2,5%
Electrical characteristic	see paragraph 6	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (class 17/15/12 for flows < 0,5 l/min)	
Recommended viscosity	cSt	25
Mass	kg	1,5

HYDRAULIC SYMBOLS



RPCED1
SERIES 52

1 - IDENTIFICATION CODE

R	P	C	E	D	1	-		/	C	/	52	-	24	/	

Compensated flow control valve

Electric proportional control

Open loop control

Size: ISO 6263-03 (CETOP 03)

Maximum controlled flow:
1 = 1,5 l/min **8** = 8 l/min **25** = 25 l/min
4 = 4 l/min **16** = 16 l/min

Built-in check valve

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

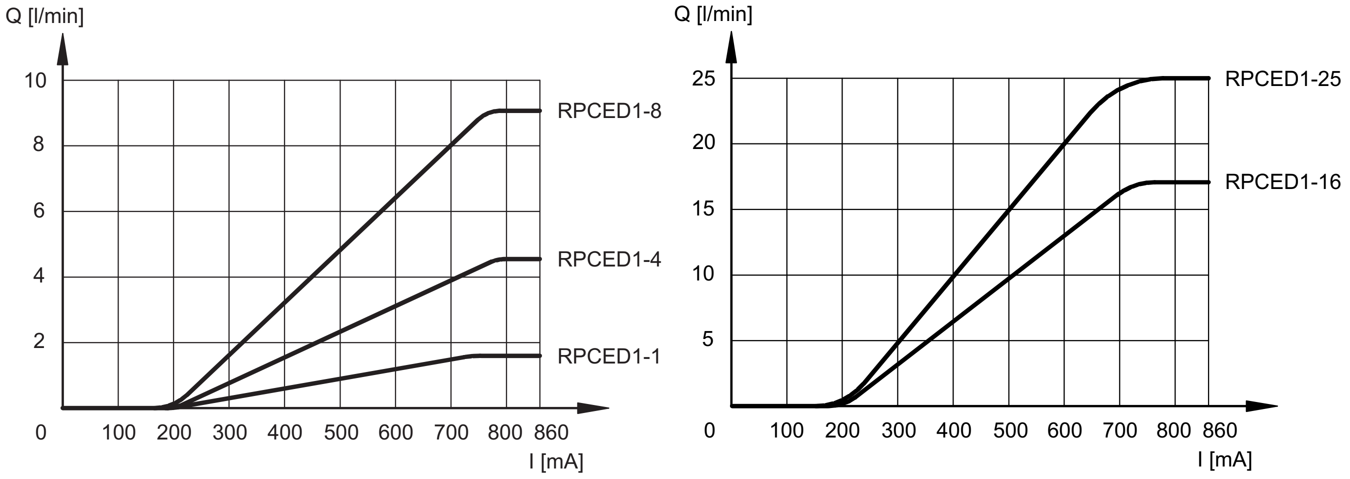
Nominal solenoid voltage 24 V DC

Seal: omit for mineral oils
V = viton for special fluids

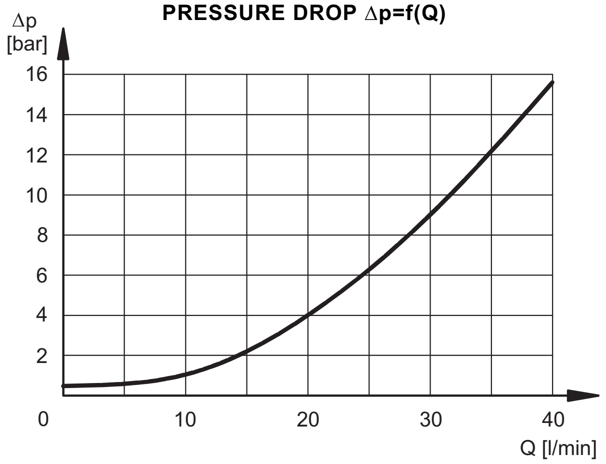
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

Typical curves for flow rate A→ B according to the current supplied to the solenoid for controlled flow rate of: 1- 4 - 8 - 16 - 25 l/min.

FLOW CONTROL Q=f(I)



PRESSURE DROP Δp=f(Q)



Pressure drop with free flow B →A
through check valve.

3 - PRESSURE COMPENSATION

The valves are equipped with two restrictors in series. The first one is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance limit of ± 2% of the full scale flow rate for maximum pressure variation between the valve inlet and outlet chambers.

4 - THERMAL COMPENSATION

Thermal compensation of the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity.
For controlled flow rates of lower than 0.5 l/min and with a temperature change of 30°C, flow rate varies by approx. 13% of the set value.
For higher flow rates and with the same temperature change the flow rate variation is <4% of the set flow rate.

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTICS

6.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	17.6
MAXIMUM CURRENT	A	0.86
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

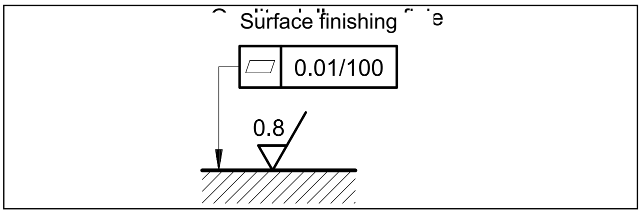
7 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

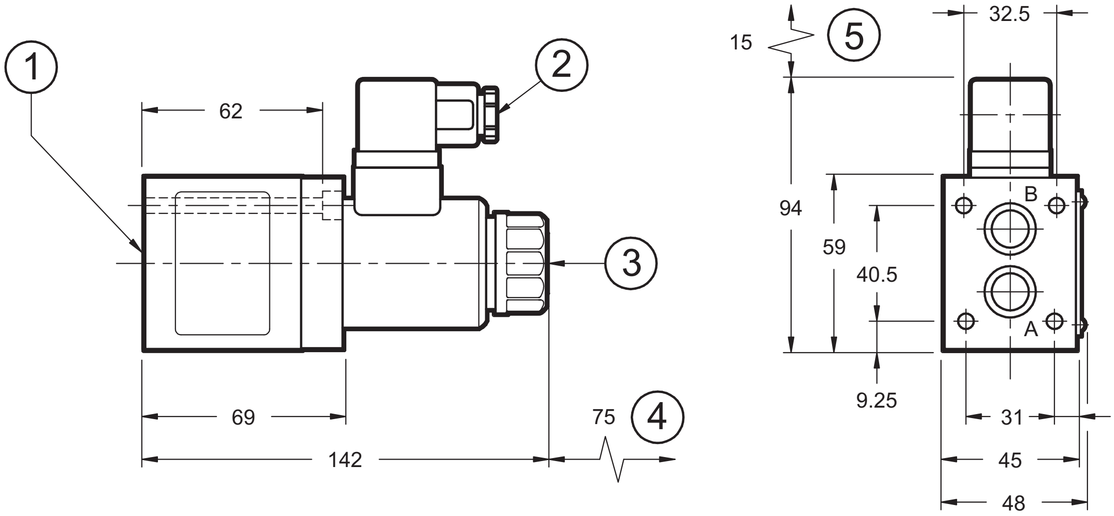
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%	25→75%	75→25%
Step response [ms]	60	80	50	70

8 - INSTALLATION

RPCED1 valves can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.



9 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 2 ORM-0140-20 (14x2)
2	Coil electrical connector DIN 43650
3	Manual override control
4	Coil removal space
5	Connector removal space

Fastening bolts: 4 bolts M5x70
Torque: 5 Nm

10 - ELECTRONIC CONTROL UNITS

EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250

11 - SUBPLATES (see cat. 51 000)

Type	PMRPC1-AI3G ports on rear PMRPC1-AL3G side ports
Port dimensions	3/8” BSP

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

RPCED1-*/T3

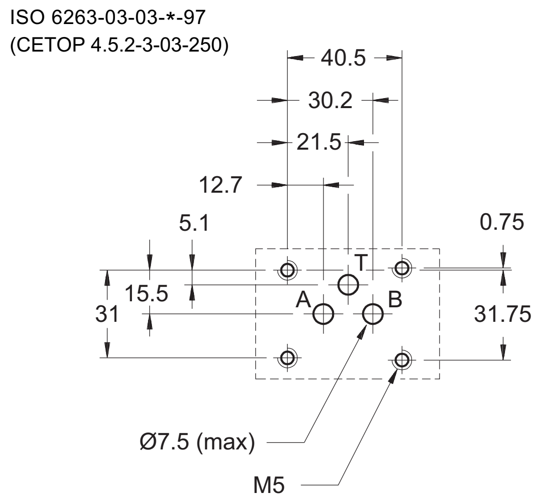
THREE-WAY DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

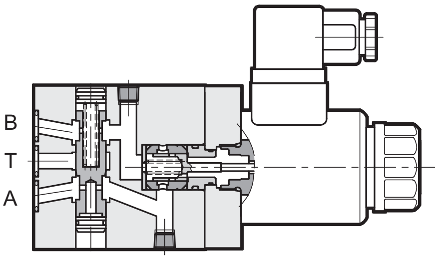
SUBPLATE MOUNTING
ISO 6263-03

p max **250** bar
Q max (see table of performances)

MOUNTING INTERFACE



OPERATING PRINCIPLE



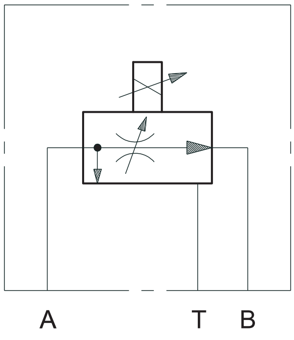
- RPCED1-*/T3 is a three-way flow control valve, pressure and temperature compensated with electric proportional control and mounting interface in compliance with ISO 6263 standards.
- This valve controls the flow to the circuit, by dumping the exceeding oil flow to the tank.
- Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 10).
- It is available in five flow rate control ranges up to 25 l/min.

PERFORMANCES

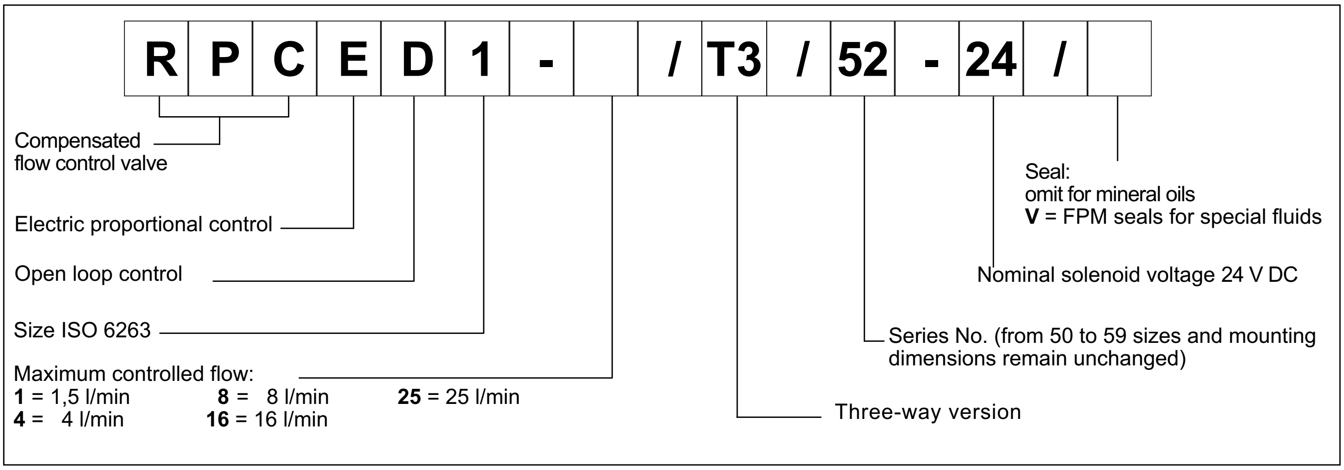
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Maximum operating pressure Minimum Δp between A and B port	bar	250 8
Maximum controlled flow Min. controlled flow (for 1 and 4 l/min. reg.)	l/min	1,5 - 4 - 8 - 16 - 25 0,025
Step response	see paragraph 7	
Hysteresis (PWM 100)	% of Q max	< 6%
Repeatability	% of Q max	< ±2,5%
Electrical characteristic	see paragraph 6	
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (class 17/15/12 for flows < 0,5 l/min)	
Recommended viscosity	cSt	25
Mass	kg	1,5

HYDRAULIC SYMBOL

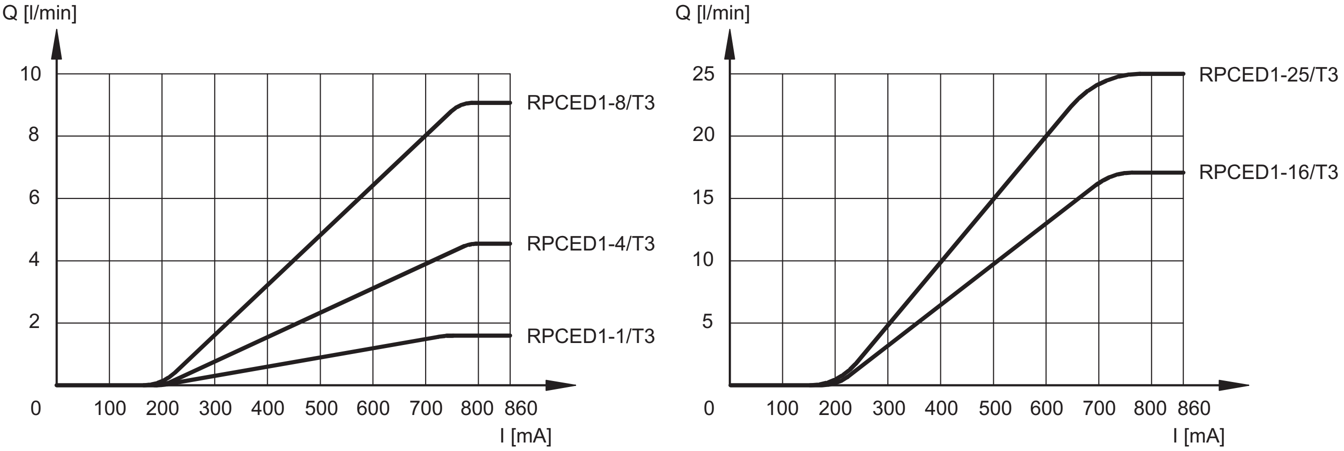


1 - IDENTIFICATION CODE



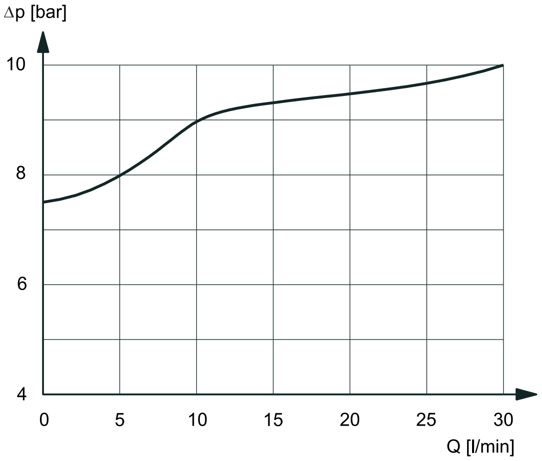
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

FLOW CONTROL Q = f(I)



Typical curves for flow rate A→B according to the current supplied to the solenoid for controlled flow rate of: 1 - 4 - 8 - 16 - 25 l/min.

PRESSURE DROP Δp = f(Q)



Pressure drop with flow A →T through the compensator.

3 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance limit of ± 2% of the set flow rate for maximum pressure variation between the valve inlet and outlet chambers.

4 - THERMAL COMPENSATION

Thermal compensation of the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity.
For controlled flow rates of lower than 0.5 l/min and with a temperature change of 30°C, flow rate varies by approx. 13% of the set value.
For higher flow rates and with the same temperature change the flow rate variation is <4% of the set flow rate.

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTICS

6.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	17.6
MAXIMUM CURRENT	A	0.86
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

7 - STEP RESPONSE (obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

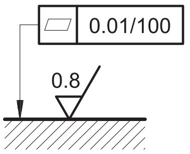
Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%	25→75%	75→25%
Step response [ms]	60	80	50	70

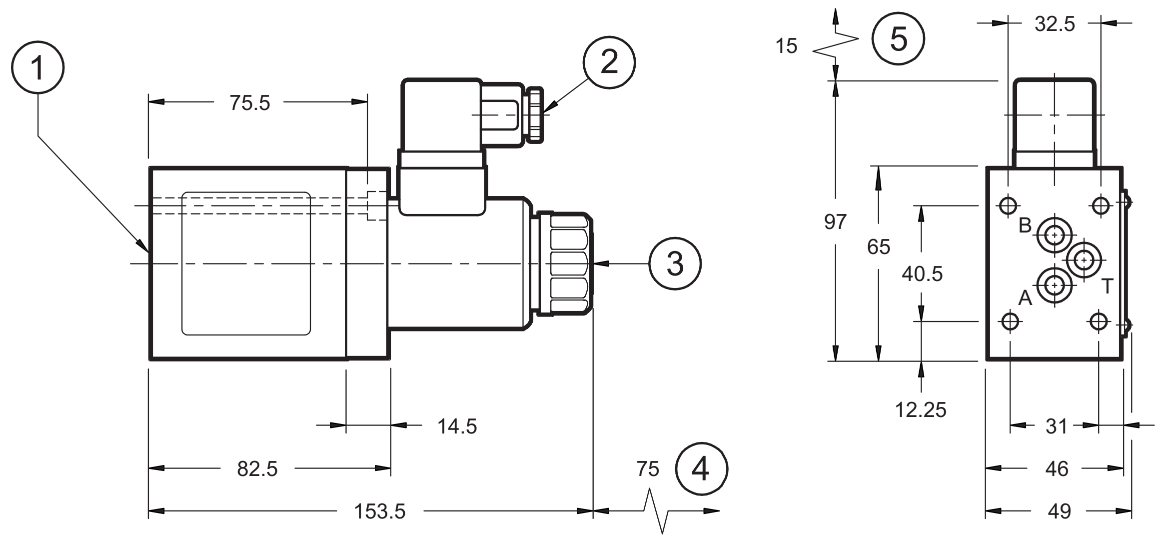
8 - INSTALLATION

RPCED1-*/T3 valves can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface finishing



9 - OVERALL AND MOUNTING DIMENSIONS



dimensions in mm

1	Mounting surface with sealing rings: 3 OR type 2037 (9.25x1.78) - 90 Shore
2	Coil electrical connector DIN 43650
3	Manual emergency control
4	Coil removal space
5	Connector removal space

Fastening bolts: 4 bolts M5x85
Torque: 5 Nm

10 - ELECTRONIC CONTROL UNITS

EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250

11 - SUBPLATES (see cat. 51 000)

Type	PMMD-AI3G rear ports with user P plugged PMMD-AL3G side ports with user P plugged
Port dimensions	3/8” BSP

QDE*

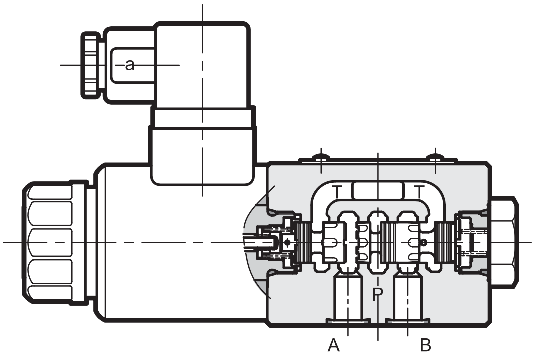
DIRECT OPERATED FLOW CONTROL VALVE WITH PROPORTIONAL CONTROL AND COMPENSATION

SERIES 10

SUBPLATE MOUNTING
ISO 6263-03 (CETOP 03)
ISO 4401-05 (CETOP 05)

p max **250** bar
Q max **80** l/min

OPERATING PRINCIPLE

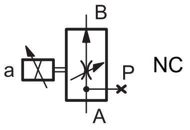


- The QDE* are a compensated flow control valves with pressure compensation and proportional electric control, with mounting surface according to ISO 6263-03 and ISO 4401-05 (CETOP RP121H), supplied with 2 or 3 way design, depending on the use of port P.
- This valve is used for the regulation of the flow in branches of a hydraulic circuit or for the speed control of hydraulic cylinders.
- The flow can modulated continuously in proportion to the current supplied by the solenoid
- The valve can be controlled directly from a current controlled power supply or with an integrated electronic, which allow to fully exploit the performance of the valve.
- QDE* valves are available in two sizes, for 5 flow adjustment ranges of up to 80 l/min.

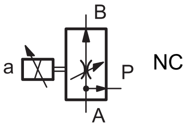
PERFORMANCES (Obtained with mineral oil of viscosity 36 cSt at 50°C and electronic control card)		QDE3				QDE5
Maximum operating pressure	bar	250				250
Controlled flow (Q_B)	l/min	14	20	30	40	80
Minimum suggested input flow (Q_A)	l/min	40	50	40	50	90
Spring setting in pressure compensator	bar	4	8	4	8	8
Minimum pressure drop A > B	bar	10	22	10	22	22
Hysteresis	% of Q_{max}	< 6 %				< ±2 %
Repeatability	% of Q_{max}	< ± 1,5 %				
Electrical characteristics	see paragraph 6					
Fluid temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13					
Recommended viscosity	cSt	25				
Mass	kg	1,6				4,6

HYDRAULIC SYMBOLS

TWO WAYS



THREE WAYS



1 - IDENTIFICATION CODE

Q	D	E	3	-		/	10		-		K1	

Direct flow control valve pressure compensated

Electric proportional control

3 = Size NG06 - ISO 6263-03 (CETOP 03)
5 = Size NG10 - ISO 4401-05 (CETOP 05)

Controlled flow:

QDE3	QDE5
14 = 14 l/min	**80** = 80 l/min
20 = 20 l/min	
30 = 30 l/min	
40 = 40 l/min	

Manual override (see par. 12)

Coil electrical connection: plug for connector type DIN 43650 (**standard**)

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

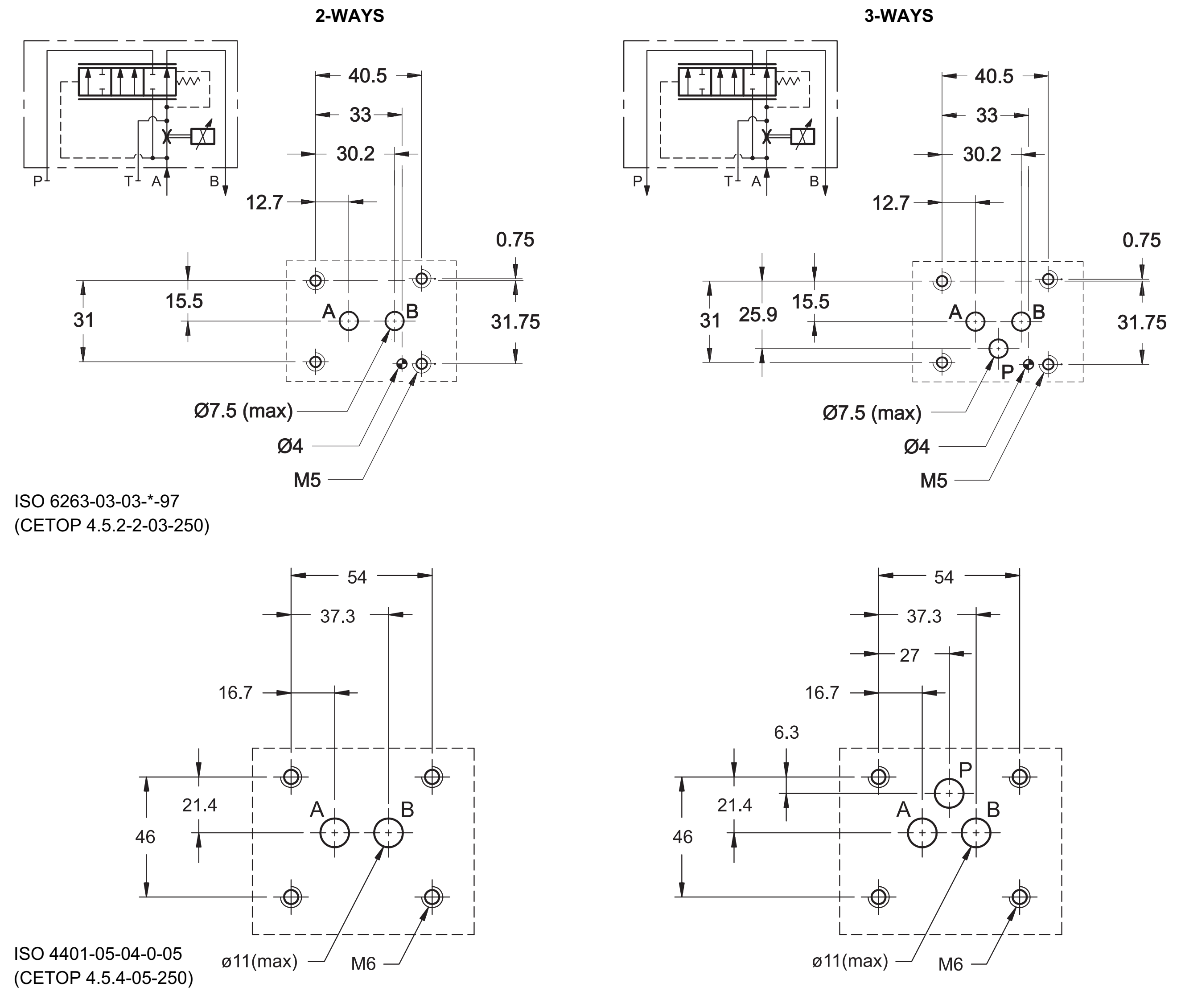
Seals:
N = NBR seals (**standard**)
V = FPM seals for special fluids

Series no. (from 10 to 19 sizes and mounting dimensions remains unchanged)

2 - CONFIGURATIONS AND MOUNTING INTERFACE

The function of two or three ways is obtained realizing the mounting interface according to ISO 6263-03 (CETOP 03) for QDE3 and ISO 4401-05 (CETOP 05) for QDE5, using the port P for three way configuration only. The port T will never be used.

To use the valve in two ways for QDE3 is also possible to interpose a subplate with plug (code 0113388 and 0530384) be ordered separately.

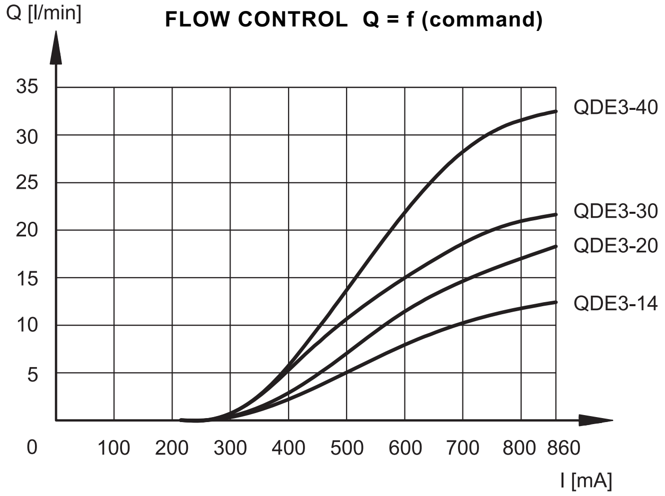


ISO 6263-03-03-*-97
(CETOP 4.5.2-2-03-250)

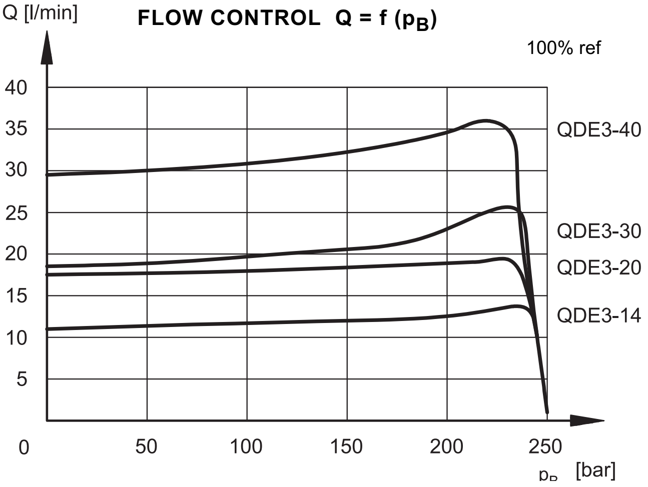
ISO 4401-05-04-0-05
(CETOP 4.5.4-05-250)

4 - CHARACTERISTIC CURVES QDE3 (obtained with viscosity of 36 cSt a 50°C)

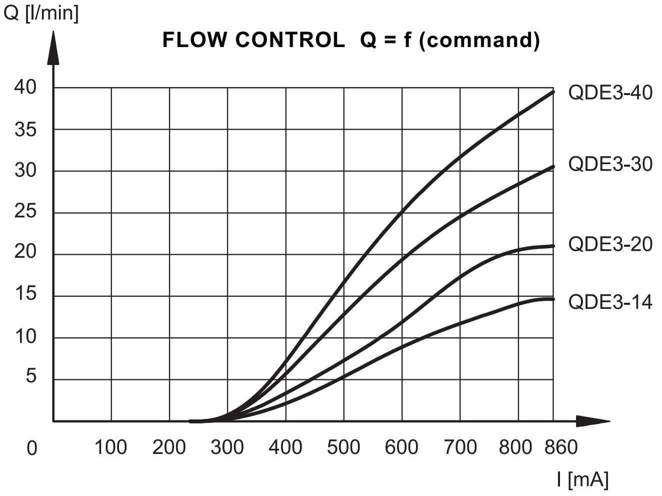
4.1 - Two ways



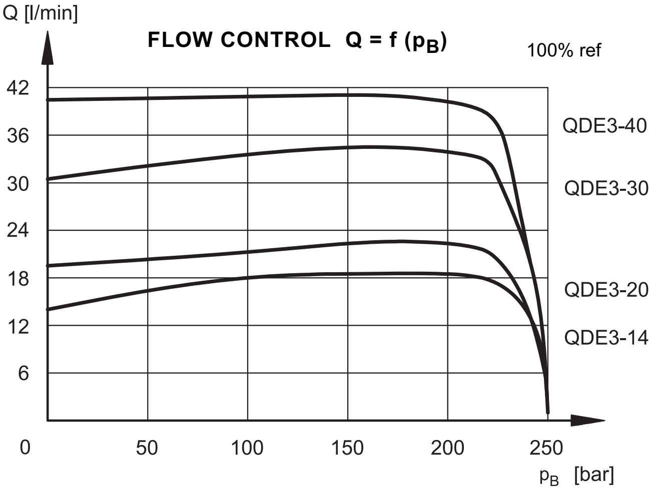
Typical flow rate characteristics A → B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)

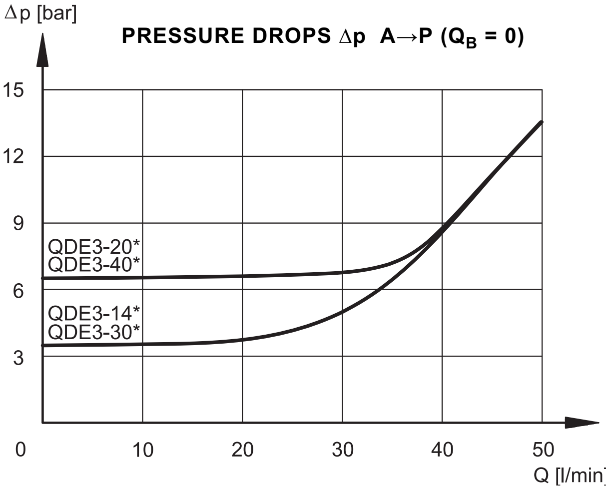


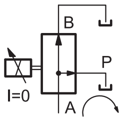
4.2 - Three ways



Typical flow rate characteristics A → B for controlled flow rate: 14 - 20 - 30 - 40 l/min in function of the current supplied to the solenoid (D24 version, maximum current 860 mA, PWM 100 Hz)



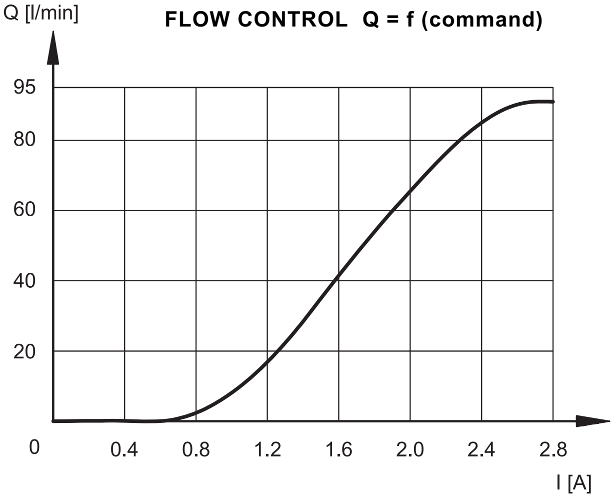


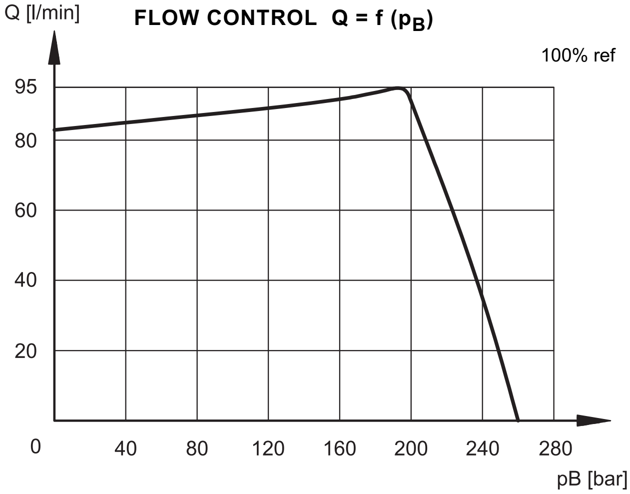


Pressure drops with flow A→P.
Obtained with Q_B = 0 (no current)

4 - CHARACTERISTIC CURVES QDE5 (obtained with viscosity of 36 cSt a 50°C)

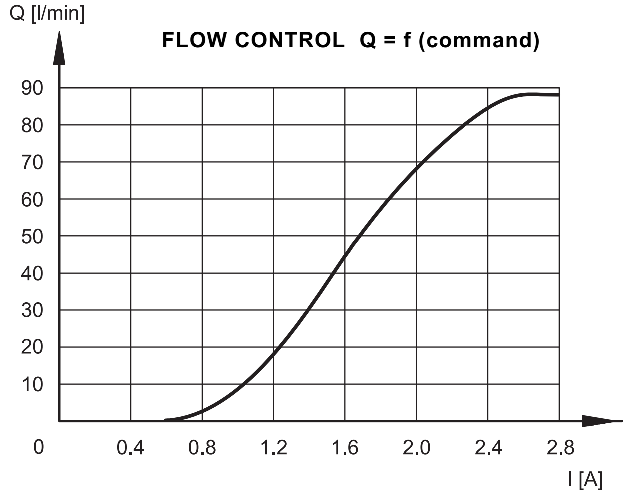
4.1 - Two ways

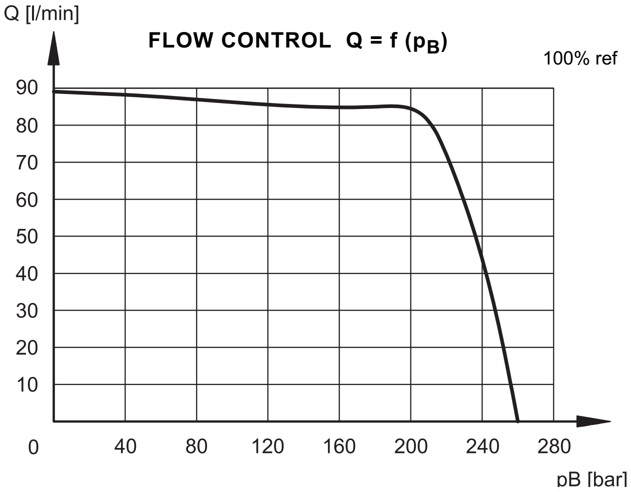




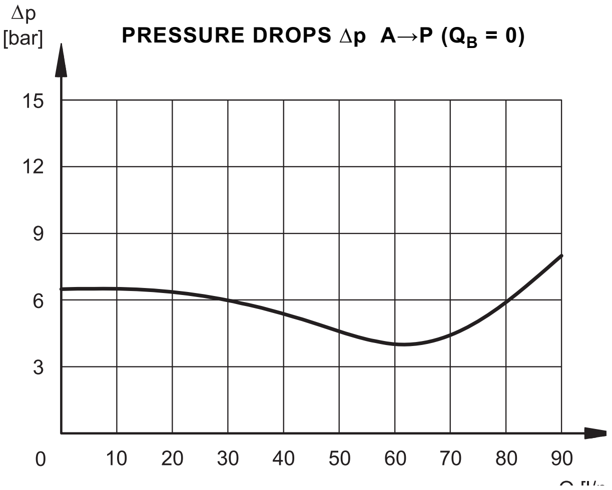
Typical flow rate characteristics A → B in function of the current supplied to the solenoid (D12 version, max current 2.8 A, PWM 100 Hz).

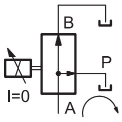
4.2 - Three ways





Typical flow rate characteristics A → B in function of the current supplied to the solenoid (D12 version, max current 2.8 A, PWM 100 Hz).





Pressure drops with flow A→P.
Obtained with Q_B = 0 (no current)

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTIC

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C) QDE3 QDE5	Ω	3,66 3,2	17,6 8,65
NOMINAL CURRENT QDE3 QDE5	A	1,88 2,8	0,86 1,6
PWM FREQUENCY QDE3 QDE5	Hz	200 100	100 100
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: atmospheric agents (CEI EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control cards)

Step response is the time taken for the valve to reach 90% of the set flow value following a step change of reference signal.

The table illustrates typical response times with Δp = 8 bar.

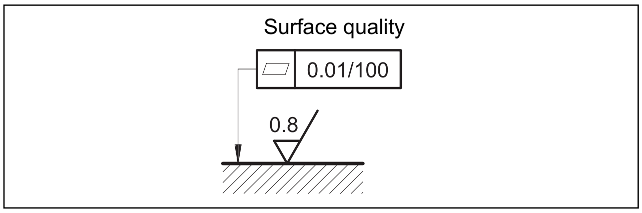
REFERENCE SIGNAL STEP	0 →100%
Step response [ms]	< 70

8 - INSTALLATION

QDE* valves can be installed in any position without impairing correct operation.

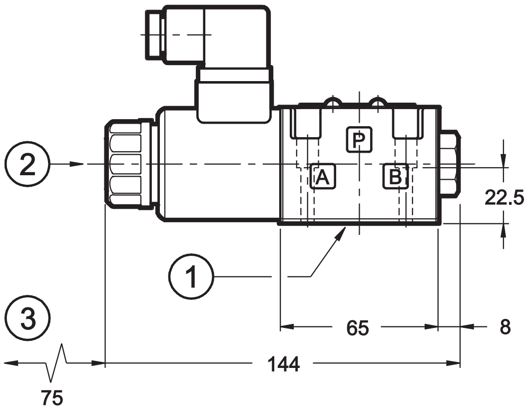
Ensure that there is no air in the hydraulic circuit.

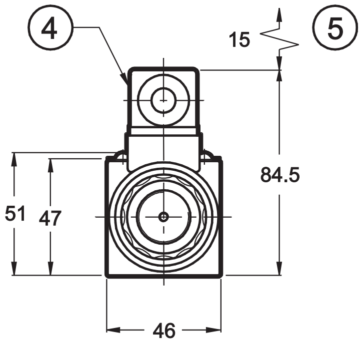
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

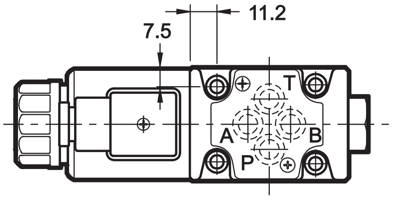


9 - QDE3 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





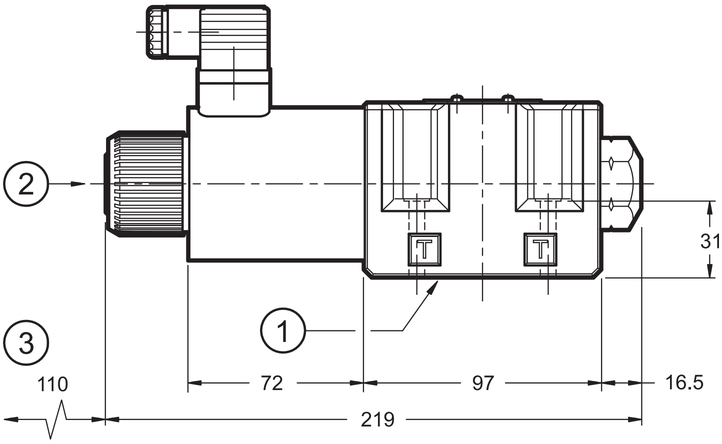


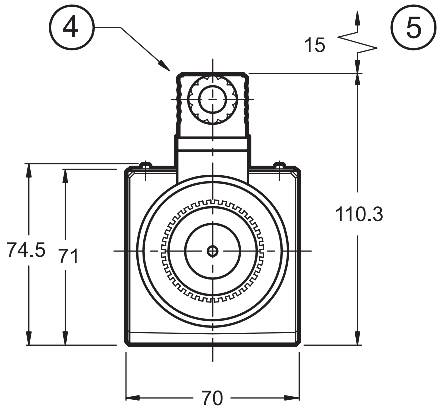
Fastening bolts: N. 4 SHC screws ISO 4762 M5x30
Torque: 5 Nm - A8.8 screws

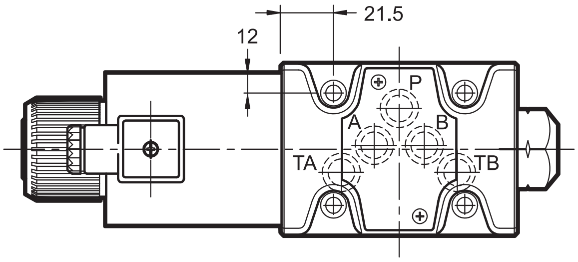
1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Standard manual override integrated in the solenoid tube
3	Coil removal space
4	DIN 43650 Electrical coil connector
5	Connector removal space

10 - QDE5 OVERALL AND MOUNTING DIMENSIONS

dimensions in mm







Fastening bolts: N. 4 SHC screws ISO 4762 M6x40
Torque: 8 Nm - A8.8 screws

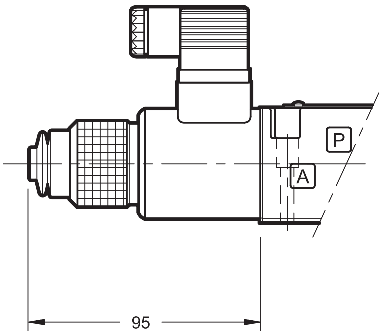
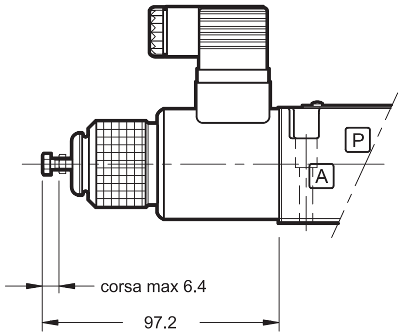
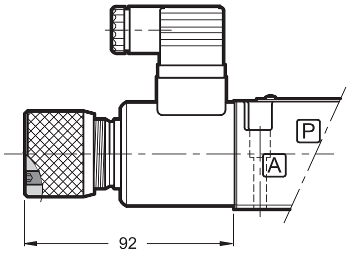
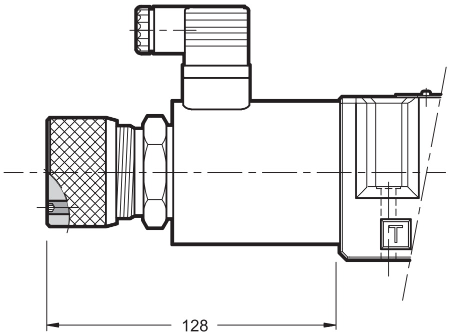
1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore
2	Standard manual override integrated in the solenoid tube
3	Coil removal space
4	DIN 43650 Electrical coil connector
5	Connector removal space

11 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

On demand, there are three types of manual override:

- **CM** version, manual override belt protected (available only for QDE3).
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations (available only for QDE3).
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

CM Version	**CS Version**
 Code: 3803210003	 Code: 3803210004
CK Version for QDE3	**CK Version** for QDE5
 Spanner for set screw: 3 mm. Code: 3803210005	 Spanner for set screw : 3 mm. Code: 3803260003

12 - ELECTRONIC CONTROL UNITS

QDE3

EDC-111	24V DC solenoids	plug version	see cat. 89 120
EDC-142	12V DC solenoids		
EDM-M111	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M142	12V DC solenoids		

QDE5

EDC-131	24V DC solenoids	plug version	see cat. 89 120
EDC-151	12V DC solenoids		
EDM-M131	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M151	12V DC solenoids		

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RPCER1

DIRECT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL AND POSITION FEEDBACK

SERIES 52

SUBPLATE MOUNTING

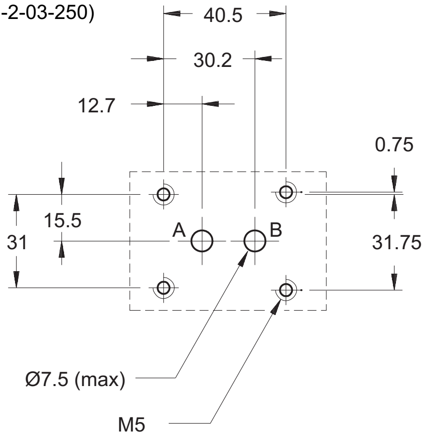
ISO 6263-03 (CETOP 03)

p max **250** bar

Q max (see performances table)

MOUNTING INTERFACE

ISO 6263-03-03-0-97
(CETOP 4.5.2-2-03-250)

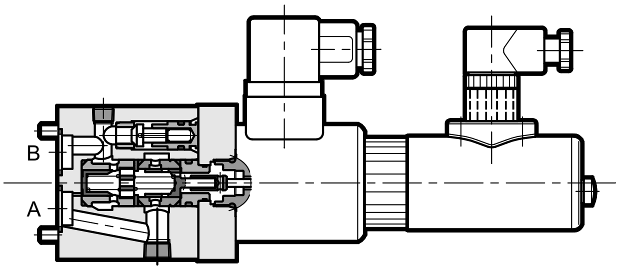


NOTE: The RPCER1 mounting interface, with holes according to ISO 6263-03 (CETOP 03), must not have P and T ports

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and UEIK-11RSQ/52-24 electronic card)

Maximum operating pressure Minimum ∆p between A and B port	bar	250 10
Maximum controlled flow Min. controlled flow (for 1 and 4 l/min. reg.) Maximum free-reverse flow	l/min	1,5 - 4 - 8 - 16 - 25 0,025 40
Step response	see paragraph 7	
Hysteresis	% of Q max	< 2,5%
Repeatability	% of Q max	< ±1%
Electrical characteristic	see paragraph 6	
Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13 (class 17/15/12 for flows < 0,5 l/min)	
Recommended viscosity	cSt	25
Mass:	kg	2,2

OPERATING PRINCIPLE



— RPCER1 is a pressure and temperature compensated two-way flow control valve, with electric proportional control and mounting interface in accordance with the ISO 6263 (CETOP RP121H) standards.

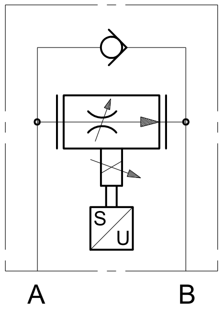
— The position feedback of the flow rate controlling throttle gives regulation conditions featuring highly reduced hysteresis and high repeatability.

— It is normally used to control the flow rate into an arm of the hydraulic circuit or the speed of the hydraulic actuators.

— The flow rate can be modulated continuously in proportion to the reference signal sent to the electronic control unit.

— It is available in five flow rate control ranges up to 25 l/min.

HYDRAULIC SYMBOLS



1 - IDENTIFICATION CODE

R P C E R 1 - ☐ / C / 52 - 24 / ☐

RPC: Compensated flow control valve

E: Electric proportional control

R: Position feedback

1: ISO 6263 (CETOP 03) size

Maximum controlled flow:
1 = 1.5 l/min
4 = 4 l/min
8 = 8 l/min
16 = 16 l/min
25 = 25 l/min

C: Built-in check valve

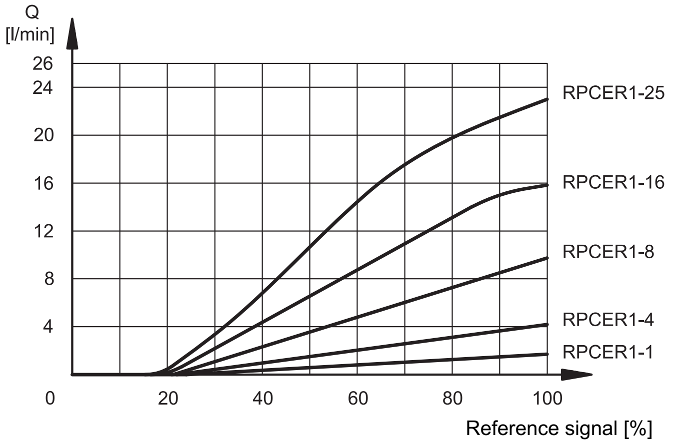
52: Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

24: Nominal solenoid voltage 24 V DC

Seal: omit for mineral oils
V = FPM seals for special fluids

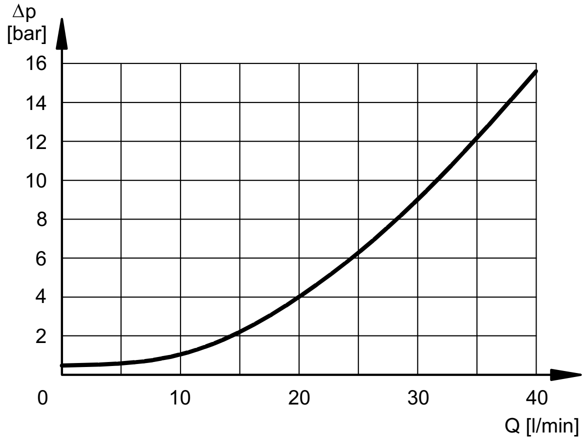
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C and UEIK-11RSQ/52-24 card)

FLOW CONTROL Q=f (ref)



Typical curves for flow rate A →B according to the reference signal sent to the electronic control unit.

PRESSURE DROP ∆p=f (Q)



Pressure drop with free flow B→A through check valve.

3 - PRESSURE COMPENSATION

The valves are equipped with two restrictors in series. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance limit of ± 2% of the full scale flow rate for maximum pressure variation between the valve inlet and outlet chambers.

4 - THERMAL COMPENSATION

Thermal compensation of the valve is obtained by adopting the principle of restricted fluid passage, so that the fluid is not influenced significantly by variations in oil viscosity.

For controlled flow rates of lower than 0.5 l/min and with a temperature change of 30°C, flow rate varies by approx. 13% of the set value.

For higher flow rates and with the same temperature change the flow rate variation is <4% of the set flow rate.

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4.

For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

6 - ELECTRICAL CHARACTERISTICS

6.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to reduce friction to a minimum thereby reducing hysteresis.

The armature connected to the LVDT transducer core sends the position status to the electronic control unit.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	17.6
MAXIMUM CURRENT	A	0.86
DUTY CYCLE	100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

6.2 - Positional transducer

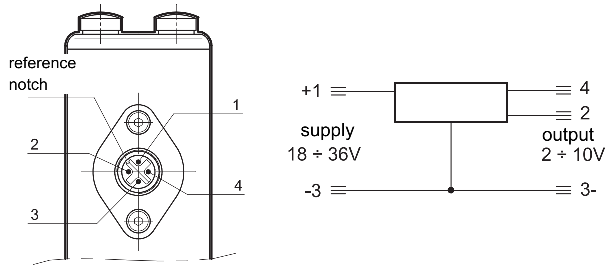
The feedback control version RPCER1 uses an LVDT type positional transducer with amplified signal to enable precise control of the restrictor and the set flow rate, thus improving repeatability and hysterisis characteristics.

The transducer is fitted coaxially on the proportional solenoid and the connector features 360° positioning.

Technical specifications and connections are indicated here beside.

The transducer is protected against polarity inversion on the power line.

Position transducer connection		**Electronic card connections** (see par. 10)
pin 1	supply 18 ÷ 36 V	pin 8c
pin 2	output 2 ÷ 10 V	pin 24a
pin 3	0 V	pin 22c
pin 4	NC	NC



7 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with UEIK-11RSQ/52-24 electronic control unit)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical response times with valve flow rate of 16 l/min and with input pressure of 100 bar.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%	25→100%	100→25%
Step response [ms]	180	150	150	120

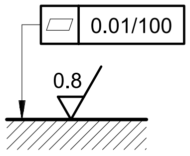
8 - INSTALLATION

RPCER1 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

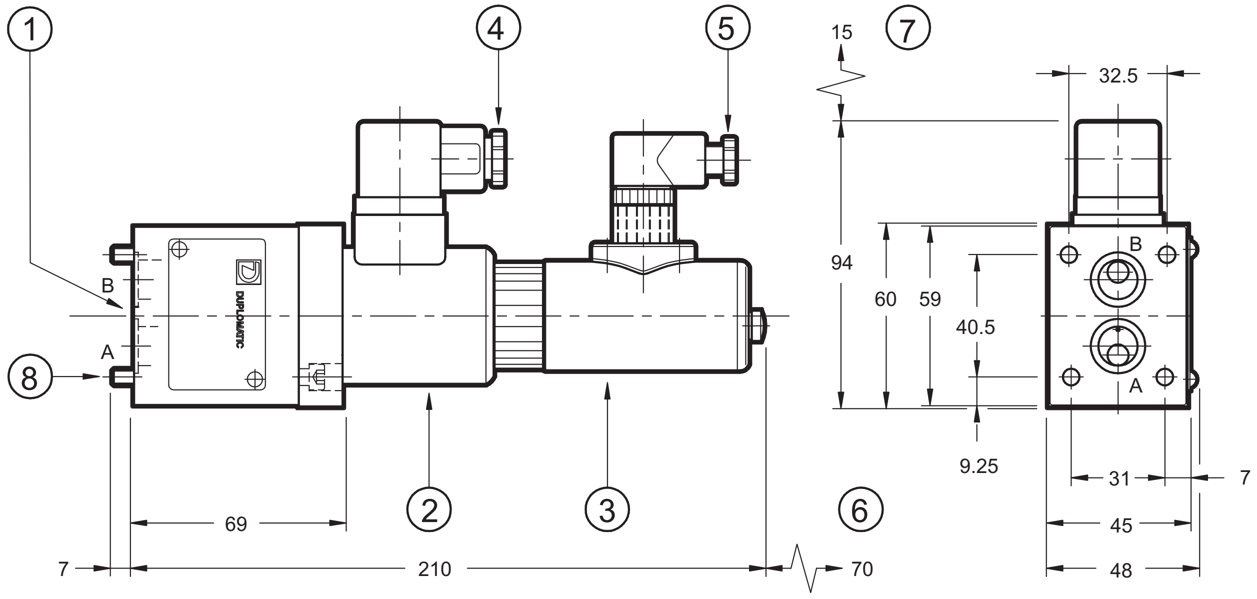
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and mounting surface.

Surface finishing



9 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Mounting surface with sealing rings: 2 ORM-0140-20 (14 x 2)
2	Proportional solenoid
3	Position transducer
4	DIN 43650 electrical connector for proportional solenoid
5	Electrical connector 4 pin M12 - IP67 PG7 for position transducer
6	Position transducer removal space
7	Connector removal space
8	4 bolts M5 x 65 included in the supply Torque: 5 Nm

Torque: 5 Nm

10 - ELECTRONIC CONTROL UNIT

UEIK-11RSQ/52-24	Eurocard format	see cat. 89 315

11 - SUBPLATES (see cat. 51 000)

Type	PMRPC1-AI3G rear ports PMRPC1-AL3G side ports
Port dimensions	3/8” BSP

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RPCE2-*

PILOT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

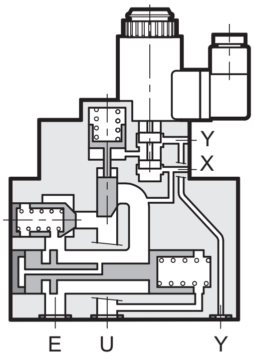
RPCE2-*	**two-way**
RPCE2-*-T3	**three-way**

SUBPLATE MOUNTING
ISO 6263-06 (CETOP 06)

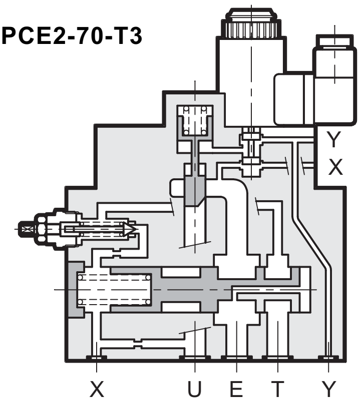
p max **250** bar
Q max (see performaces table)

OPERATING PRINCIPLE

RPCE2-*



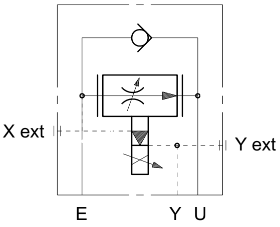
RPCE2-70-T3



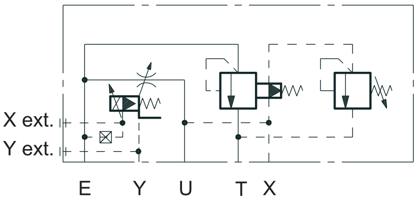
- — RPCE2-* valves are two-way or three-way flow control valves with pressure and thermal compensation and electric proportional control with mounting interface in compliance with ISO 6263 (CETOP RP 121H) standards.
- — These valves are normally used for flow rate control in hydraulic circuit branches and for speed control of hydraulic actuators.
- — Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- — The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units which enable optimal valve performance (see par. 12).
- — The valves are available in four flow control ranges: three with progressive gain up to 60 l/min and the fourth with differential gain of 35 l/min.
- — To ensure correct valve operation, maintain a minimum pilot control flow rate of 2 l/min and minimum pressure of 20 bar.
- — Pilot control can be internal, with intake of oil from line E, or external from a line with 1/4” BSP connection on the pilot body.
- — Drainage is always external and must be connected directly to the tank without backpressure by means of subplate connection Y (OR ø 35) or by means of a line (1/4” BSP coupling) on the pilot body.
- — The three-way version RPCE2-70-T3 allows flow control to the circuit by dumping the exceeding flow to the tank. Maximum pressure in the circuit is limited by means of a manual adjustment relief valve which operates on the compensator pilot.
- — RPCE2-70-T3 valve is also available in M version, which allows, by means of an electric control, to unload the total flow with a minimum pressure drop.

HYDRAULIC SYMBOLS

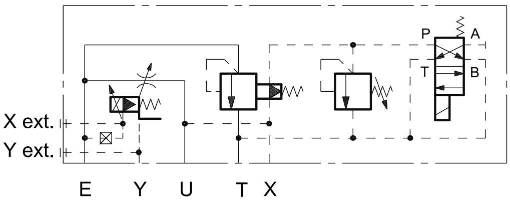
RPCE2-*



RPCE2-70-T3

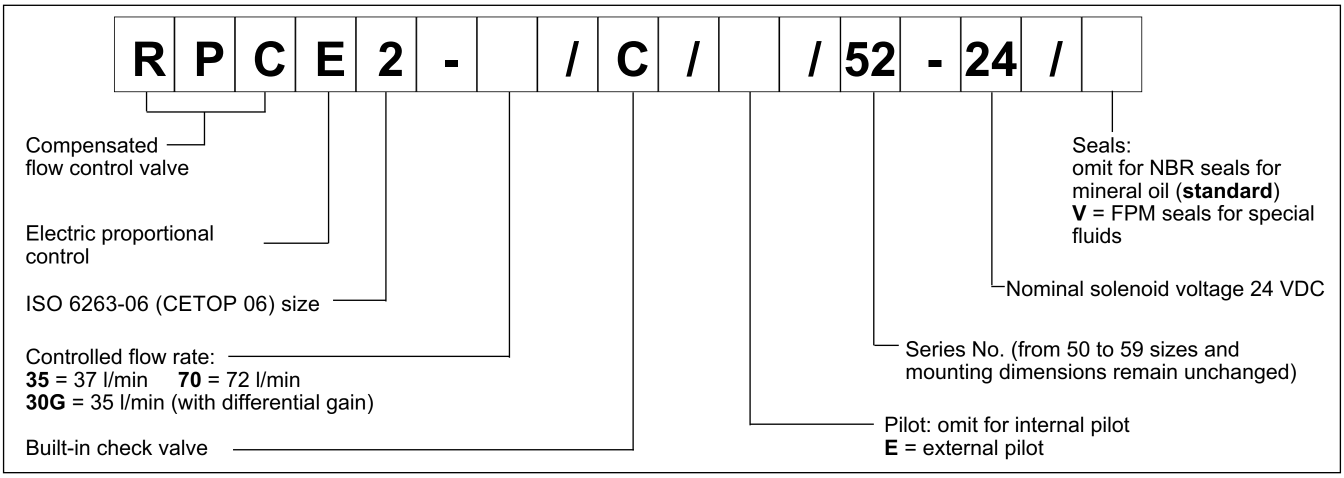


RPCE2-70-T3M



1 - IDENTIFICATION CODES

1.1 - Identification code for two-way valve: RPCE2-*



R	P	C	E	2	-		/	C	/		/	52	-	24	/	

Compensated flow control valve

Electric proportional control

ISO 6263-06 (CETOP 06) size

Controlled flow rate:
35 = 37 l/min **70** = 72 l/min
30G = 35 l/min (with differential gain)

Built-in check valve

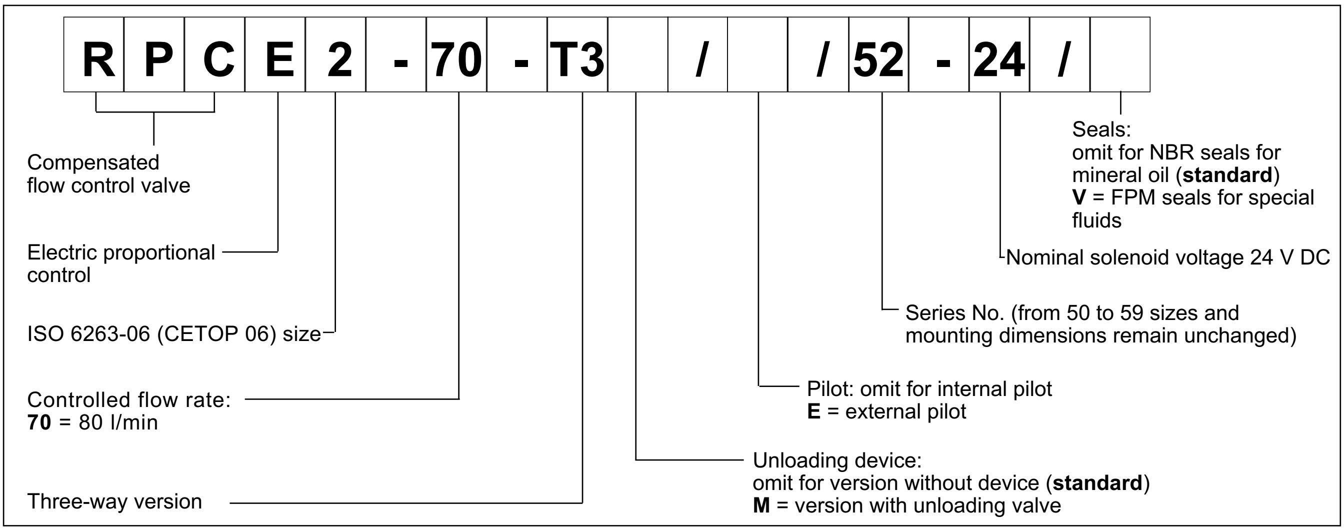
Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Nominal solenoid voltage 24 VDC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Pilot: omit for internal pilot
E = external pilot

1.2 - Identification code for three-way valve: RPCE2-70-T3



R	P	C	E	2	-	70	-	T3		/		/	52	-	24	/	

Compensated flow control valve

Electric proportional control

ISO 6263-06 (CETOP 06) size

Controlled flow rate:
70 = 80 l/min

Three-way version

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Nominal solenoid voltage 24 V DC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Pilot: omit for internal pilot
E = external pilot

Unloading device:
omit for version without device (**standard**)
M = version with unloading valve

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and relevants electronic control units)

Maximum working pressure Minimum Δp across E and U ports Piloting pressures: min max	bar	250 10 20 160 (**NOTE 1**)
Maximum controlled flow E→U (RPCE2-*) Maximum controlled flow (RPCE2-70-T3) Minimum controlled flow with P=100 bar (versions 35 and 70) (version 30G) Maximum free reverse flow U→E	l/min	22 - 35 - 40 - 60 50 - 60 - 90 0,5 0,2 60 (**NOTE 2**)
Step response	see paragraph 8	
Hysteresis (with PWM 100 Hz)	% of Q_{max}	< 8%
Repeatability	% of Q_{max}	< ±3%
Electrical features	see paragraph 7	
Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: RPCE2-* RPCE2-70-T3 RPCE2-70-T3M	kg	7,2 9

NOTE 1: Pilot must be external if the valve is used with line pressure over 160 bar.

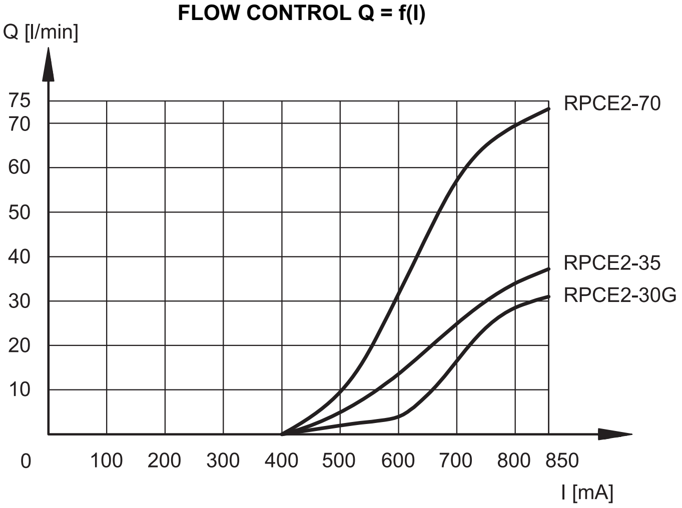
NOTE 2: Maximum recommended flow U→E through the check valve (only for two-way version).

3 - HYDRAULIC FLUIDS

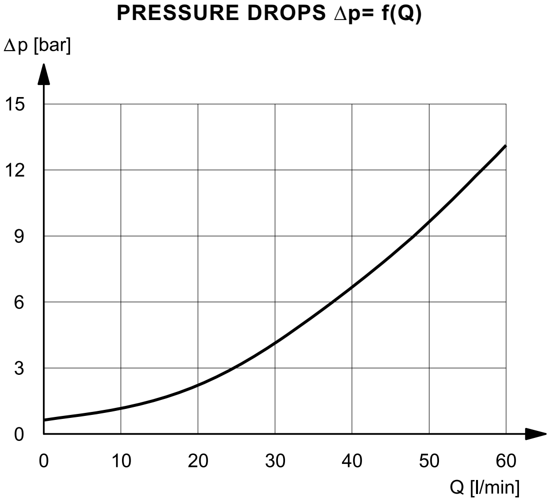
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

4.1 2-way valve

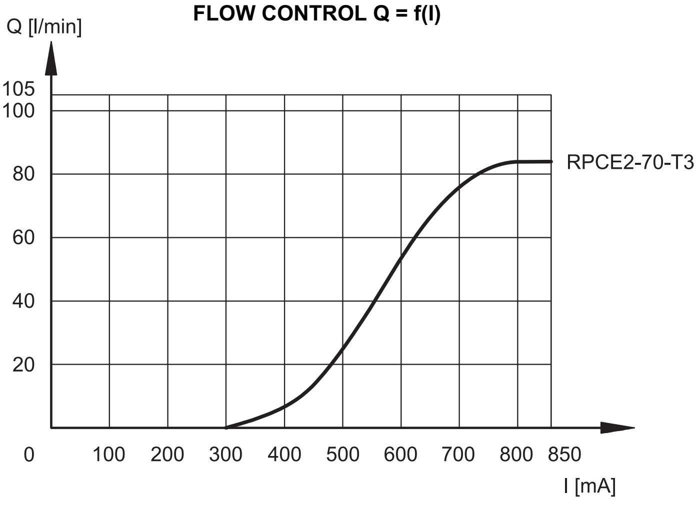


Typical flow control curves for flow rate E → U according to the current supplied to the solenoid.
The RPCE2-G version, featuring differential gain control, is particularly suitable for “FAST-SLOW” flow rate control as it ensures high sensitivity at low flow rates while enabling high flow rates for rapid actuator movement.

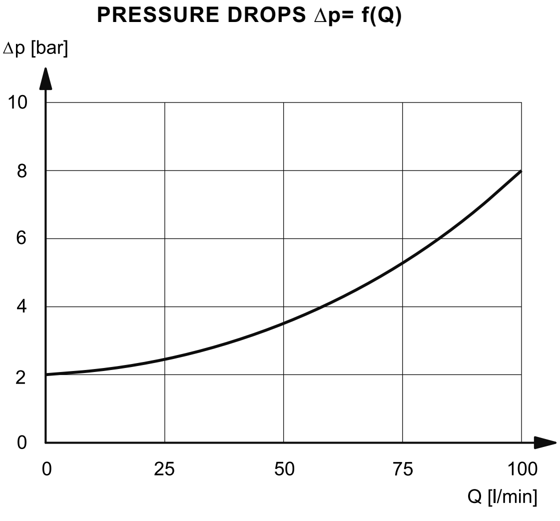


Pressure drops with free flow U → E through check valve.

4.2 - 3-way valve



Typical flow control curves for flow rate E → T , according to the current supplied to the solenoid.



Pressure drops E → T
Curve obtained with unloading electrical control (RPCE2-70-T3M)

5 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance range of ±3% of the set flow rate for maximum pressure variation between the valve inlet and outlet chambers.

6 - THERMAL COMPENSATION

A temperature-sensitive device installed on the flow control element corrects the position and maintains the set flow rate virtually unchanged, also in the case of fluid viscosity variation.
Flow rate variation remains within 2,5% of the set flow rate, for a fluid temperature variation of 10°C

7 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	16.6
MAXIMUM CURRENT	A	0.85
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108 CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529) Coil insulation (VDE 0580) Impregnation	IP 65 class H class F	

8 - STEP RESPONSE (with mineral oil with viscosity of 36 cSt at 50°C and relevants electronic control units)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table shows typical response times measured with valves “S” (40 l/min) and with an input pressure of 100 bar.

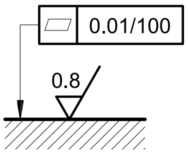
REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	250	120

9 - INSTALLATION

The RPCE2-* valve, both two-way or three-way versions, can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

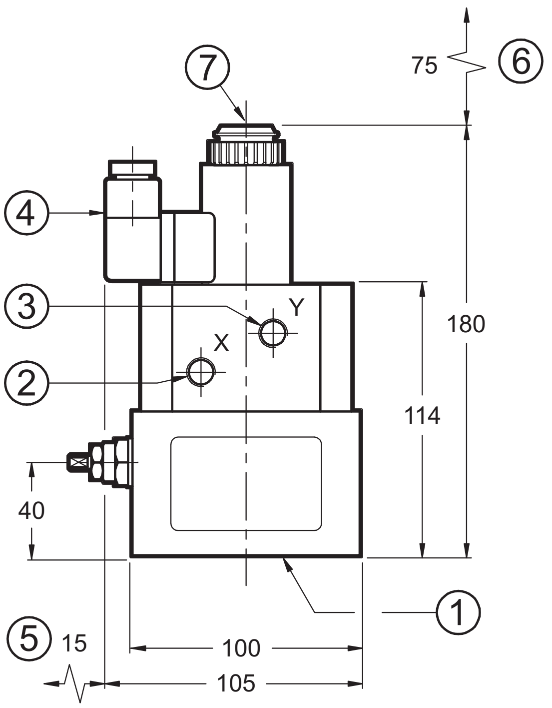
Surface finishing



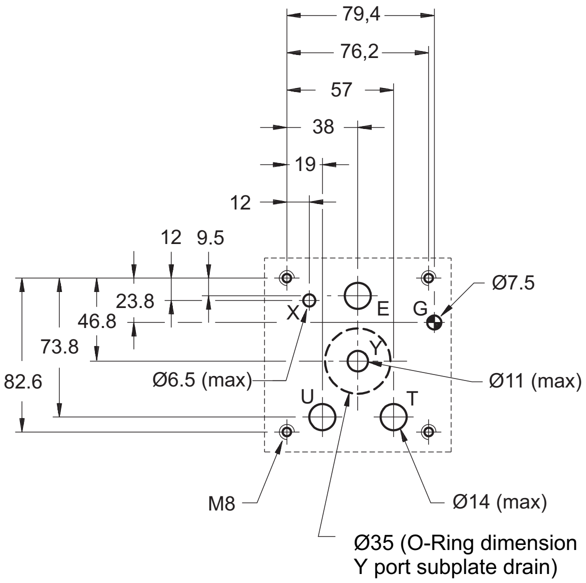
10 - ELECTRONIC CONTROL UNITS

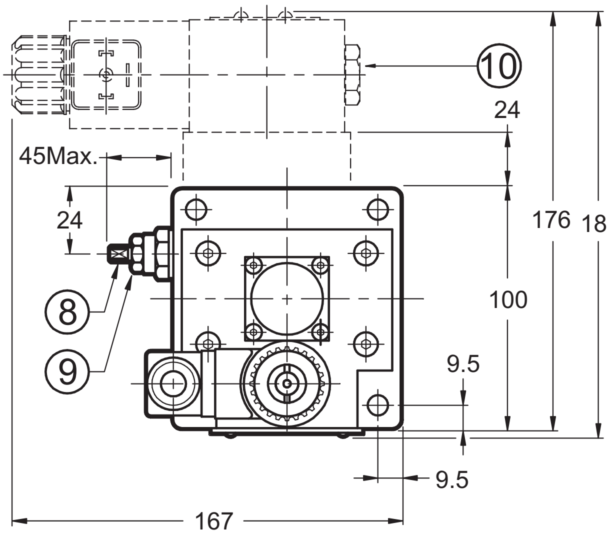
EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250

11 - OVERALL AND MOUNTING DIMENSIONS THREE-WAY VALVES RPCE2-70-T3 and RPCE2-70-T3M



MOUNTING SURFACE:
ISO 6263-06-07-*-97 (CETOP 4.5.2-3-06-250)



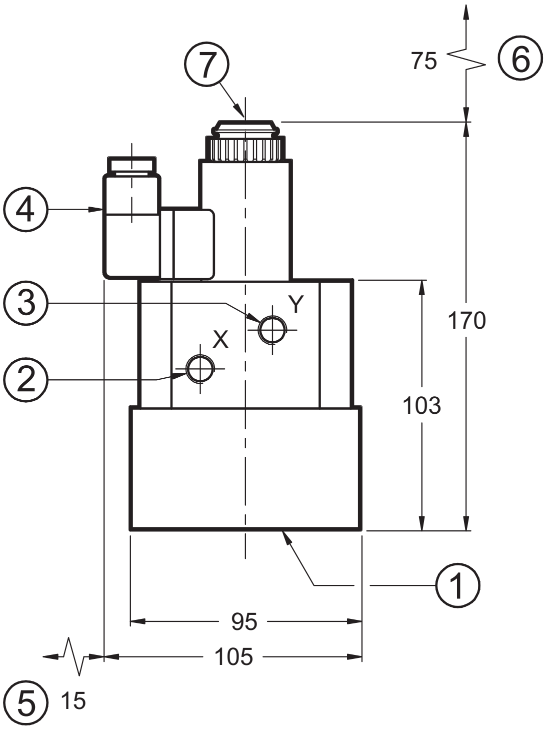


dimensions in mm

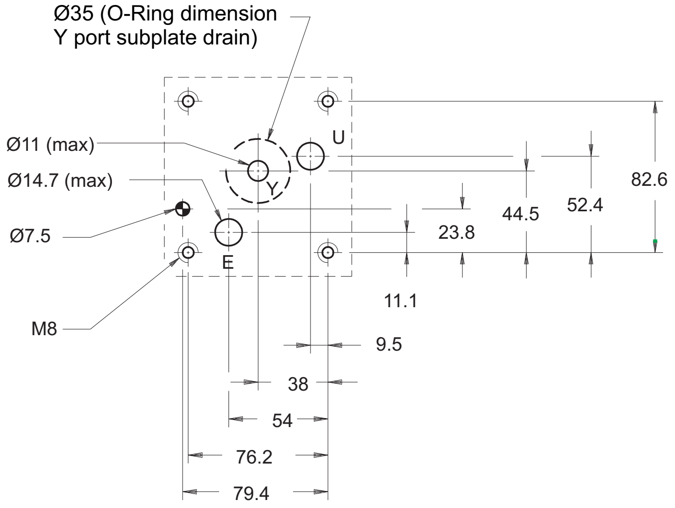
1	Mounting surface with sealing rings: 3 OR type 119 (15.08x2.62) 1 OR type 2125 (31.47x1.78) 1 OR type 109 (19.13x2.62)
2	External pilot port X: 1/4” BSP
3	Drain port Y: 1/4” BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (male hexagonal spanner 4)
8	Pressure relief valve - adjustment screw: square spanner 6 - pressure adjustment range up to 210 bar - default setting: minimum
9	Locking nut: spanner 13
10	Unloading solenoid valve type DS3-TB (only for version RPCE2 -*-T3M) - solenoid valve OFF = flow unloading at minimum pressure - solenoid valve ON = unloading pressure controlled by pressure relief valve 8

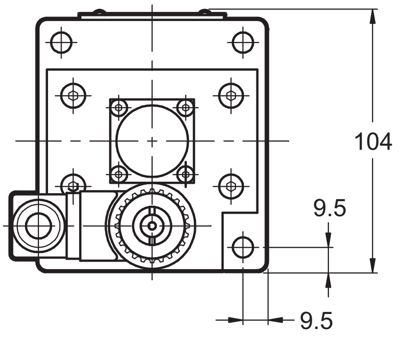
Fastening bolts: 4 bolts M8x75
Torque: 20 Nm

12 - OVERALL AND MOUNTING DIMENSION TWO-WAY VALVE RPCE2-*



MOUNTING SURFACE:
ISO 6263-06-05-*-97 (CETOP 4.5.2-2-06-250)





dimensions in mm

1	Mounting surface with sealing rings: 2 OR type 119 (15.08x2.62) 1 OR type 2125 (31.47x1.78)
2	External pilot port X: 1/4” BSP
3	Drain port Y: 1/4” BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (male hexagonal spanner 4)

Fastening bolts: 4 bolts M8x60
Torque: 20 Nm

13 - SUBPLATES (see catalogue 51 000)

The valve must have the Y drain with external pipe when using the subplates listed below.

	RPCE2-* two way version	**RPCE2-*-T3** three way version
Type	PMRPC2-AI4G rear ports	PMRPCQ2-AI4G rear ports
E, U, T ports threading	1/2” BSP	1/2” BSP
X port threading	-	1/4” BSP

DUPLOMATIC OLEODINAMICA

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DUPLOMATIC OLEODINAMICA

RPCE3-*

PILOT OPERATED FLOW CONTROL VALVE WITH ELECTRIC PROPORTIONAL CONTROL

SERIES 52

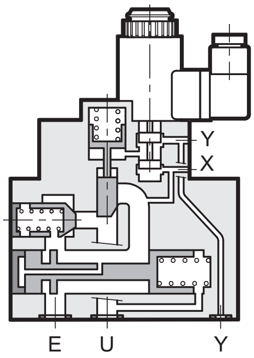
RPCE3-* two-way
RPCE3-100-T3 three-way

SUBPLATE MOUNTING
ISO 6263-07 (CETOP 07)

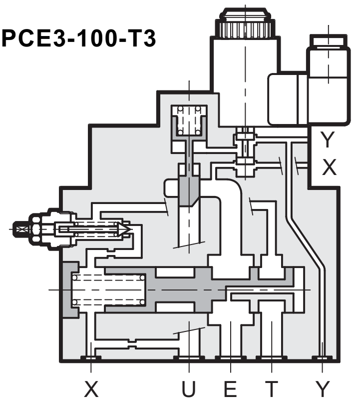
p max **250** bar
Q max (see performances table)

OPERATING PRINCIPLE

RPCE3-*



RPCE3-100-T3



— RPCE3-* valves are two-way or three-way flow control valves with pressure and thermal compensation and electric proportional control with mounting interface in compliance with ISO 6263 (CETOP RP 121H) standards.

— These valves are normally used for flow rate control in hydraulic circuit branches and for speed control of hydraulic actuators.

— Flow rate can be modulated continuously in proportion to the current supplied to the solenoid.

— The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units which enable optimal valve performance (see paragraph 12).

— The valves are available in two flow control ranges of 100 l/min, with progressive gain or with differential gain.

— To ensure correct valve operation, maintain a minimum pilot control flow rate of 2 l/min and minimum pressure of 20 bar.

— Pilot control can be internal, with intake of oil from line E, or external from a line with 1/4” BSP connection on the pilot body.

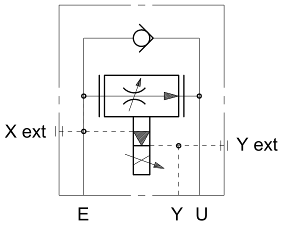
— Drainage is always external and must be connected directly to the tank without backpressure by means of subplate connection Y (OR Ø32) or by means of a line (1/4” BSP coupling) on the pilot body.

— The three-way version RPCE3-100-T3 allows flow control to the circuit by dumping the exceeding flow to the tank. Maximum pressure in the circuit is limited by means of a manual adjustment relief valve which operates on the compensator pilot.

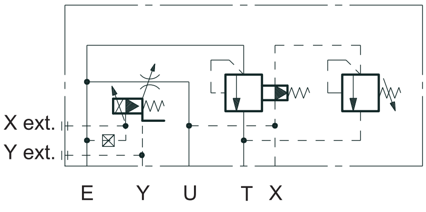
— RPCE3-100-T3 valve is also available in /M version, which allows, by means of an electric control, to unload the total flow with a minimum pressure drop.

HYDRAULIC SYMBOLS

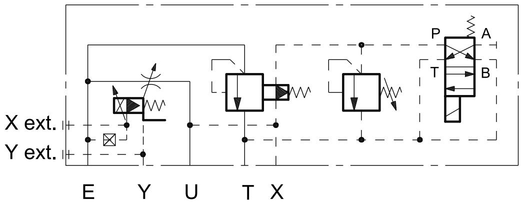
RPCE3-*



RPCE3-100-T3



RPCE3-100-T3M



1 - IDENTIFICATION CODES

1.1 - Identification code for two-way valve: RPCE3-*

R	P	C	E	3	-		/	C	/		/	52	-	24	/	

Compensated flow control valve

Electric proportional control

ISO 6263-07 (CETOP 07) size

Controlled flow rate:
100 = 100 l/min
100G = 100 l/min (with differential gain)

Built-in check valve

Pilot: omit for internal pilot
E = external pilot

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Nominal solenoid voltage 24 V DC

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

1.2 - Identification code for three-way valve: RPCE3-100-T3

R	P	C	E	3	-	100	-	T3		/		/	52	-	24	/	

Compensated flow control valve

Electric proportional control

ISO 6263-07 (CETOP 07) size

Controlled flow rate:
100 = 100 l/min

Three-way version

Unloading device:
Omit for version without device (**standard**)
M = version with unloading valve

Pilot: omit for internal pilot
E = external pilot

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

Nominal solenoid voltage 24 V DC

Seals:
omit for NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and the related electronic control units)

Maximum working pressure Minimum Δp across E and U ports Piloting pressures: min max	bar	250 10 20 160 (**NOTE 1**)
Maximum controlled flow E→U (RPCE3-*) Minimum controlled flow with P=100 bar (version 100) (version 100G) Maximum free reverse flow U→E	l/min	100 1,5 0,5 150 (**NOTE 2**)
Step response	see paragraph 8	
Hysteresis (with PWM 100 Hz)	% of Q max	< 8%
Repeatability	% of Q max	< ±3%
Electrical features	see paragraph 7	
Ambient temperature range	°C	-10 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: RPCE3-* RPCE3-100-T3 RPCE3-100-T3M	kg	10,8 12,6

NOTE 1: Pilot must be external if the valve id used with line pressure over 160 bar.

NOTE 2: Maximum recommended flow U→E through the check valve (only for two-way version)

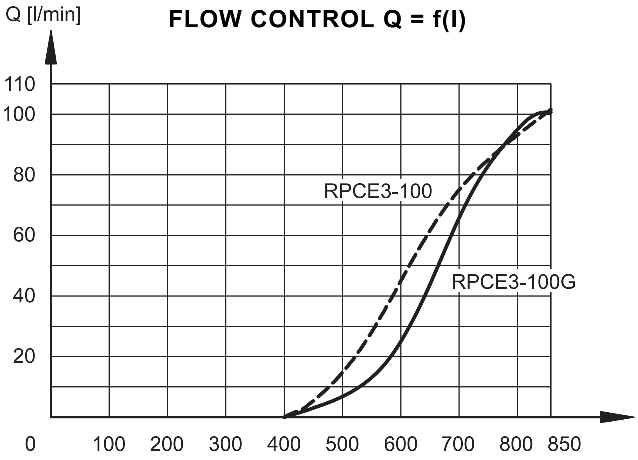
3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

4 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

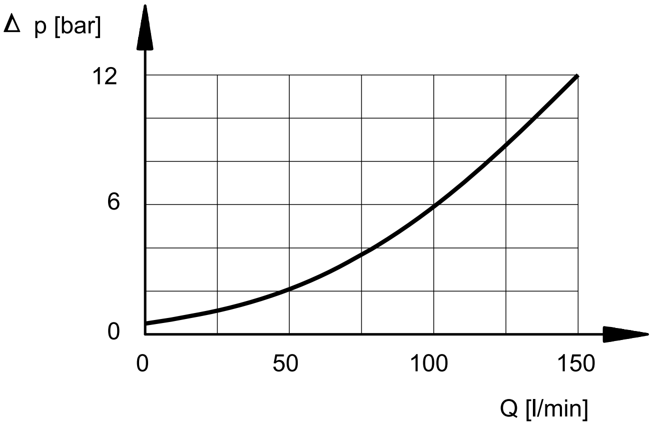
4.1 2-way valve

FLOW CONTROL Q = f(I)



Typical flow control curves for flow rate E→U , according to the current supplied to the solenoid.
The RPCE3-100G version, featuring differential gain control, is particularly suitable for “FAST-SLOW” flow rate control as it ensures high sensitivity at low flow rates while enabling high flow rates for rapid actuator movement.

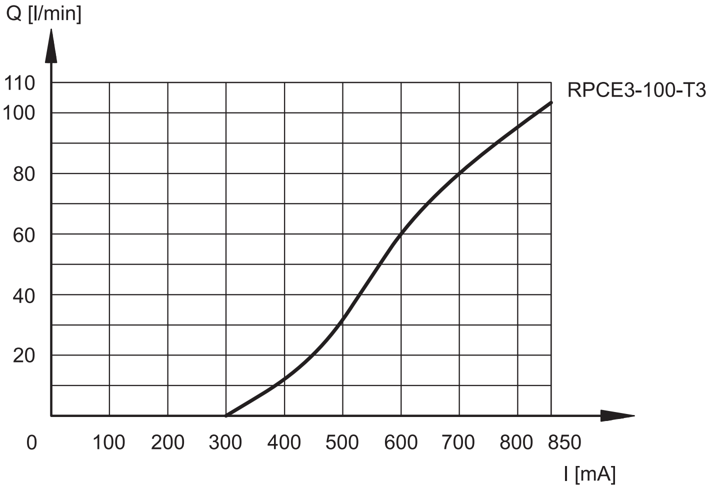
PRESSURE DROPS ∆p= f(Q)



Pressure drops with free flow U→E through the check valve

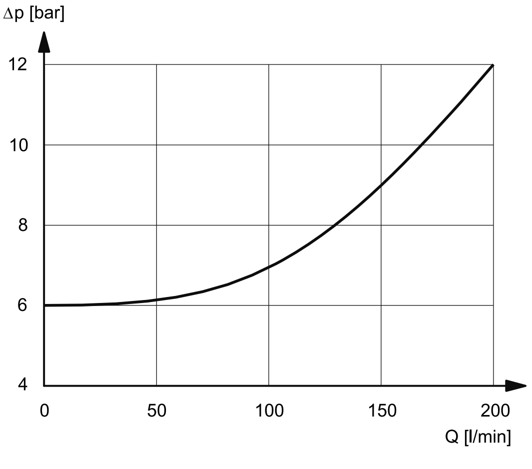
4.1 3-way valve

FLOW CONTROL Q = f(I)



Typical flow control curves for flow rate E→U , according to the current supplied to the solenoid.

PRESSURE DROPS ∆p= f(Q)



Pressure drops E→T (only for three-way versions)
Curve obtained with unloading electrical control (RPCE3-100-T3M)

5 - PRESSURE COMPENSATION

The valves are equipped with two restrictors. The first is an opening which can be adjusted by the proportional solenoid; the second, controlled by the pressure upstream and downstream of the first restrictor ensures constant pressure drop across the adjustable restrictor. In these conditions, the set flow rate value is maintained constant within a tolerance range of ±3% of the set flow rate for maximum pressure variation between the valve inlet and outlet chambers.

6 - THERMAL COMPENSATION

A temperature-sensitive device installed on the flow control element corrects the position and maintains the set flow rate virtually unchanged, also in the case of fluid viscosity variation.
Flow rate variation remains within 2,5% of the set flow rate, for a fluid temperature variation of 10°C.

7 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut and can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**24**
RESISTANCE (at 20°C)	Ω	16.6
MAXIMUM CURRENT	A	0.85
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

8 - STEP RESPONSE (with mineral oil with viscosity of 36 cSt at 50°C with the related electronic control units)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.
The table shows typical response times measured with valves “S” (150 l/min) and with an input pressure of 100 bar.

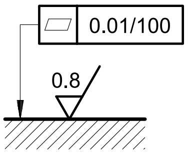
REFERENCE SIGNAL STEP	0 →100%	100% →0
Step response [ms]	250	120

9 - INSTALLATION

The RPCE3 valve, both two-way or three-way versions, can be installed in any position without impairing correct operation.
Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

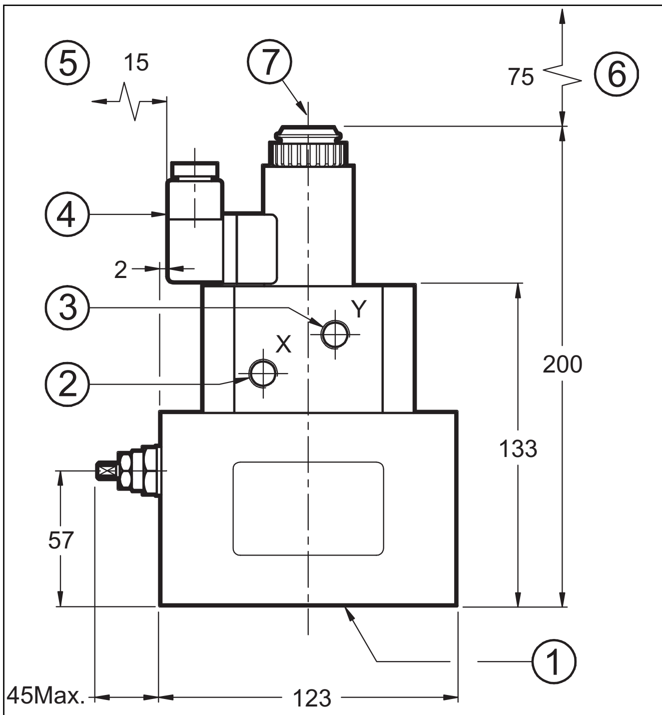
Surface finishing



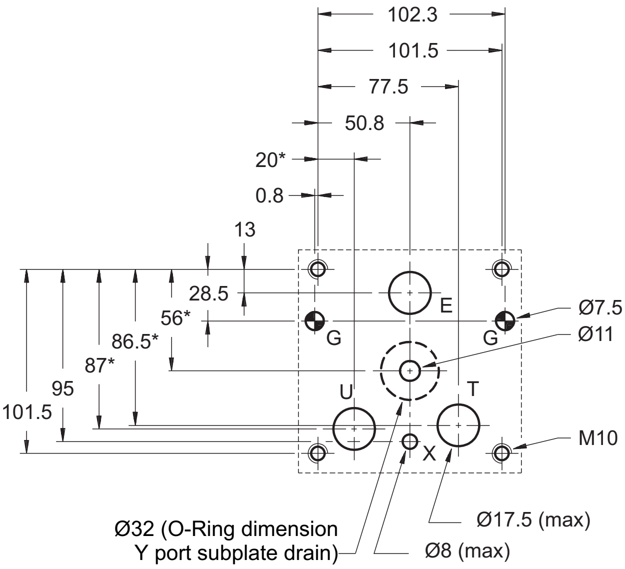
10 - ELECTRONIC CONTROL UNITS

EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250

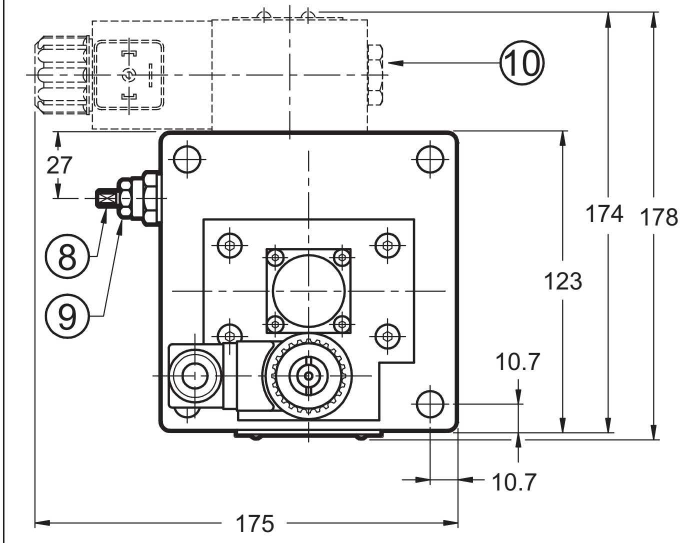
11 - OVERALL AND MOUNTING DIMENSIONS THREE-WAY VALVES RPCE3-100-T3 and RPCE3-100-T3M



MOUNTING SURFACE: ISO 6263-07-11-*-97
(CETOP 4.5.2-3-07-250)



NOTE = The dimension with the asterisk * are slightly different from ISO (CETOP) standards.

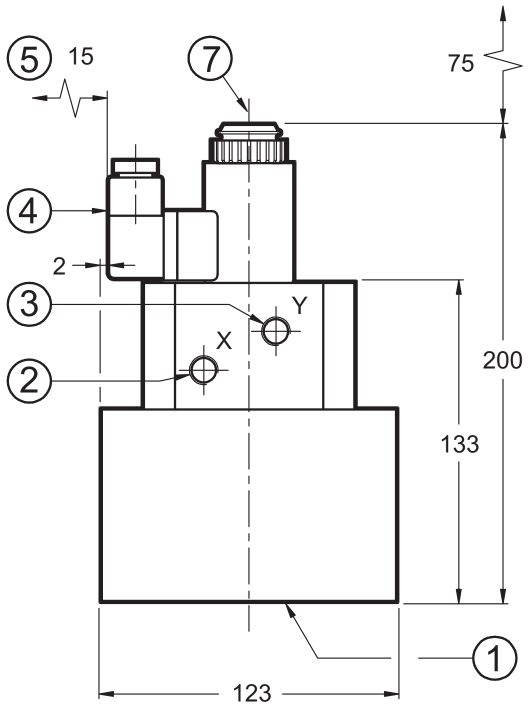


dimensions in mm

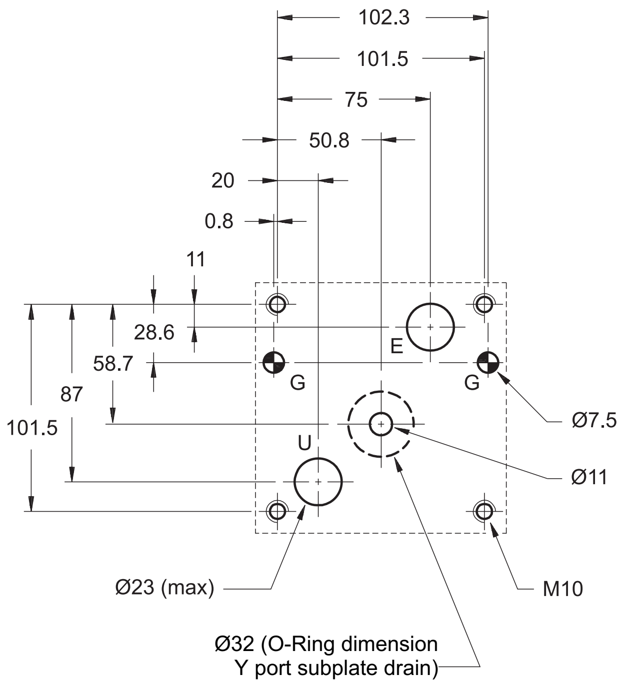
1	Mounting surface with sealing rings: N. 3 OR type 3106 (26.65x2.62) N. 1 OR type 2112 (28.30x1.78) N. 1 OR type 3050 (12.37x2.62)
2	External pilot port X: 1/4” BSP
3	Drain port Y: 1/4” BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (hexagonal male spanner 4)
8	Pressure relief valve - adjustment screw: square spanner 6 - pressure adjustment range up to 210 bar - default setting: minimum
9	Locking nut: spanner 13
10	Unloading solenoid valve type DS3-TB (only for version RPCE3 -*-T3M) - solenoid valve OFF = flow unloading at minimum pressure - solenoid valve ON = unloading pressure controlled by pressure relief valve 8

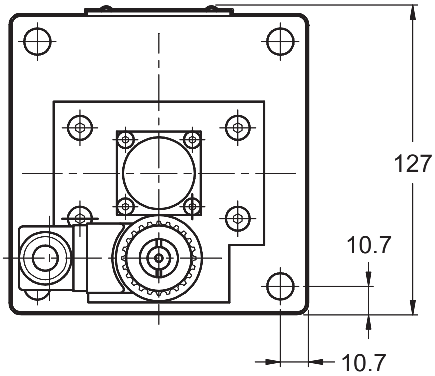
Fastening bolts: 4 bolts M10x90
Torque: 40 Nm

10 - OVERALL AND MOUNTING DIMENSIONS TWO-WAY VALVE RPCE3



MOUNTING SURFACE: ISO 6263-07-09-*-97
(CETOP 4.5.2-2-07-250)





Fastening bolts: 4 bolts M10x90
Torque: 40 Nm

dimensions in mm

1	Mounting surface with sealing rings: N. 2 OR type 3106 (26.65x2.62) N. 1 OR type 2112 (28.30x1.78)
2	External pilot port X: 1/4” BSP
3	Drain port Y: 1/4” BSP if mounting interface port is not used
4	DIN 43650 electric connector
5	Connector removal space
6	Coil removal space
7	Breather (hexagonal male spanner 4)

13 - SUBPLATES (see catalogue 51 000)

The valve must have the Y drain with external pipe when using the subplates listed below.

	RPCE3-* two way version	**RPCE3-*-T3** three way version
Type	PMRPC3-AI6G rear ports	PMRPCQ3-AI6G rear ports
E, U, T ports threading	1” BSP	1” BSP
X port threading	-	1/4” BSP

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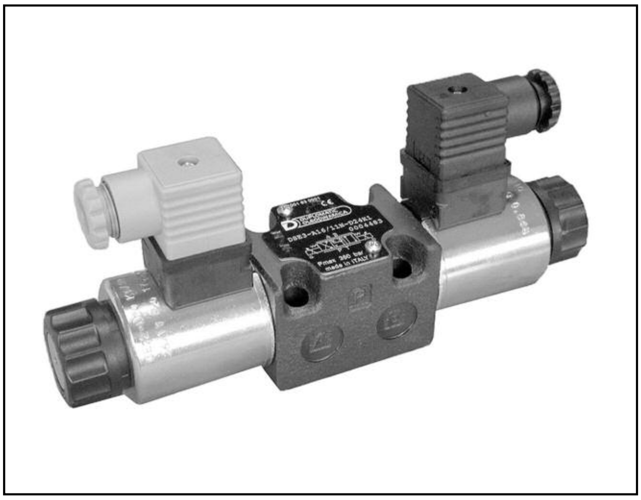
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE3

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

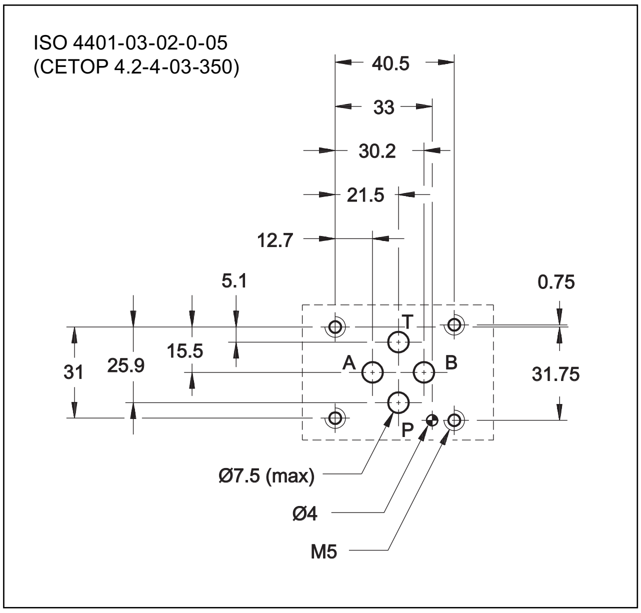
SERIES 11



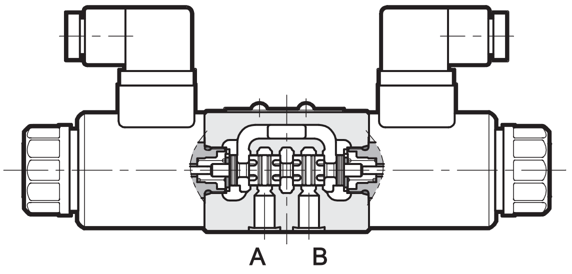
SUBPLATE MOUNTING
ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



- The DSE3 valve is a direct operated directional control valve with electric proportional control and with ports in compliance with ISO 4401 standards.
- It is used for directional and speed control of hydraulic actuators.
- Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the full (see paragraph 11).

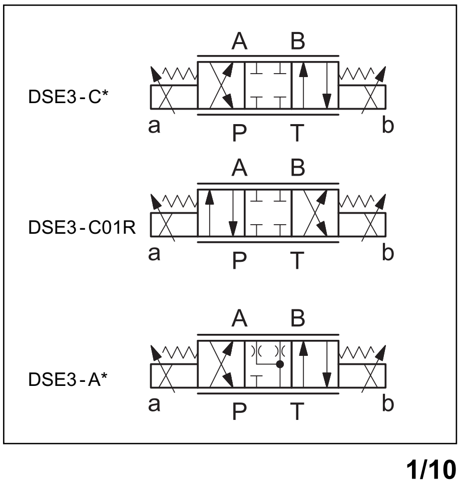
— Also available with several manual override.

PERFORMANCES

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

Max operating pressure: P - A - B ports T port	bar	350 210
Maximum flow with Δp 10 bar P-T	l/min	1 - 4 - 8 - 16 - 26
Step response		see par. 5
Hysteresis (with PWM 200 Hz)	$\% Q_{max}$	< 6%
Repeatability	$\% Q_{max}$	< ± 1,5%
Electrical characteristics		see par. 4
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,6 2,0

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	3	-				/	11		-			/	

Direct operated directional control valve

Electric proportional control

Size ISO 4401-03

Spool type:
C = closed centers
A = open centers

Spool nominal flow. See par. 2

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on A side
SB = 1 solenoid on B side

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see at par. 8)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For a salt spray resistance up to 600 hours order the high corrosion resistance version.

1.2 - High corrosion resistance version

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600 hours** (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The coil are specific for this version, featuring a zinc-nickel surface treatment. Electrical features at paragraph 4.

The boot manual override (CM) is installed as standard in order to protect the solenoid tube.

Follow the indentification code below to order it:

D	S	E	3	-		/	11		-			/		/	W7

Choices as in standard identification code

DC power supply
D12 = 12 V
D24 = 24 V

Coil electrical connection
WK1 = plug for connector type DIN 43650
On request: plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

Manual override:
CM = manual override, boot protected (**standard**)
CS = screw override
CH = lever manual overide
CK = knob manual override

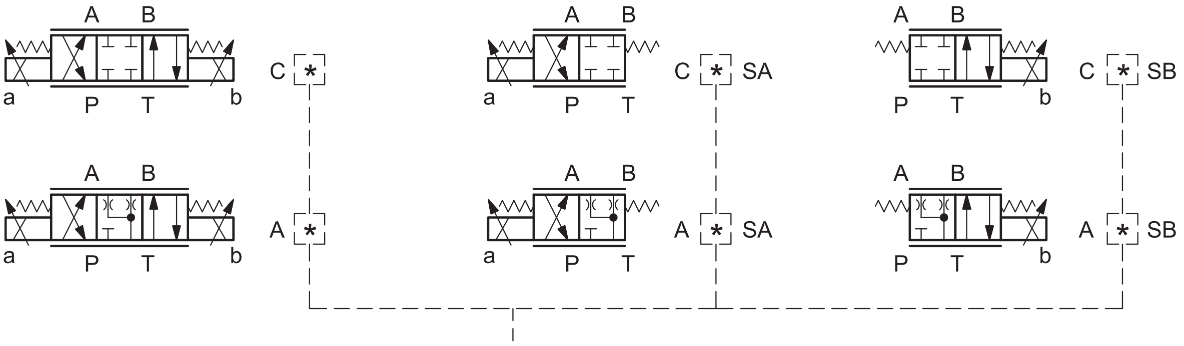
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

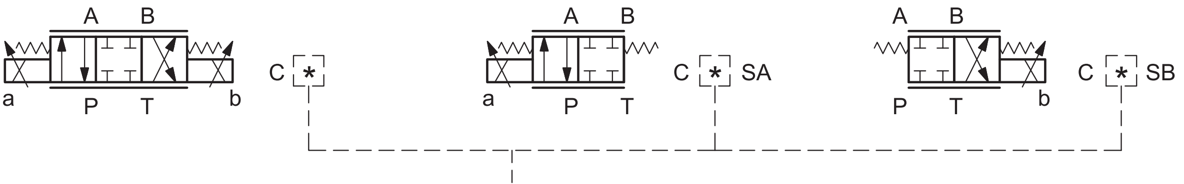
2 solenoids configuration:
3 positions with spring centering

“**SA**” configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

“**SB**” configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering



*	Nominal flow with Δp10 bar P→T
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P→A) / 08 (B→T) l/min
26	26 l/min
26/13	26 (P→A) / 13 (B→T) l/min

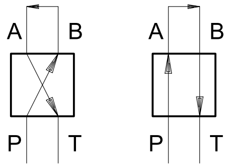


*	Nominal flow with Δp10 bar P→T
01R	1 l/min

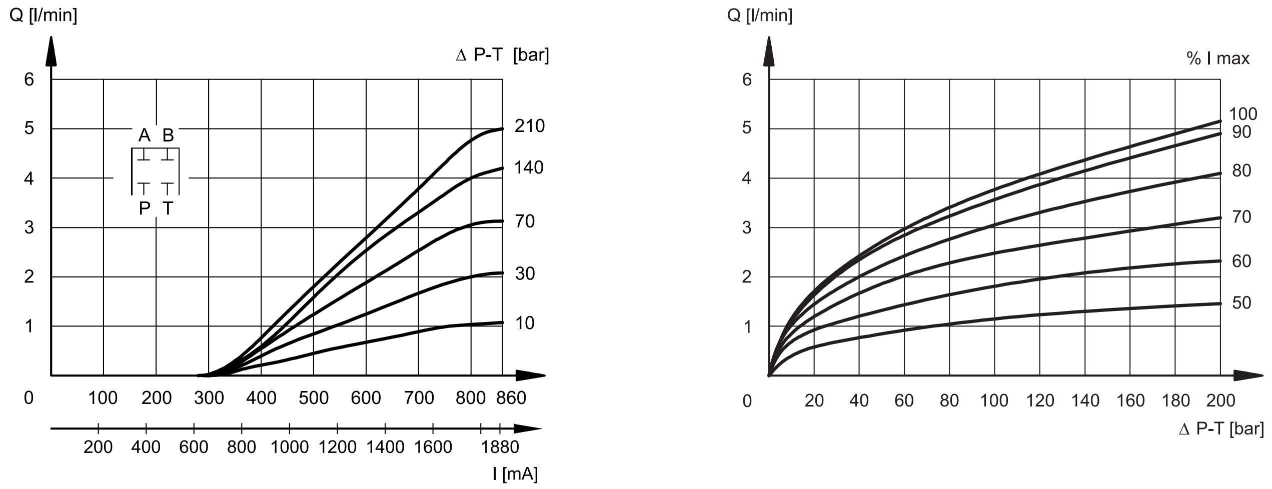
3 - CHARACTERISTIC CURVES

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

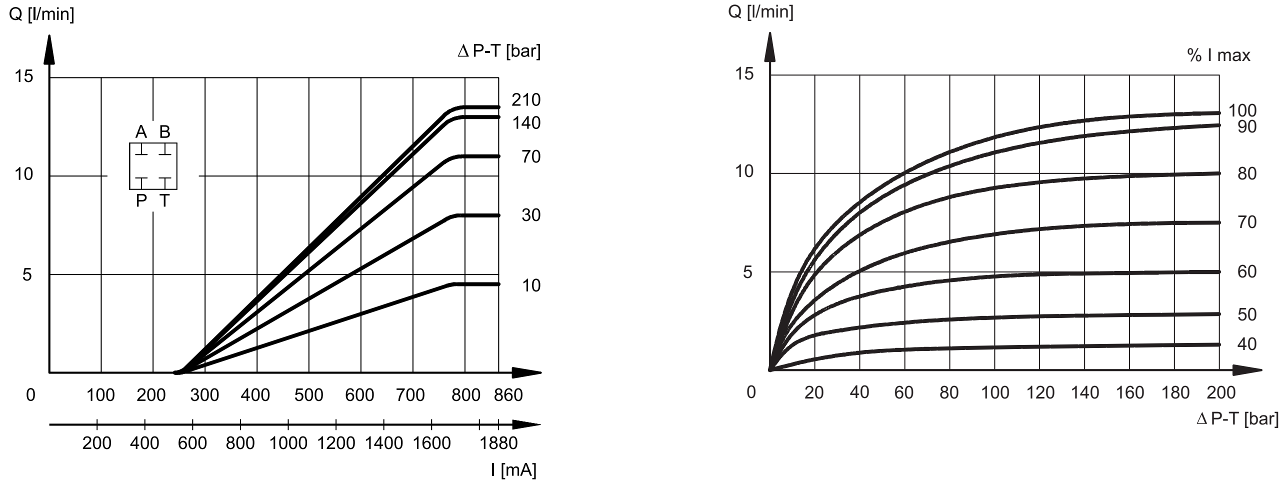
Typical flow rate control curves according to the current supply to solenoid. The reference ∆p values are measured between ports P and T on the valve.



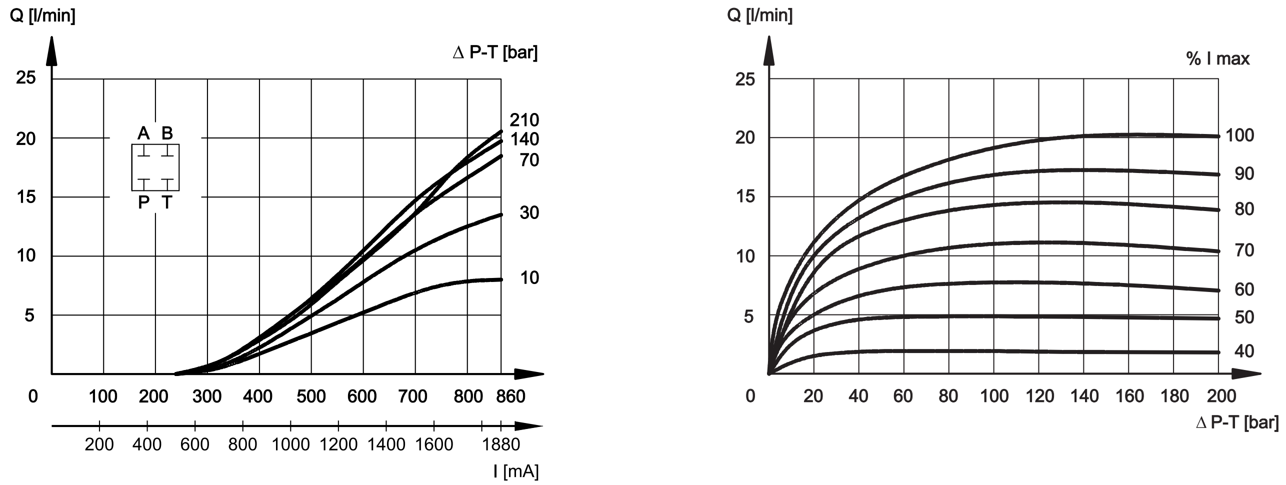
SPOOL TYPE C01R



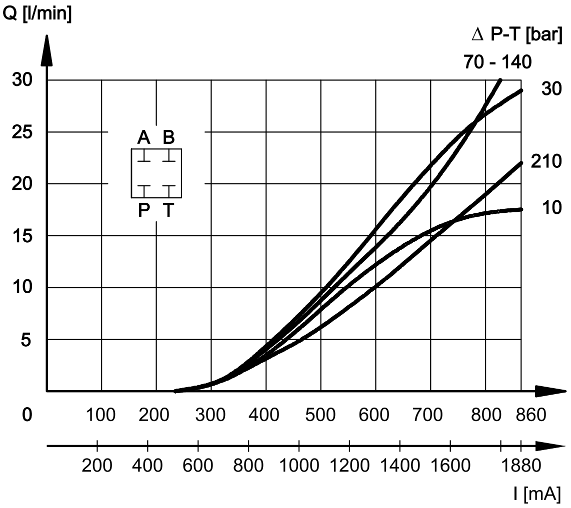
SPOOL TYPE C04

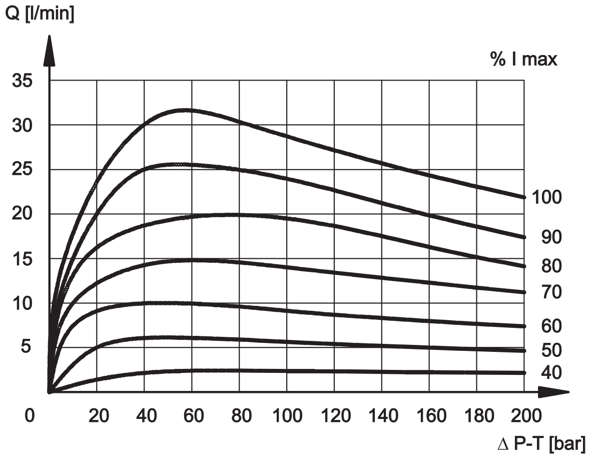


SPOOL TYPE C08

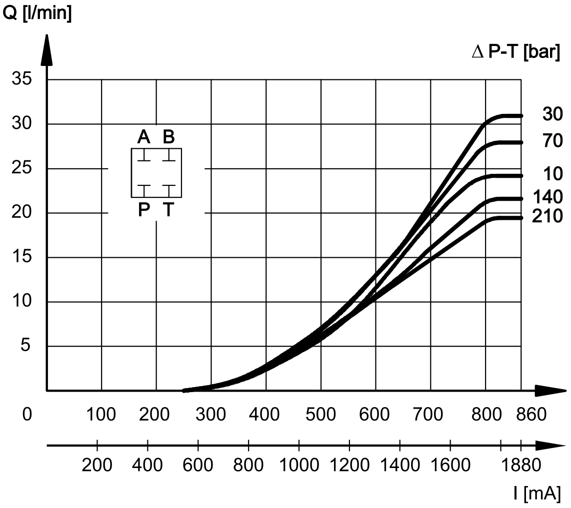


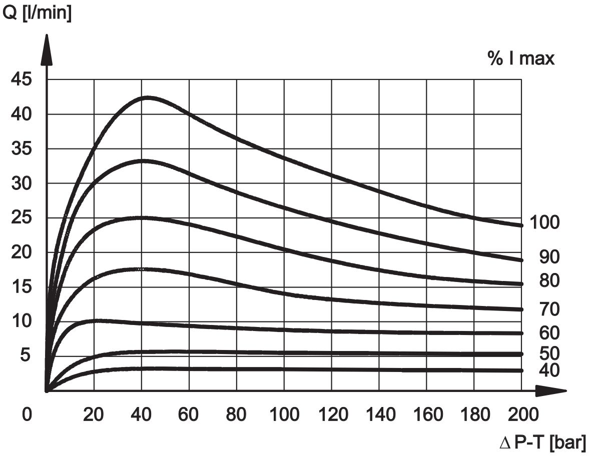
SPOOL TYPE C16



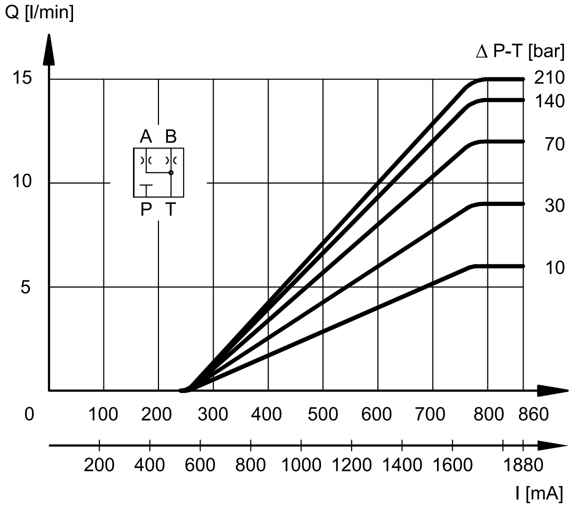


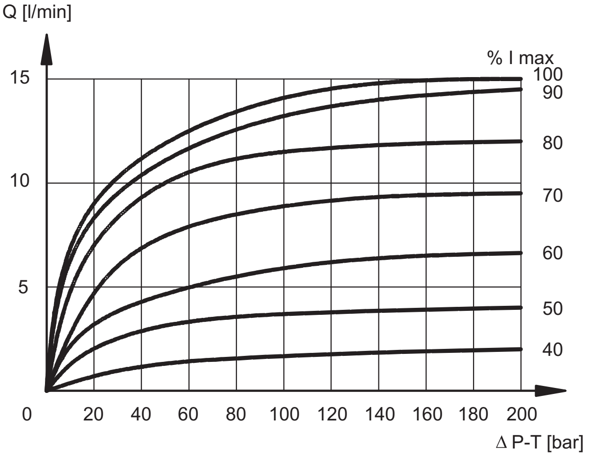
SPOOL TYPE C26



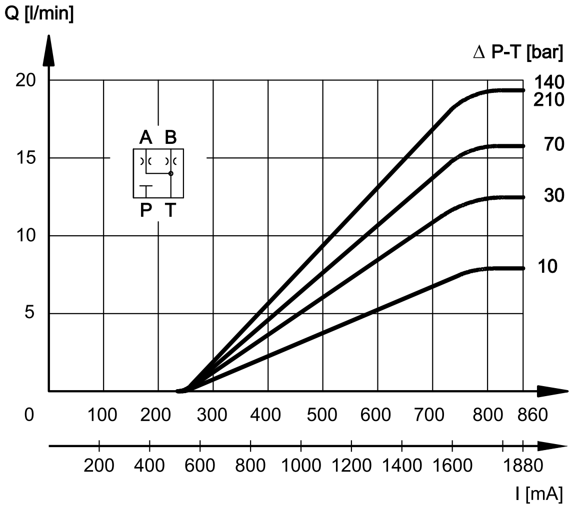


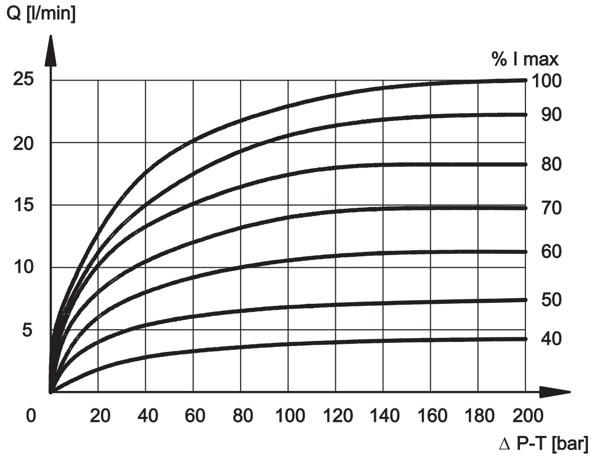
SPOOL TYPE A04



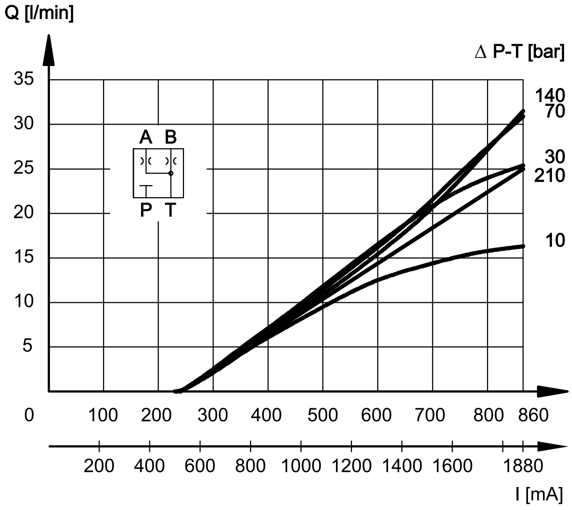


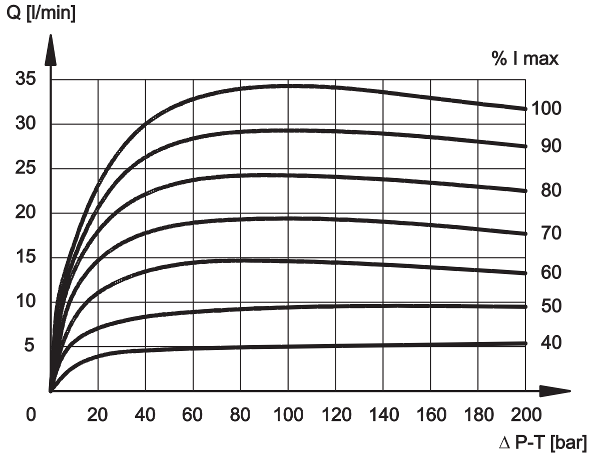
SPOOL TYPE A08



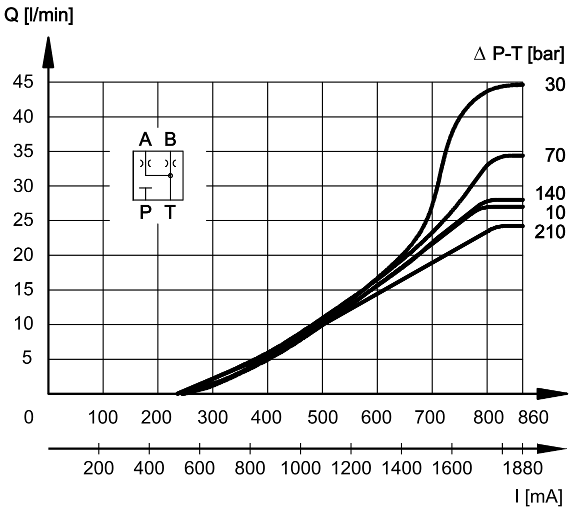


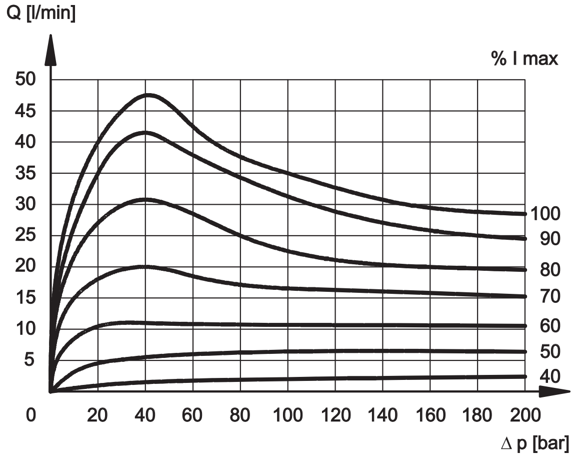
SPOOL TYPE A16





SPOOL TYPE A26





4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C) K1 coil K7 coil	Ω	3.66 4	17.6 19
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/EC		
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation:	class H class F		

Protection from atmospheric agents IEC EN 60529

Plug-in type	IP 65	IP 69 K
K1 DIN 43650	x (*)	
K7 DEUTSCH DT04 male	x	x (*)

(*) The protection degree is guaranteed only with the connector correctly connected and installed

5 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control unit)

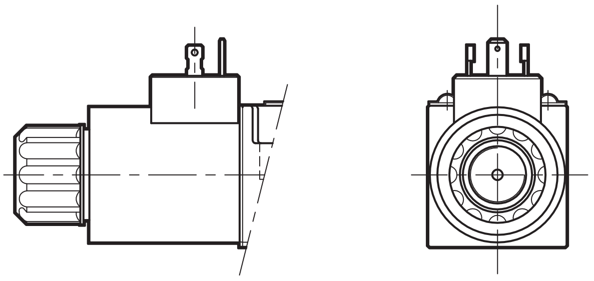
Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal. The table shows typical response times tested with spool type C16 and Δp = 30 bar P-T.

REFERENCE SIGNAL STEP	0→100%	100%→0
Step response [ms]		
DSE3-A* **DSE3-C***	50	40

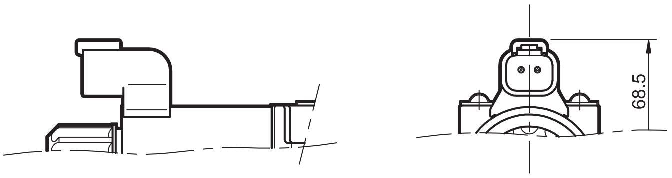
6 - ELECTRIC CONNECTIONS

Connectors for K1 connection are always delivered toghether with the valves.

connection for DIN 43650 connector
code **K1** (**standard**)
code **WK1** (W7 version only)

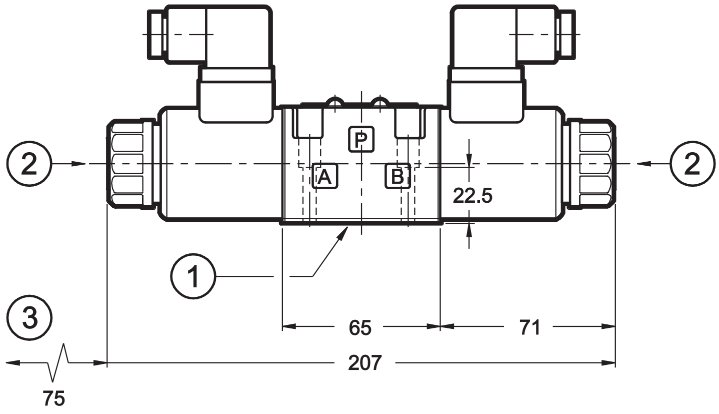


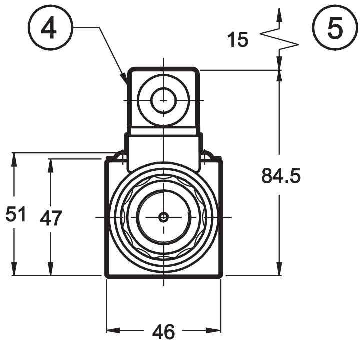
connection for
DEUTSCH DT06-2S male connector
code **K7**

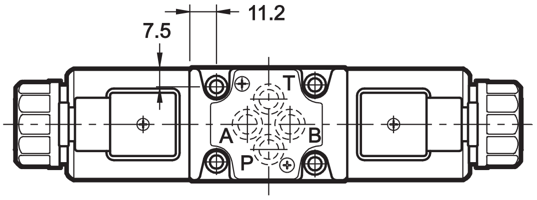


7 - OVERALL AND MOUNTING DIMENSIONS

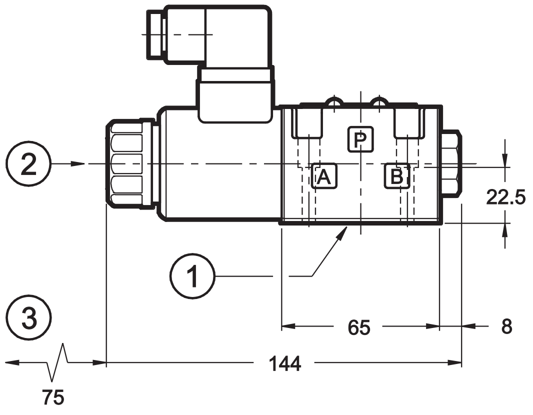
DSE3-A*
DSE3-C*

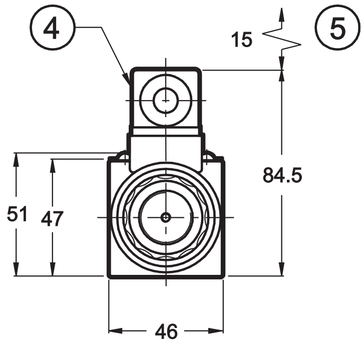


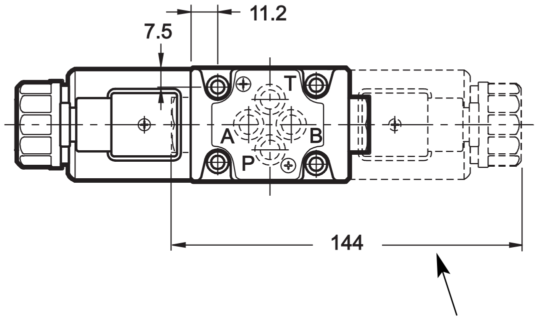




DSE3-A*SA
DSE3-C*SA







A*SB and C*SB versions solenoid position

dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 - 90 shore (9.25 x 1.78)
2	Standard manual override integrated in the solenoid tube see par. 9
3	Coil removal space
4	DIN 43650 electric coil connector
5	Connector removal space

Fastening bolts: 4 SHCS M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

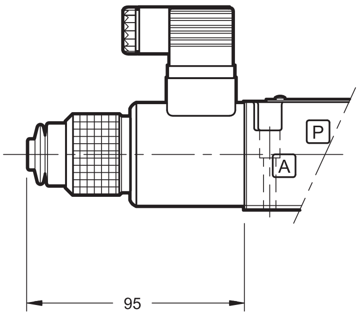
8 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Four different manual override versions are available upon request:

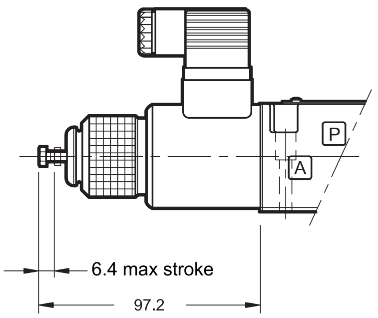
- **CM** version, manual override belt protected.
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.
- **CH** version, lever manual override. The lever device is always placed at the A side of the valve.
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

CM Version



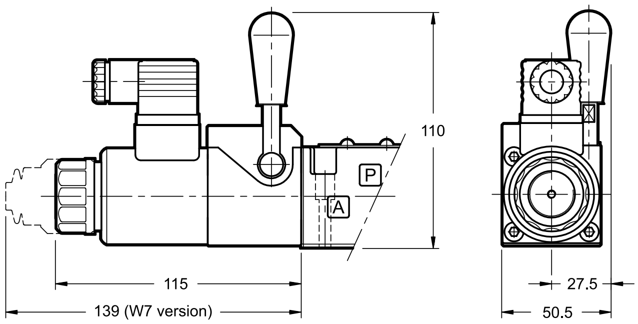
Code: 3803210003

CS Version

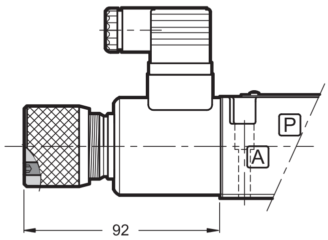


Code: 3803210004

CH Version



CK Version



Allen key for set screw: 3 mm

Code: 3803210005

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids like HL or HM type, according to ISO 6743-4. With this kind of fluids, use NBR seals type (code N). For HFDR fluids type (phosphate esters) use FPM seals (code V). For use with other kind of fluids such as HFA, HFB, HFC please consult our technical department.

Operation with fluid temperature exceeding 80°C causes premature deterioration of the quality of the fluid and seals. The physical and chemical properties of the fluid must be maintained.

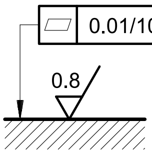
10 - INSTALLATION

DSE3 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface finishing



11 - ELECTRONIC CONTROL UNITS

DSE3 - * * SA (SB)

EDC-112	for solenoid 24V DC	plug version	see cat.89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

DSE3 - A*   DSE3 - C*

EDM-M212	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M242	12V DC solenoids		

12 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G ports on rear
Type PMMD-AL3G side ports
P, T, A, B port threading: 3/8” BSP

DSE3B

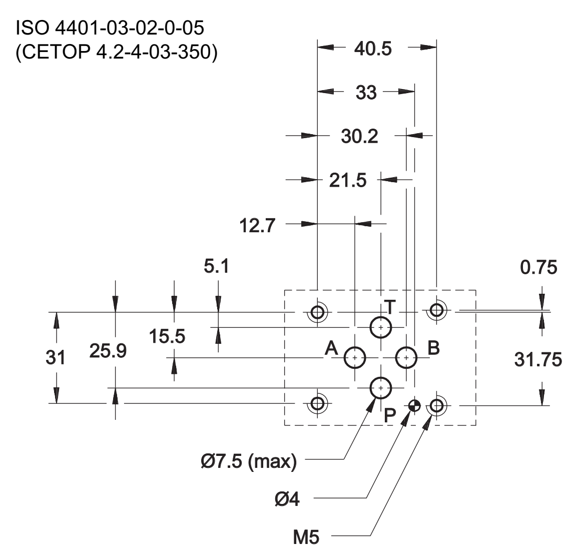
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

SERIES 10

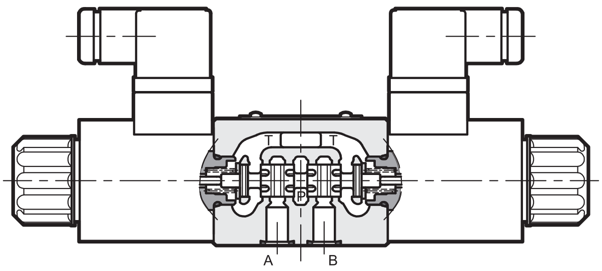
SUBPLATE MOUNTING
ISO 4401-03

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



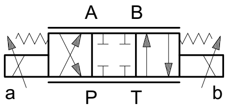
- The DSE3B valve is a directly operated directional control valve with electric proportional control and with ports, in compliance with ISO 4401-03 standards.
- It is used for directional and speed control of hydraulic actuators.
- Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or combined with an external electronic card to exploit valve performance to the full (see par. 11).

PERFORMANCES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with electronic control unit)

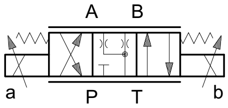
Max operating pressure: P - A - B ports T port	bar	350 160
Nominal flow with Δp 10 bar P-T	l/min	8 - 16 - 26
Step response		see chapter 5
Hysteresis (with PWM 200 Hz)	$\% Q_{max}$	< 6%
Repeatability	$\% Q_{max}$	< ± 2%
Electrical characteristics		see chapter 4
Ambient temperature range	°C	-20 / +50
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,6 2,0

HYDRAULIC SYMBOLS (typical)

DSE3B-C*



DSE3B-A*



1 - IDENTIFICATION CODE

D	S	E	3	B	-				/	10		-			/		

Directly operated directional control valve

Electric proportional control

Size ISO 4401-03

Spool type:
C = closed centers
A = open centers

Spool nominal flow (see paragraph 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

Option: manual override (see at par. 8)

Coil electrical connection:
K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For a salt spray resistance up to 600 hours order the high corrosion resistance version.

1.1 - High corrosion resistance version

This version features the zinc-nickel coating on all exposed metal parts of the valve, making it resistant to exposure to the salt spray for **600 hours** (test performed according to UNI EN ISO 9227 and assessment test performed according to UNI EN ISO 10289).

The coil are specific for this version, featuring a zinc-nickel surface treatment. Electrical features at paragraph 4.

The boot manual override (CM) is installed as standard in order to protect the solenoid tube.

Follow the indentification code below to order it:

D	S	E	3	B	-		/	10		-			/		/	W7

Choices as in standard identification code

DC power supply
D12 = 12 V
D24 = 24 V

Coil electrical connection
WK1 = plug for connector type DIN 43650
On request: plug DEUTSCH DT04-2P, for male connector type DEUTSCH DT06-2S.

Manual override:
CM = manual override, boot protected (**standard**)
CK = knob manual override

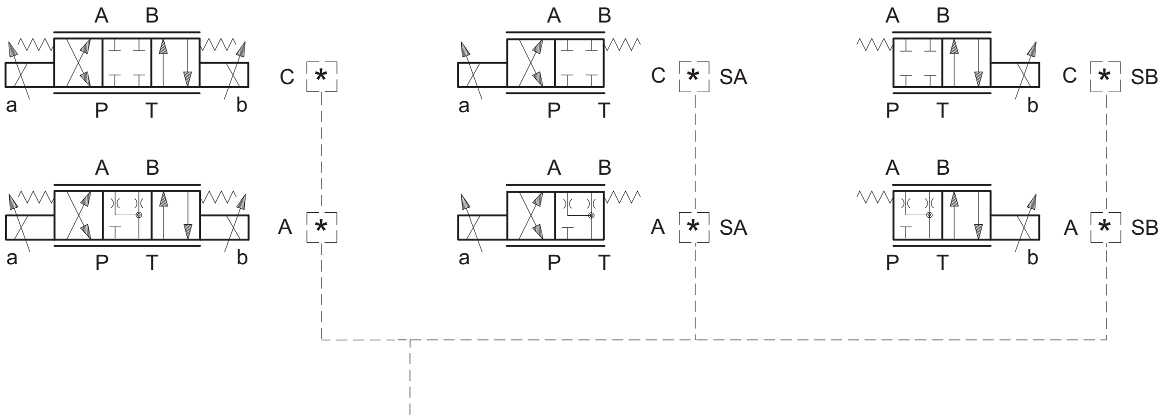
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centering

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering



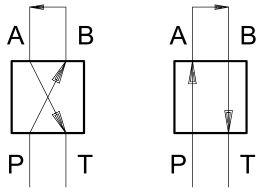
*	Controlled flow with ∆p10 bar P-T
08	8 l/min
16	16 l/min
26	26 l/min

3 - CHARACTERISTIC CURVES

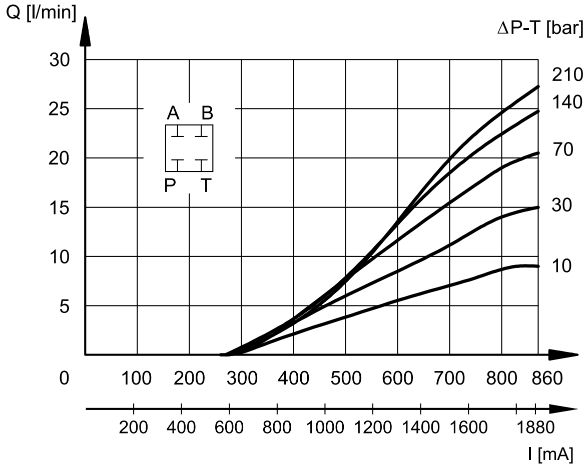
(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

Typical constant flow rate control curves at Δp according to current supply to solenoid (D24 version, maximum current 860 mA), measured for the various spool types available.

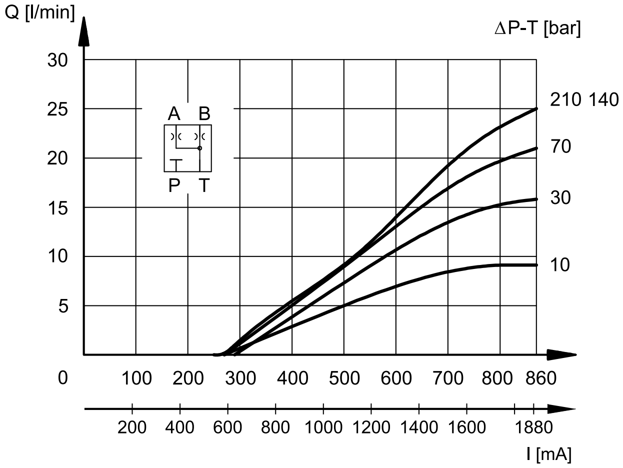
The reference Δp values are measured between ports P and T on the valve.



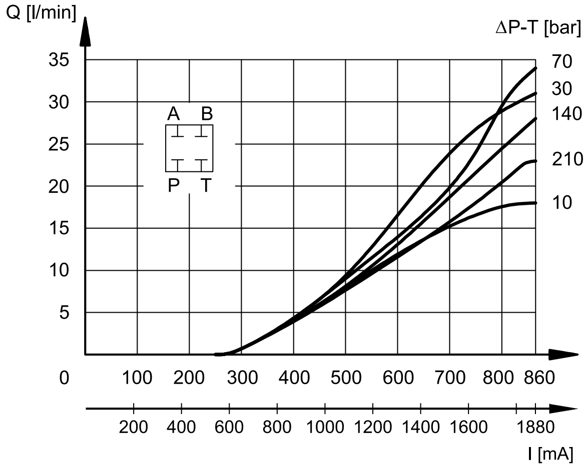
SPOOL TYPE C08



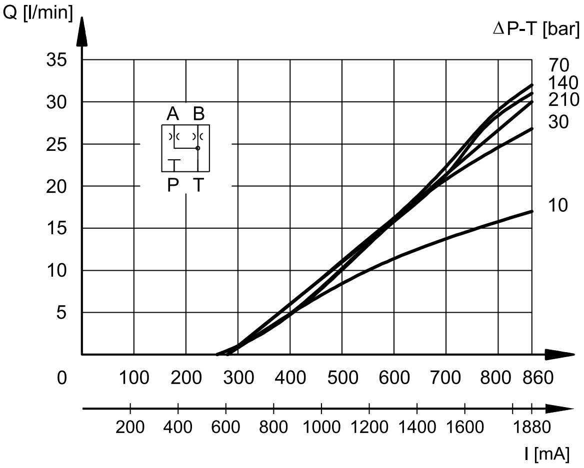
SPOOL TYPE A08



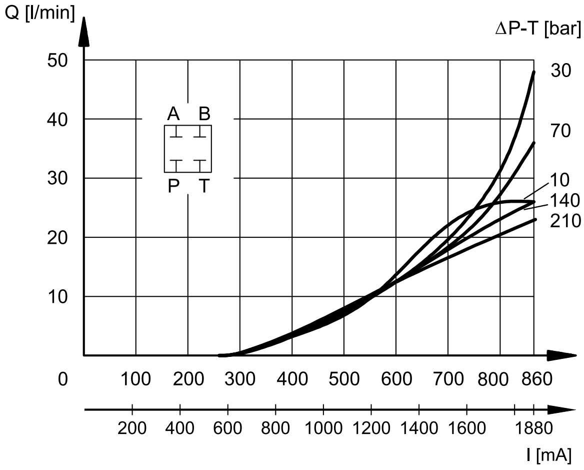
SPOOL TYPE C16



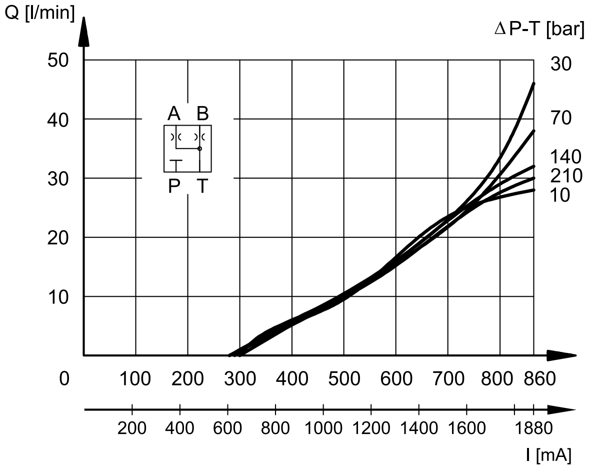
SPOOL TYPE A16



SPOOL TYPE C26



SPOOL TYPE A26



4 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	4,4	18,6
MAXIMUM CURRENT	A	1,88	0,86
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	according to 2004/108/EC		
CLASS OF PROTECTION: coil insulation (VDE 0580) impregnation	class H class F		

Protection from atmospheric agents CEI EN 60529

Plug-in type	IP 65	IP 69 K
K1 DIN 43650	x (*)	
K7 DEUTSCH DT04 male	x	x (*)

(*) The protection degree is guaranteed only with the connector correctly connected and installed.

5 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control units)

Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal.

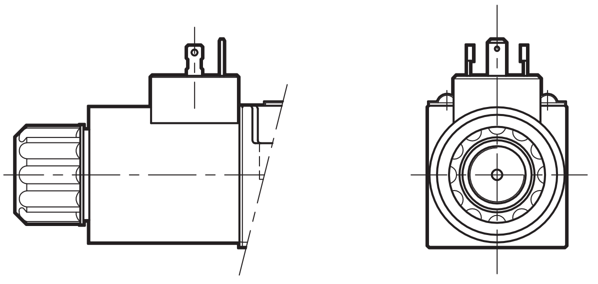
The table shows typical response times tested with spool type C16 and Δp = 30 bar P-T.

REFERENCE SIGNAL STEP	0 →100%	100 →0%
Step response [ms]		
DSE3B-A* DSE3B-C*	50	40

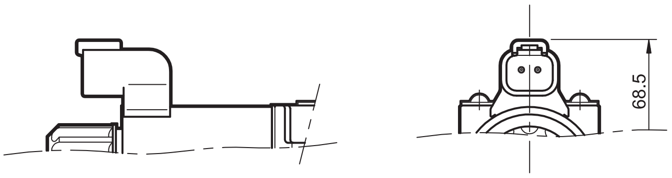
6 - ELECTRIC CONNECTIONS

Connectors for K1 connection are always delivered toghether with the valves.

connection for DIN 43650 connector
code **K1** (**standard**)
code **WK1** (W7 version only)

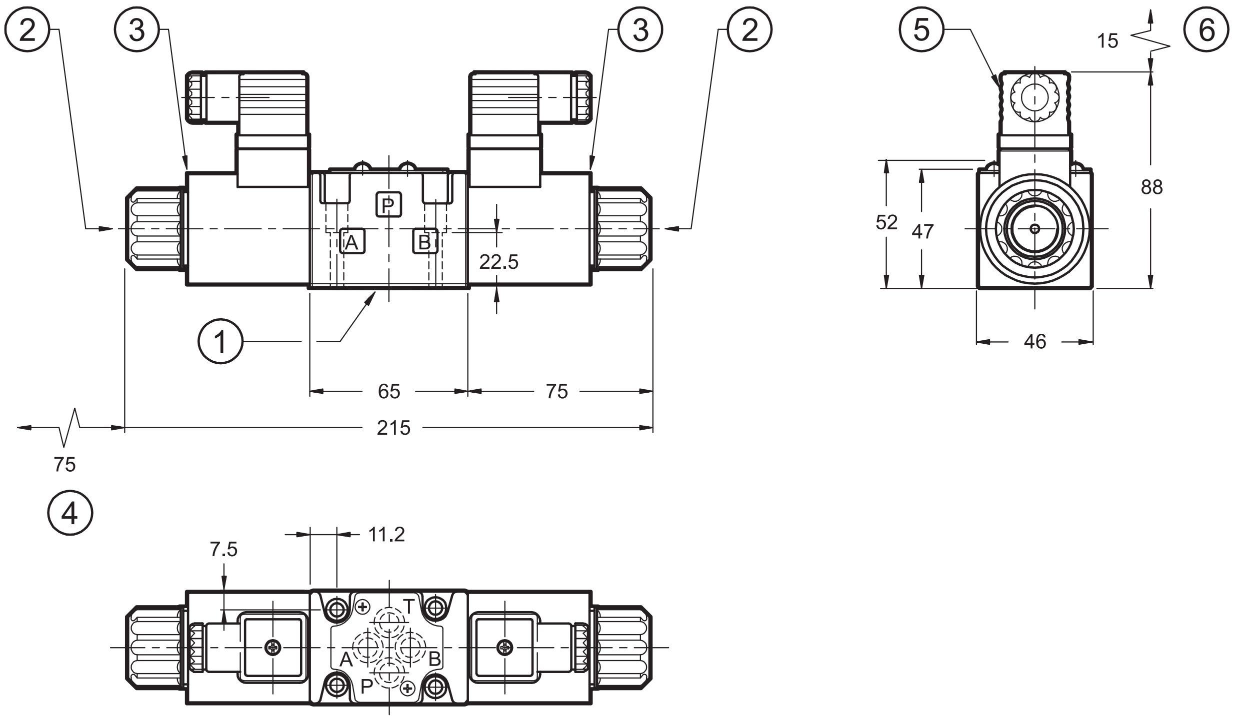


connection for
DEUTSCH DT06-2S male connector
code **K7**

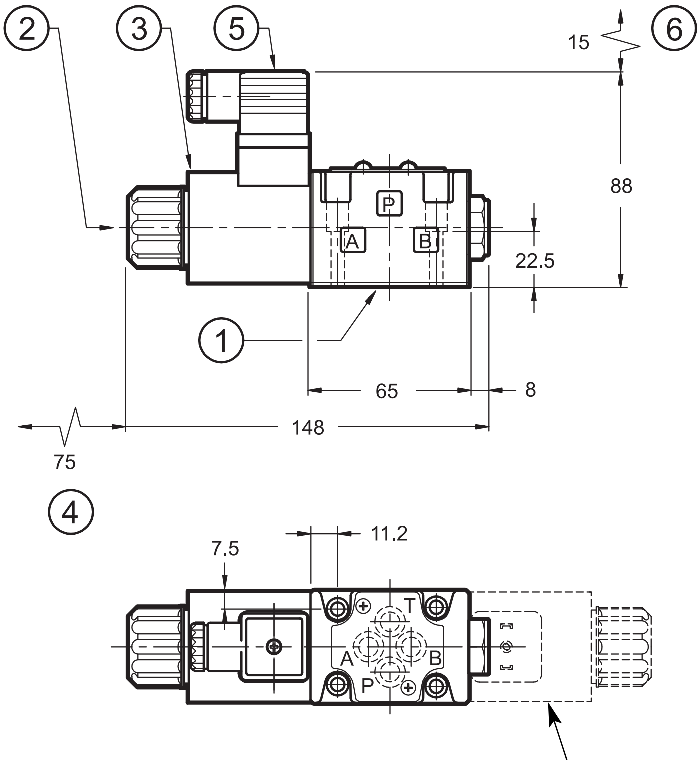


7 - OVERALL AND MOUNTING DIMENSIONS

DSE3B-A*
DSEB3-C*



DSE3B-A*SA
DSE3B-C*SA



A*SB and C*SB versions solenoid position

dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) 90 shore
2	Standard manual override integrated in the solenoid tube (see par. 8)
3	Coil (360° revolving)
4	Coil removal space
5	DIN 43650 electric coil connector
6	Connector removal space

Fastening bolts: 4 SHCS M5x30
Torque: 5 Nm (A 8.8)
Threads of mounting holes : M5x10

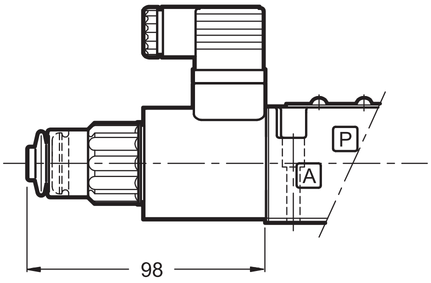
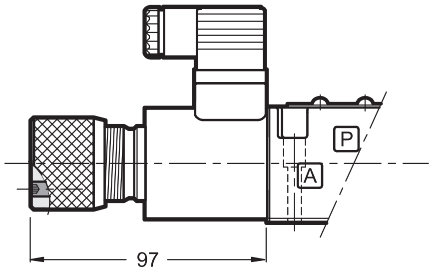
Locking ring tightening torque:
5 ± 0.5 Nm

8 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

- **CM** version, manual override belt protected.
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

Version CM	**Version CK**
	
Code: 3401150006	Code: 3401150009 Spanner for set screw: 3 mm

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids like HL or HM type, according to ISO 6743-4. With this kind of fluids, use NBR seals type (code N). For HFDR fluids type (phosphate esters) use FPM seals (code V). For use with other kind of fluids such as HFA, HFB, HFC please consult our technical department.

Operation with fluid temperature exceeding 80°C causes premature deterioration of the quality of the fluid and seals. The physical and chemical properties of the fluid must be maintained.

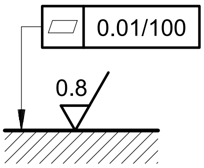
10 - INSTALLATION

DSE3B valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

Surface finishing



11 - ELECTRONIC CONTROL UNITS

DSE3B - * * SA (SB)

EDC-112	for solenoid 24V DC	plug version	see cat. 89 120
EDC-142	for solenoid 12V DC		
EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

DSE3B - A* DSE3B - C*

EDM-M212	24V DC solenoids	rail mounting DIN EN 50022	see cat. 89 250
EDM-M242	12V DC solenoids		

12 - SUBPLATES

(see catalogue 51 000)

Type PMMD-AI3G ports on rear (3/8” BSP threaded)
Type PMMD-AL3G side ports (3/8” BSP threaded)

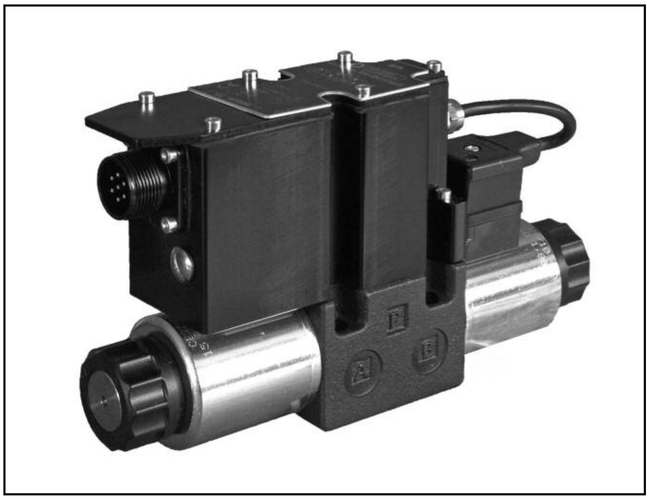
DUPLOMATIC OLEODINAMICA

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE3G

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

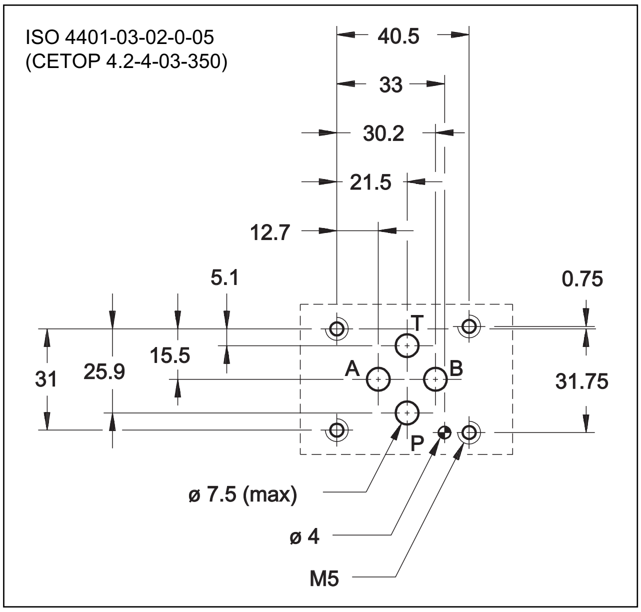
SERIES 30



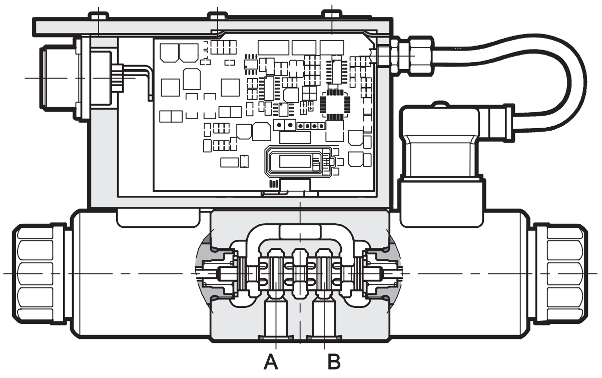
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **40** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



— The DSE3G is a direct operated directional valve with integrated electric proportional control and mounting interface compliant with ISO 4401-03 standards.

— It is used to control the positioning and the speed of hydraulic actuators.

— The valve are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

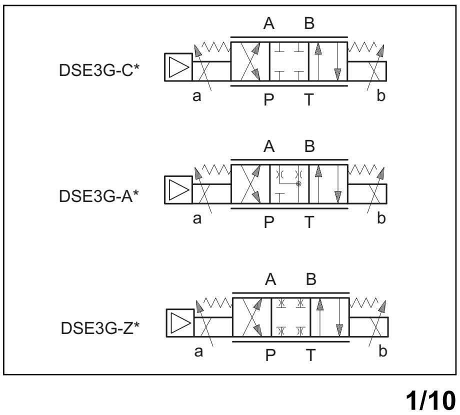
— The valve is easy to install. The driver directly manages digital settings.

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Max operating pressure: - P - A - B ports - T port	bar	350 210
Nominal flow with Δp 10 bar P-T	l/min	1 - 4 - 8 - 16 - 26
Response times	see paragraph 7	
Hysteresis	% of Q max	< 3%
Repeatability	% of Q max	< ±1%
Electrical characteristics	see paragraph 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,4

HYDRAULIC SYMBOLS (TYPICAL)



1 - IDENTIFICATION CODE

D	S	E	3	G	-				/	30		-		K11		/	

Direct operated directional control valve

Electric proportional control

Size ISO 4401-03

Digital integrated electronics for open loop

Spool type:
C = closed centres
A = open centres
Z = with overlap jump

Nominal flow rate of the spool (see chart par. 2)

Solenoid position (omit for 2 solenoids configuration):
SA = 1 solenoid on side A

Option:
manual override
(see paragraph 8)

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Main connector 6 pin + PE

Reference signal:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

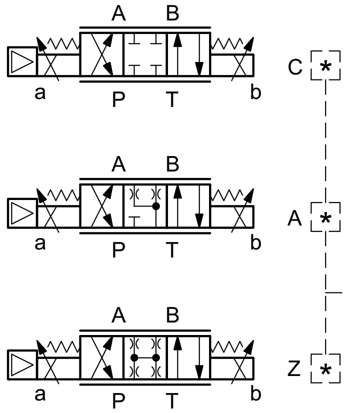
Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

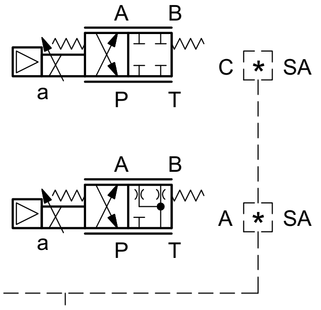
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

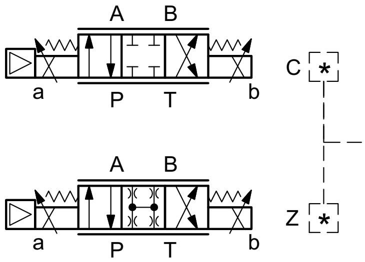
Configuration 2 solenoids :
3 positions with spring centering

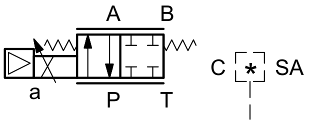
Configuration 1 solenoid on side A “**SA**”:
2 positions (central + external) with spring centering





*	Controlled flow with Δp10 bar P-T
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P-A) / 08 (B-T) l/min
26	26 l/min
26/13	26 (P-A) / 13 (B-T) l/min





*	Controlled flow with Δp10 bar P-T
01R	1 l/min

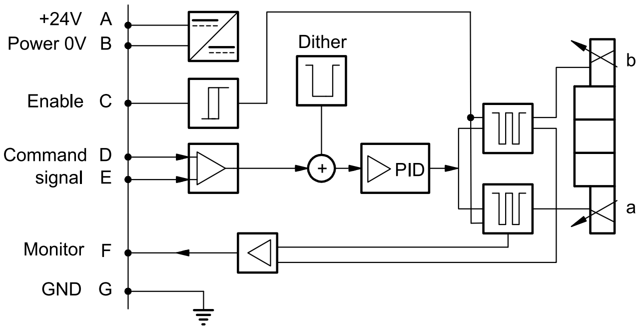
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

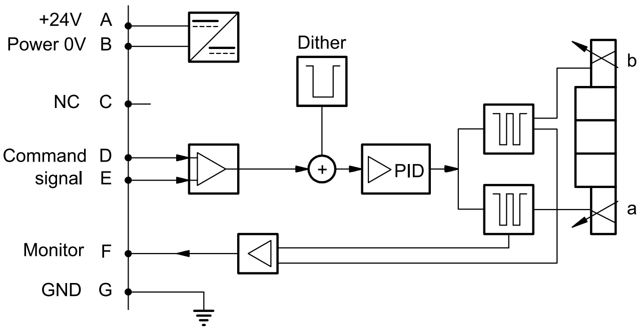
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		3A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedence Ri > 11 kOhm) 4 ÷ 20 (Impedence Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	±10 (Impedence Ro > 1 kOhm) 4 ÷ 20 (Impedence Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

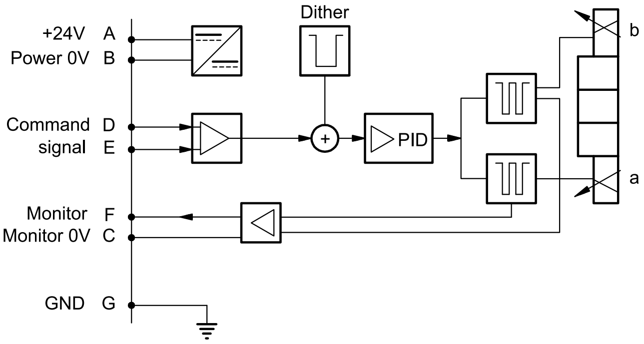
VERSION **A** - External Enable



VERSION **B** - Internal Enable

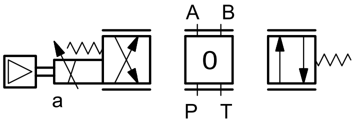


VERSION **C** - 0V Monitor

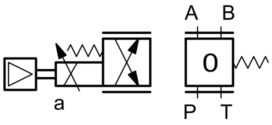


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

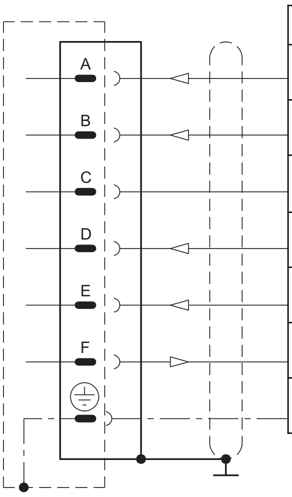
The reference signal is between -10V and +10V on double solenoid valve, and 0…10V on single solenoid valves SA. The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



COMMAND	**+10V**	**0V**
MONITOR	**+10V**	**0V**

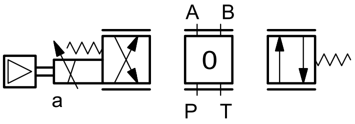


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

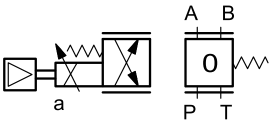
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

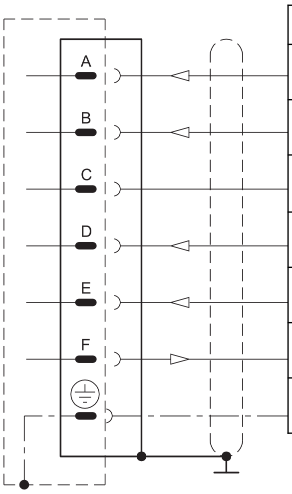
The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



COMMAND	**20 mA**	**4 mA**
MONITOR	**20 mA**	**4 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

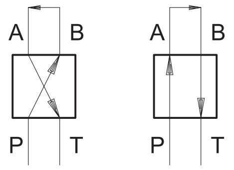
6 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

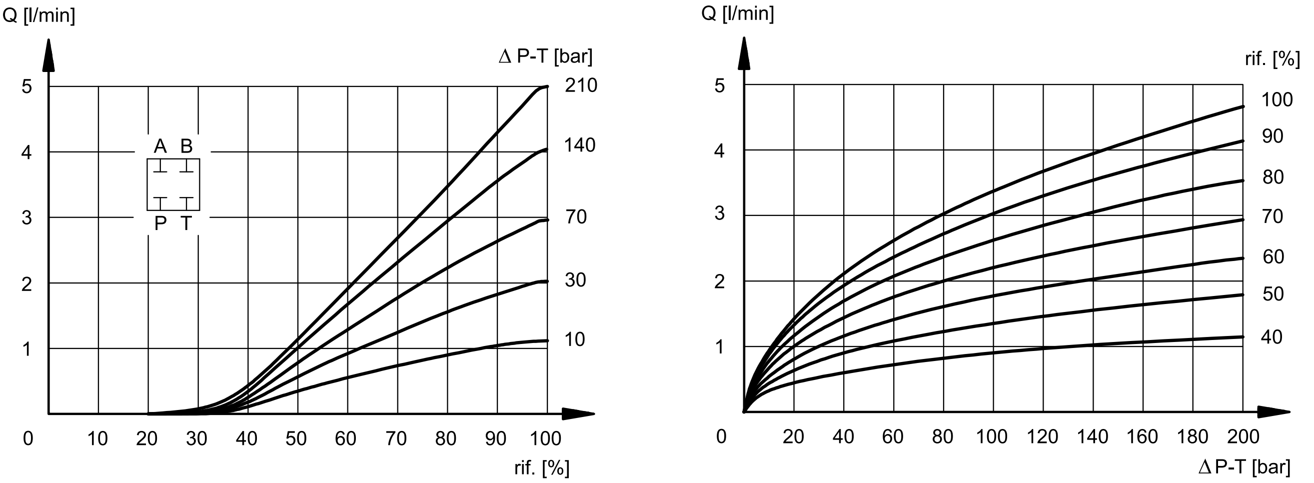
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

The curves are obtained after linearization in factory of the characteristic curve through the digital amplifier. The linearization of the curve is performed with a constant Δp of 5 bar and by setting the value of flow start at 20% of the reference signal.

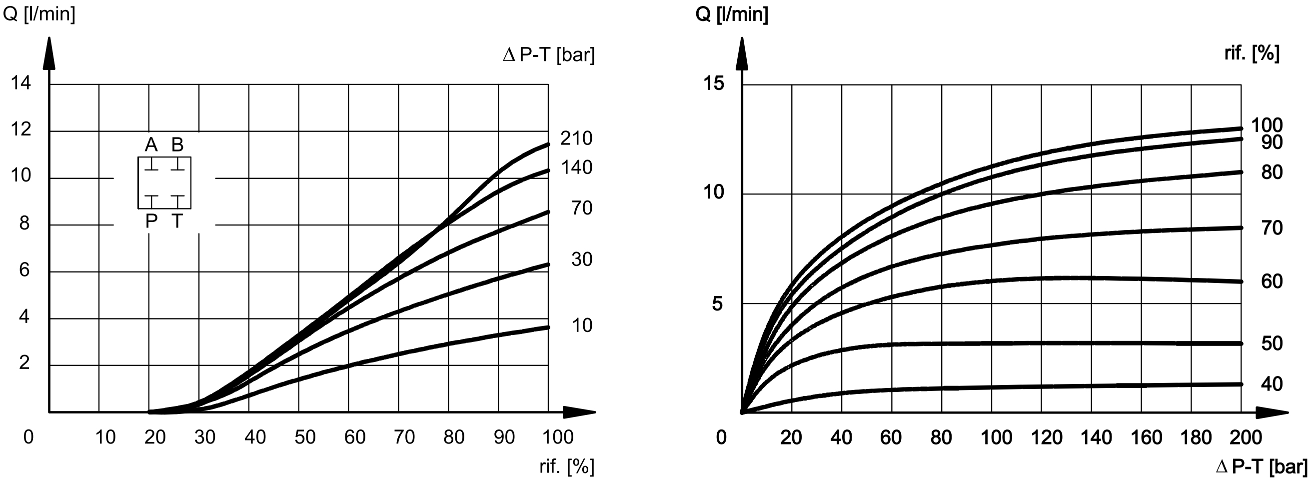
NOTE: for the zero overlap spool (Z), please refer to the characteristic curves of C type spool, considering that the starting flow rate value is approx. 150 mV.



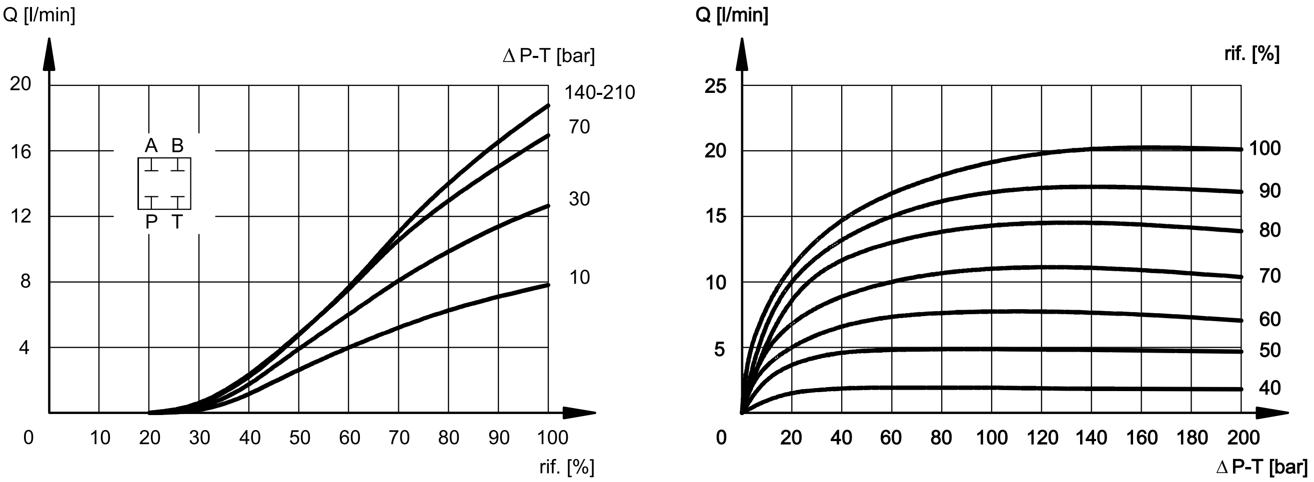
SPOOL TYPE C01R



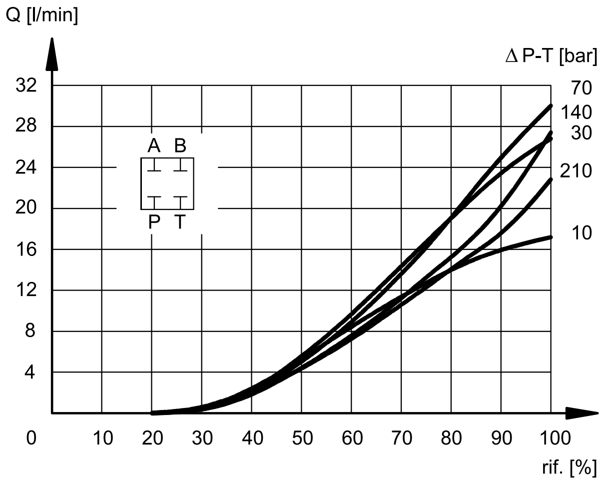
SPOOL TYPE C04

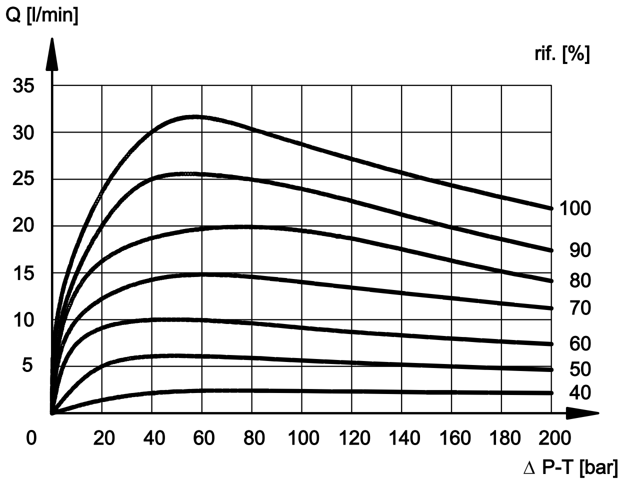


SPOOL TYPE C08

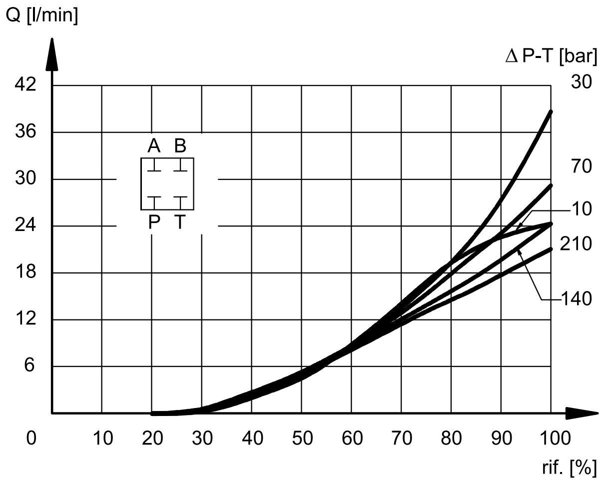


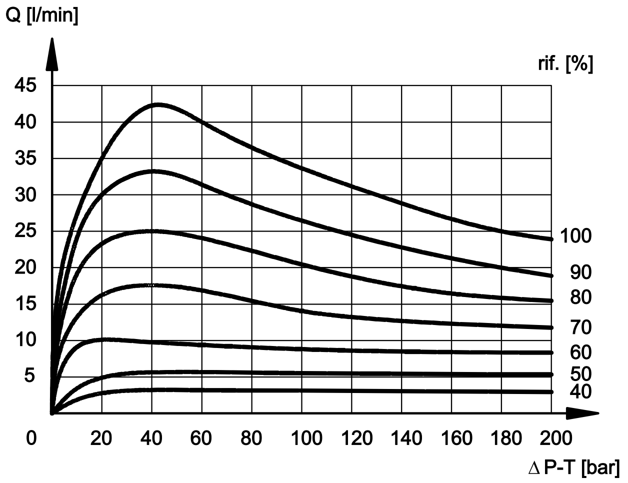
SPOOL TYPE C16



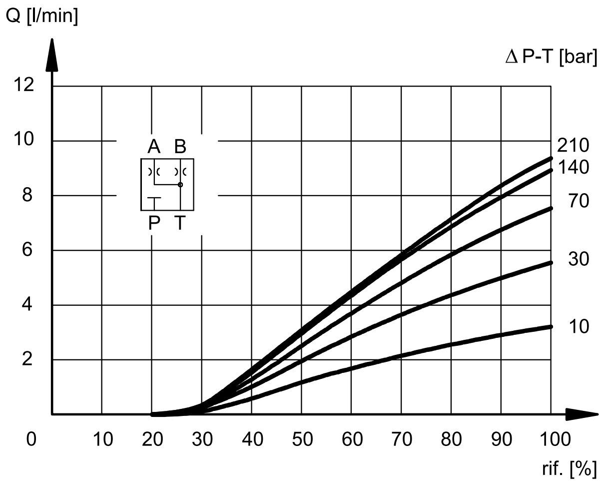


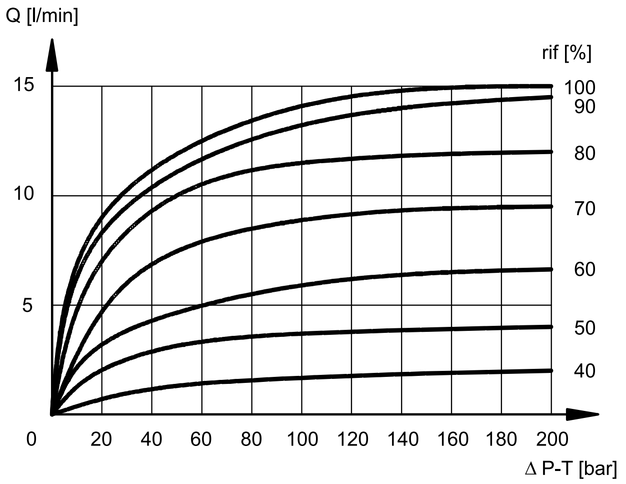
SPOOL TYPE C26



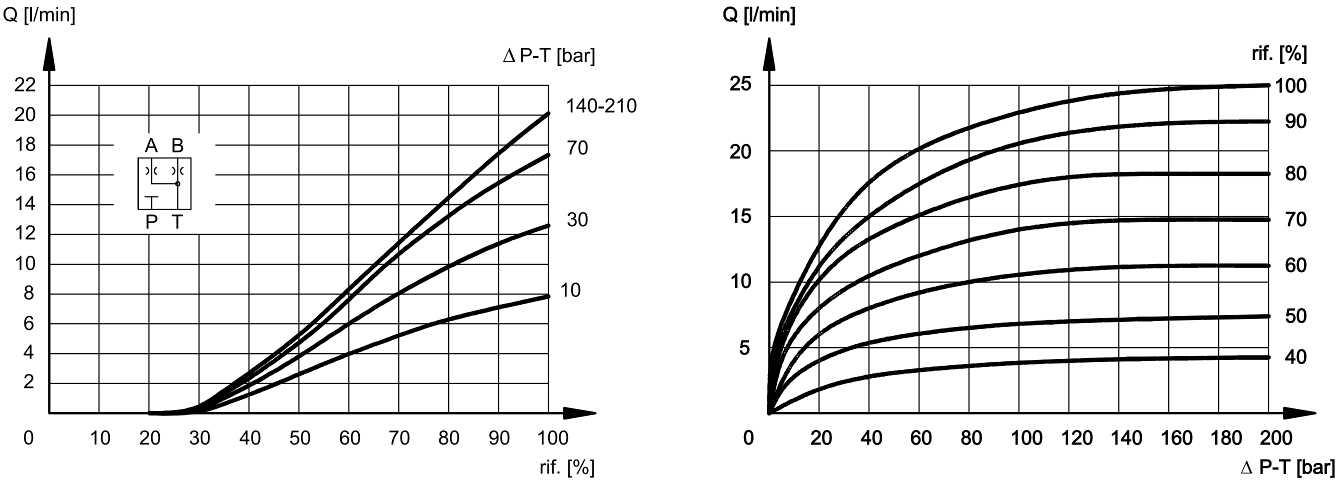


SPOOL TYPE A04

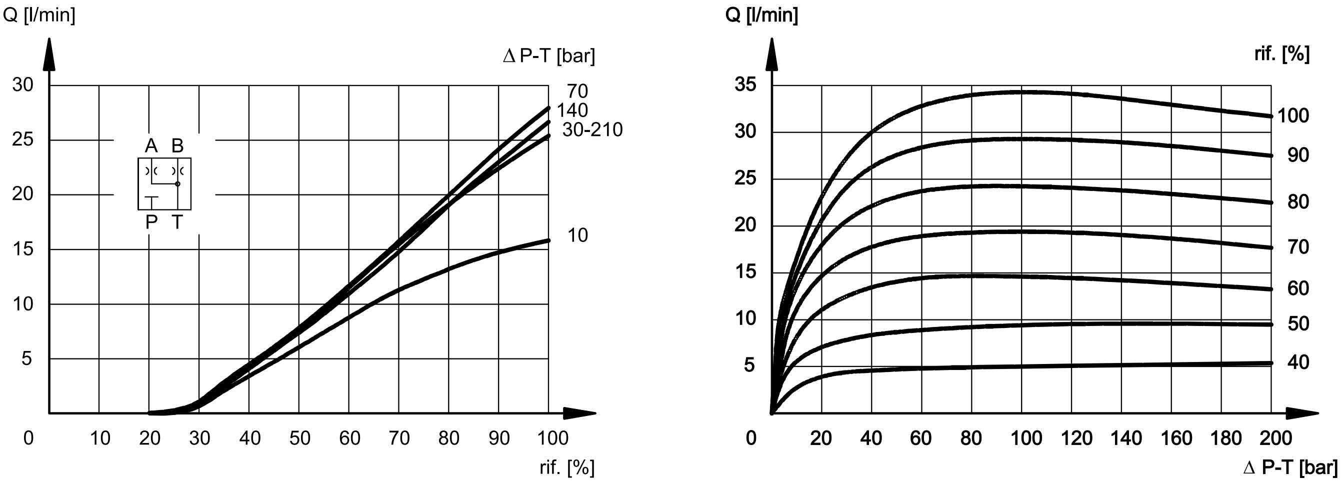




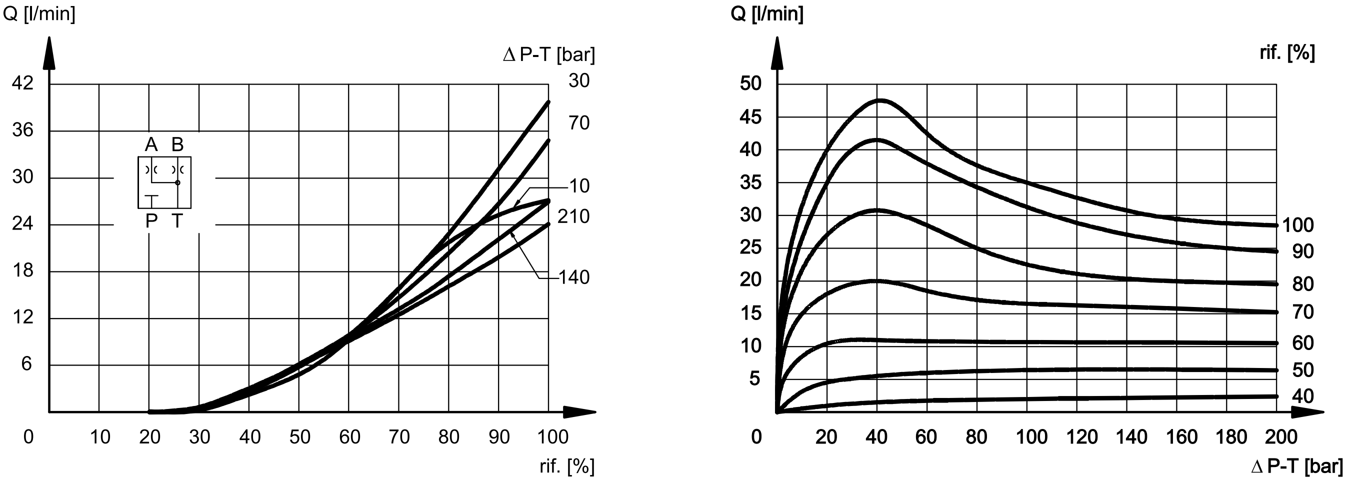
SPOOL TYPE A08



SPOOL TYPE A16

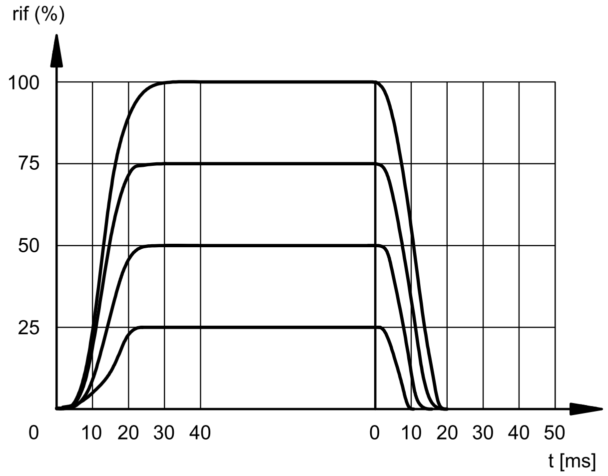


SPOOL TYPE A26



7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

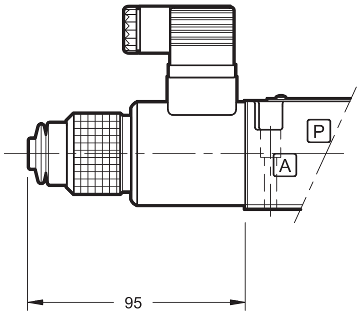
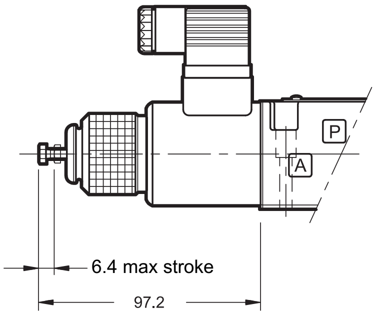


8 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The actuation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two versions are available upon request:

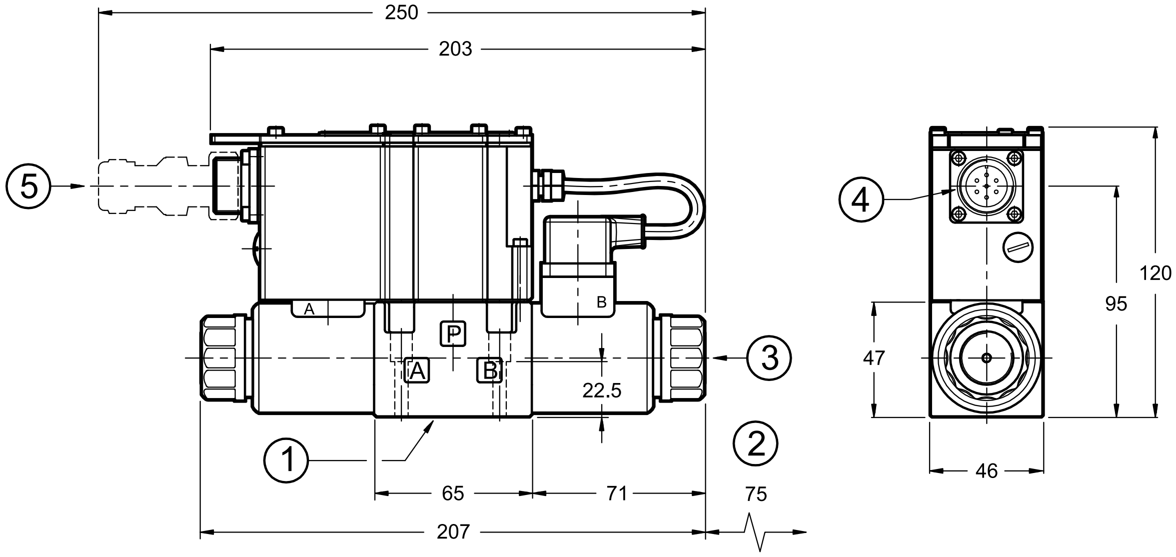
- **CM** version, manual override boot protected.
- **CS** version, with metal locking ring provided with an M4 screw and lock nut to allow the continuous and adjustable mechanical operation.

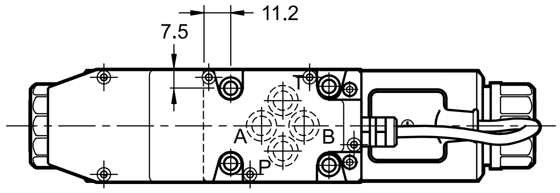
CM Version	**CS Version**
	
Code: 3803210003	Code: 3803210004

9 - OVERALL AND MOUNTING DIMENSIONS

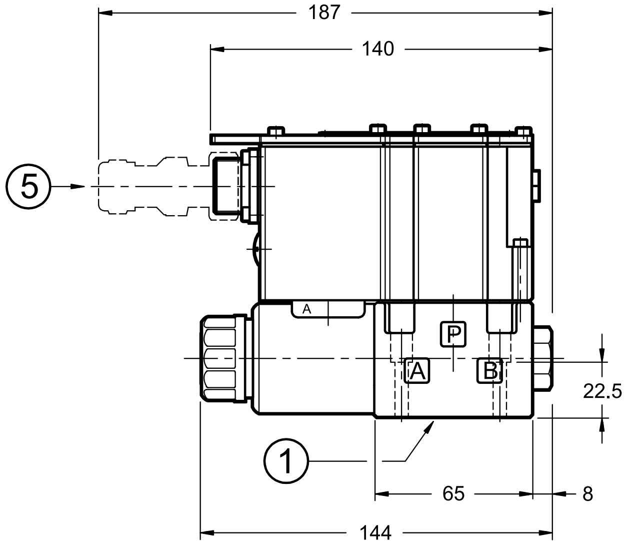
dimensions in mm

DSE3G-A*
DSE3G-C*
DSE3G-Z*





DSE3G-A* SA
DSE3G-C* SA



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Standard manual override embedded in the solenoid tube
4	Main connection
5	Mating connector. **To be ordered separately.** See paragraph 12

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

10 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

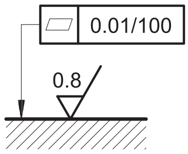
11 - INSTALLATION

DSE3G valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



12 - ACCESSORIES

(to be ordered separately)

12.1 Mating connector

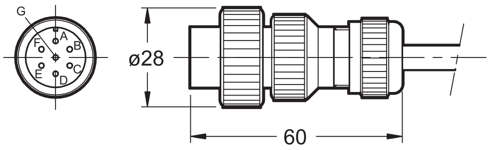
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



12.2 - Connection cables size

Power supply:
- up to 20 m cable lenght : 1,0 mm^2
- up to 40 m cable lenght : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

12.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

13 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC OLEODINAMICA

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Tel. +39 0331.895.111
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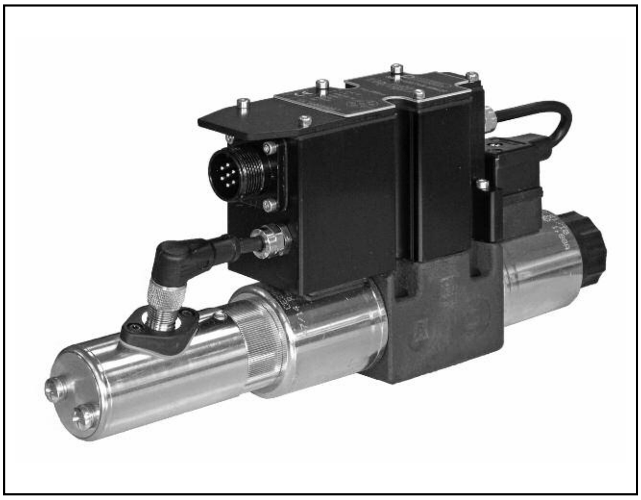
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSE3J

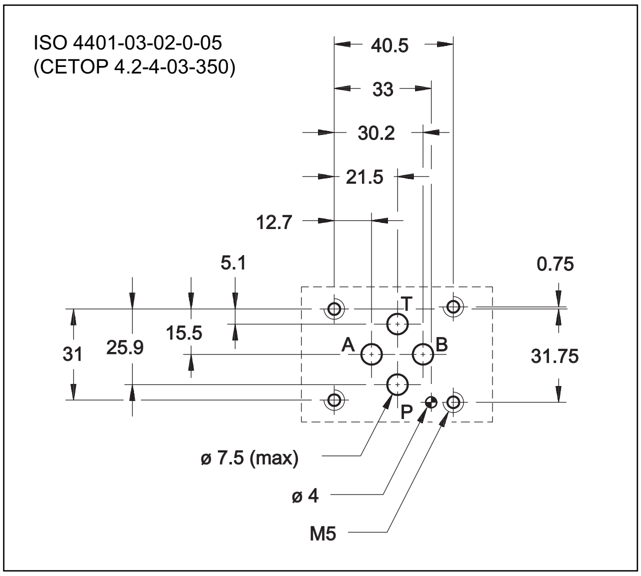
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL FEEDBACK AND INTEGRATED ELECTRONICS

SERIES 30

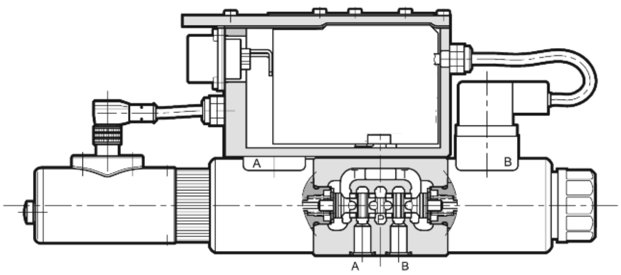
SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **80** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



- The DSE3J is a direct operated directional valve with integrated electric proportional control, feedback and mounting interface in compliance with ISO 4401 standards.
- The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal. Transducer and digital card allow a fine control of the positioning of the cursor, reducing hysteresis and response time and optimizing the performance of the valve.
- It is available with fail safe function.
- The valve is easy to install. The driver directly manages digital settings. It's possible to customize the settings for special applications using the optional kit (see at par. 11).

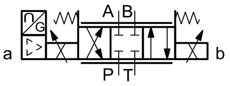
PERFORMANCES

(Mineral oil with viscosity of 36 cSt at 50°C and p =140 bar)

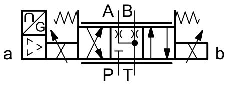
Max operating pressure: - P - A - B ports - T port	bar	350 210
Nominal flow with Δp 10 bar P-T	l/min	1 - 4 - 12 - 30
Response times	see paragraph 7	
Hysteresis	% of Q $_{max}$	< 0,2%
Repeatability	% of Q $_{max}$	< 0,2%
Threshold		< 0,1%
Valve reproducibility		≤ 5%
Electrical characteristics	see paragraph 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	2,2 2,7

HYDRAULIC SYMBOLS (typical)

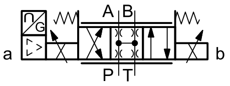
DSE3J-C*



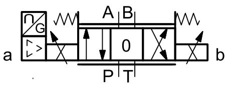
DSE3J-A*



DSE3J-Z*



DSE3J-*01R*



1 - IDENTIFICATION CODE

D	S	E	3	J	-					/	30		-		K11	

Direct operated directional control valve

Electric proportional control

Size ISO 4401-03

Digital integrated electronics for valves with feedback

Spool type:
C = closed centres
A = open centres
Z = zero overlap

Nominal flow rate of the spool (see chart par. 2)

FS = Fail safe option. (omit if not required).
Available on spool Z04, Z12 and Z30 only.

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Main connector 6 pin + PE

Reference signal:
E0 = voltage ±10V
E1 = current 4…20mA

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

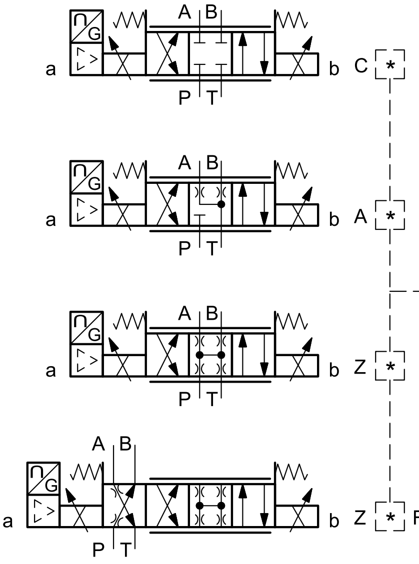
Solenoid position (omit for 2 solenoids configuration):
SA = 1 solenoid on side A

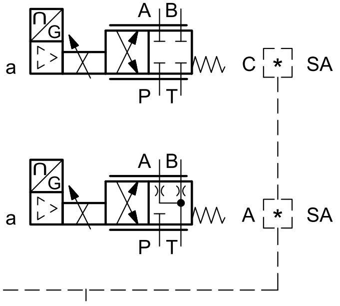
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

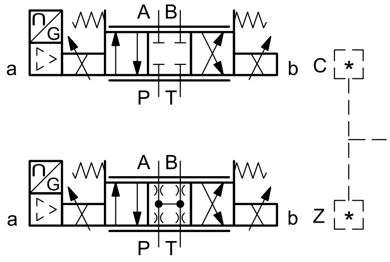
Configuration 2 solenoids :
3 positions with spring centering

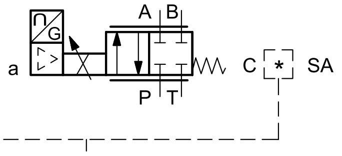
Configuration 1 solenoid on side A "**SA**":
2 positions (central + external) with spring centering





*	Controlled flow with Δp10 bar P-T
04	4 l/min (available for spools Z only)
12	12 l/min
30	30 l/min
30/15	30 (P-A) / 15 (P-B) l/min





*	Controlled flow with Δp10 bar P-T
01R	1 l/min

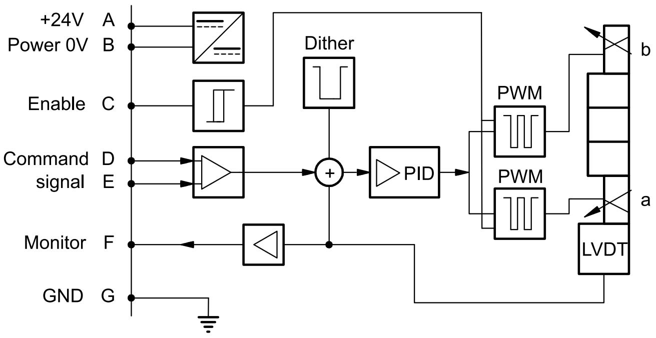
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

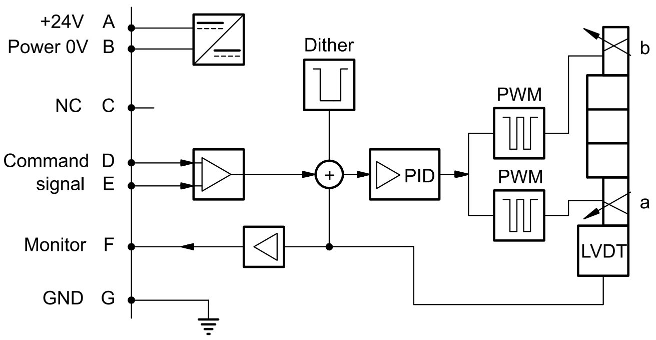
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		3A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

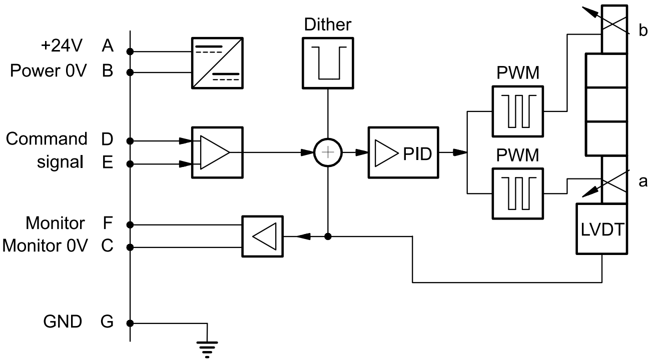
VERSION **A** - External Enable



VERSION **B** - Internal Enable

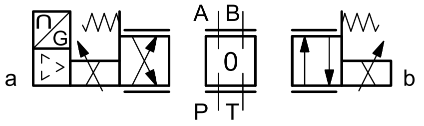


VERSION **C** - 0V Monitor

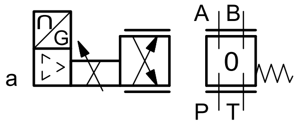


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

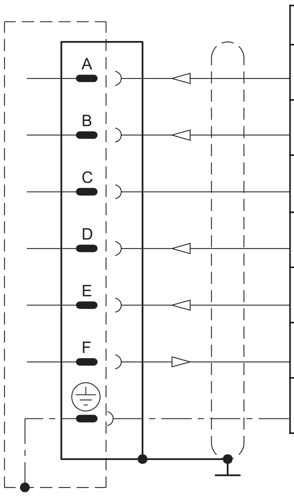
The reference signal is between -10V and +10V on double solenoid valve, and 0…10V on single solenoid valves SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



COMMAND	**+10V**	**0V**
MONITOR	**+10V**	**0V**

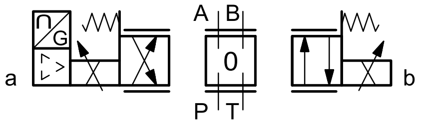


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

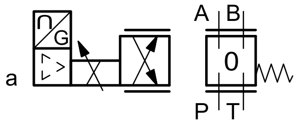
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

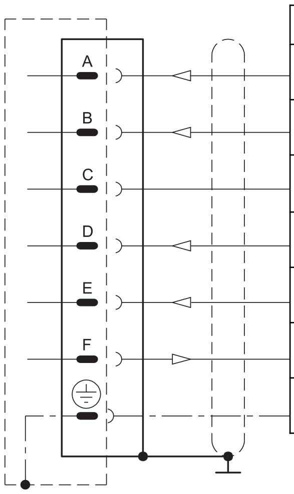
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



COMMAND	**20 mA**	**4 mA**
MONITOR	**20 mA**	**4 mA**

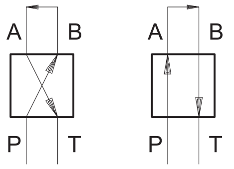


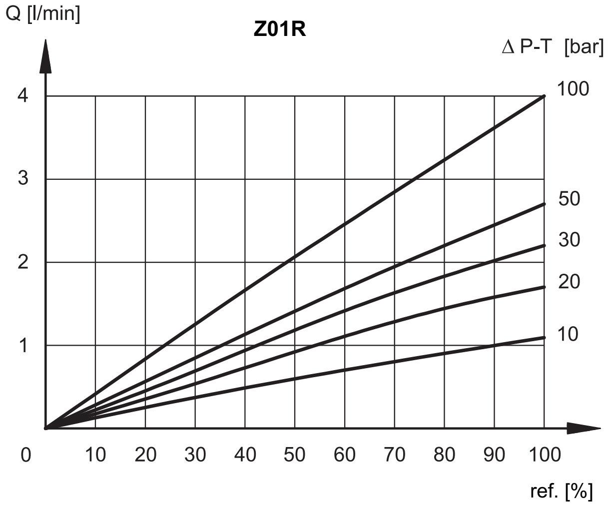
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

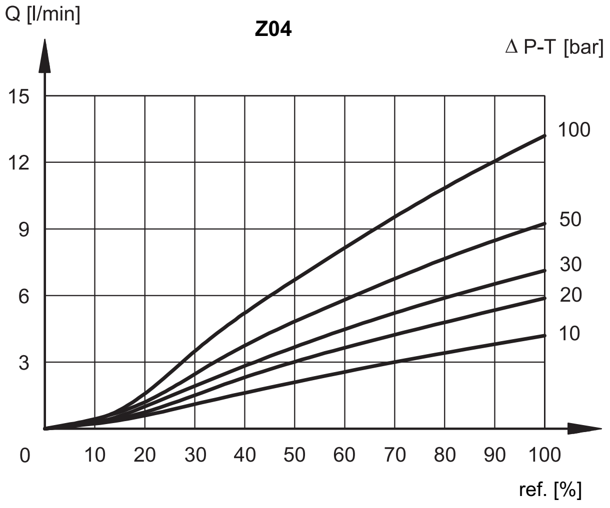
6 - CHARACTERISTIC CURVES

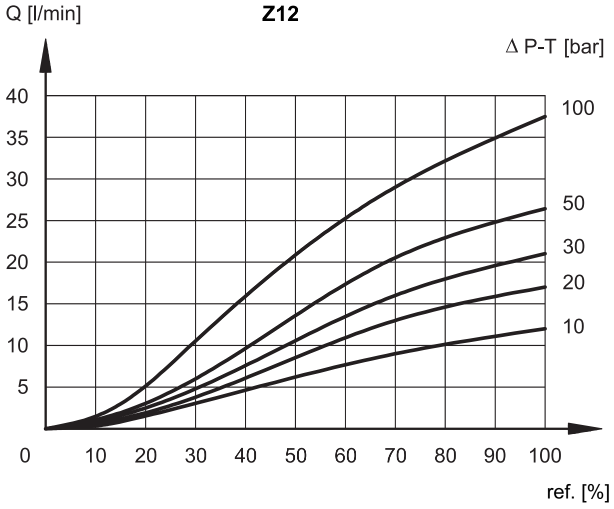
(obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

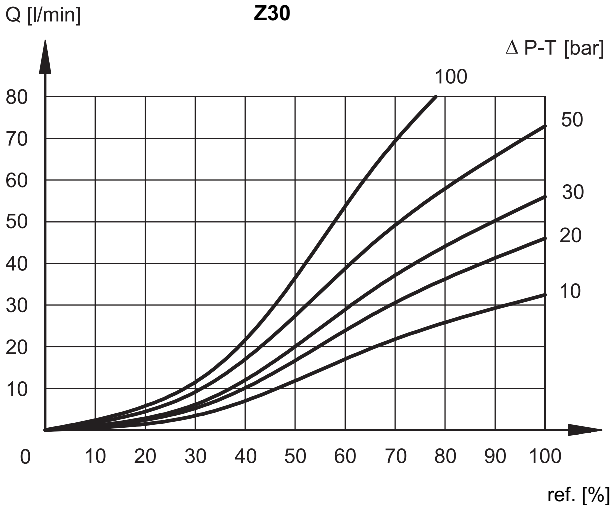
Typical flow rate curves related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

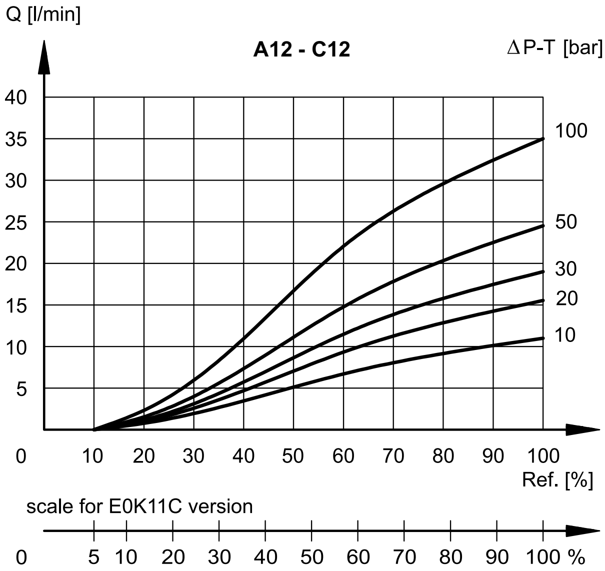


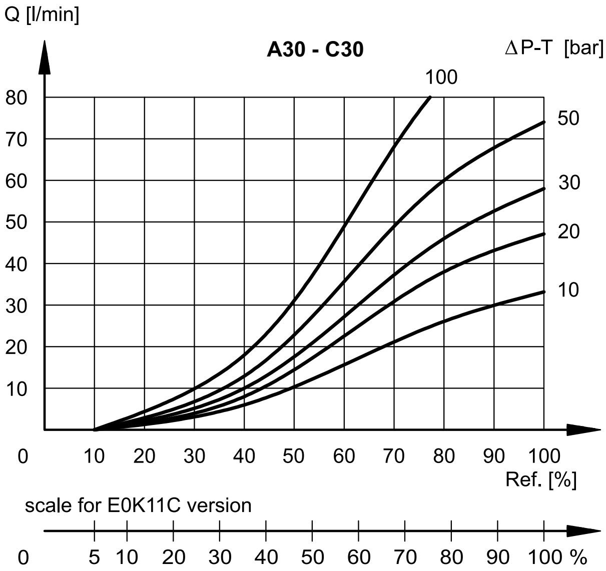


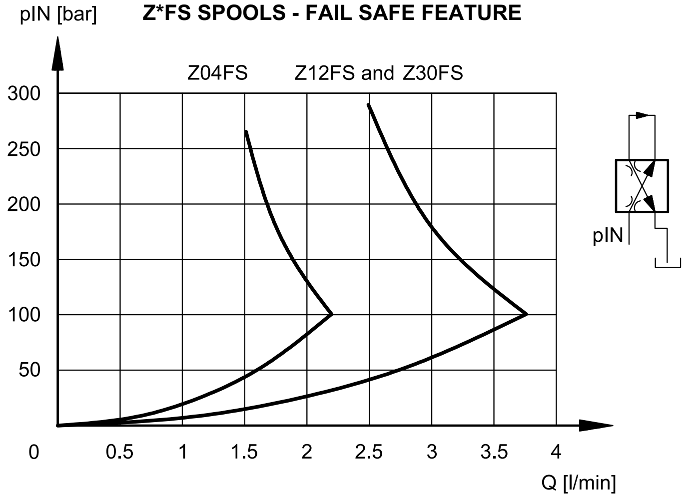








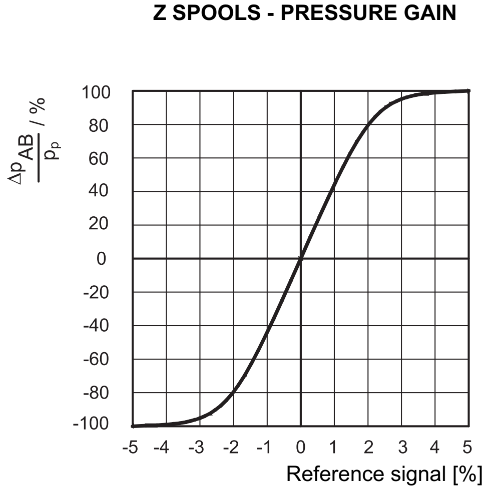




Flow P→B / A→T with valve in fail safe position, depending on the incoming pressure.

When a power failure (enabling OFF) occurs, the valve moves in 'fail safe' position by maintaining a minimum flow that allows the actuator to return slowly to a safety position.

During the black-out the centering springs retain the spool in fail safe-position.

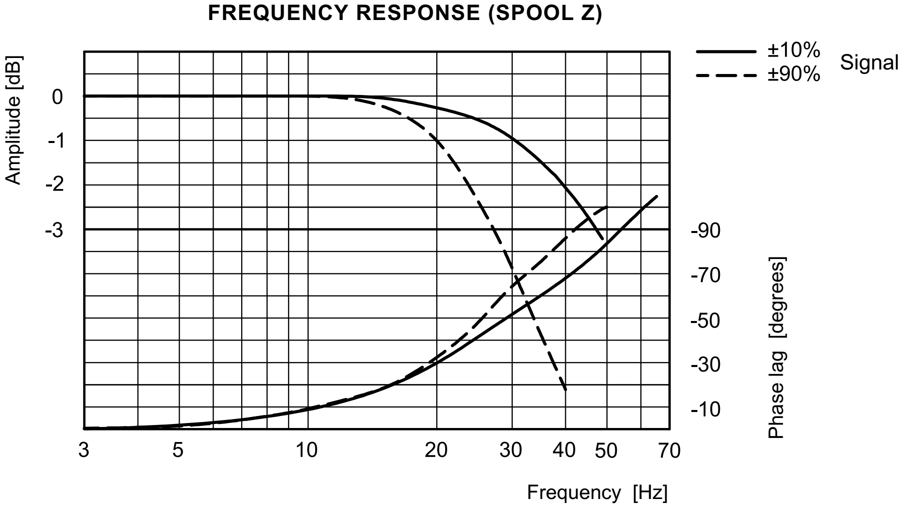


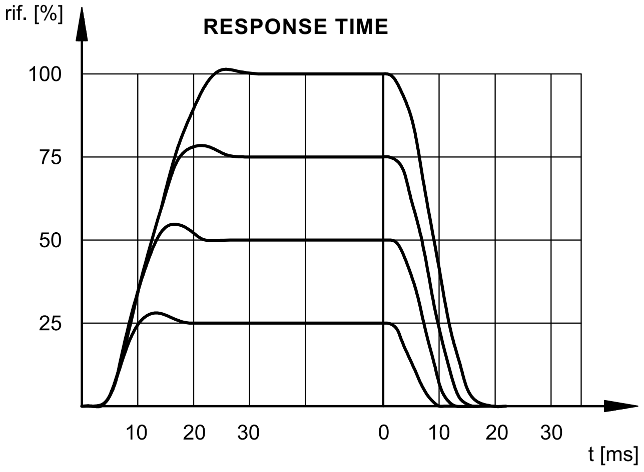
The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and 140 bar Δp P→T)

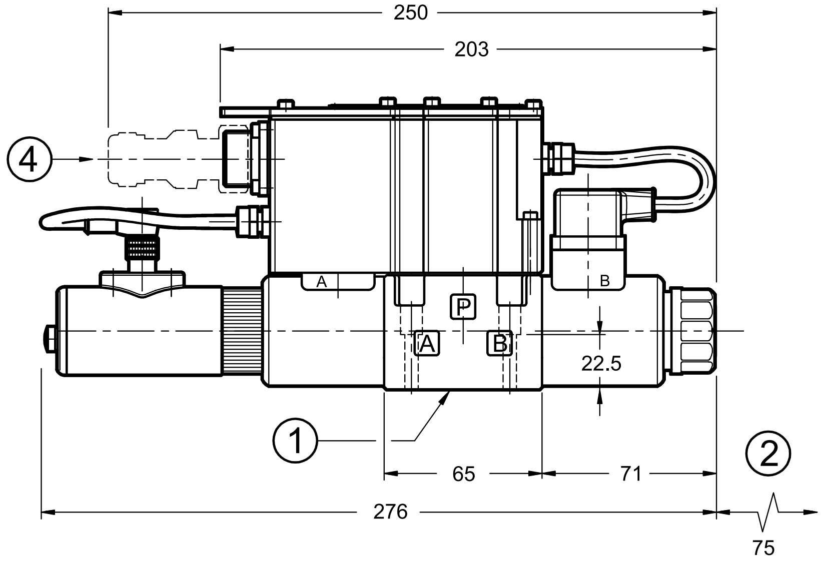


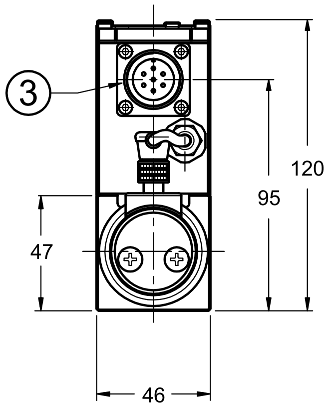


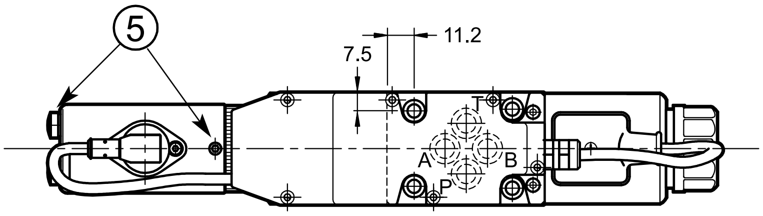
8 - OVERALL AND MOUNTING DIMENSIONS

DSE3J-A*
DSE3J-C*
DSE3J-Z*

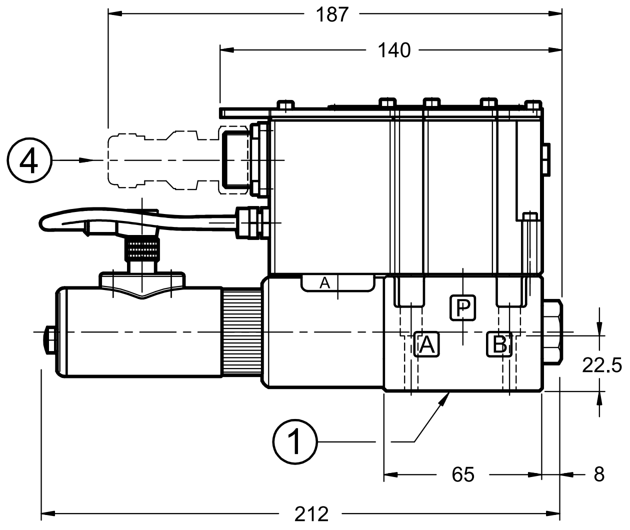
dimensions in mm







DSE3J-A* SA
DSE3J-C* SA



Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm (A8.8)
Threads of mounting holes: M5x10

1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Coil removal space (solenoid B only)
3	Main connection
4	Mating connector. **To be ordered separately.** See paragraph 11
5	Adjustment sealing performed at factory. Do not disassemble the transducer.

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

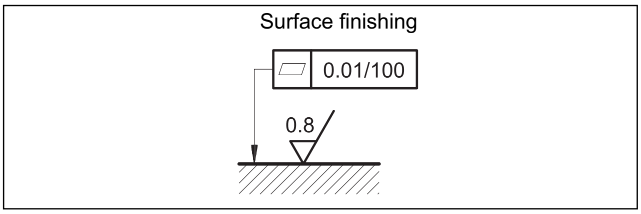
The fluid must be preserved in its physical and chemical characteristics.

10 - INSTALLATION

DSE3J valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.



11 - ACCESSORIES

(to be ordered separately)

11.1 Mating connector

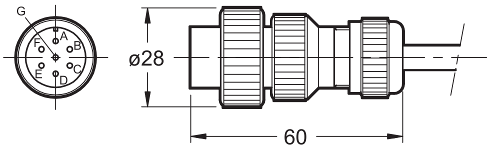
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic can provide a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



11.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

11.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

12 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

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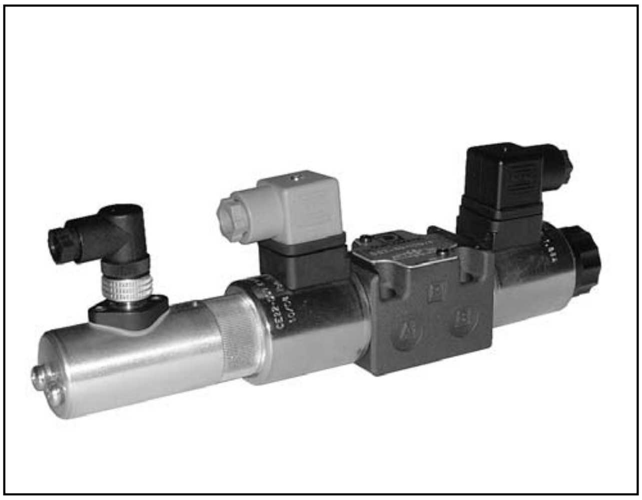
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE3F

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND ELECTRICAL FEEDBACK

SERIES 11



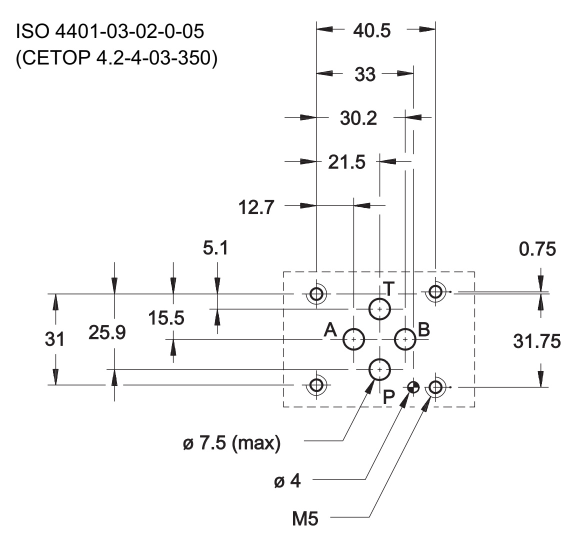
SUBPLATE MOUNTING

ISO 4401-03 (CETOP 03)

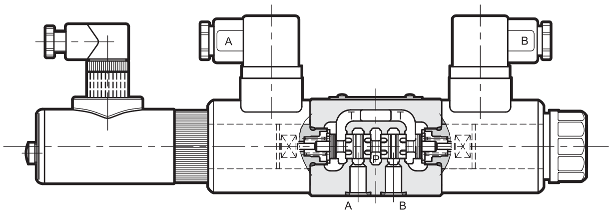
p max **350** bar

Q max **40** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



The DSE3F is a direct operated directional valve with proportional control, electrical feedback and mounting interface in compliance with ISO 4401 (CETOP RP 121H) standards.

— It is normally used to control position and the speed of hydraulic actuators.

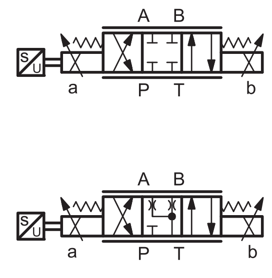
— The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal.

— The valve must be controlled directly by the UEIK-*RSD digital card (see par.9), that maximize the valve performances: the input signal and the signal from the valve are compared to obtain an accurate positioning and a reduces hysteresis.

PERFORMANCES (Obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronic)

Max operating pressure: - P - A - B ports - T port	bar	350 210
Nominal flow with Δp 10 bar P-T	l/min	8 - 16 - 26
Response times	see paragraph 6	
Hysteresis	% of Q_{max}	< 1,5 %
Repeatability	% of Q_{max}	< 1 %
Electrical characteristics, IP	see paragraph 5	
Valve reproducibility		< 5%
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	1,9 2,3

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	S	E	3	F	-				/	11		-	D12	K1

Direct operated directional control valve

Electric proportional control

Size ISO 4401-03 (CETOP 03)

Position feedback

Spool type:
C = closed centres
A = open centres

Nominal flow rate:
08 = 8 l/min
16 = 16 l/min
26 = 26 l/min

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A

Coil electrical connection: plug for connector type DIN 43650 (**standard**)

Nominal solenoid voltage 12 VDC

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

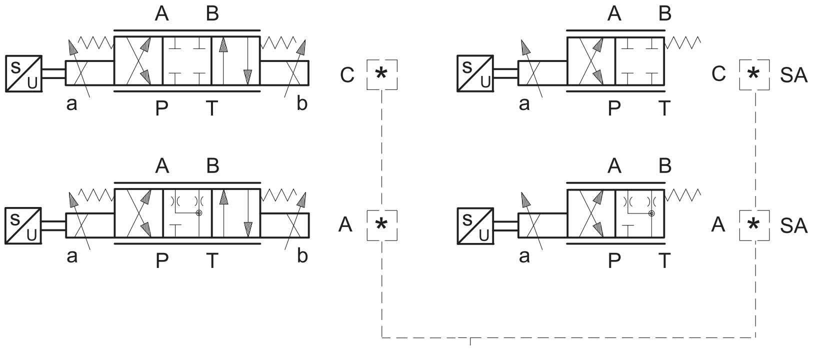
Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids :
3 positions with spring centering

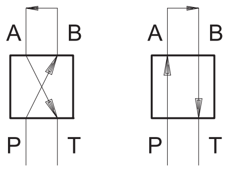
Configuration 1 solenoid on side A “**SA**”:
2 positions (central + external) with spring centering



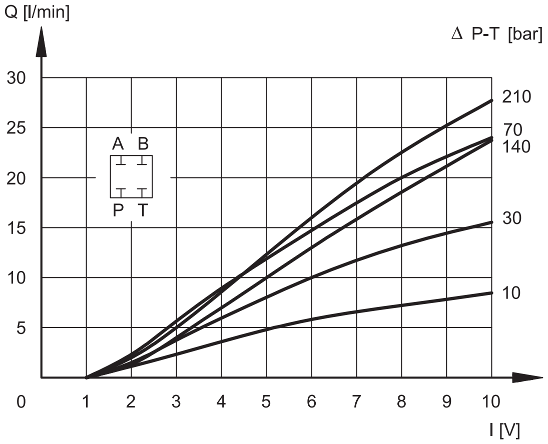
*	Controlled flow with Δp10 bar P-T
08	8 l/min
16	16 l/min
26	26 l/min

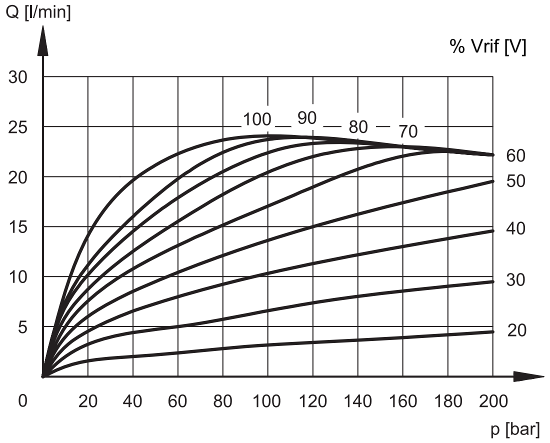
3 - CHARACTERISTIC CURVES (obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

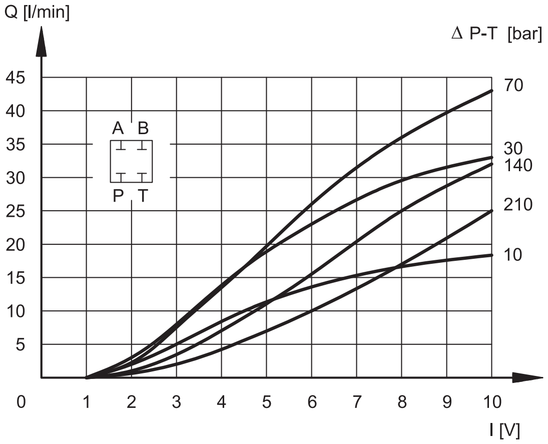


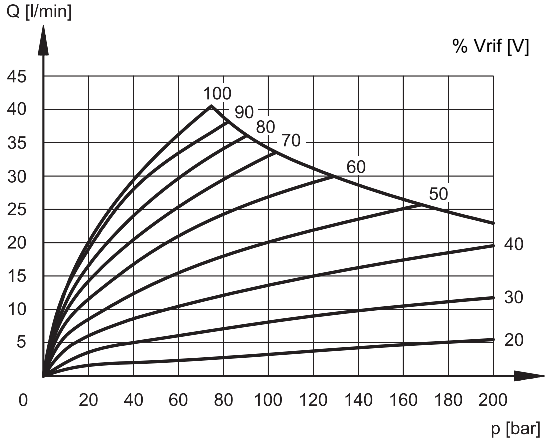
SPOOL C08



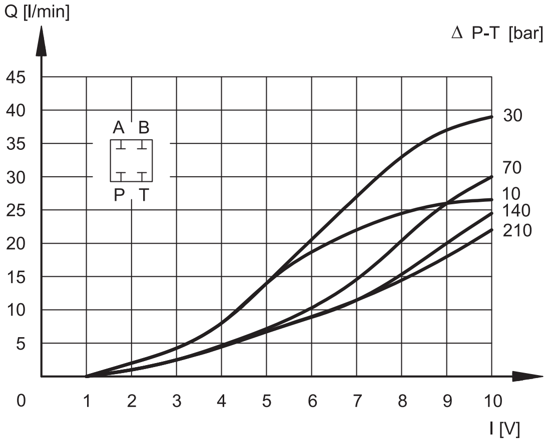


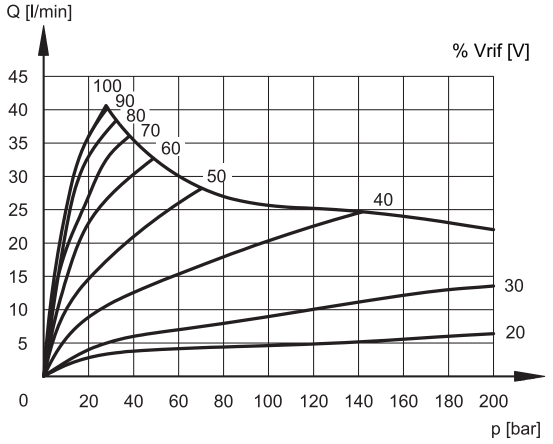
SPOOL C16



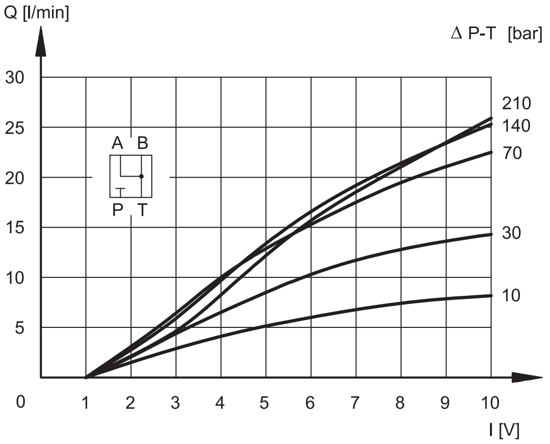


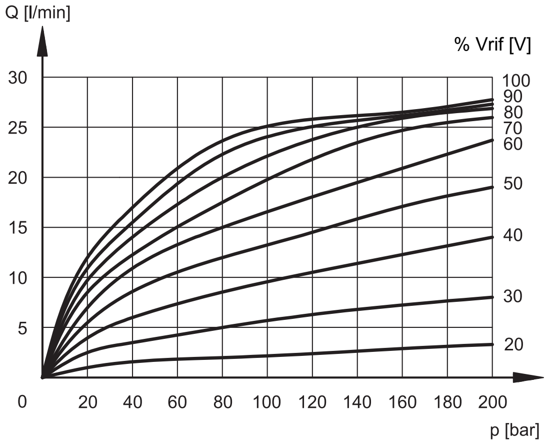
SPOOL C26



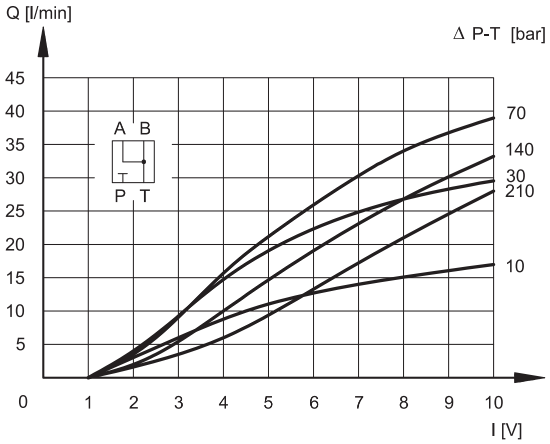


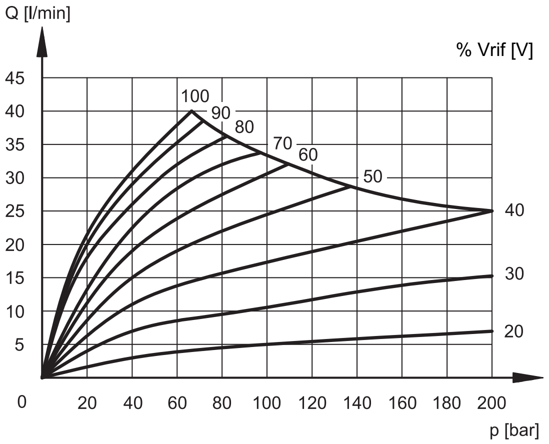
SPOOL A08



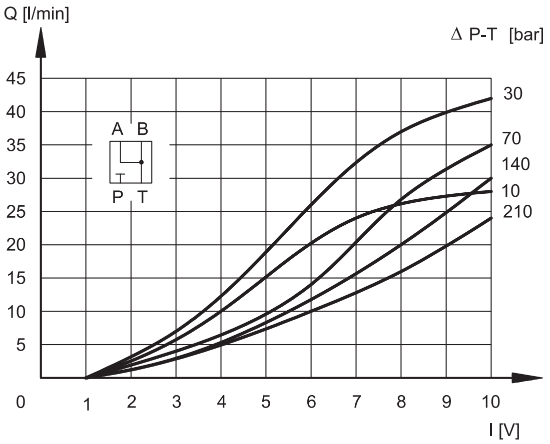


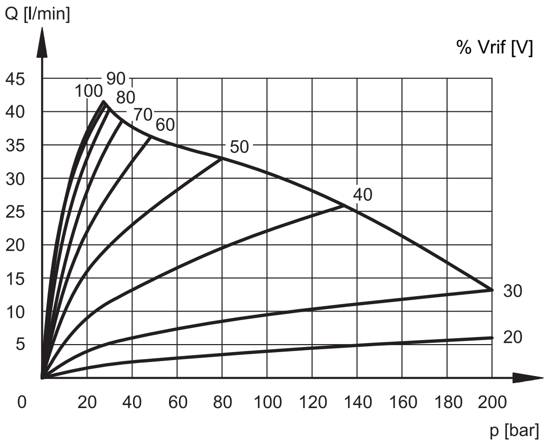
SPOOL A16





SPOOL A26





4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

5.1 - Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to reduce friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube and secured by means of a lock nut and can be rotated through 360°depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**
RESISTANCE (at 20°C)	Ω	3.66
MAXIMUM CURRENT	A	1.88
DUTY CYCLE		100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE	
CLASS OF PROTECTION: Atmospheric agents (CEI EN 60529)	IP 65	

5.2 - Positional transducer

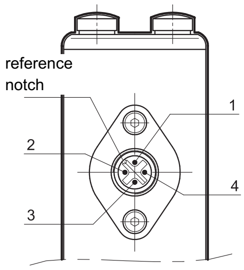
The DSE3F valve mounts an LVDT type positional transducer with amplified signal to enable precise control of the restrictor and the set flow rate, thus improving repeatability and hysteresis characteristics.

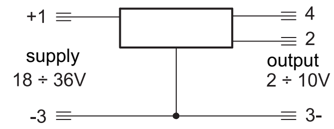
The transducer is fitted coaxially on the proportional solenoid and the connector features 360° positioning.

We recommend to use a screened cable to avoid interferences. Technical specifications and connections are indicated here beside.

The transducer is protected against polarity inversion on the power line.

Position transducer connection		**Electronic card connections** (see par. 9)
pin 1	supply 18 ÷ 36 V	pin 8c
pin 2	output 2 ÷ 10 V	pin 24a
pin 3	0 V	pin 22c
pin 4	NC	NC





6 - STEP RESPONSE (measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control unit)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table illustrates typical response times with the C13 spool and with ∆p = 30 bar P-T.

REFERENCE SIGNAL STEP	0 → 100%	100 → 0%
Step response [ms]	30	25

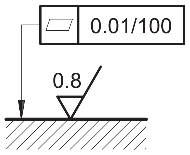
7 - INSTALLATION

DSE3F valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

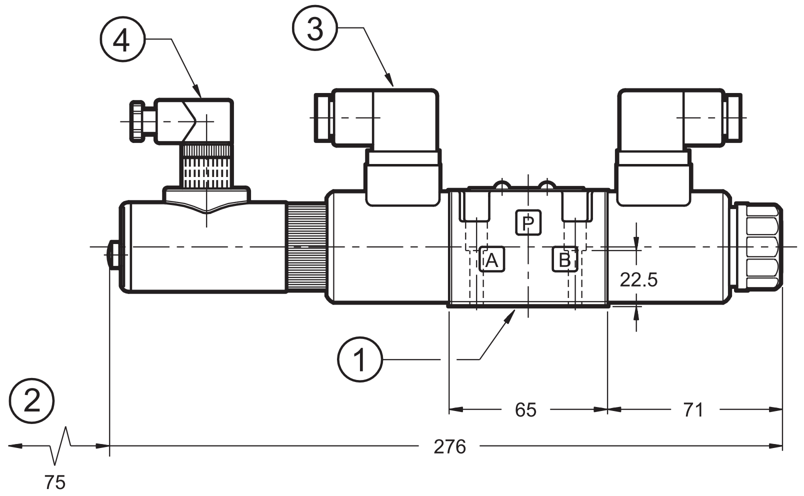
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and mounting surface.

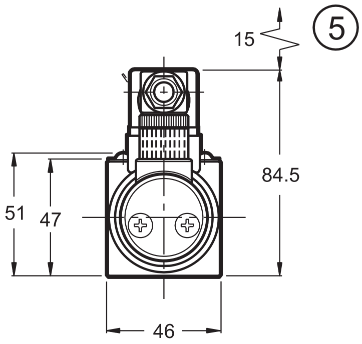
Surface finishing

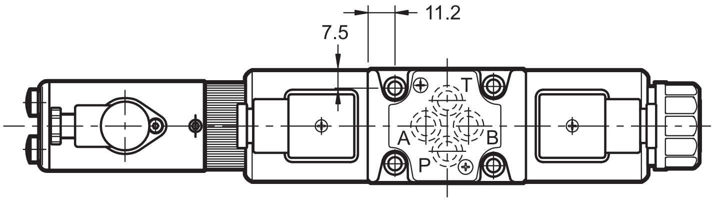


9 - OVERALL AND MOUNTING DIMENSIONS

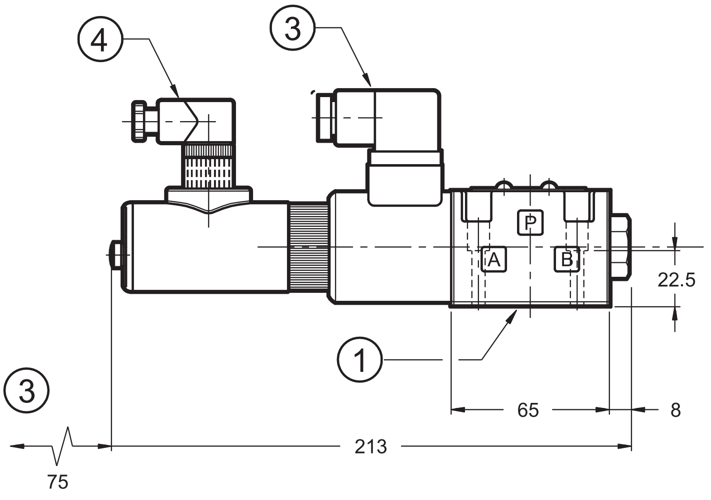
DSE3F-A*
DSE3F-C*

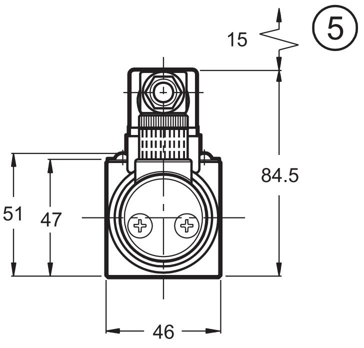


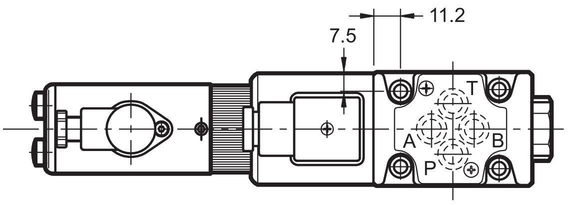




DSE3F-A* SA
DSE3F-C* SA







dimensions in mm

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25 x 1.78) - 90 shore
2	Transducer and coil removal space
3	Main electrical connector DIN 43650
4	Electrical connector 4 pin EC4S/M12S/10 code 3491001002 for position transducer (included)
5	Removal space of the main electrical connector

Fastening bolts: 4 bolts M5x30 - ISO 4762
Torque: 5 Nm

9 - ELECTRONIC CONTROL UNITS

UEIK-21RSD	for two solenoids valves 12V DC	Eurocard format	see cat. 89 335
UEIK-11RSD	for single solenoid valve 12V DC	Eurocard format	see cat. 89 315

A card holder, PSC-32D/20 is available, to be ordered separately with code 3899000001.

10 - SUBPLATES (see catalogue 51 000)

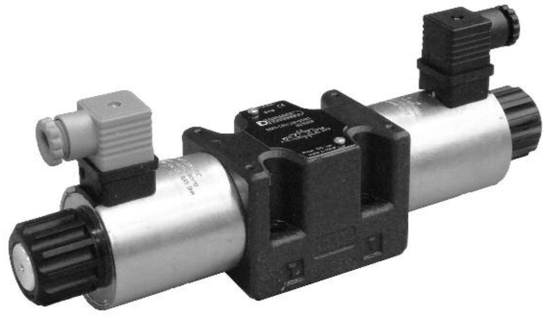
PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

DSE5

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

SERIES 10

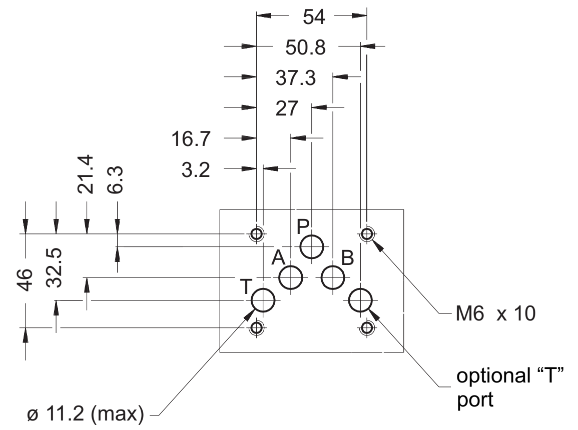


SUBPLATE MOUNTING
ISO 4401-05

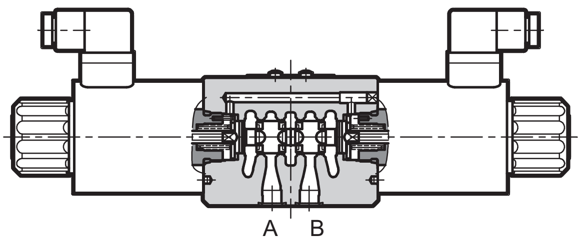
p max **320** bar
Q max **90** l/min

MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)



OPERATING PRINCIPLE



- The DSE5 valve is a directly operated directional control valve with electric proportional control and with ports in compliance with ISO 4401 standards.
- It is used for directional and speed control of the hydraulic actuators.
- Valve opening and hence flow rate can be modulated continuously in proportion to the current supplied to the solenoid.
- The valve can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see paragraph 11).
- Other two versions with external subplate drain port are available (see paragraph 9).

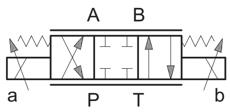
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

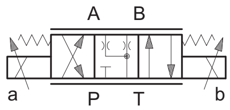
Maximum operating pressure: - P - A - B ports - T port : standard version version with Y port	bar	320 210 320
Maximum flow with ∆p 10 bar P-T	l/min	30 - 60
Step response	see paragraph 6	
Hysteresis (with PWM 100 Hz)	% of Q max	< 6%
Repeatability	% of Q max	< ±1,5%
Electrical characteristics	see paragraph 5	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	4,4 5,9

HYDRAULIC SYMBOLS (typical)

DSE5-C*



DSE5-A*



1 - IDENTIFICATION CODE

D	S	E	5	-				/	10		-			/		

Directly operated directional control valve

Electric proportional control

Size ISO 4401-05

Spool type:
C = closed centers
A = open centers

Spool nominal flow
(see table 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection:
plug for connector type
DIN 43650 (**standard**)

Option: manual override (see at par. 9)

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Omit if not required

NOTE: The standard valve is supplied with surface treatment of phosphating black.

The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to 240 hours (test operated according to EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

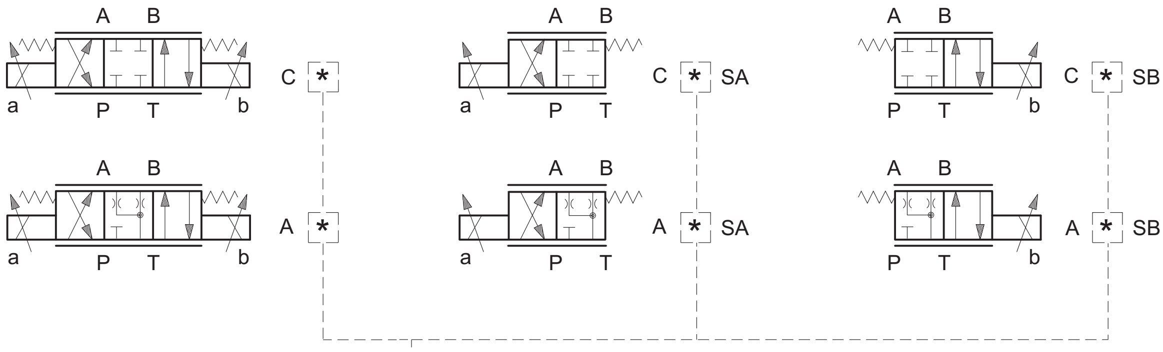
2 - CONFIGURATIONS

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

2 solenoids configuration:
3 positions with spring centering

“**SA**” configuration: 1 solenoid on side A.
2 positions (central + external)
with spring centering

“**SB**” configuration: 1 solenoid on side B.
2 positions (central + external)
with spring centering



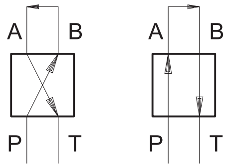
*	Controlled flow with Δp 10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/min

3 - CHARACTERISTIC CURVES

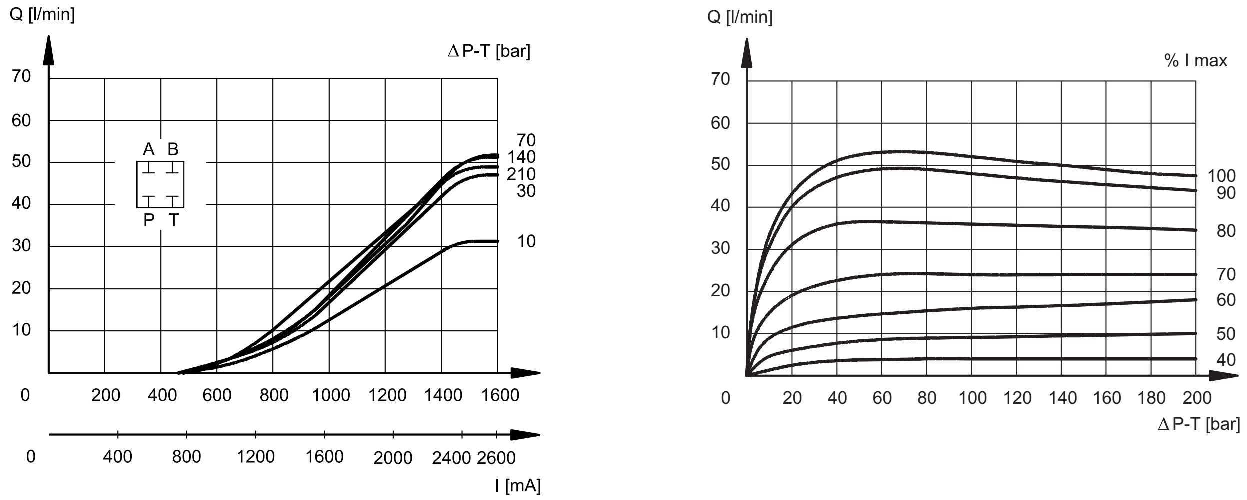
(values measured with oil viscosity of 36 cSt at 50°C and with electronic control unit)

Typical constant flow rate control curves at Δp according to current supply to solenoid (D24 version, maximum current 1600 mA), measured for the various spools types available.

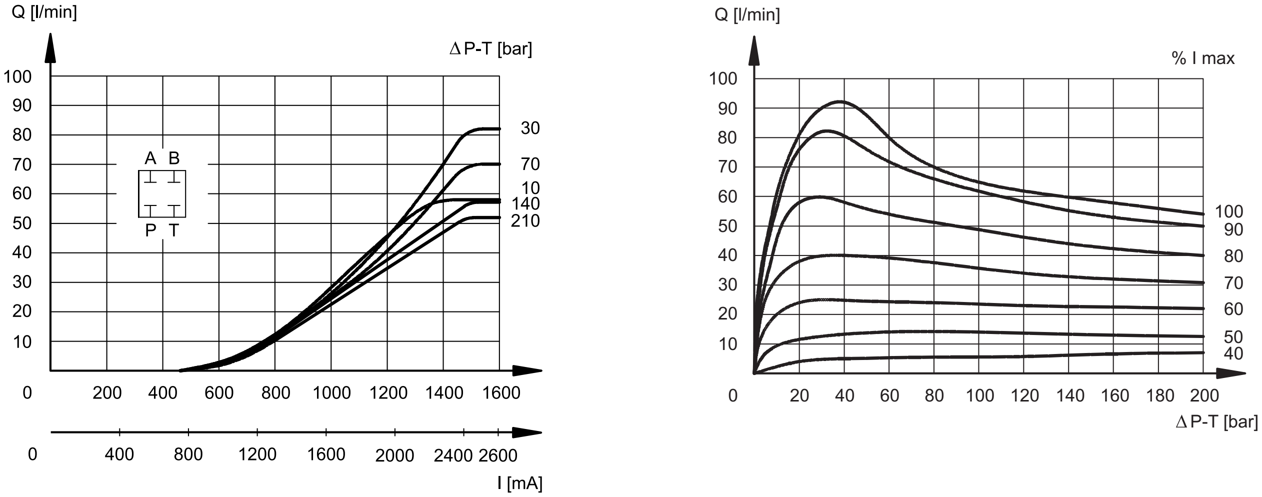
The reference Δp values are measured between ports P and T on the valve.



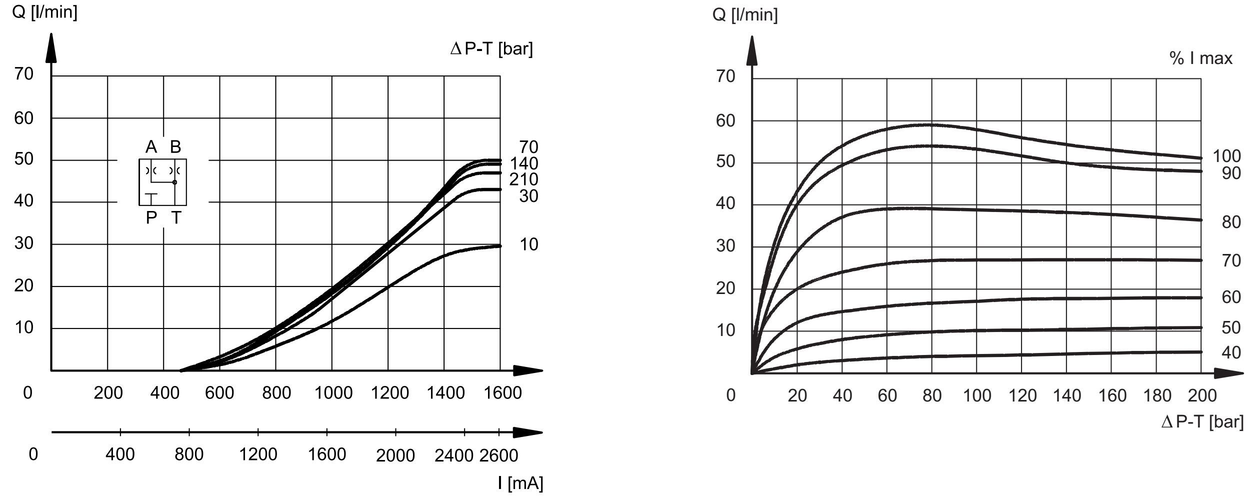
SPOOL TYPE C30



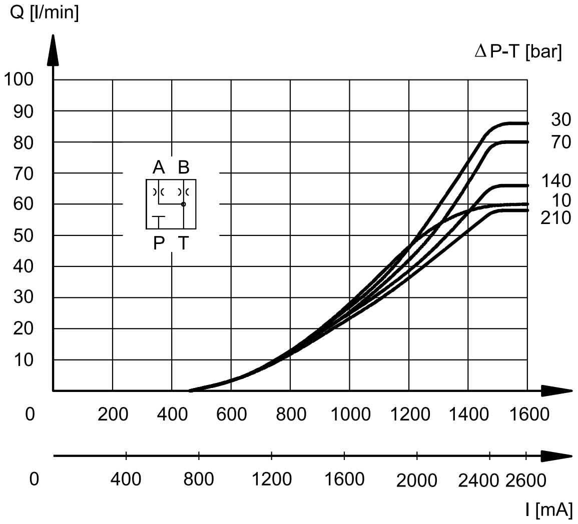
SPOOL TYPE C60

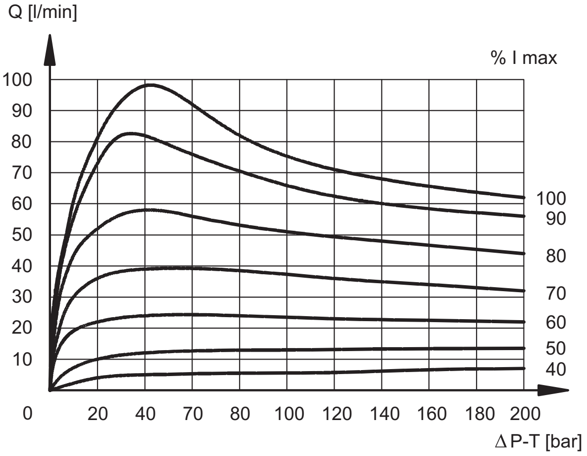


SPOOL TYPE A30



SPOOL TYPE A60





4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

5 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.

It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	VDC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3 - 3.4	8.65
MAXIMUM CURRENT	A	2.6	1.6
DUTY CYCLE	100%		
ELECTROMAGNETIC COMPATIBILITY (EMC)	according to 2004/108/EC		
CLASS OF PROTECTION: atmospheric agents (IEC 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

6 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C and with electronic control unit)

Step response is the time taken for the valve to reach 90% of the set position value following a step change of reference signal.

The table shows typical response times tested with spool type C60 and ∆p = 20 bar P-T.

REFERENCE SIGNAL STEP	0→100%	100%→0
Step response [ms]		
DSE5-A* **DSE5-C***	50	40

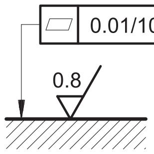
7 - INSTALLATION

DSE5 valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed fluid can easily leak between the valve and support surface.

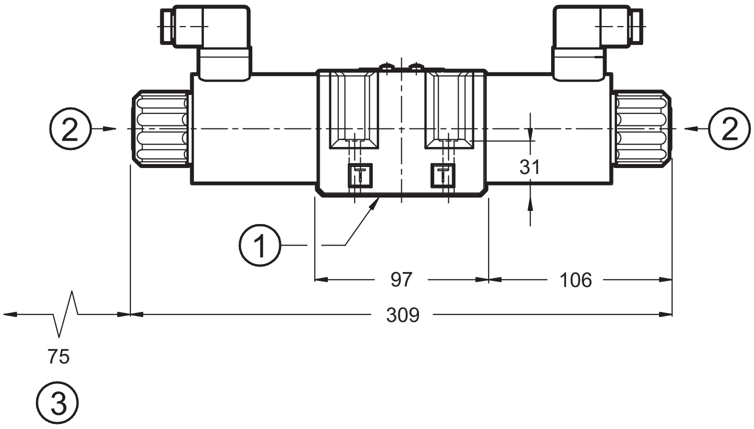
Surface finishing

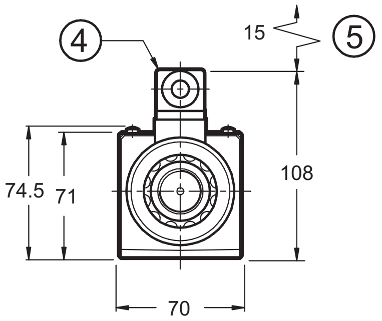


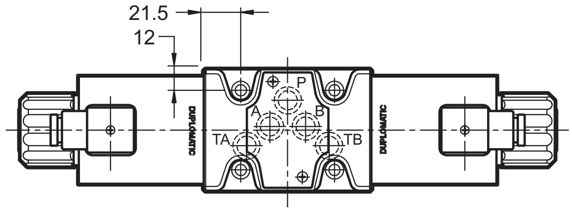
8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

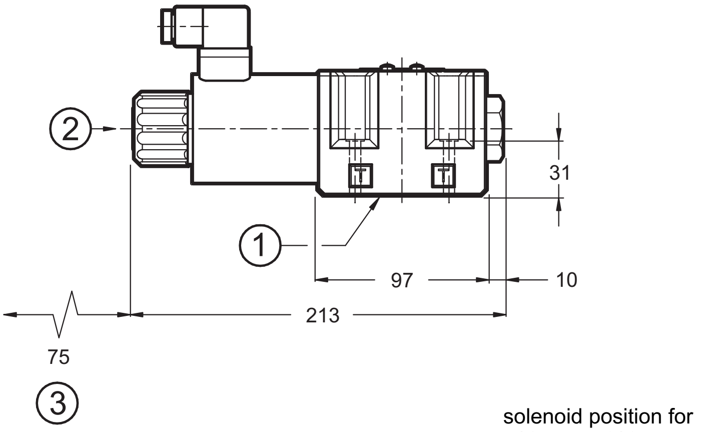
DSE5-A*
DSE5-C*

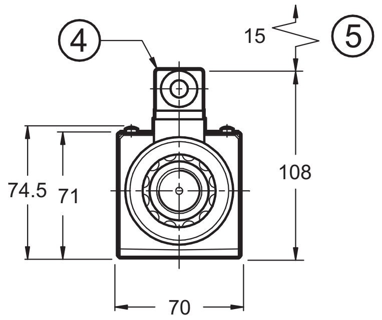




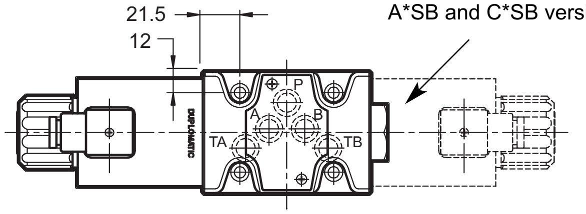


DSE5-A*SA
DSE5-C*SA





solenoid position for
A*SB and C*SB versions



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore Additional for version Y: 1 OR 2037 (9.25x1.78) - 90 Shore Additional for version L: 1 OR 2025 (6.07x1.78) - 90 Shore
2	Standard manual override integrated in the solenoid tube
3	Coil removal space
4	DIN 43650 electric connector
5	Connector removal space

Fastening bolts: 4 SHC screws ISO 4762 M6x40
Torque: 8 Nm (bolts A8.8)
Threads of mounting holes: M6x10

9 - VERSIONS WITH EXTERNAL DRAIN PORT

9.1 - Identification Code

D	S	E	5	-				/	10		-		K1	/	

Directly operated directional control valve

Electric proportional control

ISO 4401-05 size

Spool type:
C = closed centers
A = open centers

Spool nominal flow (see table 2)

Solenoid position (omit for configuration with two solenoids):
SA = 1 solenoid on side A
SB = 1 solenoid on side B

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

D12 = Nominal solenoid voltage 12V DC
D24 = Nominal solenoid voltage 24V DC

Coil electrical connection: plug for connector type DIN 43650 (**standard**)

Port for subplate external drain
Y = according to ISO 4401-05-05-0-05
L = according to I ISO 4401-05-06-0-05

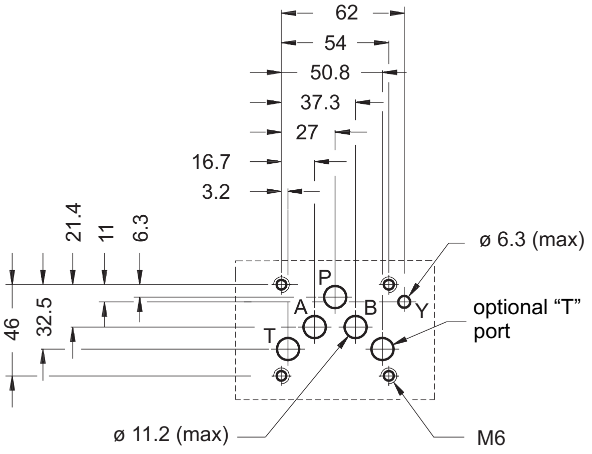
These versions allow the operation with pressures up to 320 bar on T port of the valve .

The additional drain port is connected with the solenoid chamber: in this way the tubes are not stressed by the pressure operating on the T port of the valve.

9.2 - Y Version

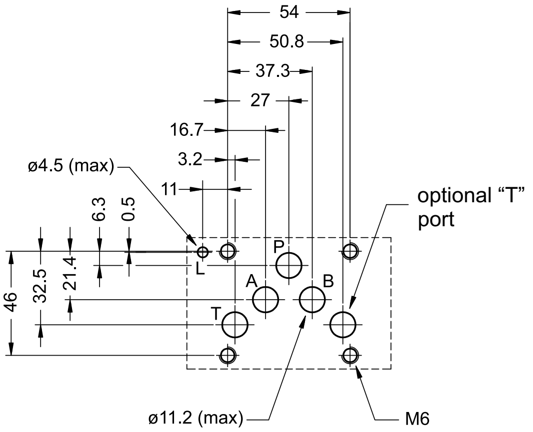
The drain port Y is realized on the valve mounting surface in compliance with ISO 4401-05-05-0-05 standard.

There is no X port.



9.3 - L version

It consists of a drain port on the mounting surface of the valve according to ISO 4401-05-06-0-05 standard



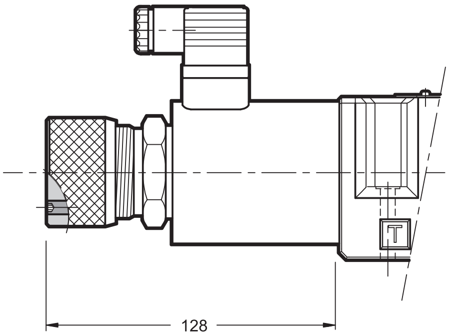
10 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

The following manual override is available upon request:

- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

CK Version



Spanner for set screw: 3 mm
Code: 3803260003

11 - ELECTRONIC CONTROL UNITS

DSE5- * *SA (SB)

EDC-131	for solenoid 24V DC	plug version	see catalogue 89 120
EDC-151	for solenoid 12V DC		
EDM-M131	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 250
EDM-M151	for solenoid 12V DC		

DSE5- A* **DSE5-C***

EDM-M231	for solenoid 24V DC	DIN EN 50022 rail mounting	see catalogue 89 250
EDM-M251	for solenoid 12V DC		

12 - SUBPLATES

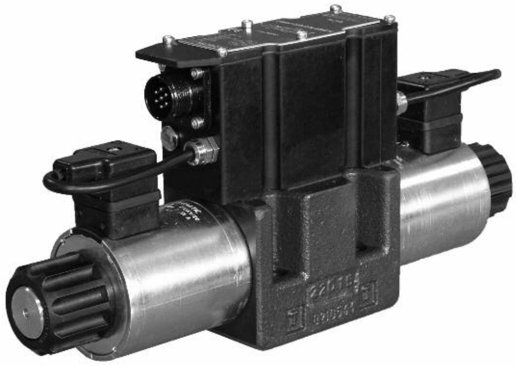
(see cat. 51 000)

Type PMD4-AI4G with rear ports 3/4” BSP
Type PMD4-AL4G with side ports 1/2” BSP

DSE5G

DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND INTEGRATED ELECTRONICS

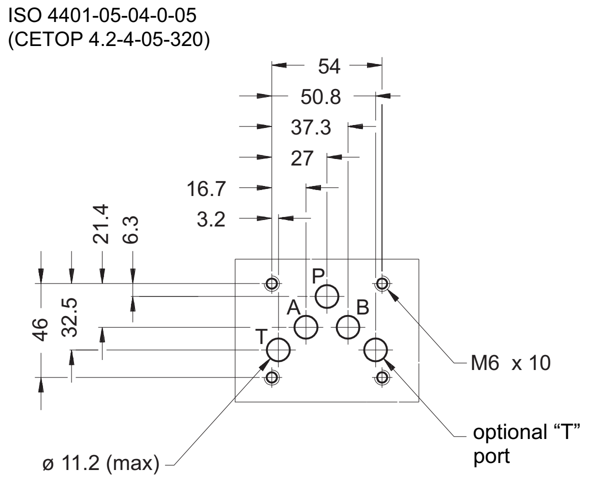
SERIES 30



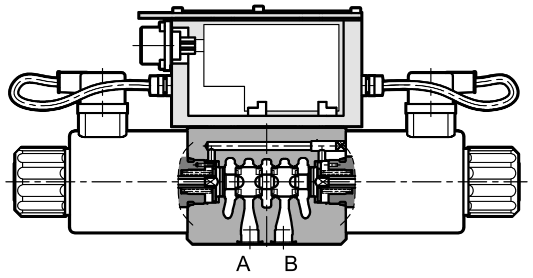
SUBPLATE MOUNTING
ISO 4401-05 (CETOP 05)

p max **320** bar
Q max **90** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— The DSE5G is a direct operated directional valve with integrated electric proportional control and mounting interface in compliance with ISO 4401 standards.

— It is used for control the positioning and the speed of hydraulic actuators.

— The valves are available with command signal in voltage or current, and on-board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

— The valve is easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 11.3)

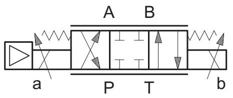
PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

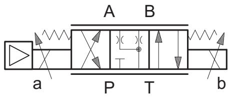
Maximum operating pressure: - P - A - B ports - T port	bar	320 140
Maximum flow with ∆p 10 bar P-T	l/min	30 - 60
Response times	see paragraph 7	
Hysteresis	% of Q max	< 3%
Repeatability	% of Q max	< ±1%
Electrical characteristics	see paragraph 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	5,1 6,6

HYDRAULIC SYMBOLS (typical)

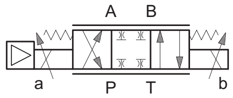
DSE5G-C*



DSE5G-A*



DSE5G-Z*



1 - IDENTIFICATION CODE

D	S	E	5	G	-				/	30		-		K11	

Direct operated directional control valve

Electric proportional control

Size ISO 4401-05 (CETOP 05)

Digital integrated electronics for open loop

Spool type:
C = closed centres
A = open centers
Z = with overlap jump

Nominal flow rate of the spool (see chart par. 2)

Solenoid position (omit for 2 solenoids configuration):
SA = 1 solenoid on side A

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

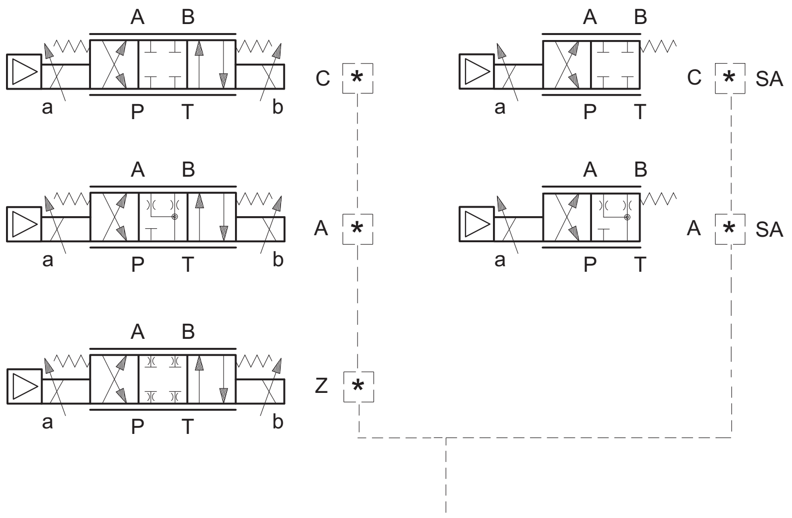
Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - CONFIGURATION

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids :
3 positions with spring centering

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external) with spring centering



*	Controlled flow with10 bar P-T
30	30 l/min
60	60 l/min
60/30	60 (P-A) / 30 (B-T) l/n

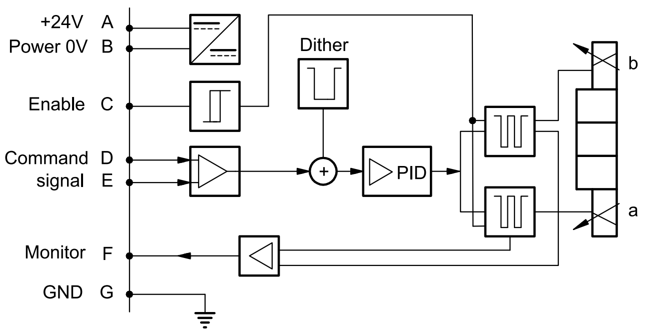
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

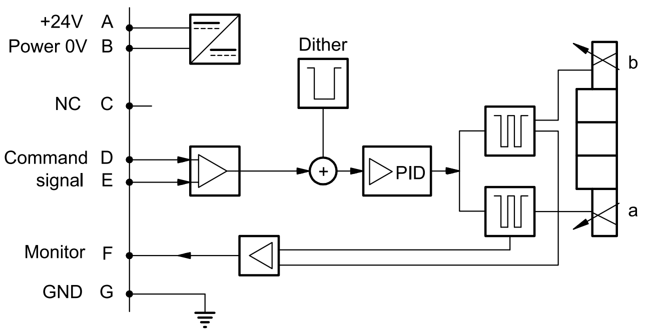
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 35 VDC), ripple max 3 Vpp
Power consumption	VA	40
Maximum solenoid current	A	2.8
Fuse protection, external		3A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failure
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

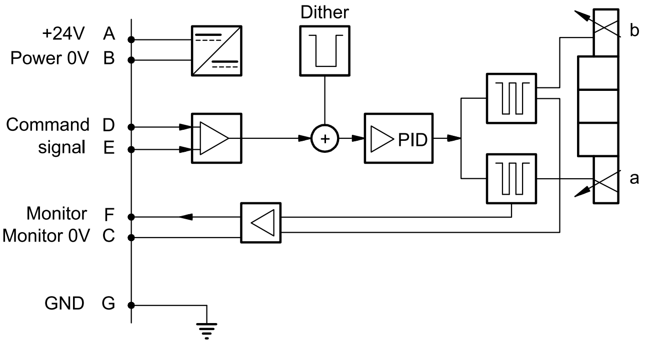
VERSION **A** - External Enable



VERSION **B** - Internal Enable

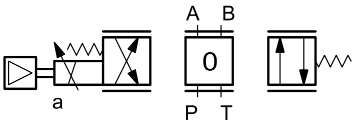


VERSION **C** - 0V Monitor

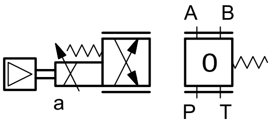


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

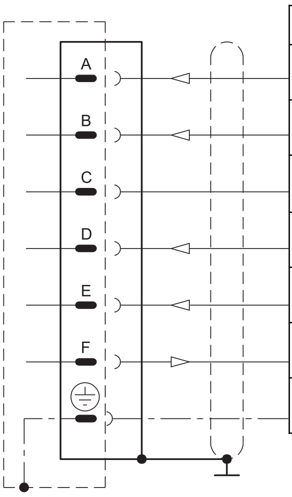
The reference signal is between -10V and +10V on double solenoid valve, and 0…10V on single solenoid valves SA. The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



COMMAND	**+10V**	**0V**
MONITOR	**+10V**	**0V**

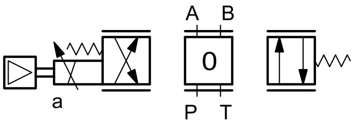


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

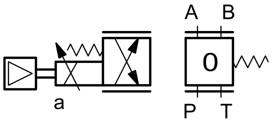
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

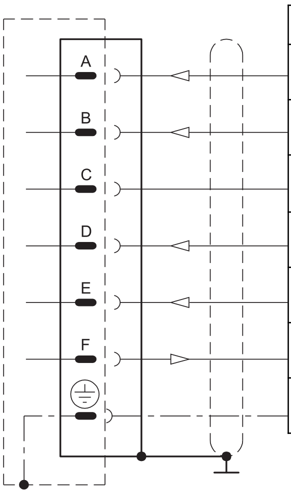
The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



COMMAND	**20 mA**	**4 mA**
MONITOR	**20 mA**	**4 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

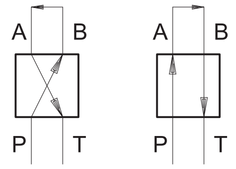
6 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

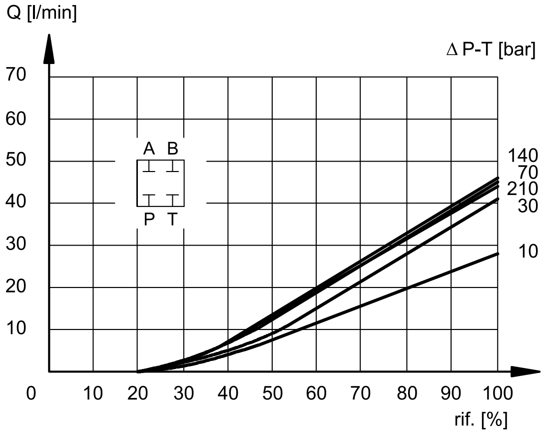
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools.

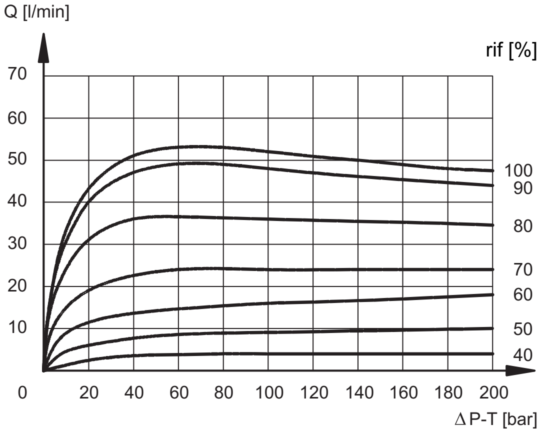
The curves are obtained with a constant meter-in with Δp of 5 bar and by setting the value of flow start at 20% of the reference signal.

NOTE: for spools with overlap jump (Z), please refer to the characteristic curves of spools C type, considering that the starting flow rate value is approx. 150 mV.

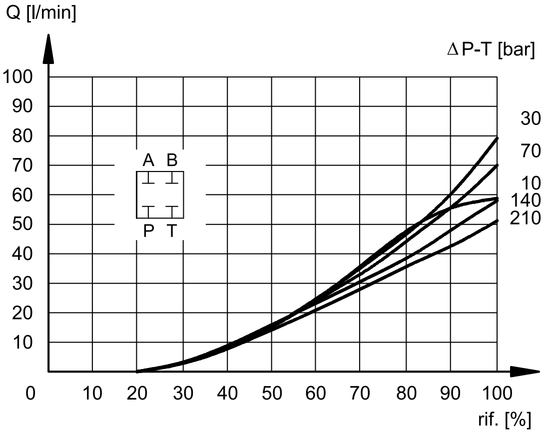


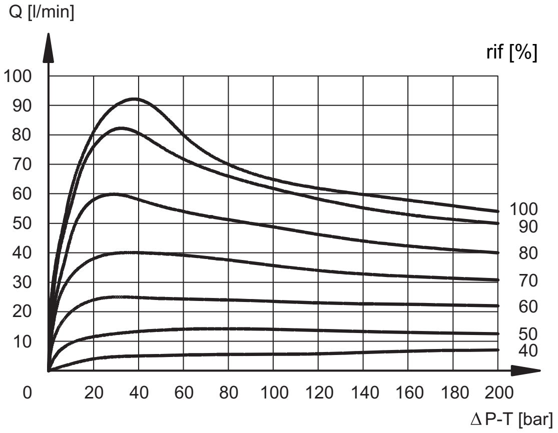
SPOOL TYPE C30



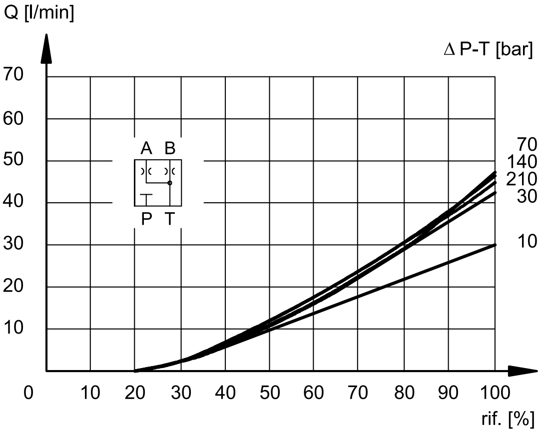


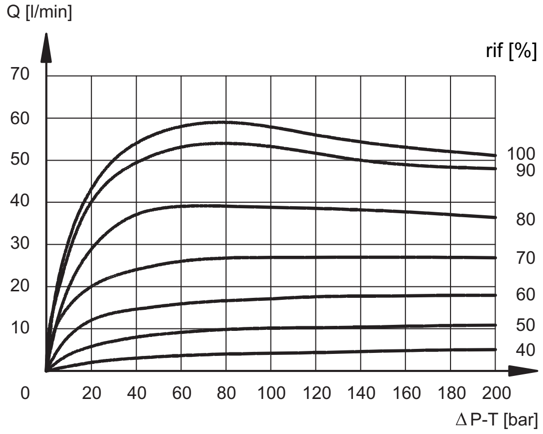
SPOOL TYPE C60



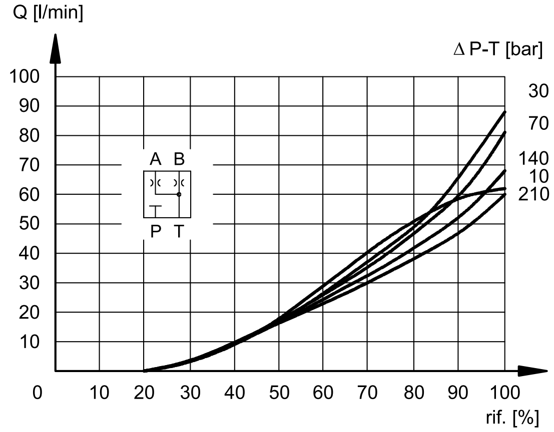


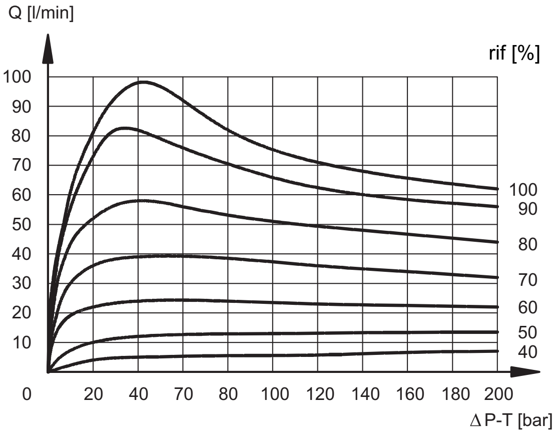
SPOOL TYPE A30





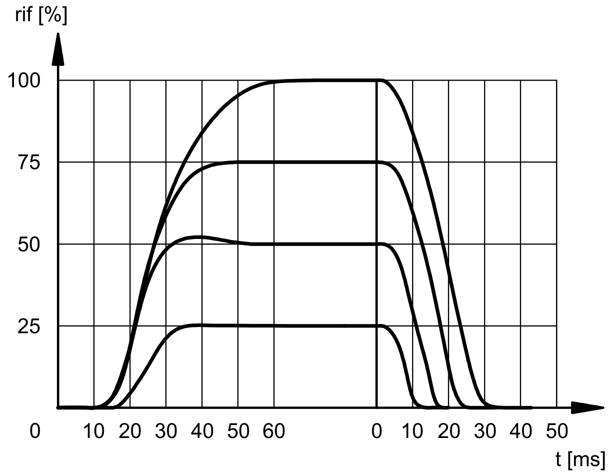
SPOOL TYPE A60





7 - RESPONSE TIMES

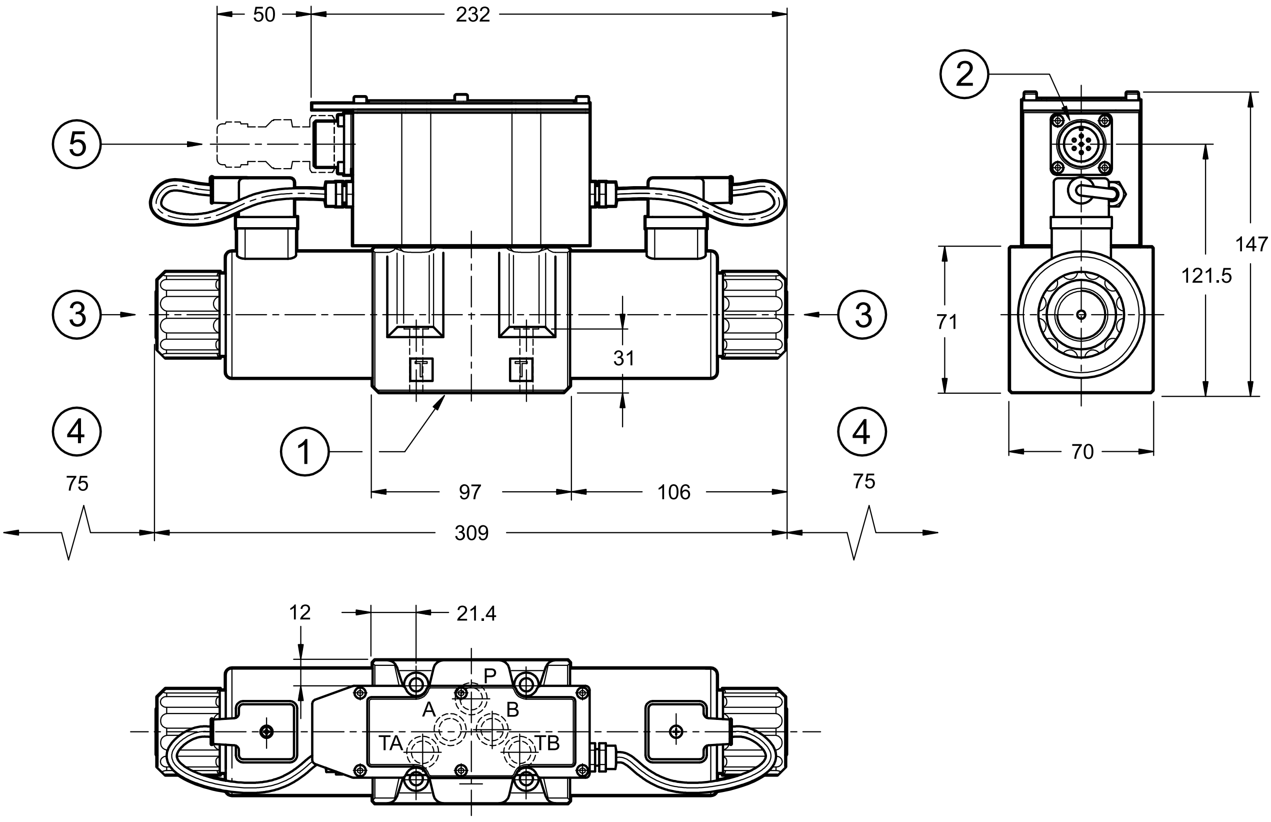
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)



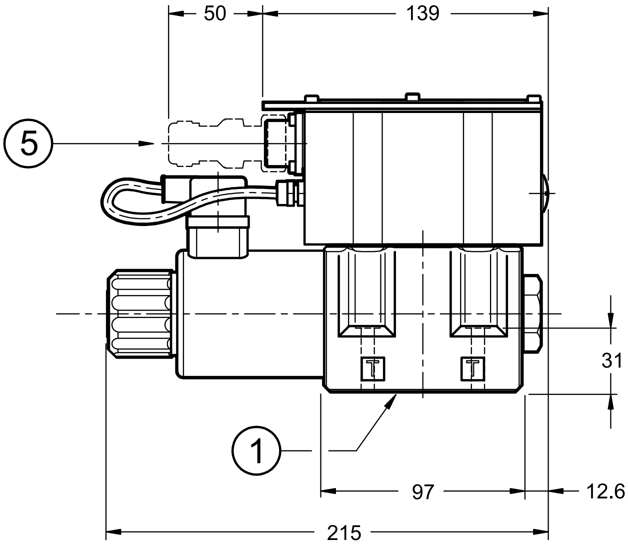
8 - OVERALL AND MOUNTING DIMENSIONS

DSE5G-A*
DSE5G-C*
DSE5G-Z*

dimensions in mm



DSE5G-A* SA
DSE5G-C* SA



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
2	Main connection
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 11

Fastening bolts: 4 bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

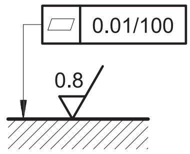
10 - INSTALLATION

DSE5G valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



11 - ACCESSORIES

(to be ordered separately)

11.1 Mating connector

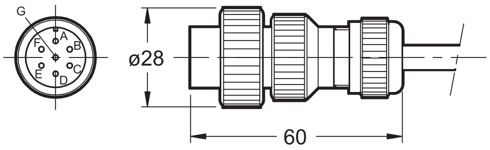
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10**   code **3890000003**



11.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

11.3 - Kit for start-up LINPC-USB

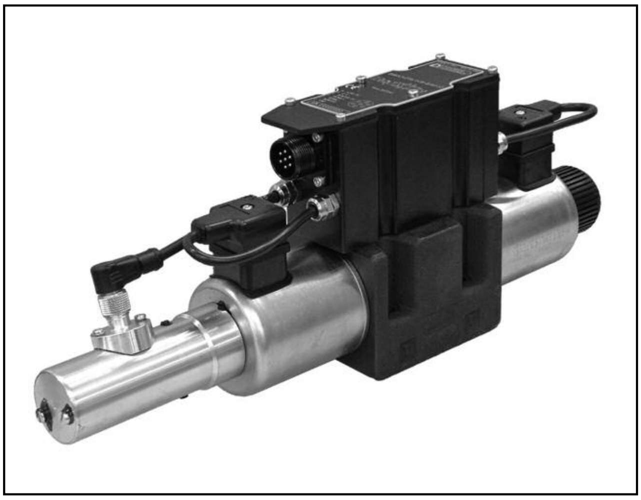
Device for service start-up and diagnostic, see catalogue 89850.

12 - SUBPLATES

(see catalogue 51 000)

PMD4-AI4G rear ports 3/4” BSP
PMD4-AL4G side ports 1/2” BSP

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSE5J

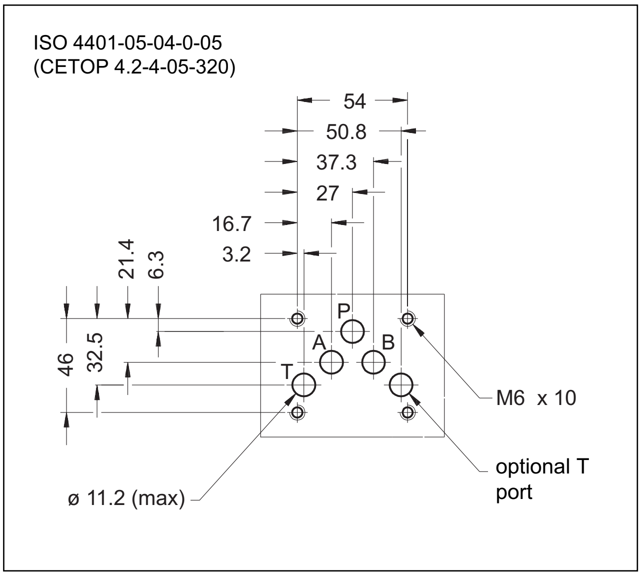
DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL FEEDBACK AND INTEGRATED ELECTRONICS

SERIES 30

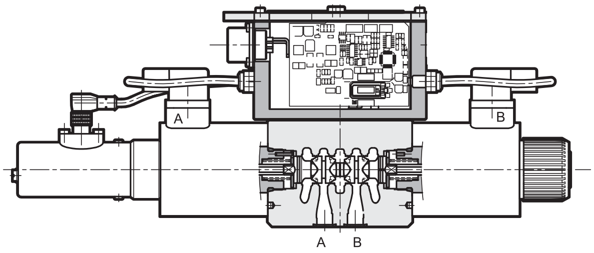
SUBPLATE MOUNTING
ISO 4401-05

p max **320** bar
Q max **180** l/min

MOUNTING INTERFACE



OPERATING PRINCIPLE



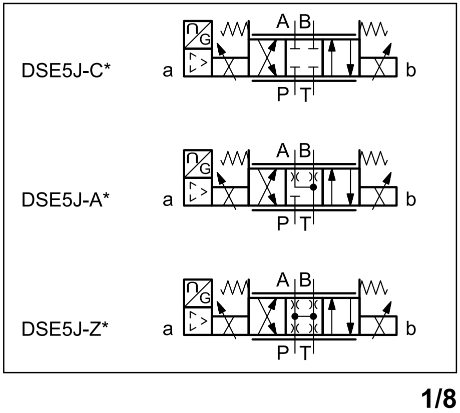
- The DSE5J is a direct operated directional valve with electric proportional control, on-board electronics and feedback, with mounting interface in compliance with ISO 4401 standards.
- It is used to control the direction and the speed of hydraulic actuators.
- Transducer and digital card allow a fine control of the positioning of the cursor, reducing hysteresis and response time and optimizing the performance of the valve.
- The valves are available with command signal in voltage or current and on board electronics with internal enable, external enable or 0V monitor on pin C.
- The monitoring of the spool position is available on pin F.
- The valve is easy to install. The driver directly manages digital settings (see par. 6). In the event of special applications, you can customize the settings using the optional kit (see par. 11).

PERFORMANCES

(Obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

Max operating pressure: - P - A - B ports - T port	bar	320 210
Nominal flow with Δp 10 bar P-T	l/min	50 - 75
Response times	see paragraph 7	
Hysteresis	% of Q max	< 0,2%
Repeatability	% of Q max	< ± 0,1%
Threshold		< 0,1%
Valve reproducibility		≤ 5%
Electrical characteristics, IP	see paragraph 3	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 18/16/13	
Recommended viscosity	cSt	25
Mass: single solenoid valve double solenoid valve	kg	5,6 7,1

HYDRAULIC SYMBOLS (typical)



DSE5J

SERIES 30

1 - IDENTIFICATION CODE

D	S	E	5	J	-					/	30		-		K11	

Direct operated directional control valve (DS)

Electric proportional control (E)

Size ISO 4401-05 (5)

Digital integrated electronics for valves with feedback (J)

Spool type:
C = closed centres
A = open centres
Z = zero overlap

Nominal flow rate of the spool (see par. 2)

FS = Fail safe option. (omit if not required).

Solenoid position (omit for 2 solenoids configuration):
SA = 1 solenoid on side A

Series N. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA

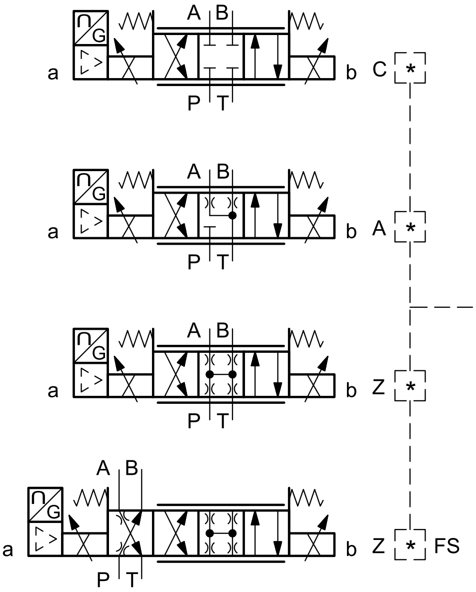
Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

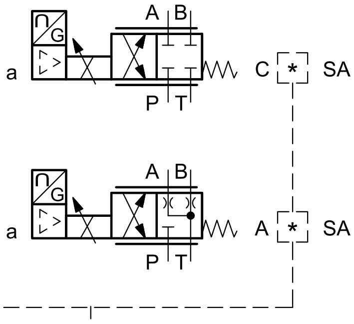
2 - CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids :
3 positions with spring centering



Configuration 1 solenoid on side A “**SA**”:
2 positions (central + external) with spring centering



*	Controlled flow with Δp 10 bar P-T
50	50 l/min
75	75 l/min
70/35	70 (P-A) / 35 (P-B) l/min

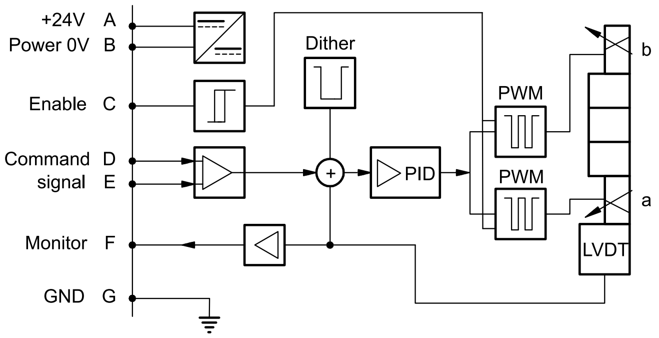
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

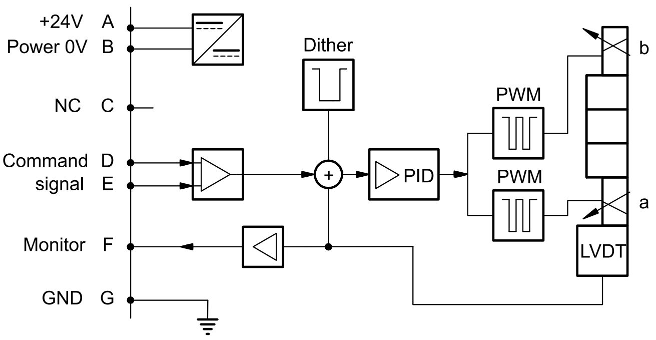
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	40
Maximum solenoid current	A	2.8
Fuse protection, external		3A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

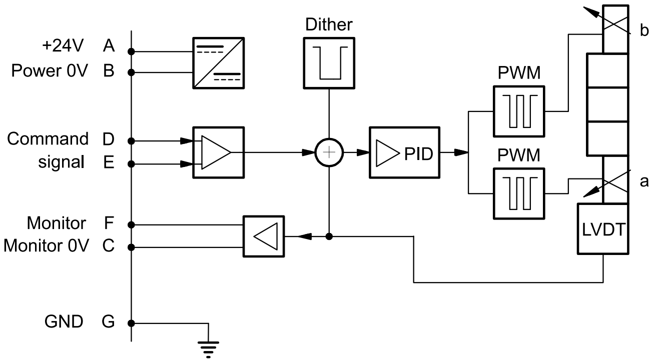
VERSION **A** - External Enable



VERSION **B** - Internal Enable

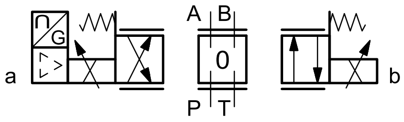


VERSION **C** - 0V Monitor

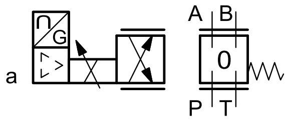


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

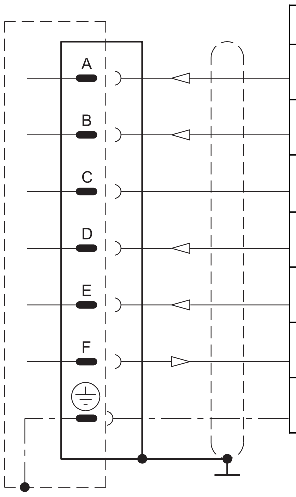
The reference signal is between -10V and +10V on double solenoid valve, and 0…10V on single solenoid valves SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



COMMAND	**+10V**	**0V**
MONITOR	**+10V**	**0V**

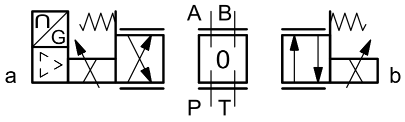


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

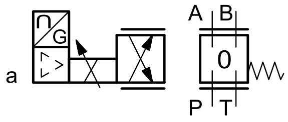
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

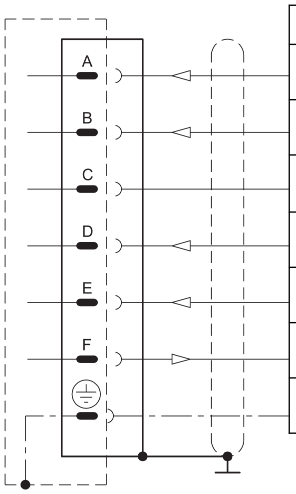
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



COMMAND	**20 mA**	**4 mA**
MONITOR	**20 mA**	**4 mA**

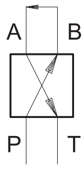


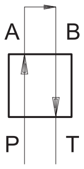
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

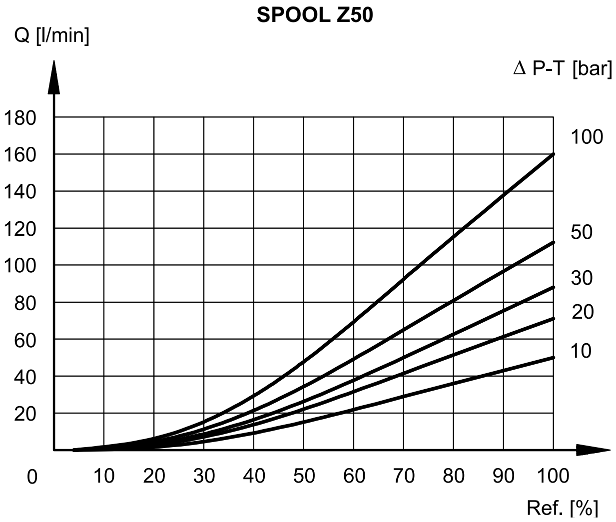
6 - CHARACTERISTIC CURVES

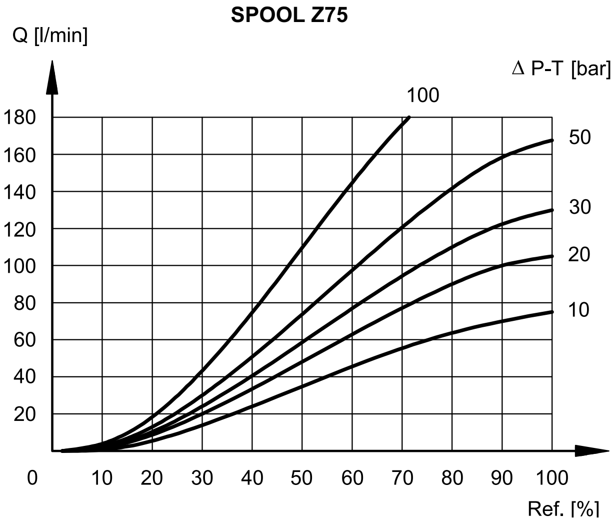
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

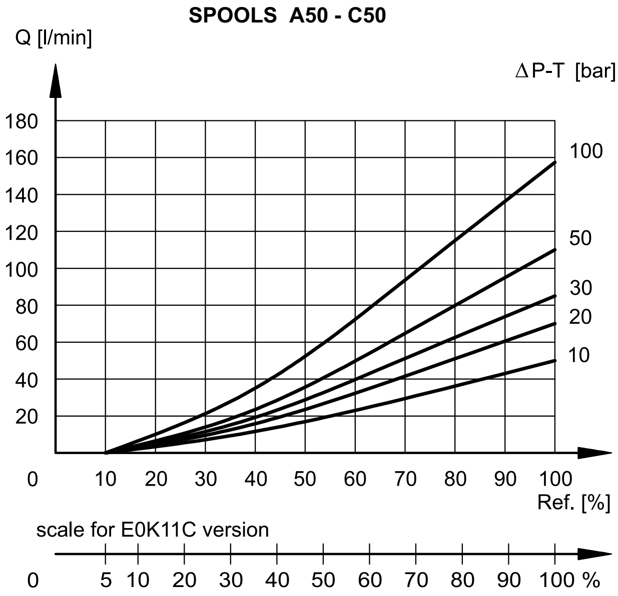
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

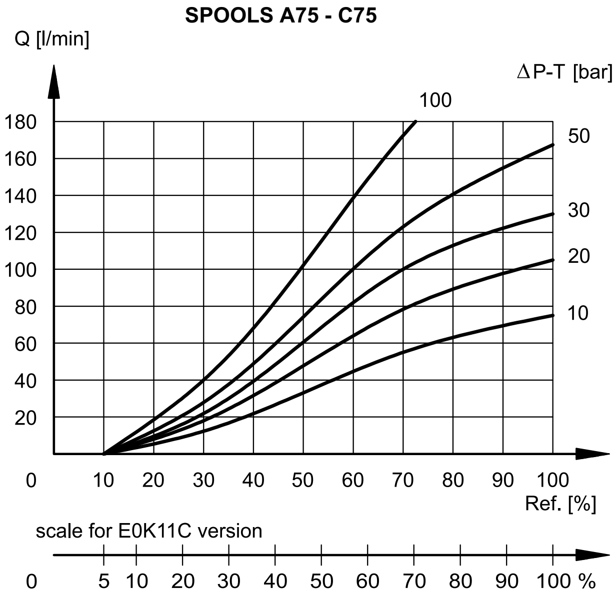




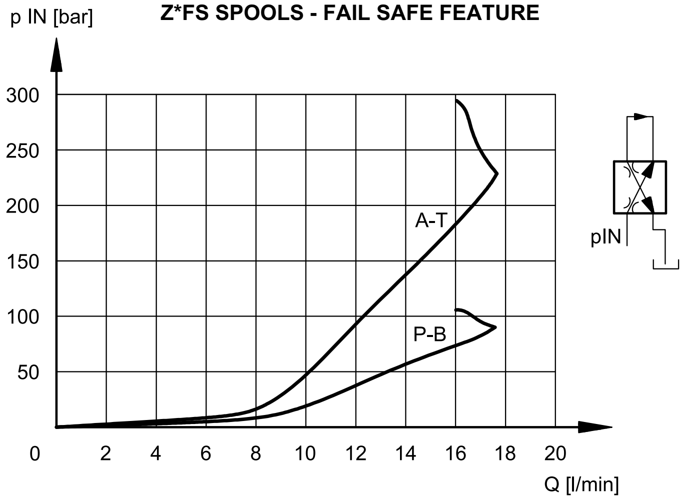








Z*FS SPOOLS - FAIL SAFE FEATURE

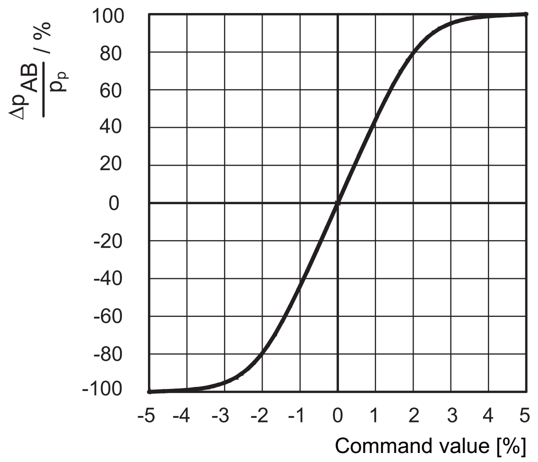


Flow P→B / A→T with valve in fail safe position, depending on the incoming pressure.

When a power failure (enabling OFF) occurs, the valve moves in 'fail safe' position by maintaining a minimum flow that allows the actuator to return slowly to a safety position.

During the black-out the centering springs retain the spool in fail safe-position.

Z SPOOLS - PRESSURE GAIN



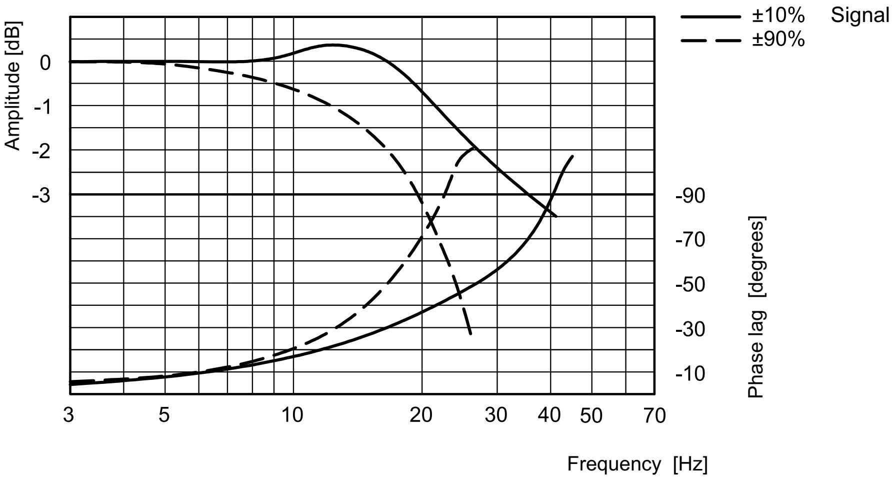
The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

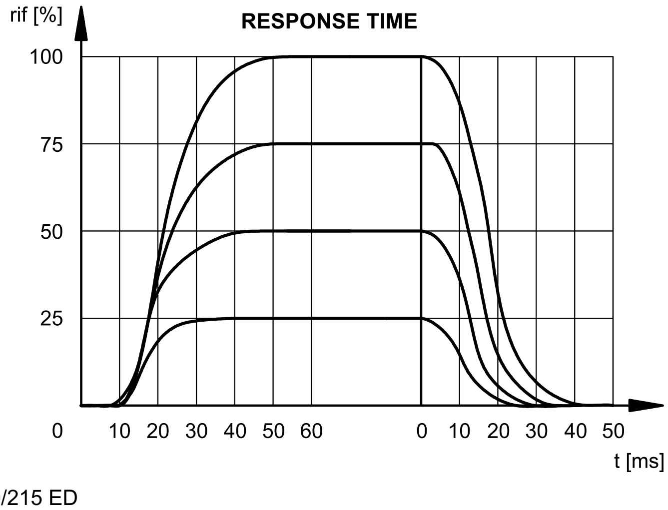
In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C 140 bar Δp P→T)

FREQUENCY RESPONSE (SPOOL Z - 4/3 valve)

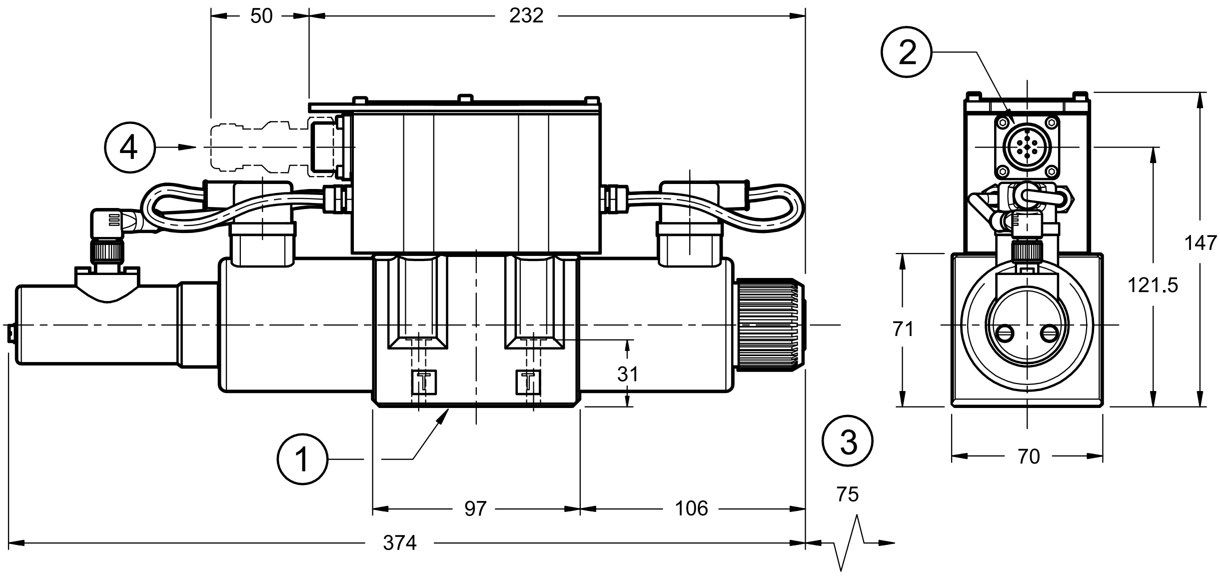


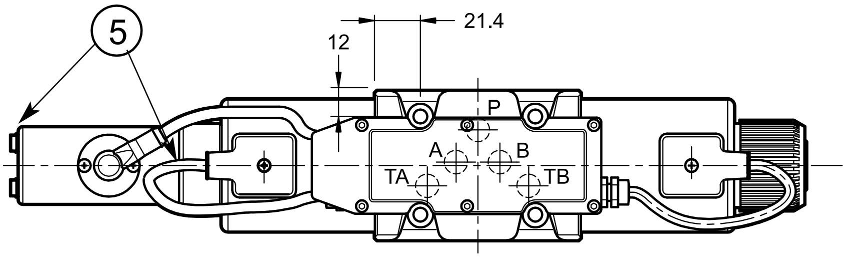


8 - OVERALL AND MOUNTING DIMENSIONS

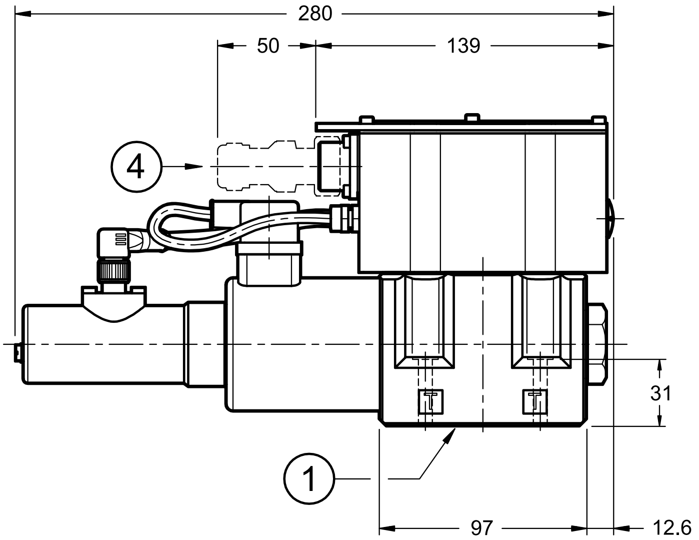
dimensions in mm

**DSE5J-A*
DSE5J-C*
DSE5J-Z***





**DSE5J-A* SA
DSE5J-C* SA**



Fastening bolts: 4 bolts M6x40 - ISO 4762
Torque: 8 Nm (A8.8)
Threads of mounting holes: M6x10

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) 90 Shore
2	Main connection
3	Coil removal space (solenoid B only)
4	Mating connector. **To be ordered separately.** See paragraph 11
5	Adjustment sealing performed at factory. Do not disassemble the transducer.

9 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

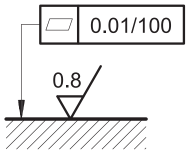
10 - INSTALLATION

DSE5J valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



11 - ACCESSORIES

(to be ordered separately)

11.1 Mating connector

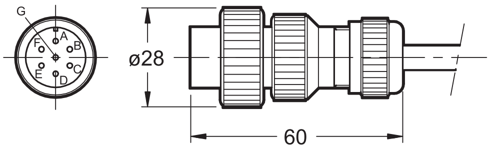
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic can provide a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



11.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

11.3 - Kit for start-up LINPC-USB

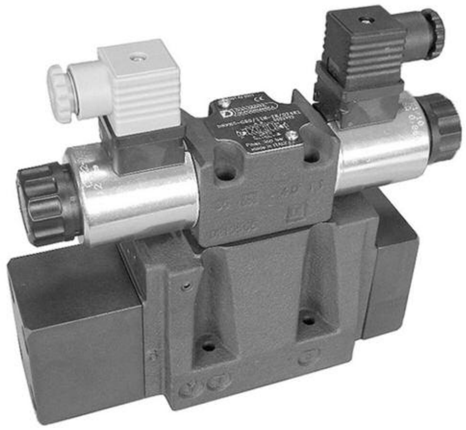
Device for service start-up and diagnostic, see catalogue 89850.

12 - SUBPLATES

(see catalogue 51 000)

PMD4-AI4G rear ports 3/4” BSP
PMD4-AL4G side ports 1/2” BSP

DUPLOMATIC OLEODINAMICA
DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSPE*

PILOT OPERATED DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

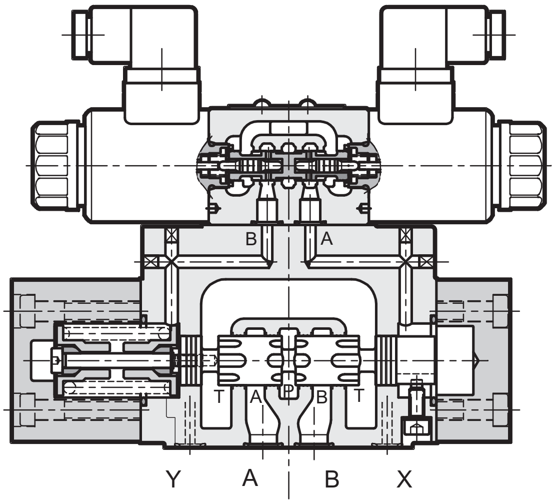
SERIES 11

DSPE5	**CETOP P05**
DSPE5R	**ISO 4401-05** (CETOP R05)
DSPE7	**ISO 4401-07** (CETOP 07)
DSPE8	**ISO 4401-08** (CETOP 08)
DSPE10	**ISO 4401-10** (CETOP 10)

p max (see performances table)

Q max (see performances table)

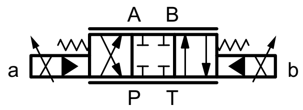
OPERATING PRINCIPLE



- The DSPE* are pilot operated directional control valves with electric proportional control and mounting interface in compliance with ISO 4401 standards.
- The valve opening (and hence the flow rate) can be modulated continuously in proportion to the current supplied to the proportional solenoids of the pilot valve.
- They can be controlled directly by a current control supply unit or by means of the relative electronic control units to exploit valve performance to the full (see par. 15).
- They are available in CETOP P05, ISO 4401-05 (CETOP R05), ISO 4401-07 (CETOP 07), ISO 4401-08 (CETOP 08) and ISO 4401-10 (CETOP 10) sizes. Every size can be supplied with different controlled flow rates, up to 1600 l/min.

PERFORMANCES (obtained with viscosity of 36 cSt at 50°C with electronic control unit)		DSPE5 DSPE5R	DSPE7	DSPE8	DSPE10
Max operating: - P - A - B ports - T port	bar	350 see paragraph 6			
Controlled flow rate with Δp 10 bar P-T	l/min	see paragraph 2			
Step response		see paragraph 8			
Hysteresis (with PWM 100 Hz)	% Q_{max}	< 4%			
Repeatability	% Q_{max}	< ±2%			
Electrical characteristics		see paragraph 7			
Ambient temperature range	°C	-20 / +60			
Fluid temperature range	°C	-20 / +80			
Fluid viscosity range	cSt	10 ÷ 400			
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13				
Recommended viscosity	cSt	25			
Mass: single solenoid valve double solenoid valve	kg	7,1 7,5	9,3 9,7	15,6 16	52,5 53

HYDRAULIC SYMBOL (typical)



1 - IDENTIFICATION CODE

D	S	P	E		-				/	11		-			/		K1	/	

Pilot operated directional control valve

Electric proportional control

Nominal size:
5 = CETOP P05 (**NOTE**)
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)
10 = ISO 4401-10 (CETOP 10)

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centres
RA = regenerative open centres

Spool nominal flow rate (see table par. 2)

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

NOTE: This version is interchangeable with the model E4E Duplomatic

Series No. (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adj. pressure reducing valve (see par. 6)

Drainage: **I** = internal
E = external

D12 = voltage 12V DC
D24 = voltage 24V DC

Coil electrical connection: for connector type DIN 43650

Manual override: (see par. 15)

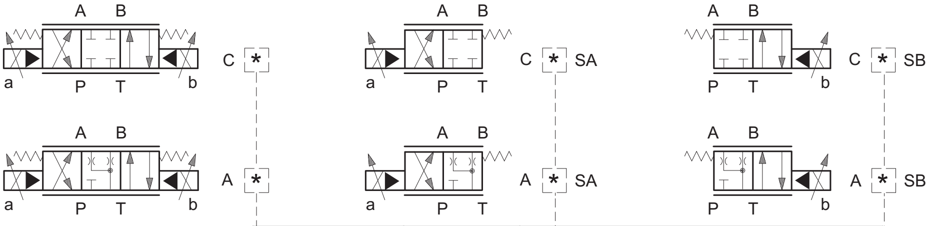
2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

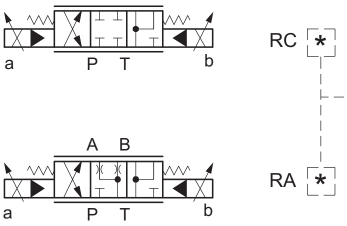
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration "**SA**":
2 positions (central + external)
with spring centering

1 solenoid for parallel configuration "**SB**":
2 positions (central + external)
with spring centering



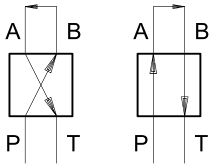
valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE5 DSPE5R	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min



valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE7	**150/75**	150 (P-A) / 75 (B-T) l/min
DSPE8	**300/150**	300 (P-A) / 150 (B-T) l/min
DSPE10	**500/250**	500 (P-A) / 250 (B-T) l/min

3 - CHARACTERISTIC CURVES

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

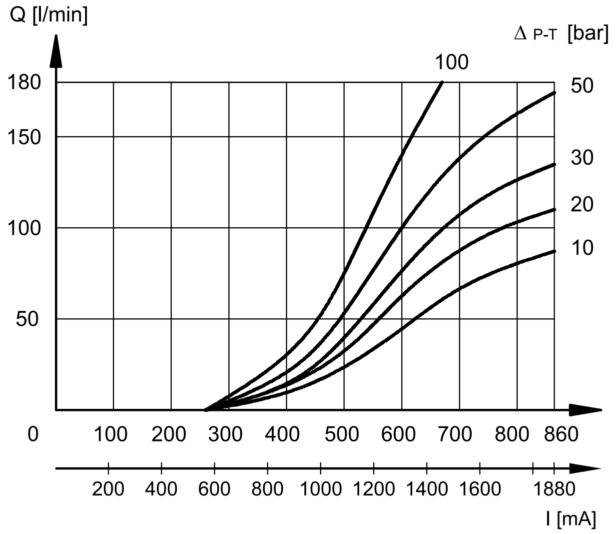


Typical flow rate control curves at constant Δp according to current supply to the solenoid (D24 version, 860 mA max current), measured for the available spool types.

The reference Δp values are measured between valve ports P and T.

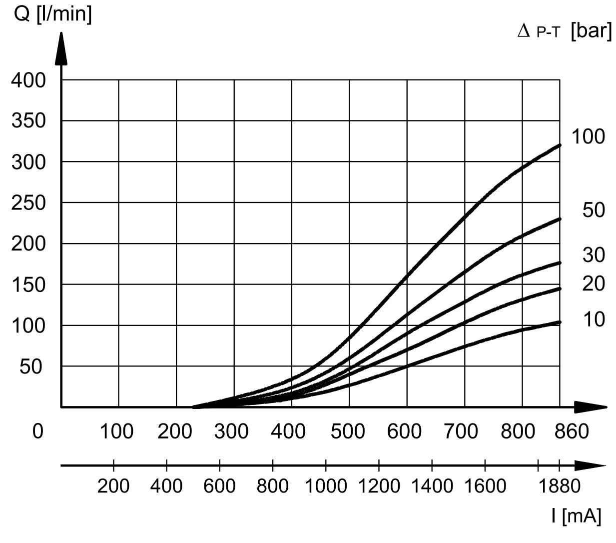
3.1 - Characteristic curves DSPE5 e DSPE5R

SPOOL C80 - A80

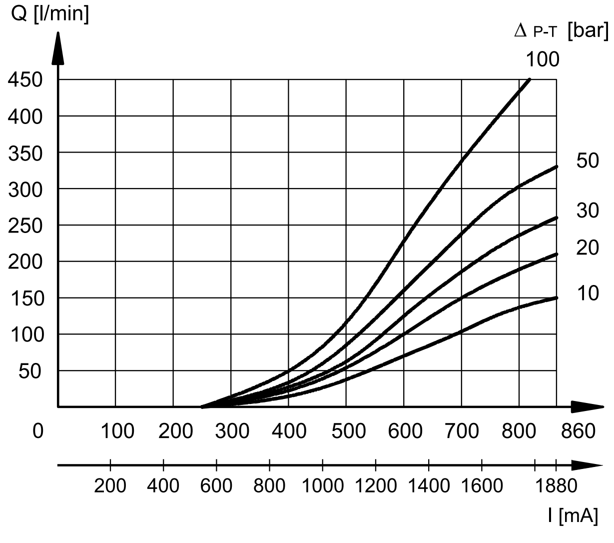


3.2 - Characteristic curves DSPE7

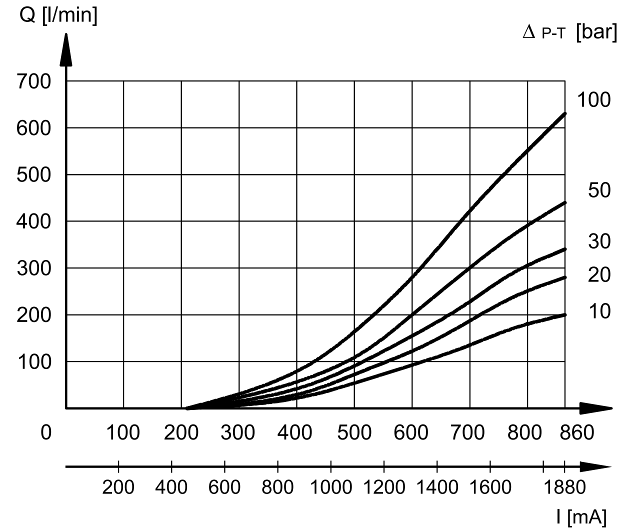
SPOOL C100 - A100

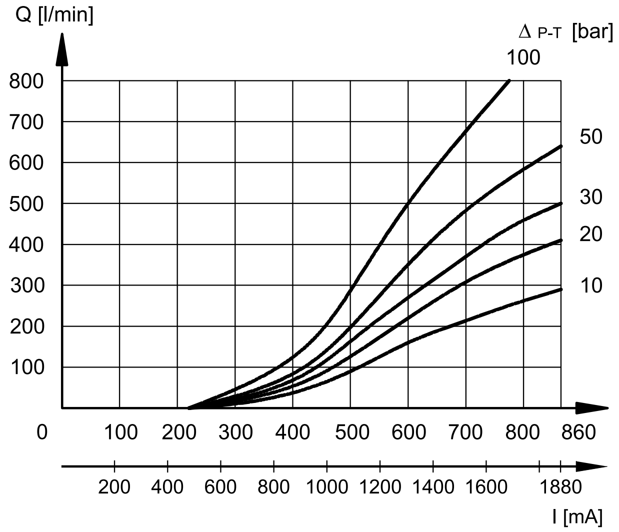


SPOOL C150 - A150

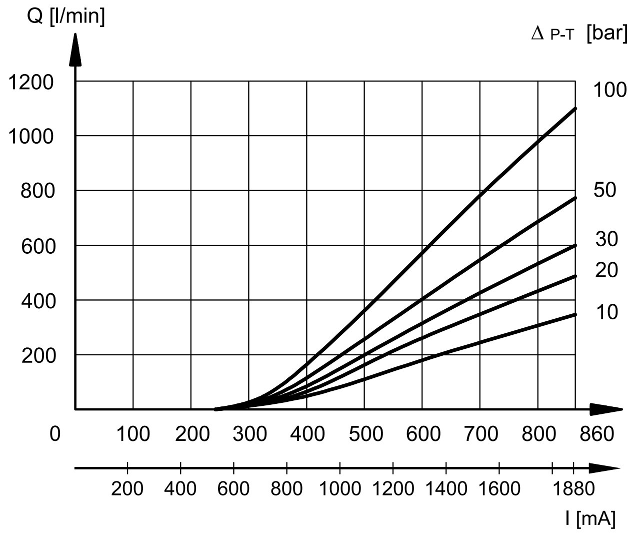


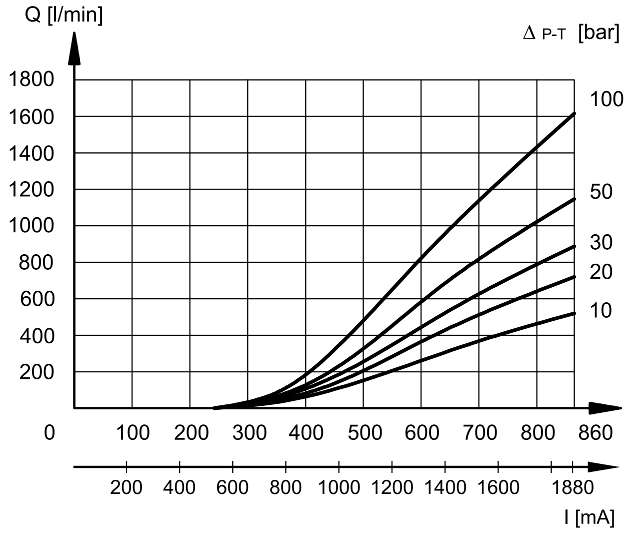
3.3 - Characteristic curves DSPE8


SPOOL C200 - A200


SPOOL C300 - A300

3.4 - Characteristic curves DSPE10


SPOOL C350 - A350


SPOOL C500 - A500

4 - HYDRAULIC CHARACTERISTICS

(values measured with viscosity of 36 cSt at 50°C with electronic control unit)

		DSPE5 DSPER5	DSPE7	DSPE8	DSPE10
Max flow rate	l/min	180	450	800	1600
Piloting flow requested with operation 0 →100%	l/min	3	5	9	13
Piloting volume requested with operation 0 →100%	cm^3	1,7	3,2	9,1	21,6

5 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

6 - PILOTING AND DRAINAGE

The DSPE valves are available with piloting and drainage, both internal and external.

The version with external drainage allows a higher backpressure on the unloading.

VALVE TYPE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

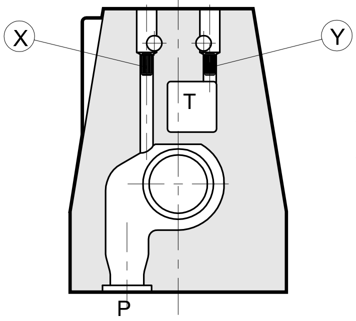
Pressure	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	–	10
Pressure on T port with external drain	–	250

NOTE: the version with external pilot with reduced pressure must be used when higher pressures are needed.

Otherwise the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered.

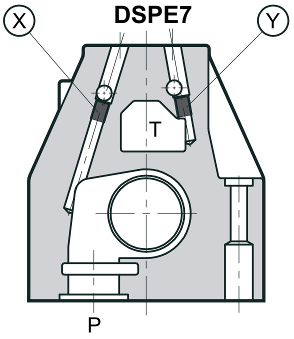
Add the letter Z to the identification code to order this option (see par. 1).

DSPE5 and DSPER5



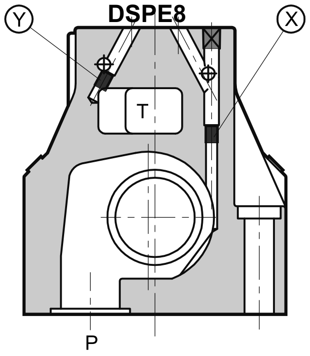
X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DSPE7



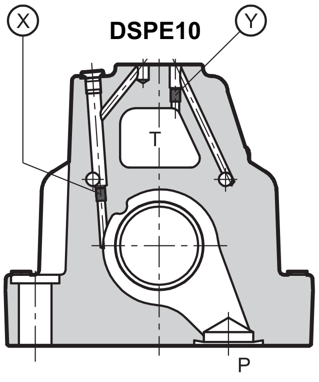
X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DSPE8



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

DSPE10



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

7 - ELECTRICAL CHARACTERISTICS

Proportional solenoid

The proportional solenoid comprises two parts: tube and coil.

The tube, screwed to the valve body, contains the armature which is designed to maintain friction to a minimum thereby reducing hysteresis.

The coil is mounted on the tube secured by means of a lock nut.
It can be rotated through 360° depending on installation clearances.

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (at 20°C)	Ω	3.66	17.6
NOMINAL CURRENT	A	1.88	0.86
DUTY CYCLE		100%	
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2004/108/CE		
CLASS OF PROTECTION: atmospheric agents (CEI EN 60529) coil insulation (VDE 0580) Impregnation	IP 65 class H class F		

8 - STEP RESPONSE

(measured with mineral oil with viscosity of 36 cSt at 50°C with electronic control unit)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table shows the typical step response tested with static pressure 100 bar.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
DSPE5 and DSPE5R	50	40
DSPE7	80	50
DSPE8	100	70
DSPE10	200	120

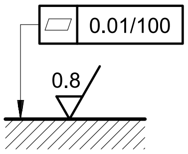
9 - INSTALLATION

The DSPE* valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

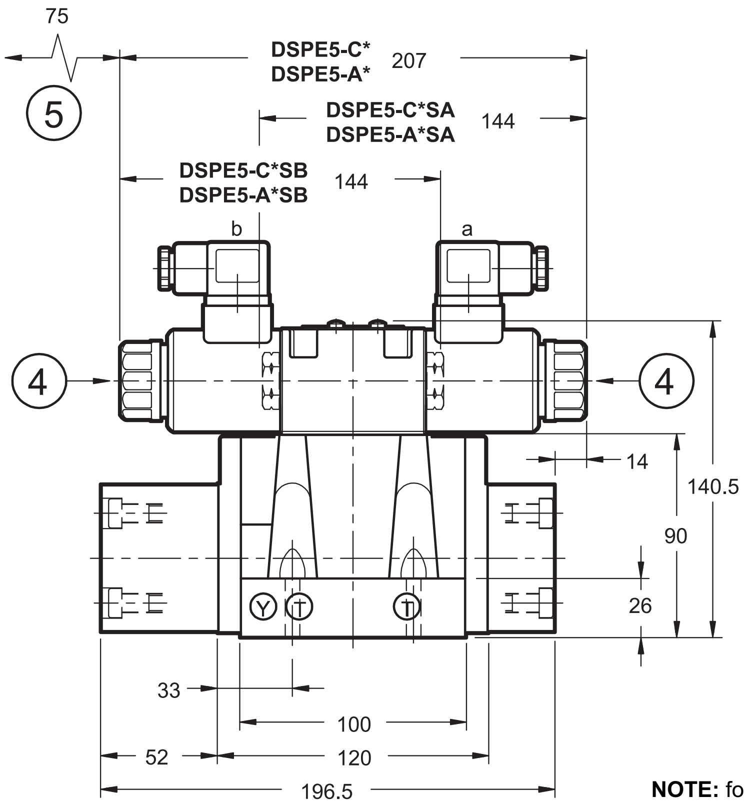
Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

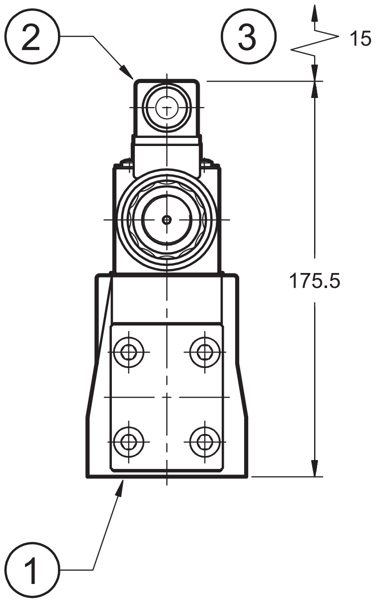
Surface finishing



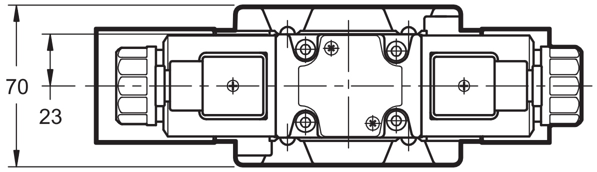
10 - OVERALL AND MOUNTING DIMENSIONS DSPE5 AND DSPE5R

dimensions in mm

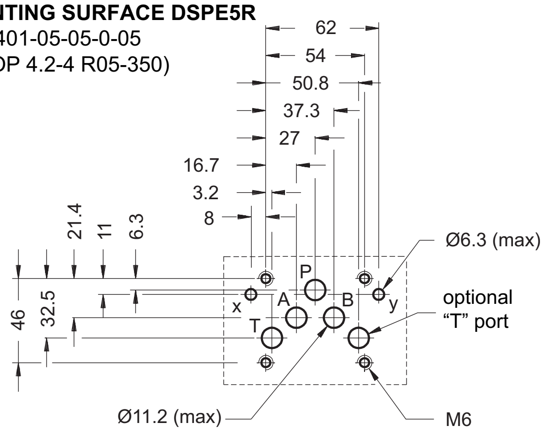




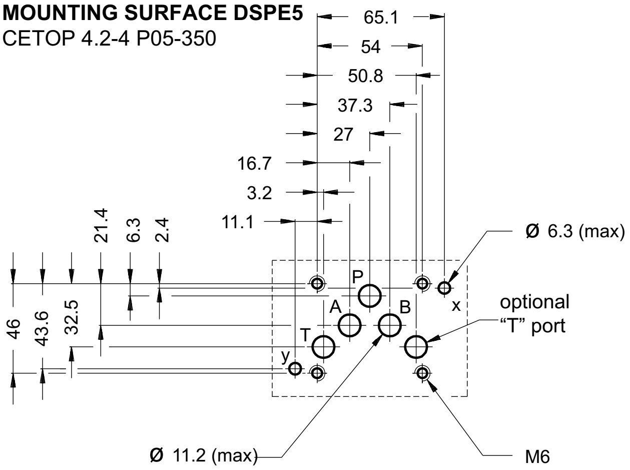
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.



MOUNTING SURFACE DSPE5R
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



MOUNTING SURFACE DSPE5
CETOP 4.2-4 P05-350

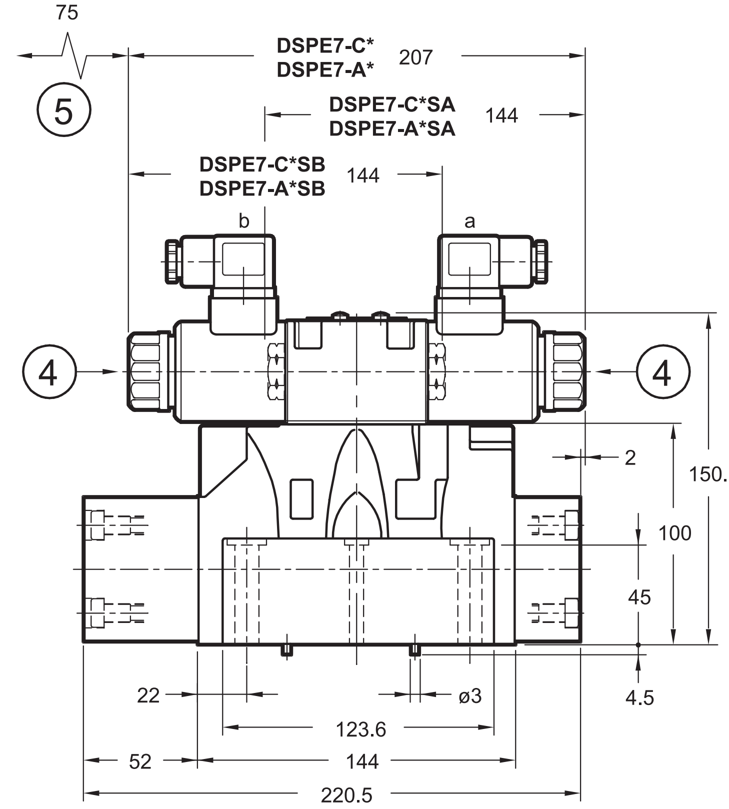


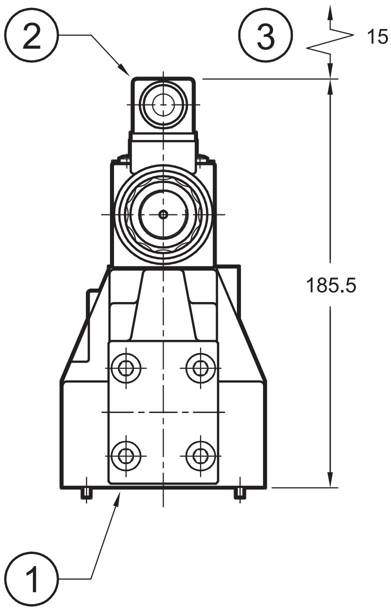
Valve fastening: N. 4 SHC screws M6x35 - ISO 4762
Tightening torque: 8 Nm (A 8.8 bolts)
Thread of mounting holes: M6x10
Sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 2 OR type 2037 (9.25x1.78) - 90 Shore

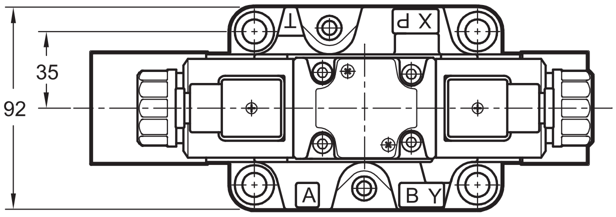
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

11 - OVERALL AND MOUNTING DIMENSIONS DSPE7

dimensions in mm

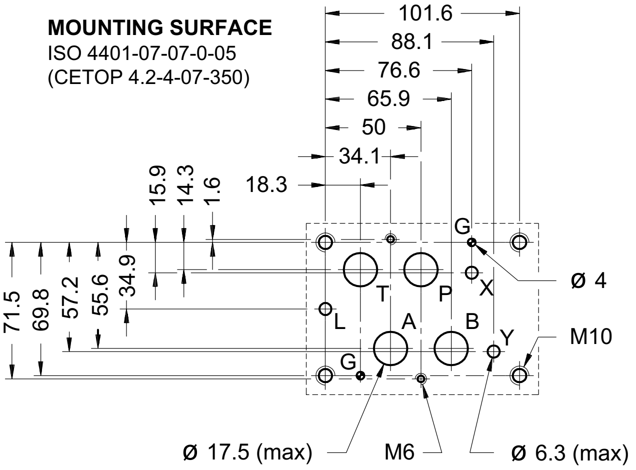






NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.

MOUNTING SURFACE
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)

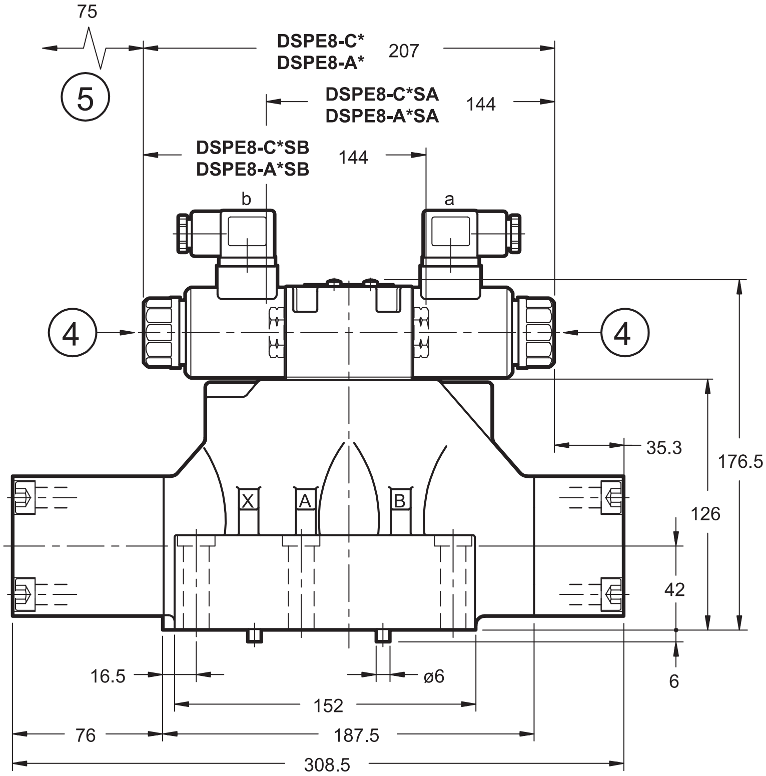


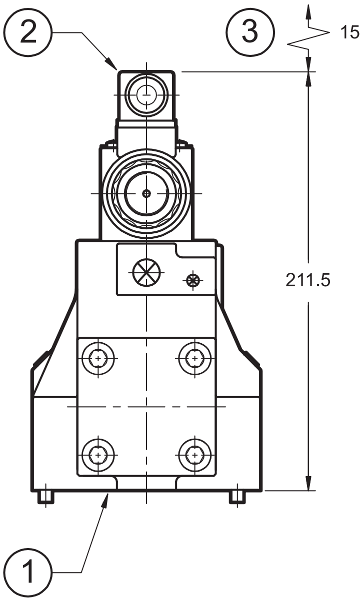
Single valve fastening:	N. 4 TCEI M10x60 bolts - ISO 4762 N. 2 TCEI M6x60 bolts - ISO 4762
Tightening torque M10x60: 40 Nm (A 8.8 bolts) M6x60: 8 Nm (A 8.8 bolts)	
Thread of mounting holes:	M6x18; M10x18
Sealing rings:	N. 4 OR type 130 (22.22x2.62) - 90 Shore N. 2 OR type 2043 (10.82x1.78) - 90 Shore

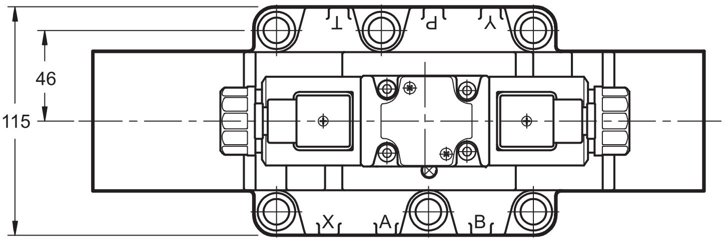
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

12 - OVERALL AND MOUNTING DIMENSIONS DSPE8

dimensions in mm

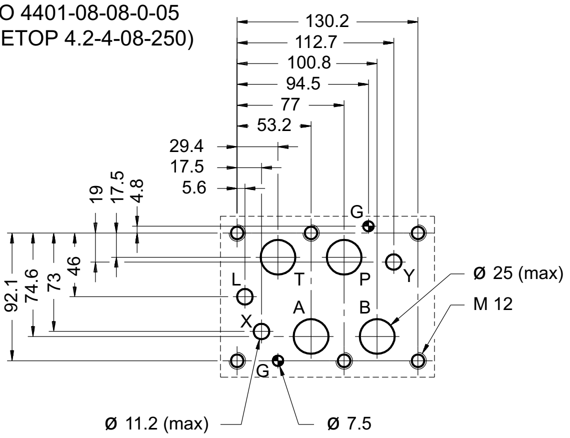






NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.

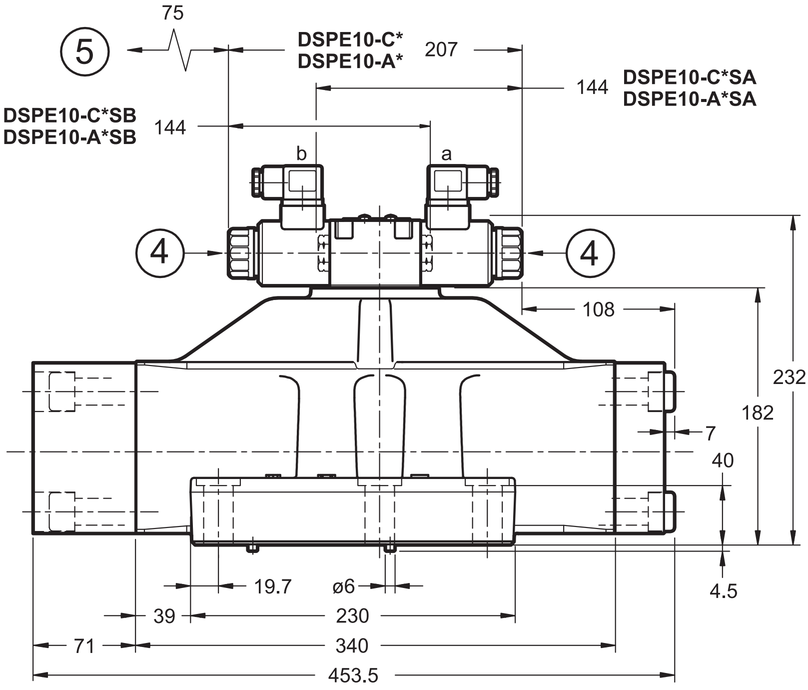
MOUNTING SURFACE
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-250)

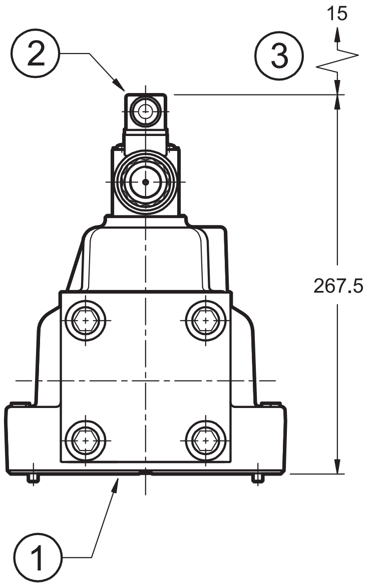


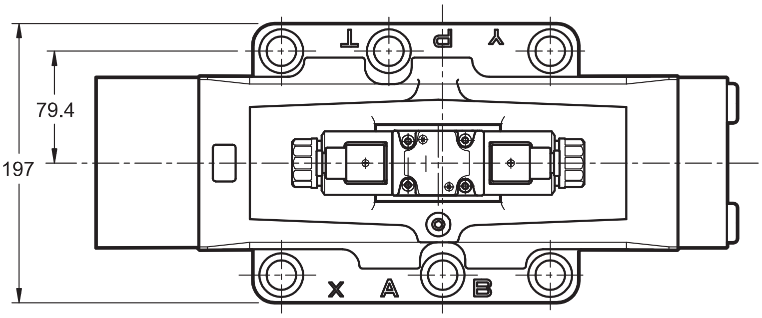
Valve fastening: N. 6 TCEI M12x60 bolts - ISO 4762
Tightening torque: 69 Nm (A 8.8 bolts)
Thread of mounting holes: M12x20
Sealing rings: N. 4 OR type 3118 (29.82x2.62) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore

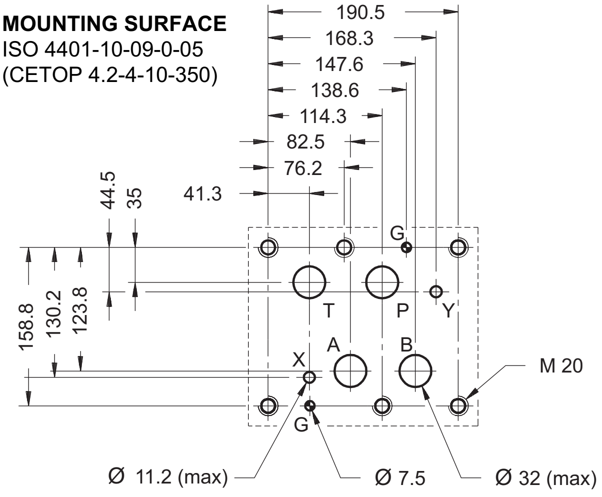
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

13 - OVERALL AND MOUNTING DIMENSIONS DSPE10









MOUNTING SURFACE
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)

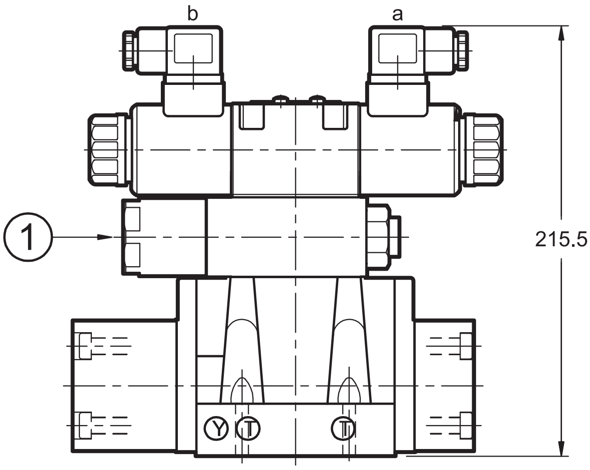
NOTE: for overall dimensions with Z option (fixed adjustment pressure reducing valve) see par. 14.

Valve fastening: N. 6 TCEI M12x70 bolts - ISO 4762
Tightening torque: 330 Nm (A 8.8 bolts)
Thread of mounting holes: M20x40
Sealing rings: N. 4 OR type 4150 (37.59x3.53) - 90 Shore N: 2 OR type 3081 (20.24x2.62) - 90 Shore

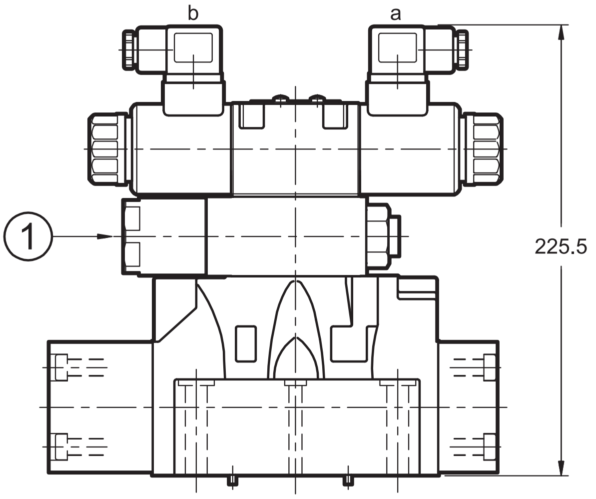
1	Mounting surface with sealing rings
2	DIN 43650 electrical connector
3	Connector removal space
4	Standard manual override integrated inside the solenoid tube (included in the supply - see par. 15).
5	Coil removal space

14 - OVERALL AND MOUNTING DIMENSIONS DSPE*-*/11*-Z*/*

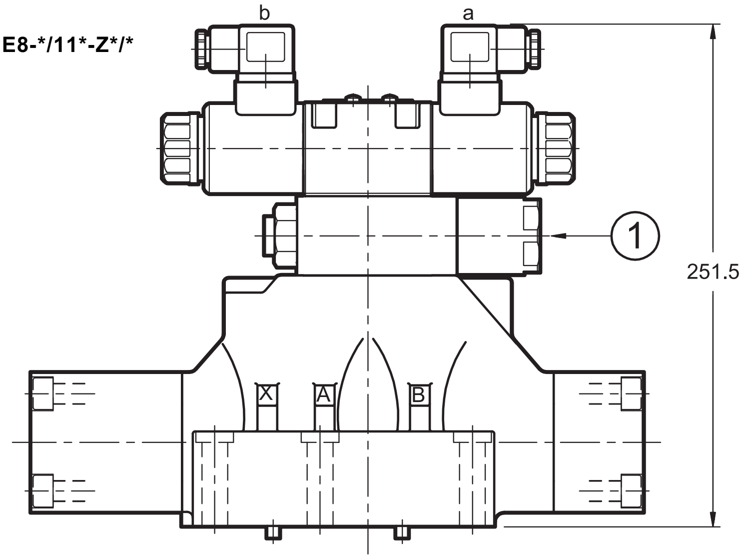
DSPE5-*/11*-Z*/*



DSPE7-*/11*-Z*/*



DSPE8-*/11*-Z*/*

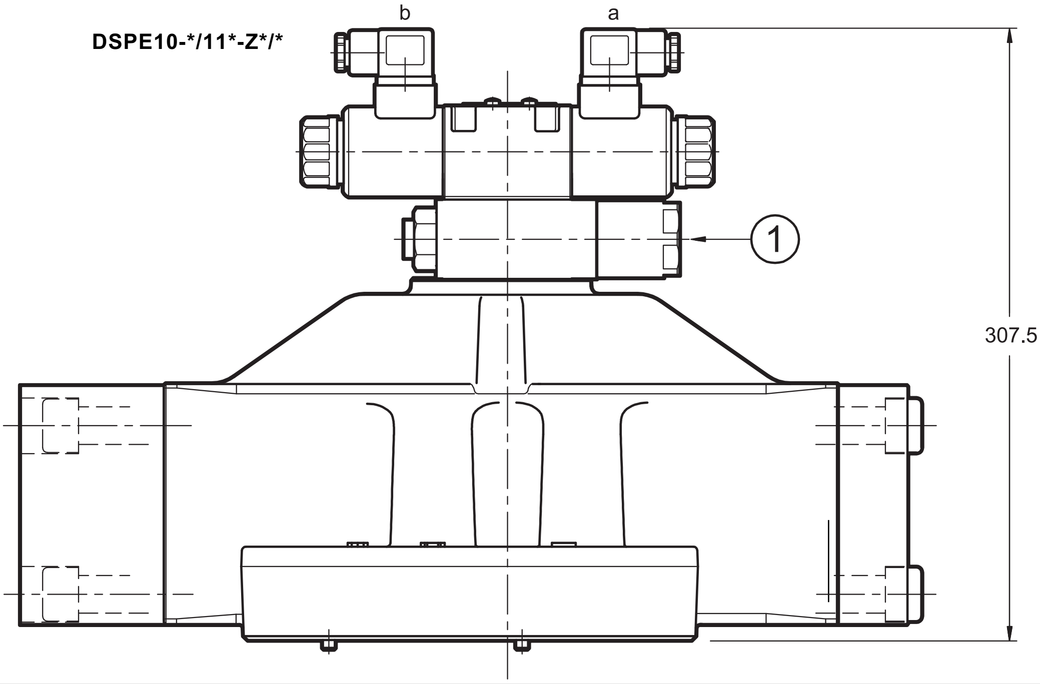


NOTE: for missing overall dimensions and characteristics see par. 10 - 11 - 12 - 13

dimensions in mm

1	30 bar fixed adjustment pressure reducing valve

DSPE10-*/11*-Z*/*



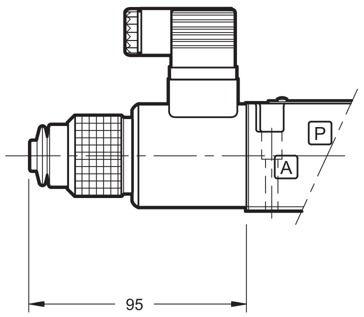
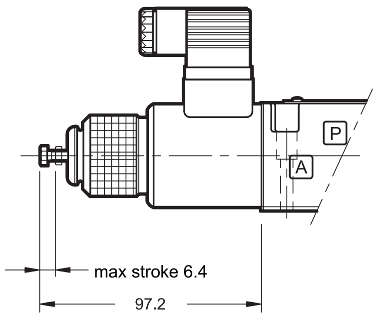
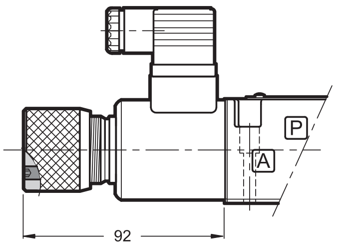
15 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

THree different manual override version are available upon request:

- **CM** version, manual override belt protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.

NOTE: The manual override use doesn't allow any proportional regulation; in fact using this kind of override, the main stage spool will open completely and the valve will behave as an on-off valve.

Versione CM	Versione CS	Versione CK
		 Allen key for set screw: 3 mm
Code: 3803210003	Code: 3803210004	Code: 3803210005

16 - ELECTRONIC CONTROL UNITS

DSPE* - * * SA (SB)

EDC-111	for solenoid 24V DC	plug version	see cat.89 120
EDC-141	for solenoid 12V DC		
EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M141	for solenoid 12V DC		

DSPE* - A*   DSPE* - C*

EDM-M211	for solenoid 24V DC	rail mounting DIN EN 50022	see cat. 89 250
EDM-M241	for solenoid 12V DC		

17 - SUBPLATES

(see catalogue 51 000)

		DSPE5	DSPE7	DSPE8	DSPE10
Model with rear ports		PME4-AI5G	PME07-AI6G	-	-
Model with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G	-
Thread of ports:	P - T - A - B X - Y	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1½” BSP 1/4” BSP	-

DUPLOMATIC OLEODINAMICA
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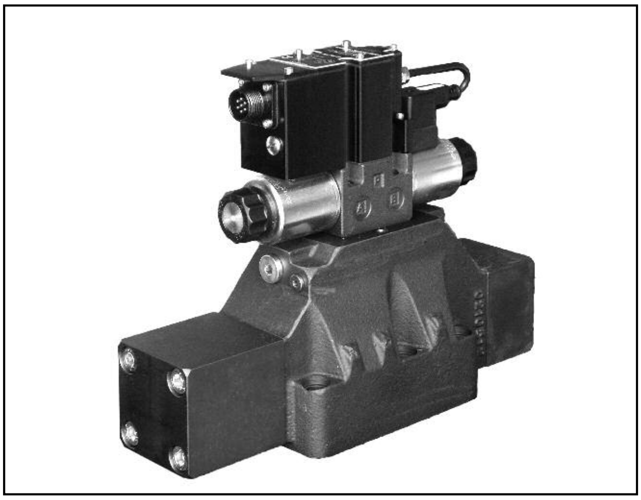
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



DSPE*G

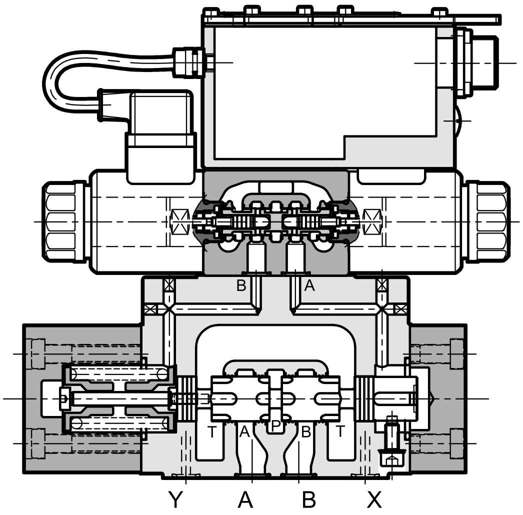
PROPORTIONAL DIRECTIONAL VALVES, PILOT OPERATED WITH INTEGRATED ELECTRONICS

SERIES 30

SUBPLATE MOUNTING

DSPE5R	**CETOP P05**
DSPE5RG	**ISO 4401-05**
DSPE7G	**ISO 4401-07**
DSPE8G	**ISO 4401-08**
DSPE10G	**ISO 4401-10**
DSPE11G	**ISO 4401-10** oversize ports

OPERATING PRINCIPLE



— The DSPE*G are pilot operated directional control valves with electric proportional control and integrated electronics and with mounting interface in compliance with ISO 4401 standards.

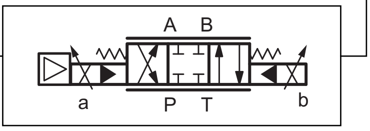
— They are controlled directly by an integrated digital amplifier.

— The valves are available with command signal in voltage or current, and on-board electronics with internal enable, external enable or 0V monitor on pin C.

— A solenoid current monitoring signal is available.

— The valves are easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 19)

HYDRAULIC SYMBOL (typical)

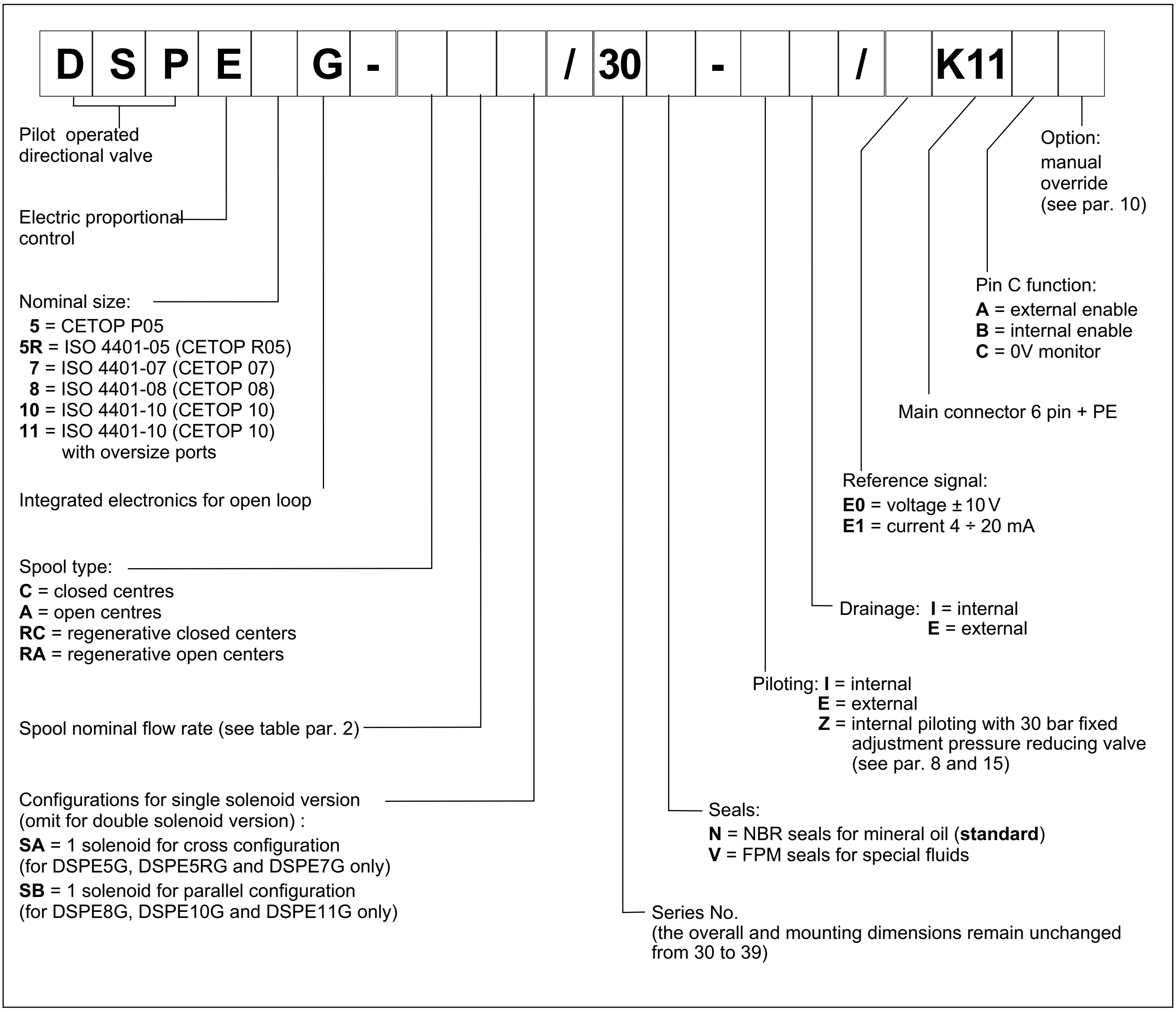


PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

		DSPE5G DSPE5RG	DSPE7G	DSPE8G	DSPE10G	DSPE11G
Max operating pressure: P - A - B ports T port	bar	350 see paragraph 8				
Max flowrate	l/min	180	450	800	1600	2800
Hysteresis	% Q max	< 2 %				
Repeatability	% Q max	< ± 1%				
Electrical characteristics		see paragraph 3				
Ambient temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree		According to ISO 4406:1999 class 18/16/13				
Recommended viscosity	cSt	25				
Mass: single solenoid valve double solenoid valve	kg	7,4 7,9	9,6 10,1	15,9 16,4	52,8 53,3	52,5 53

1 - IDENTIFICATION CODE



D	S	P	E		G	-				/	30		-			/		K11		

Pilot operated directional valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)
10 = ISO 4401-10 (CETOP 10)
11 = ISO 4401-10 (CETOP 10) with oversize ports

Integrated electronics for open loop

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centers
RA = regenerative open centers

Spool nominal flow rate (see table par. 2)

Configurations for single solenoid version (omit for double solenoid version) :
SA = 1 solenoid for cross configuration (for DSPE5G, DSPE5RG and DSPE7G only)
SB = 1 solenoid for parallel configuration (for DSPE8G, DSPE10G and DSPE11G only)

Series No. (the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve (see par. 8 and 15)

Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage ± 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Option: manual override (see par. 10)

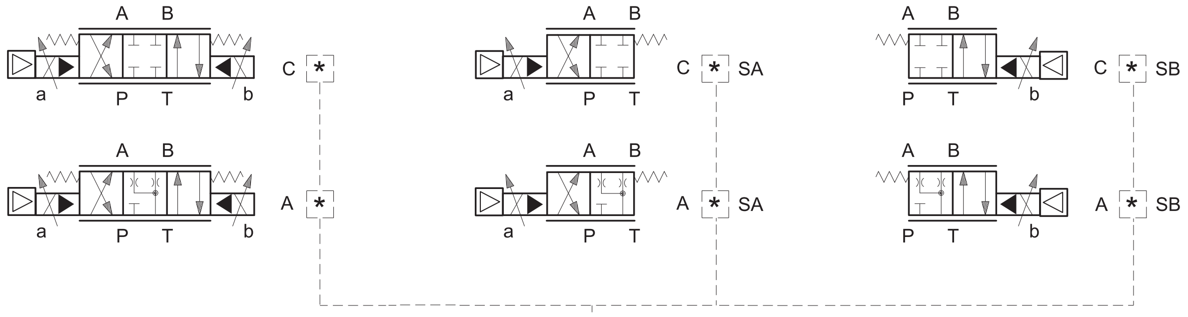
2 - AVAILABLE VERSIONS

The valve configuration depends on the combination of number of proportional solenoids, spool type, rated flow.

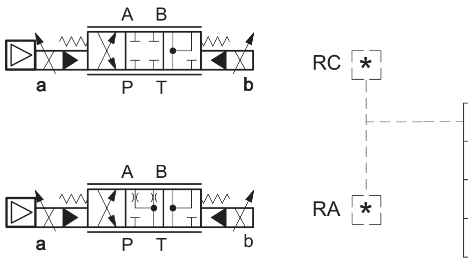
2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration “**SA**”:
2 positions (central + external)
with spring centering
for DSPE5G, DSPE5RG and DSPE7G only

1 solenoid for parallel configuration “**SB**”:
2 positions (central + external)
with spring centering
for DSPE8G, DSPE10G and DSPE11G only



valve type	*	Nominal flow with Δp 10 bar P-T
DSPE5G DSPE5RG	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7G	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8G	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10G	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min
DSPE11G	**800**	800 l/min
	800/500	800 (P-A) / 500 (B-T) l/min



valve type	*	Nominal flow with Δp 10 bar P-T
DSPE7G	**150/75**	150 (P-A) /75 (B-T) l/min
DSPE8G	**300/150**	300 (P-A) /150 (B-T) l/min
DSPE10G	**500/250**	500 (P-A) /250 (B-T) l/min

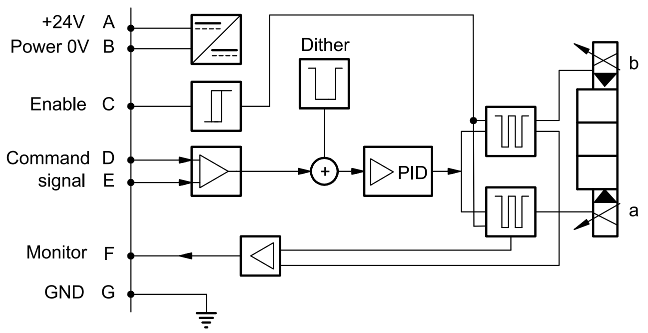
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

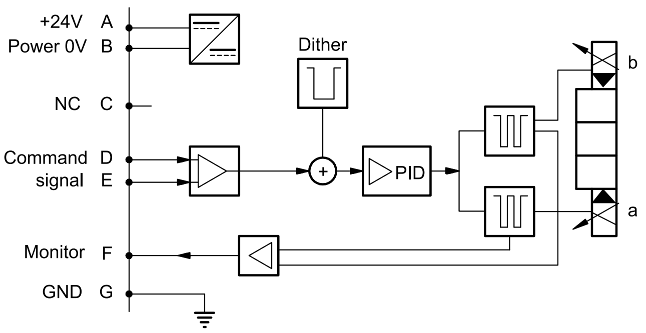
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		3A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

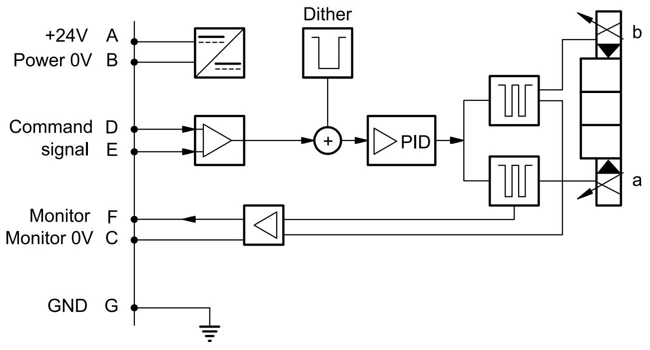
VERSION **A** - External Enable



VERSION **B** - Internal Enable

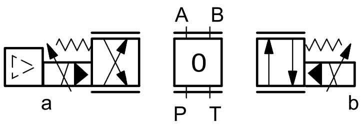


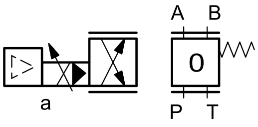
VERSION **C** - 0V Monitor



4 - VERSIONS WITH VOLTAGE COMMAND (E0)

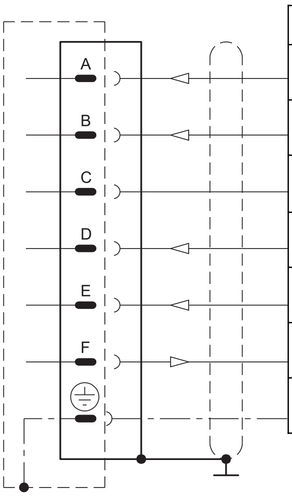
The reference signal is between -10V and +10V on double solenoid valve, and 0…10V on single solenoid valves. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**

COMMAND	**+10V**	**0V**
MONITOR	**+10V**	**0V**

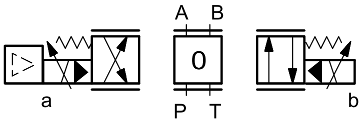


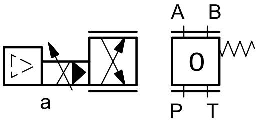
Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

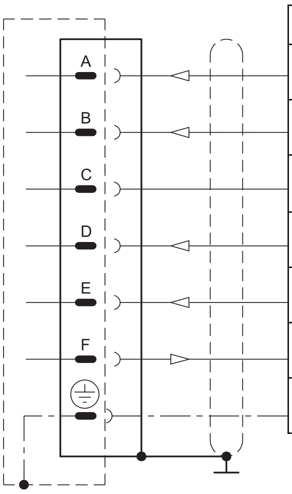
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.





COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**

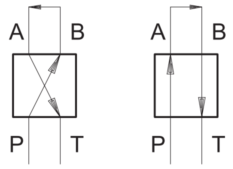
COMMAND	**20 mA**	**4 mA**
MONITOR	**20 mA**	**4 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

6 - CHARACTERISTIC CURVES

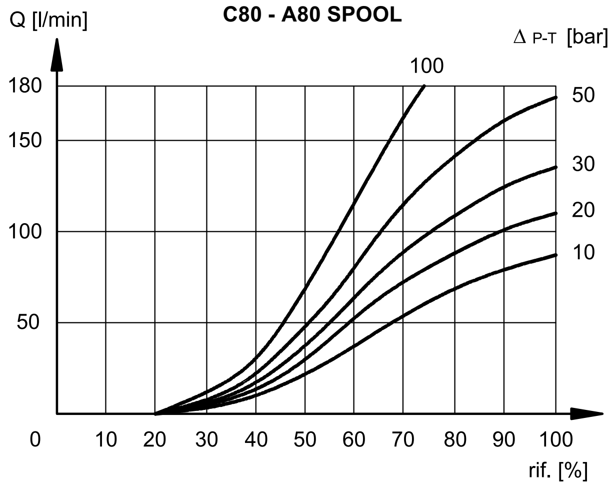
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)



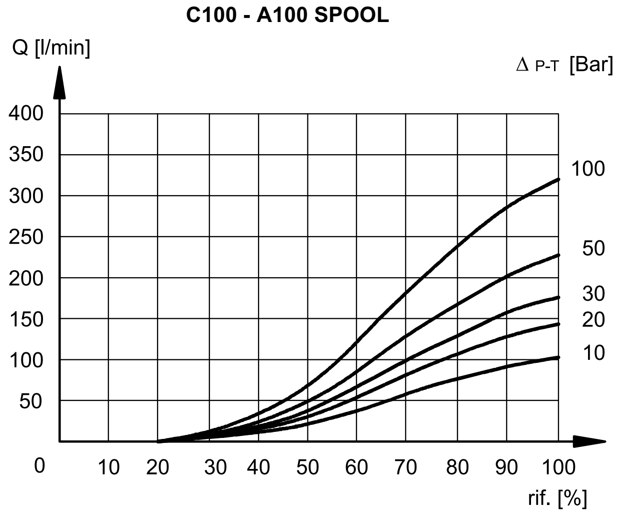
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

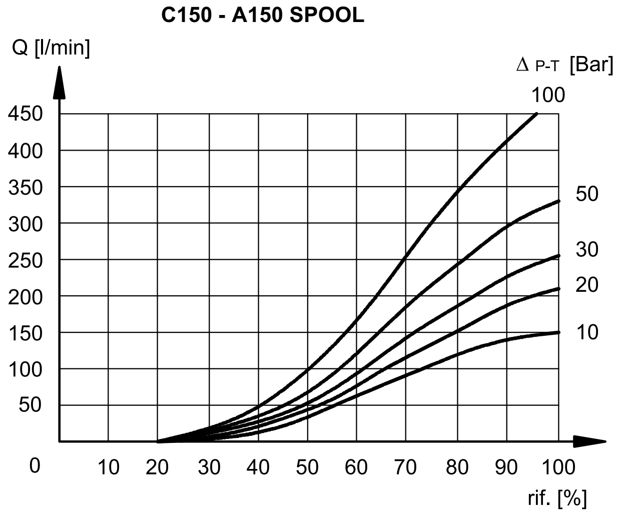
The adjustment of the curve is performed with a constant Δp of 30 bar by setting the value of flow start at 20% of the reference signal.

6.1 - Characteristic curves DSPE5G and DSPE5RG

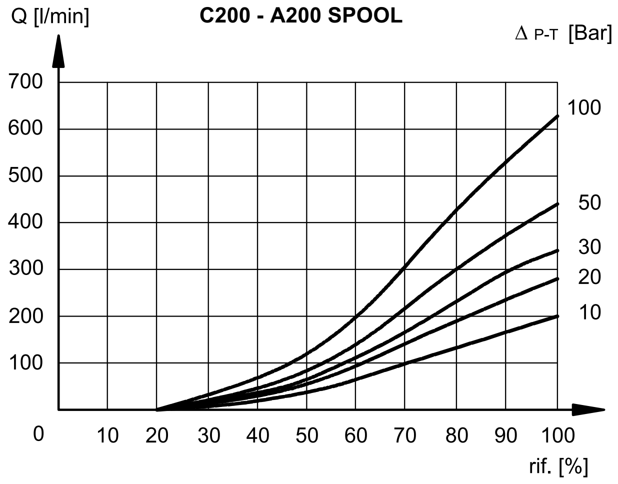

C80 - A80 SPOOL

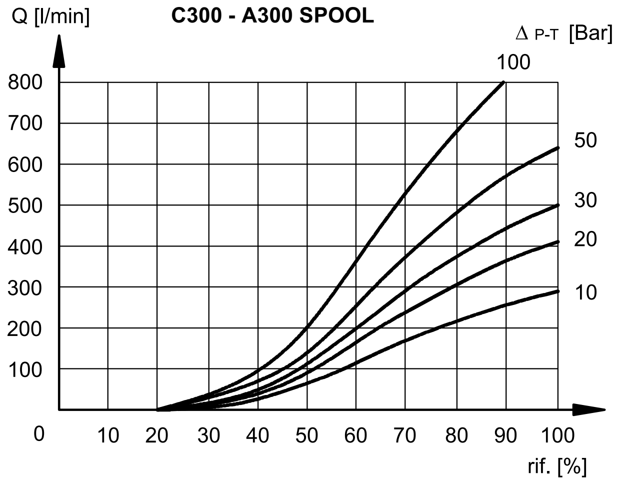
6.2 - Characteristic curves DSPE7G


C100 - A100 SPOOL


C150 - A150 SPOOL

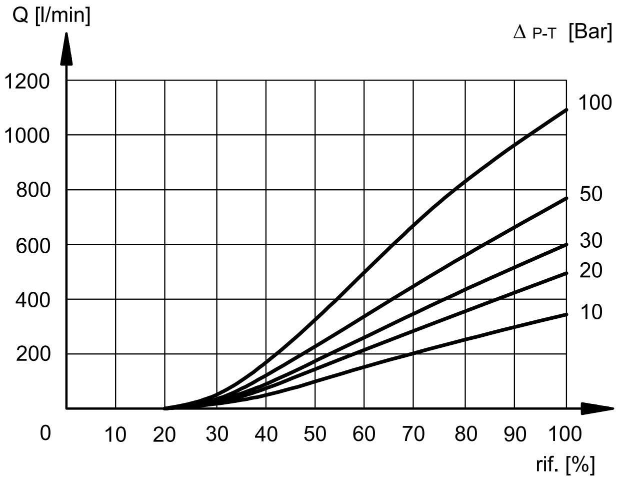
6.3 - Curve Characteristic DSPE8G


C200 - A200 SPOOL

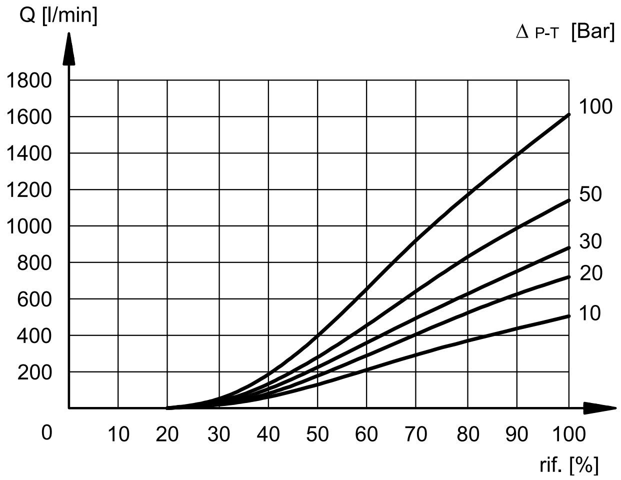

C300 - A300 SPOOL

6.4 - Characteristic curves DSPE10G

SPOOL C350 - A350

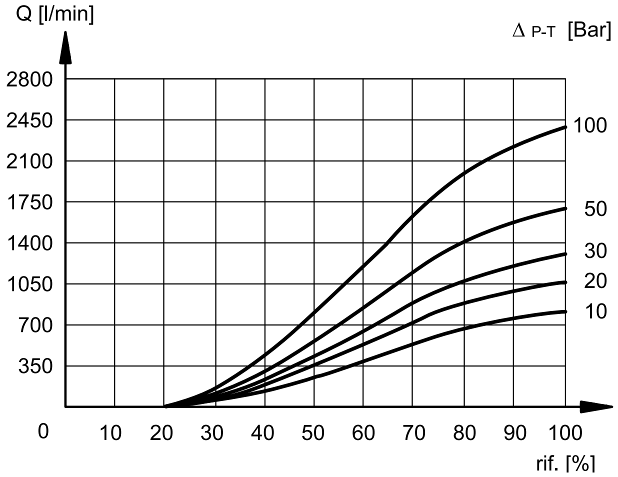


SPOOL C500 - A500



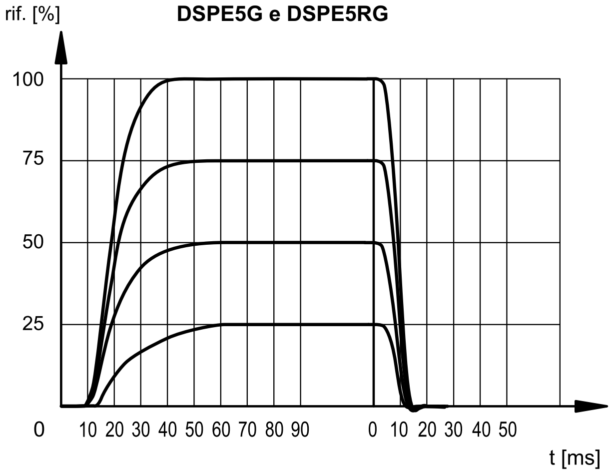
6.5 - Characteristic curves DSPE11G

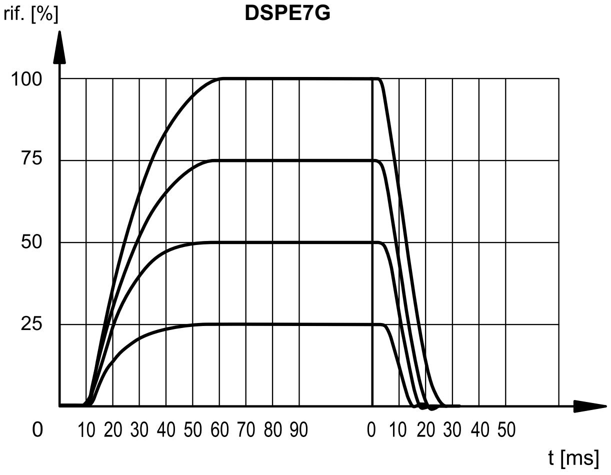
SPOOL C800 - A800

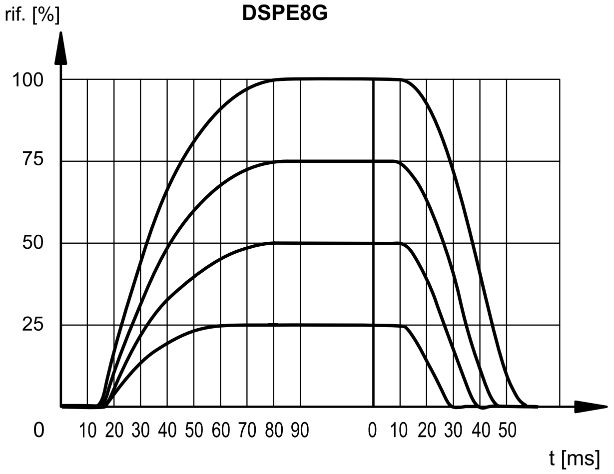


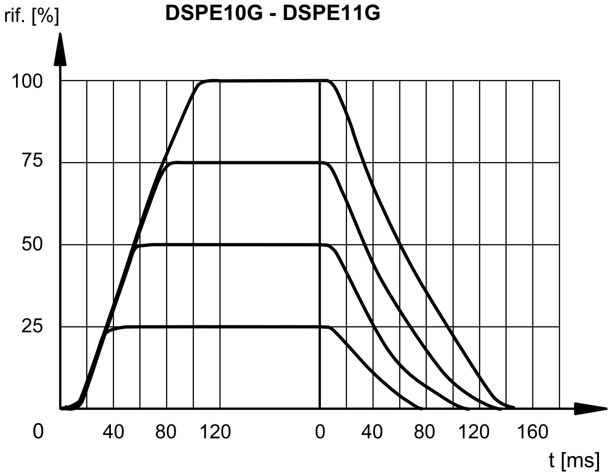
7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure = 100 bar)


DSPE5G e DSPE5RG


DSPE7G


DSPE8G


DSPE10G - DSPE11G

8 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C and static pressure = 100 bar)

FLOWRATES		**DSPE5G** **DSPER5G**	**DSPE7G**	**DSPE8G**	**DSPE10G**	**DSPE11G**
Max flow rate	l/min	180	450	800	1600	2800
Piloting flow requested with operation 0 →100%	l/min	3,5	4,1	9,2	13,7	13,7
Piloting volume requested with operation 0 →100%	cm^3	1,7	3,2	9,1	21,6	21,6

PRESSURES (bar)	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	–	10
Pressure on T port with external drain	–	250

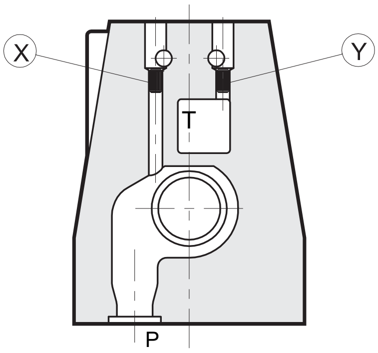
NOTE: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure.

Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (piloting type: Z, see section 1).

9 - PILOTING AND DRAINAGE

DSPE*G valves are available with piloting and drainage, both internal and external. The version with external drainage allows for a higher back pressure on the outlet.

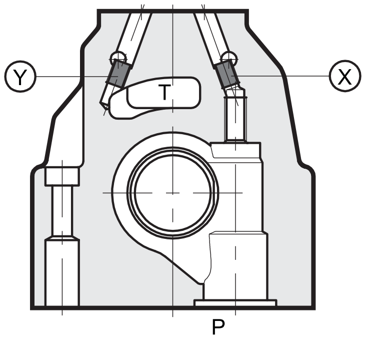
DSPE5G
DSPE5RG



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

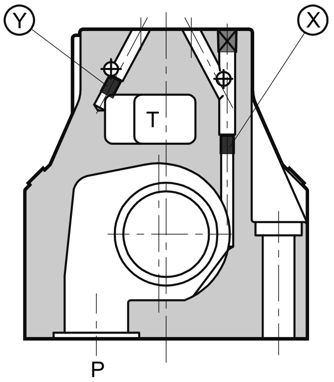
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

DSPE7G



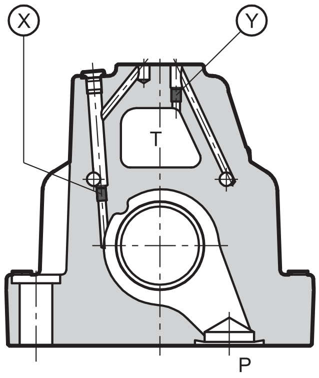
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

DSPE8G



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

DSPE10G
DSPE11G



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

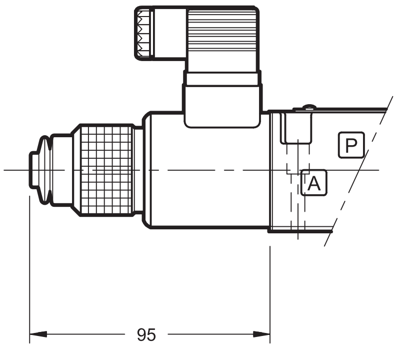
10 - MANUAL OVERRIDE

The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

Two different manual override version are available upon request:

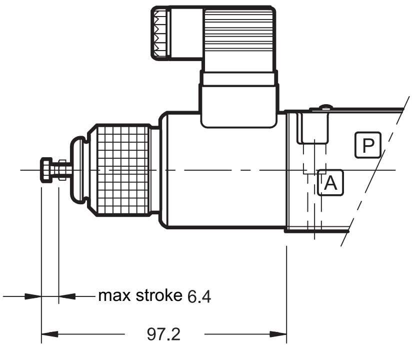
- **CM** version, manual override belt protected
- **CS** version, with metal ring nut provided with a M4 screw and a blocking locknut to allow the continuous mechanical operations.

CM Version



Code: 3803210003

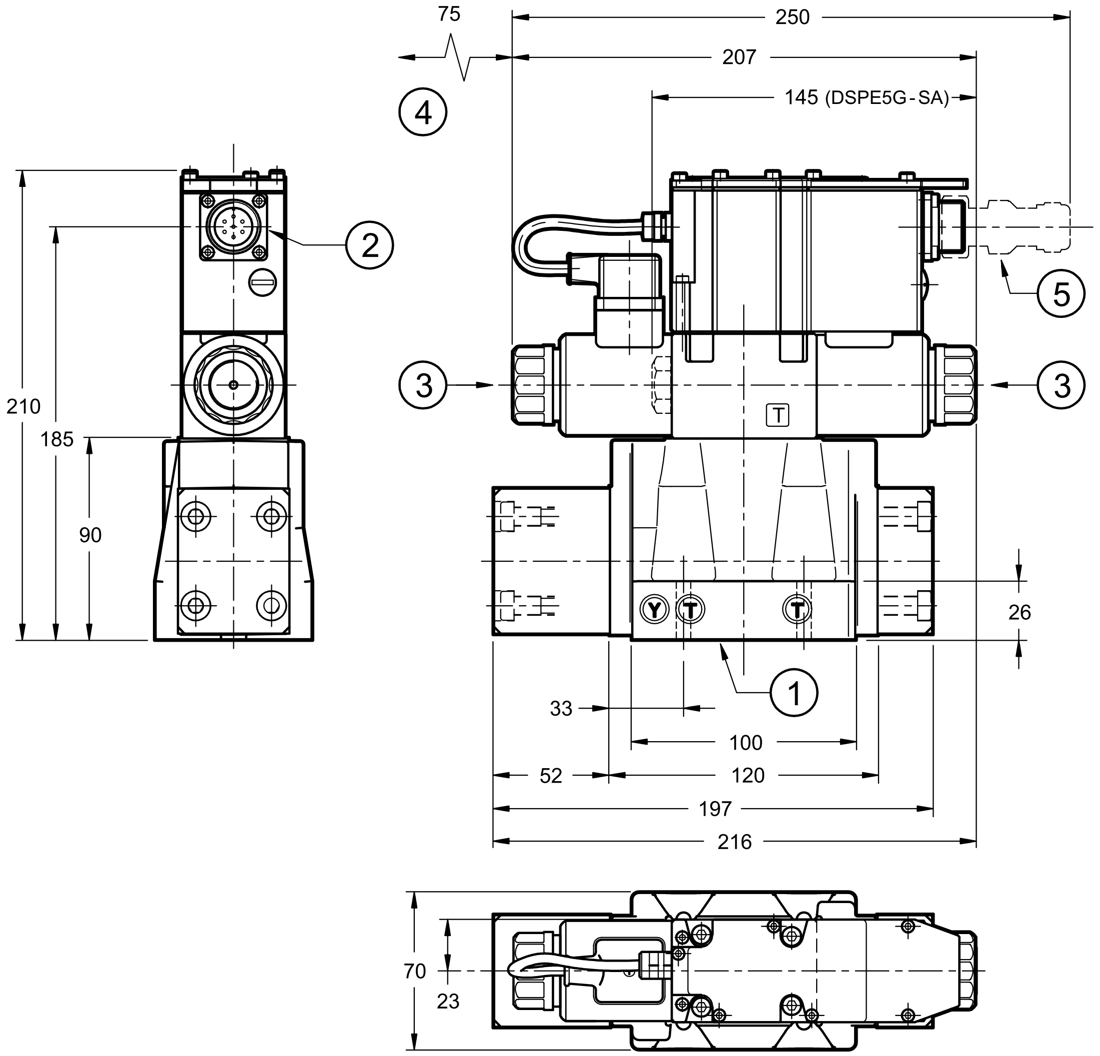
CS Version



Code: 3803210004

11 - OVERALL AND MOUNTING DIMENSIONS DSPE5G AND DSPE5RG

dimensions in mm



NOTES:

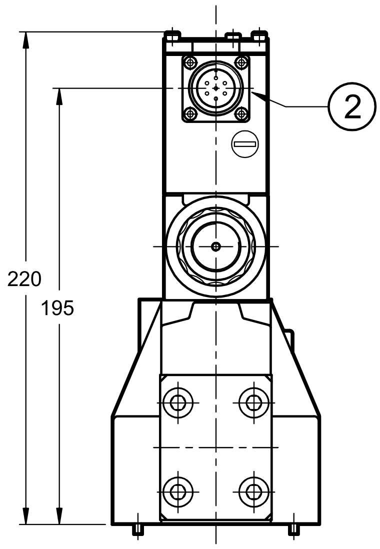
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.

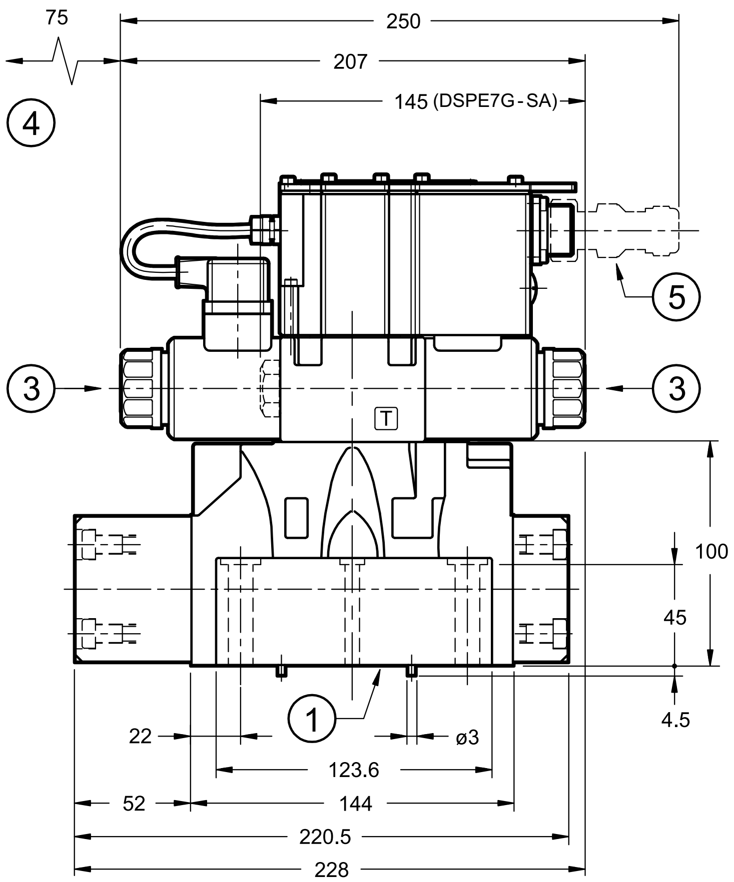
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 19

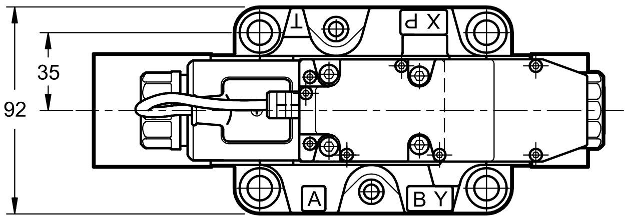
Valve fastening: 4 SHC ISO 4762 screws M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

12 - OVERALL AND MOUNTING DIMENSIONS DSPE7G

dimensions in mm







NOTES:

- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.

Valve fastening: 4 SHC screws ISO 4762 M10x60
2 SHC screws ISO 4762 M6x60

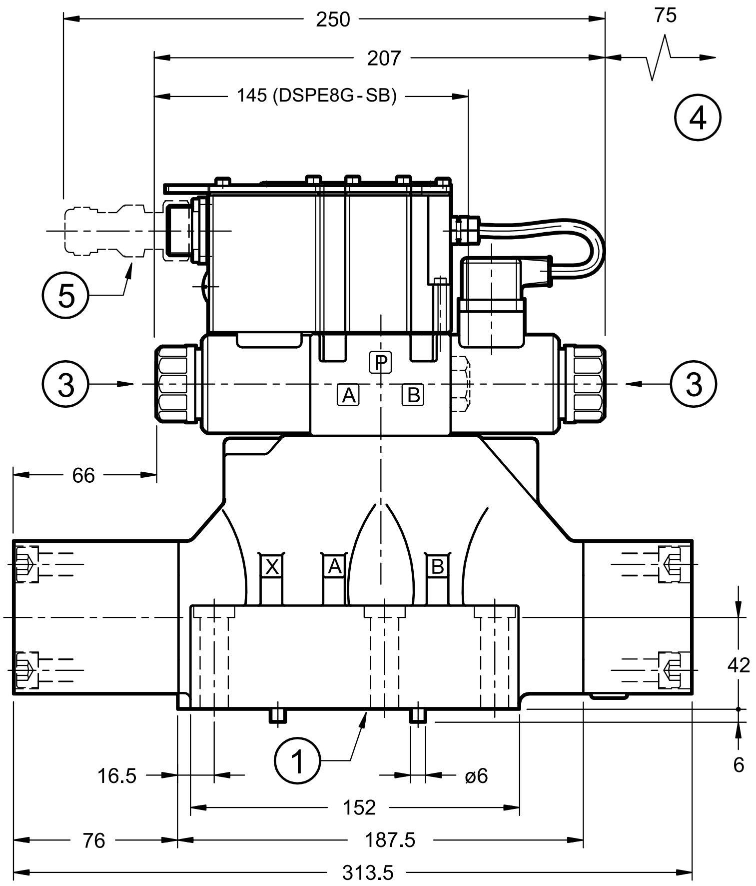
Tightening torque: M10x60: 40 Nm (A8.8 screws)
M6x60: 8 Nm (A8.8 screws)

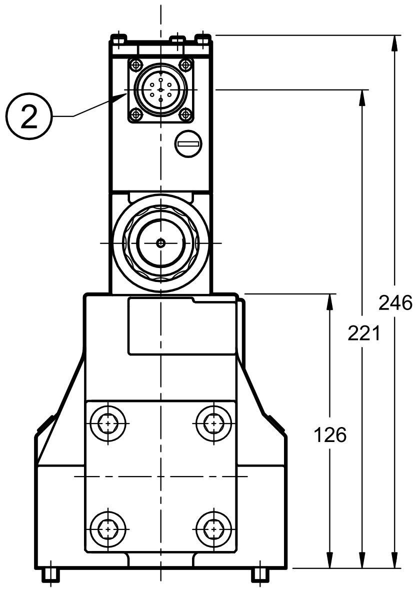
Threads of mounting holes: M6x18; M10x18

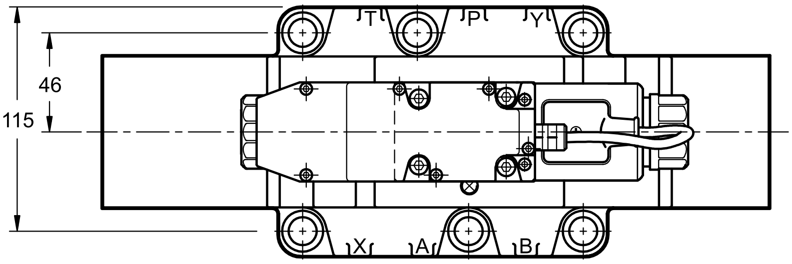
1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 19

13 - OVERALL AND MOUNTING DIMENSIONS DSPE8G

dimensions in mm







NOTES:

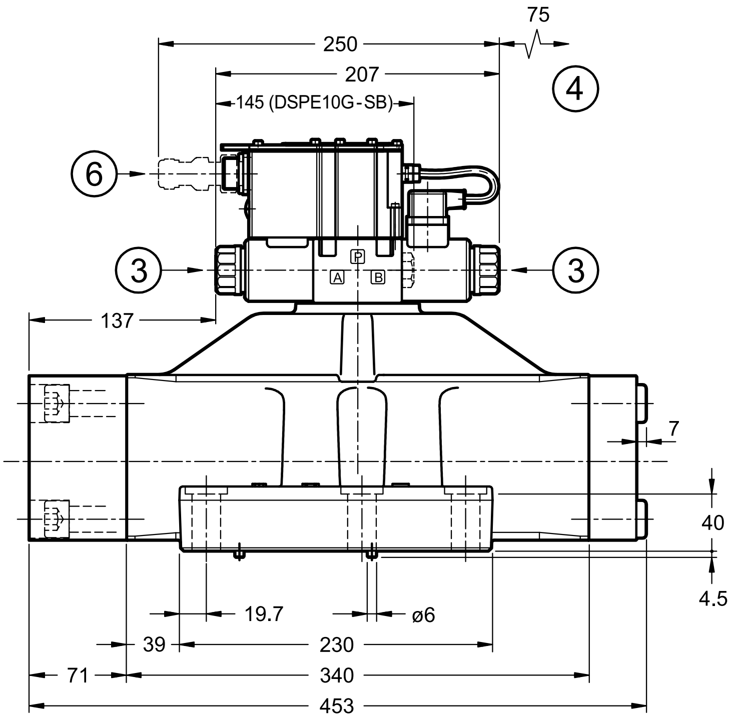
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.

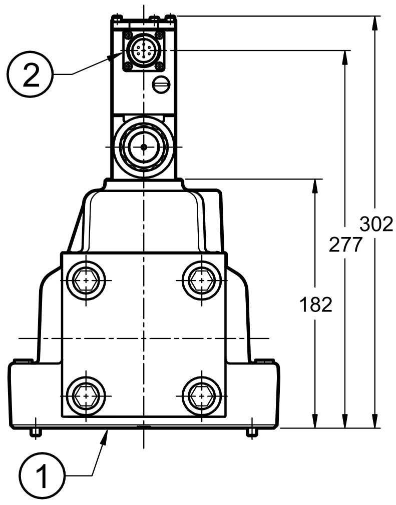
Valve fastening: 6 SHC ISO 4762 screws M12x60
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

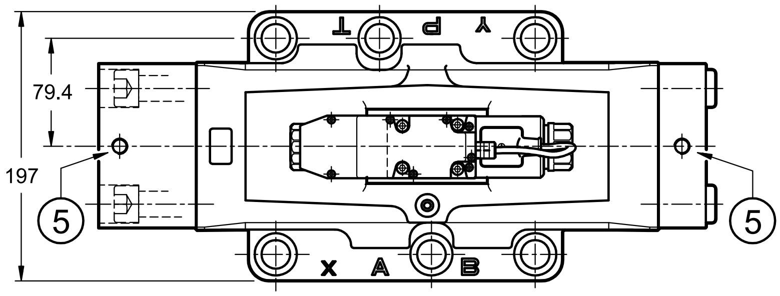
1	Mounting surface with sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 19

14 - OVERALL AND MOUNTING DIMENSIONS DSPE10G / DSPE11G

dimensions in mm







NOTES:

- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.

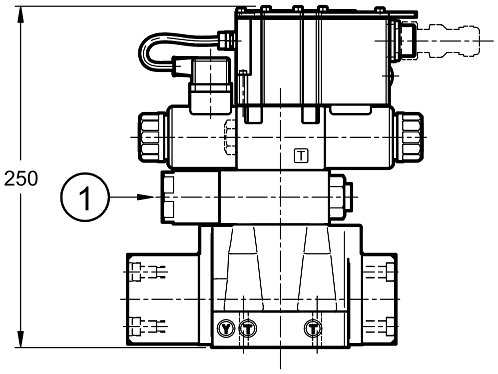
Valve fastening: 6 SHC screws ISO 4762 M20x70
Tightening torque: 330 Nm (A8.8 screws)
Threads of mounting holes: M20x40

1	Mounting surface with sealing rings: **DSPE10G** 4 OR type 4150 (37.59x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore **DSPE11G** 4 OR type 4212 (53.57x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection
3	Standard manual override embedded in the solenoid tube
4	Coil removal space
5	N. 2 M12 holes for eyebolts lifting
6	Mating connector. **To be ordered separately.** See paragraph 19

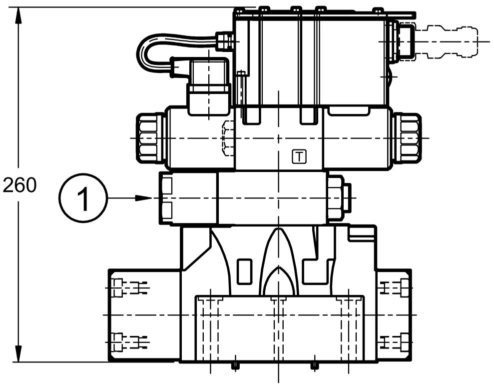
15 - OVERALL AND MOUNTING DIMENSIONS OF DSPE*G WITH PILOTING TYPE Z

dimensions in mm

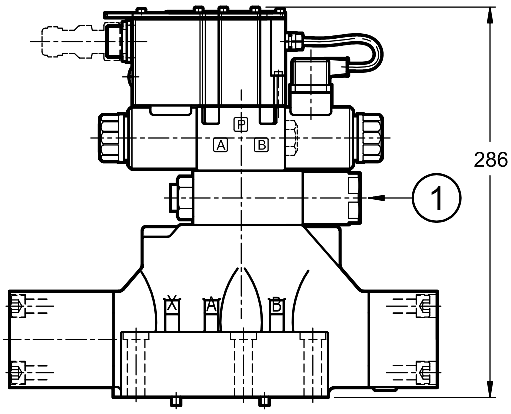
DSPE5G



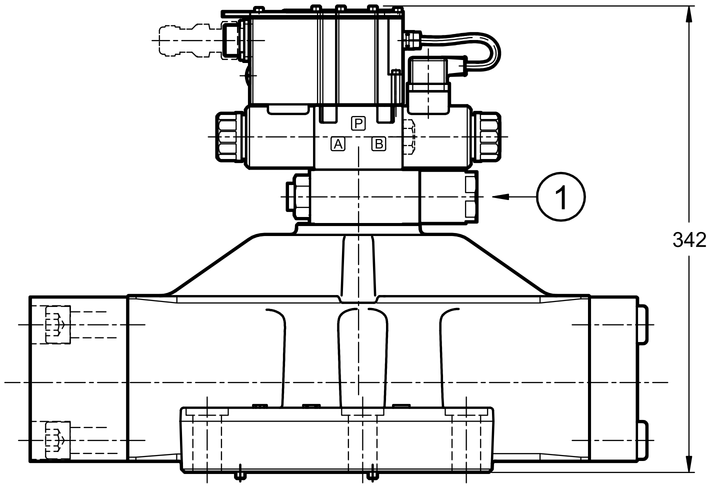
DSPE7G



DSPE8G



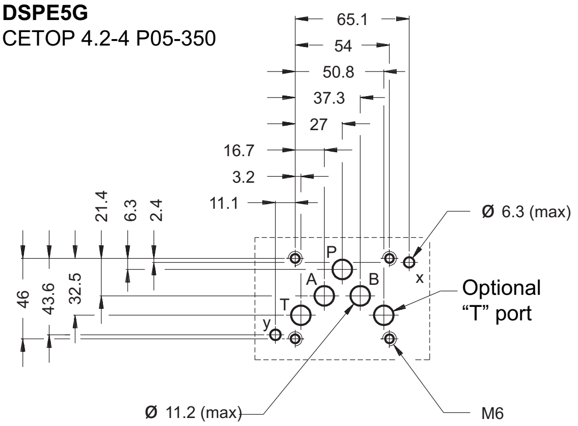
DSPE10G



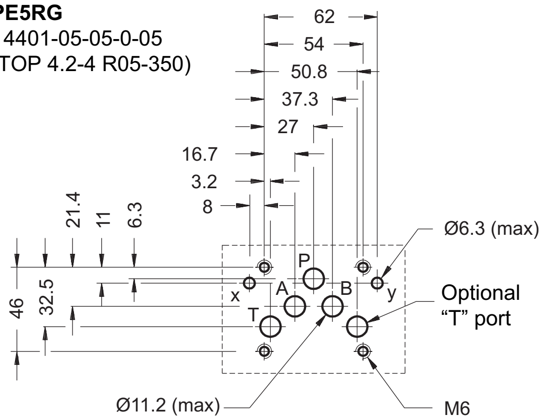
1	30 bar fixed adjustment pressure reducing valve

16 - MOUNTING SURFACES

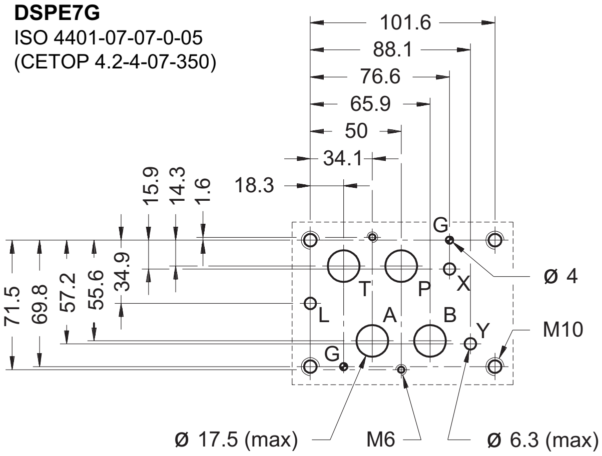
DSPE5G
CETOP 4.2-4 P05-350



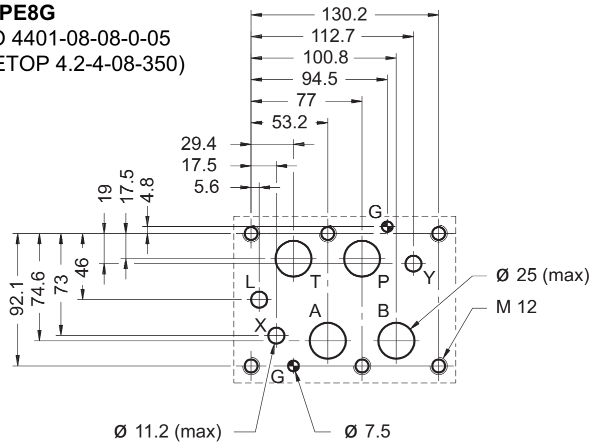
DSPE5RG
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



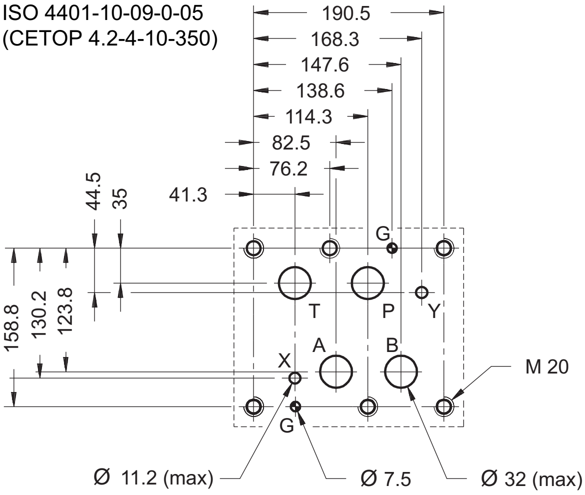
DSPE7G
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSPE8G
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

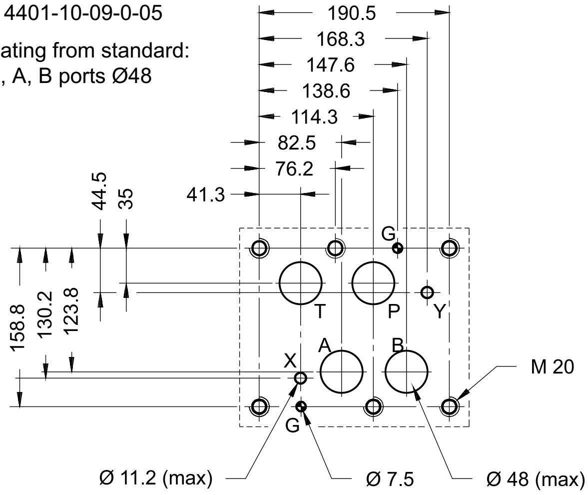


DSPE10G
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DSPE11G
ISO 4401-10-09-0-05

deviating from standard:
P, T, A, B ports Ø48



17 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

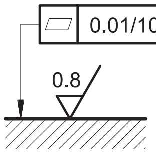
18 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Surface finishing



19 - ACCESSORIES

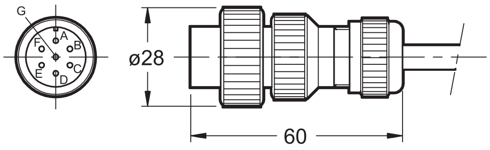
(to be ordered separately)

19.1 - Mating connector

These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.



Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**

19.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

19.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

20 - SUBPLATES

(see catalogue 51 000)

	DSPE5G	DSPE7G	DSPE8G	DSPE10G DSPE11G
Type with rear ports	PME4-AI5G	PME07-AI6G	-	-
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G	-
P, T, A, B ports dimensions X, Y ports dimensions	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP	-

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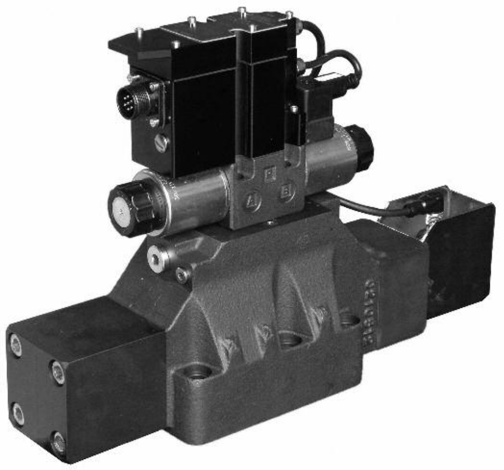


DSPE*J

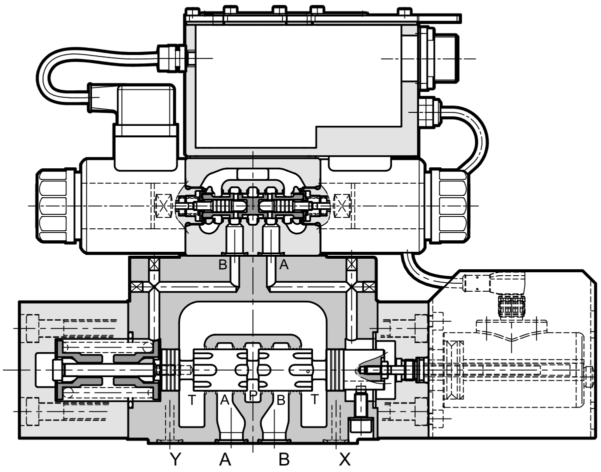
PROPORTIONAL DIRECTIONAL VALVE PILOT OPERATED WITH FEEDBACK AND INTEGRATED ELECTRONICS

SUBPLATE MOUNTING

SERIES 30

DSPE5J	**CETOP P05**
DSPE5RJ	**ISO 4401-05**
DSPE7J	**ISO 4401-07**
DSPE8J	**ISO 4401-08**
DSPE10J	**ISO 4401-10**
DSPE11J	**ISO 4401-10** oversize ports

OPERATING PRINCIPLE



— The DSPE*J are pilot operated directional control valves with electric proportional control, feedback and integrated electronics and with mounting interface in compliance with ISO 4401 standards.

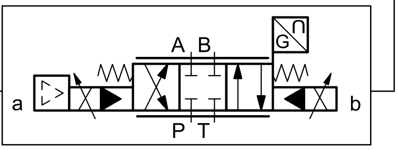
— They are controlled directly by an integrated digital amplifier. Transducer and digital card allow a fine control of the positioning of the cursor, reducing hysteresis and response times.

— The valves are available with command signal in voltage or current, and on-board electronics with internal enable, external enable or 0V monitor on pin C.

— A monitoring signal of the main spool position is available.

— The valves are easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 18)

HYDRAULIC SYMBOL (typical)



PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p =140 bar)

		DSPE5J DSPE5RJ	DSPE7J	DSPE8J	DSPE10J	DSPE11J
Max operating pressure: P - A - B ports T port	bar	350 see paragraph 8				
Max flowrate	l/min	180	450	800	1600	2800
Hysteresis	% Q_{max}	< 0,5%				
Repeatability	% Q_{max}	< ± 0,2%				
Electrical characteristics		see paragraph 3				
Ambient temperature range	°C	-20 / +60				
Fluid temperature range	°C	-20 / +80				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13					
Recommended viscosity	cSt	25				
Mass: single solenoid valve double solenoid valve	kg	8,5 9	10,5 11	17 17,5	56 56,5	54,5 55

1 - IDENTIFICATION CODE

D	S	P	E		J	-				/	30		-			/		K11	

Pilot operated directional valve

Electric proportional control

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)
10 = ISO 4401-10 (CETOP 10)
11 = ISO 4401-10 (CETOP 10) with oversize ports

Integrated electronics for closed loop

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centers
RA = regenerative open centers

Spool nominal flow rate (see table par. 2)

Configurations for single solenoid version (omit for double solenoid version) :
SA = 1 solenoid for cross configuration (for DSPE5J, DSPE5RJ and DSPE7J only)
SB = 1 solenoid for parallel configuration (for DSPE8J, DSPE10J and DSPE11J only)

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve (see par. 8 and 14)

Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage ± 10 V
E1 = current 4 ÷ 20 mA

Main connector 6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

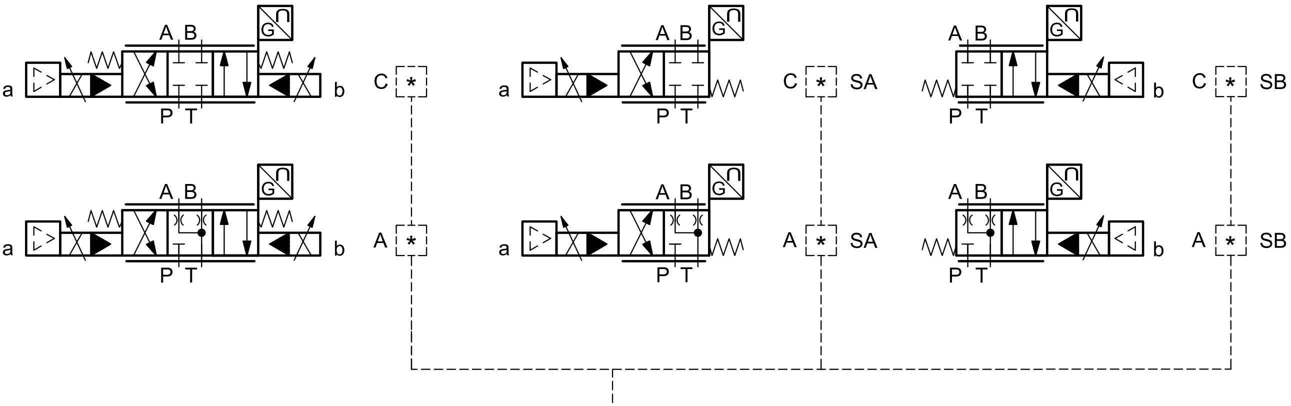
2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of number of proportional solenoids, spool type, rated flow.

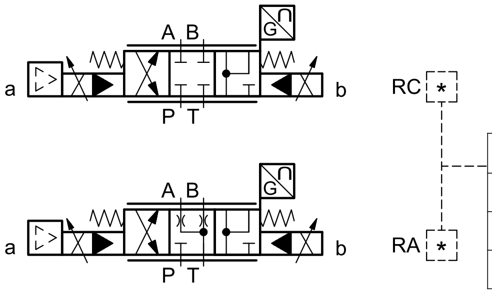
2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration “**SA**”:
2 positions (central + external)
with spring centering
for DSPE5J, DSPE5RJ and DSPE7J only

1 solenoid for parallel configuration “**SB**”:
2 positions (central + external)
with spring centering
for DSPE8J, DSPE10J and DSPE11J only



valve type	*	Nominal flow with Δp 10 bar P-T
DSPE5J DSPE5RJ	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7J	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8J	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10J	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min
DSPE11J	**800**	800 l/min
	800/500	800 (P-A) / 500 (B-T) l/min



valve type	*	Nominal flow with Δp 10 bar P-T
DSPE7J	**150/75**	150 (P-A) /75 (B-T) l/min
DSPE8J	**300/150**	300 (P-A) /150 (B-T) l/min
DSPE10J	**500/250**	500 (P-A) /250 (B-T) l/min

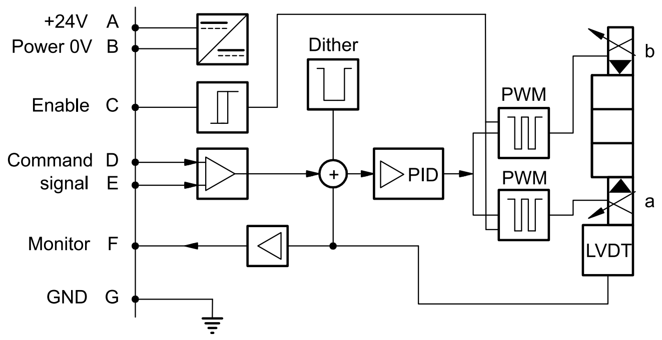
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

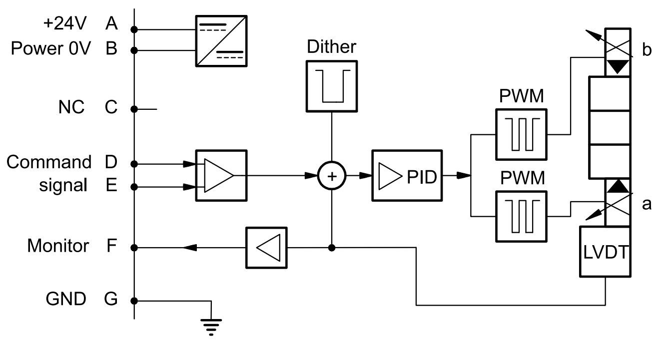
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	25
Maximum solenoid current	A	1.88
Fuse protection, external		3A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signal (spool position): voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, cable breakdown, sensor errors, supply voltage failures
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

3.2 - On-board electronics diagrams

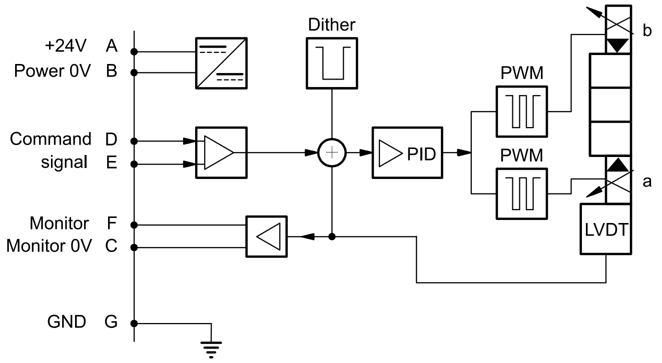
VERSION **A** - External Enable



VERSION **B** - Internal Enable

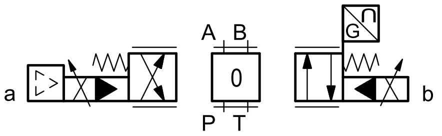


VERSION **C** - 0V Monitor

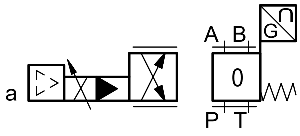


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

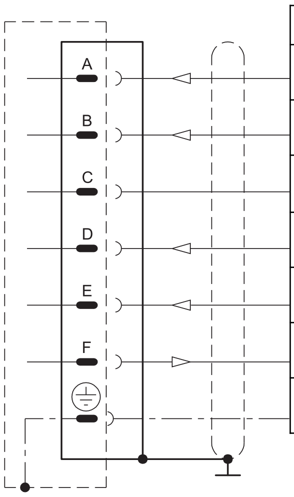
The reference signal is between -10V and +10V on double solenoid valve, and 0…10V on single solenoid valves. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**



COMMAND	**+10V**	**0V**
MONITOR	**+10V**	**0V**

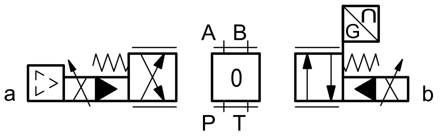


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

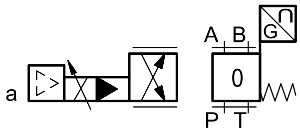
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

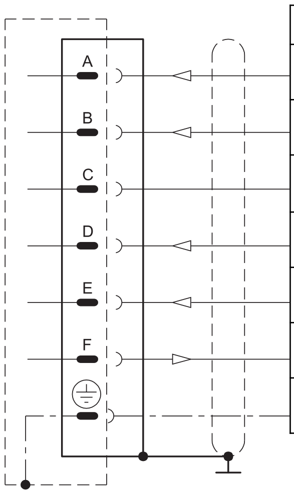
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**



COMMAND	**20 mA**	**4 mA**
MONITOR	**20 mA**	**4 mA**

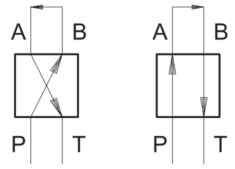


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

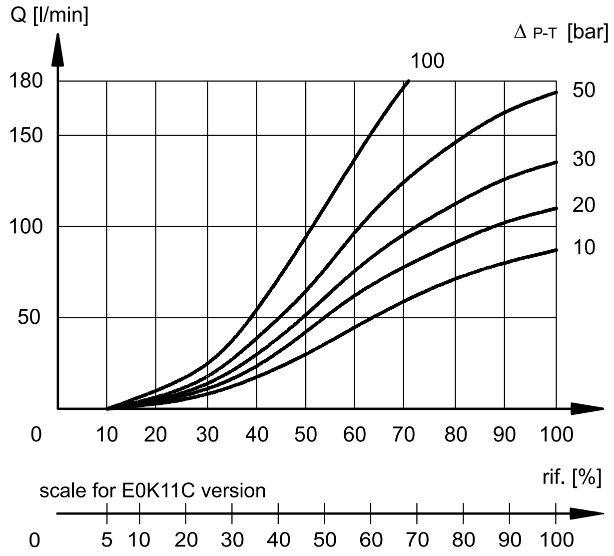
6 - CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

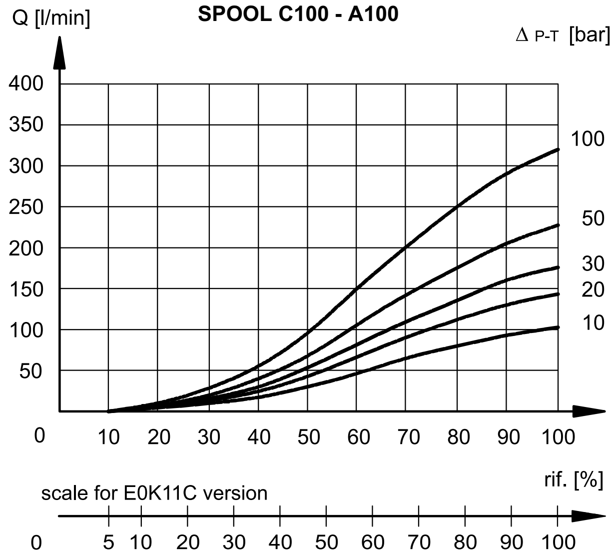
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

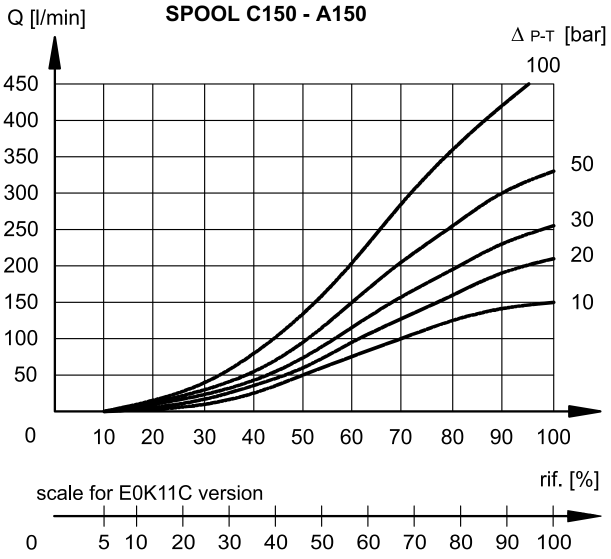


6.1 - Characteristic curves DSPE5J and DSPE5RJ

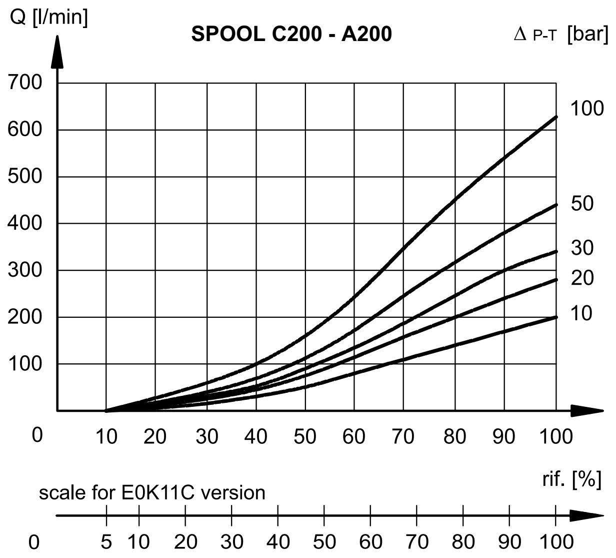


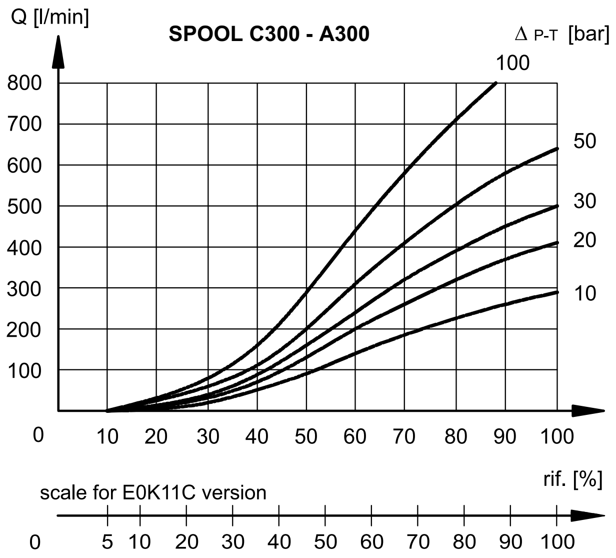
6.2 - Characteristic curves DSPE7J


SPOOL C100 - A100

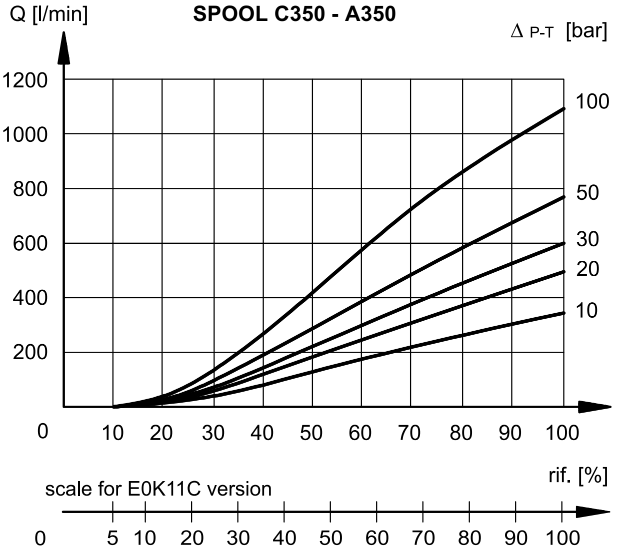

SPOOL C150 - A150

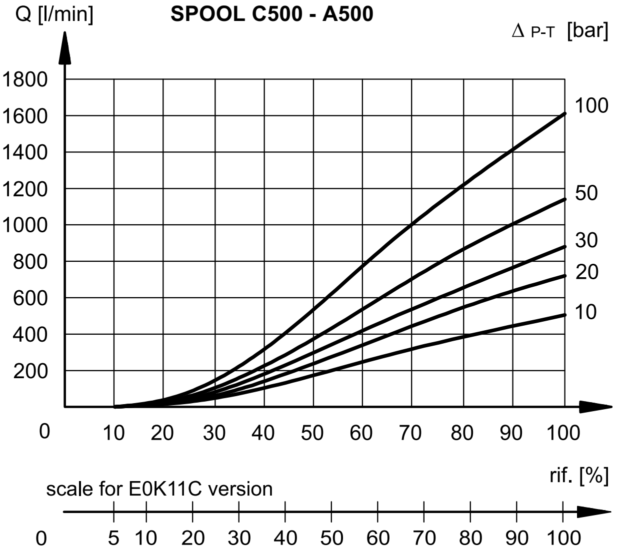
6.3 - Characteristic curves DSPE8J



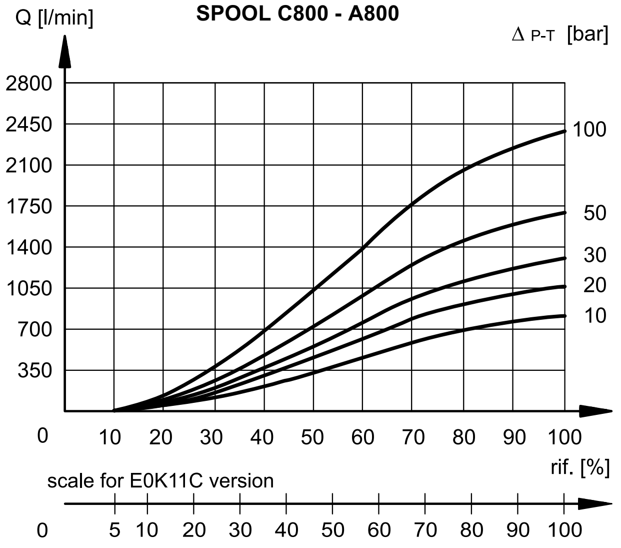


6.4 - Characteristic curves DSPE10J



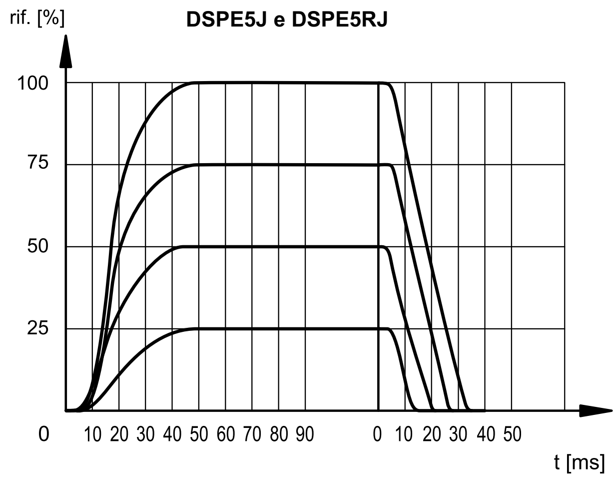


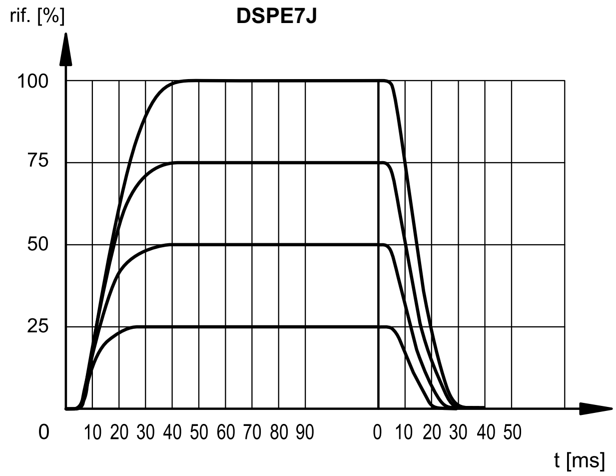
6.5 - Characteristic curves DSPE11J

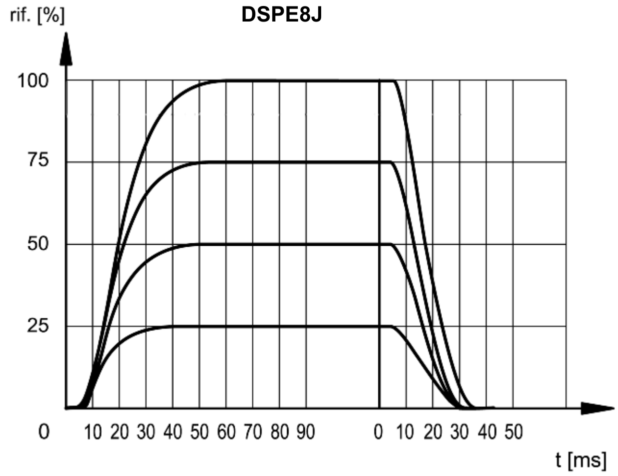


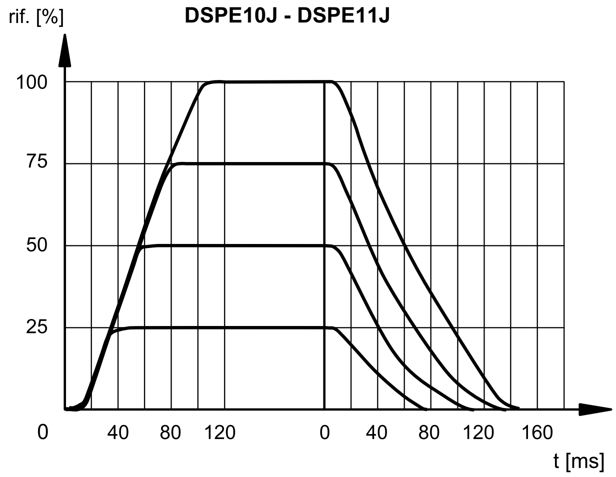
7 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure 100 bar)









8 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C)

FLOWRATES		**DSPE5J** **DSPE5RJ**	**DSPE7J**	**DSPE8J**	**DSPE10J**	**DSPE11J**
Max flow rate	l/min	180	450	800	1600	2800
Piloting flow requested with operation 0 →100%	l/min	3,5	6,4	15,3	13,7	13,7
Piloting volume requested with operation 0 →100%	cm^3	1,7	3,2	9,2	21,6	21,6

PRESSURES (bar)	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	–	10
Pressure on T port with external drain	–	250

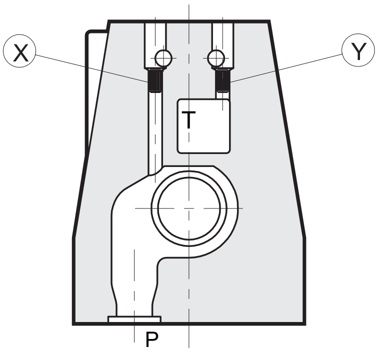
NOTE: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure.

Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (piloting type: Z, see section 1).

9 - PILOTING AND DRAINAGE

DSPE*J valves are available with piloting and drainage, both internal and external. The version with external drainage allows for a higher back pressure on the outlet.

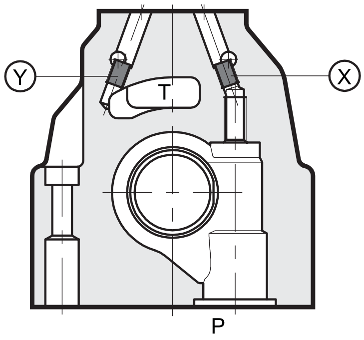
DSPE5J
DSPE5RJ



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

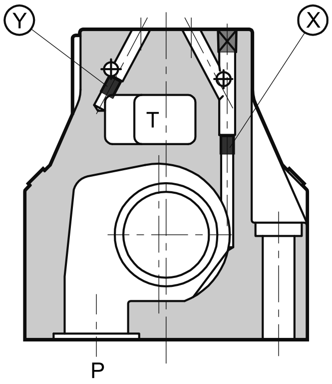
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

DSPE7J



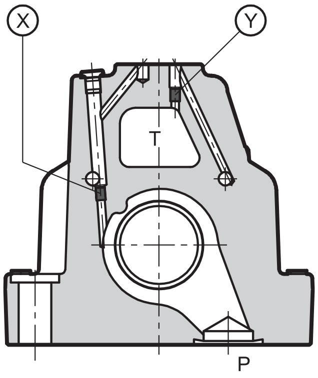
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

DSPE8J



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

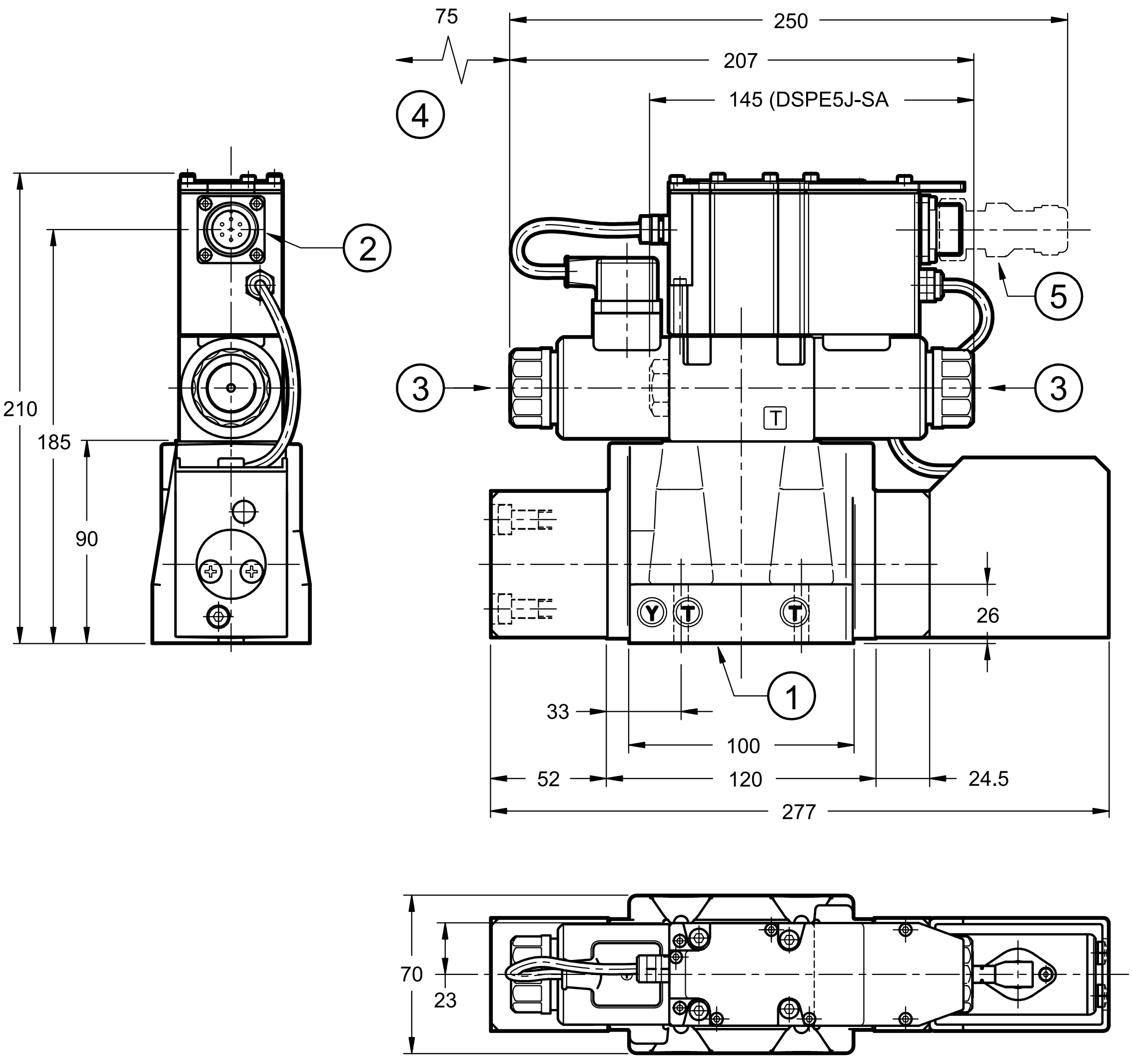
DSPE10J
DSPE11J



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

10 - OVERALL AND MOUNTING DIMENSIONS DSPE5J AND DSPE5RJ

dimensions in mm



NOTES:

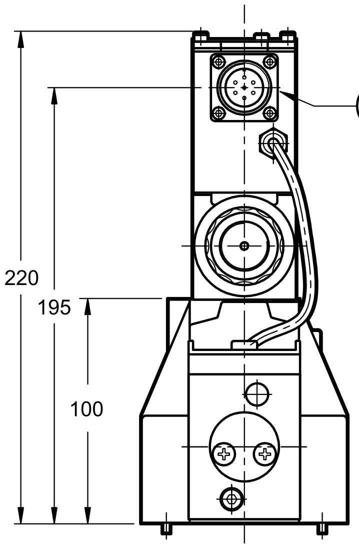
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 14.
- Mounting surface at par. 15.
- It is recommended to not disassemble the transducer.

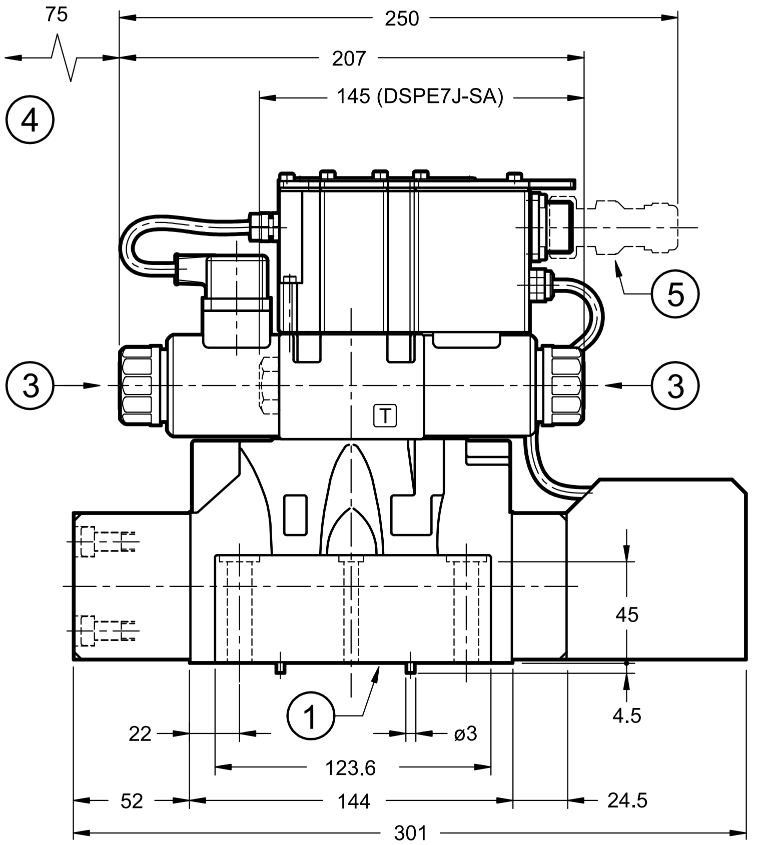
Valve fastening: 4 SHC ISO 4762 screws M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

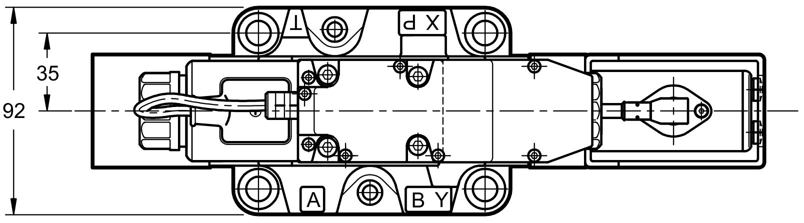
1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 18

11 - OVERALL AND MOUNTING DIMENSIONS DSPE7J

dimensions in mm







NOTES:

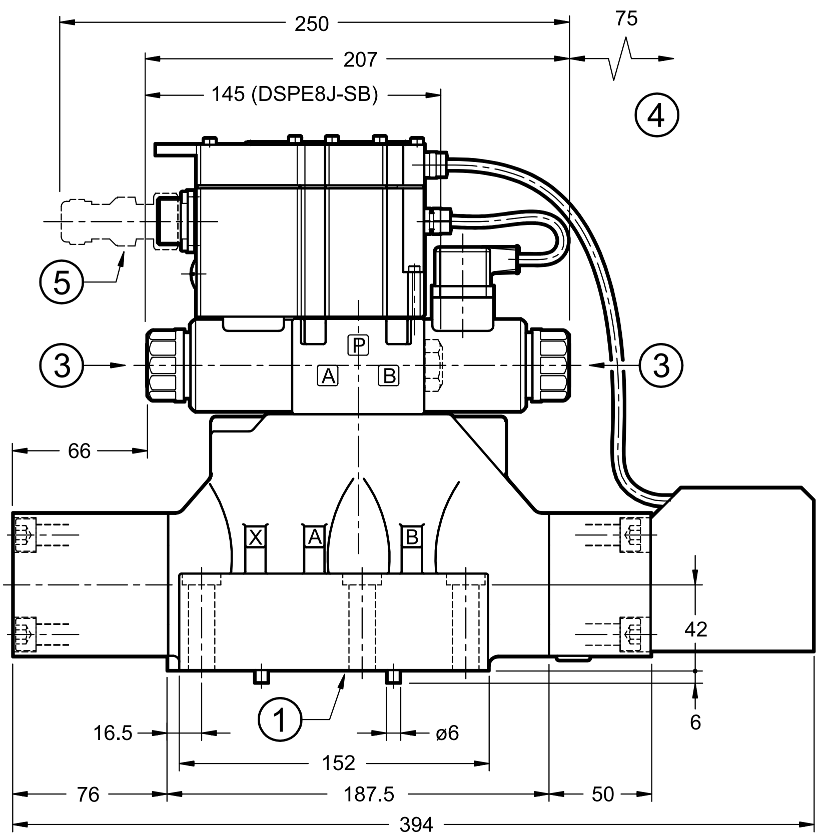
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 14.
- Mounting surface at par. 15.
- It is recommended to not disassemble the transducer.

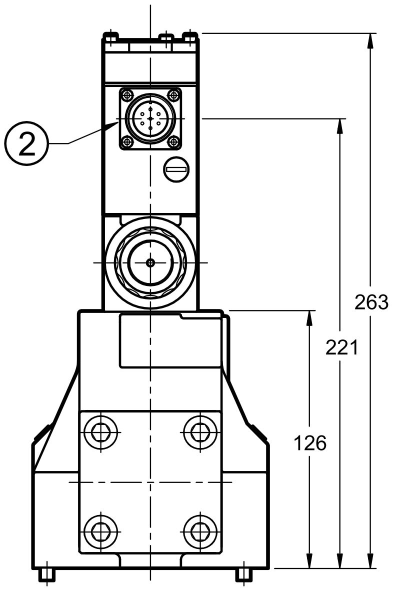
Valve fastening:	4 SHC screws ISO 4762 M10x60 2 SHC screws ISO 4762 M6x60
Tightening torque:	M10x60: 40 Nm (A8.8 screws) M6x60: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x18; M10x18	

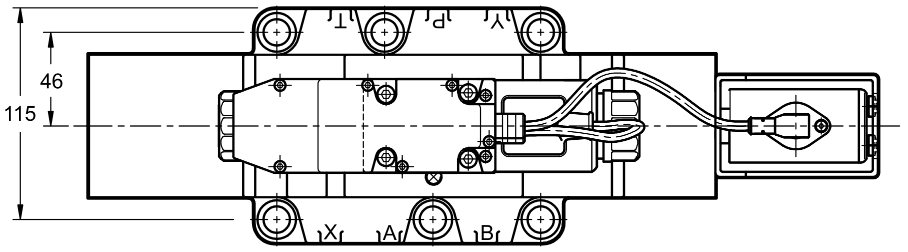
1	Mounting surface with sealing rings: 4 OR type 130 (22.22x2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 18

12 - OVERALL AND MOUNTING DIMENSIONS DSPE8J

dimensions in mm







NOTES:

- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 14.
- Mounting surface at par. 15.
- It is recommended to not disassemble the transducer.

1	Mounting surface with sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	Mating connector. **To be ordered separately.** See paragraph 18

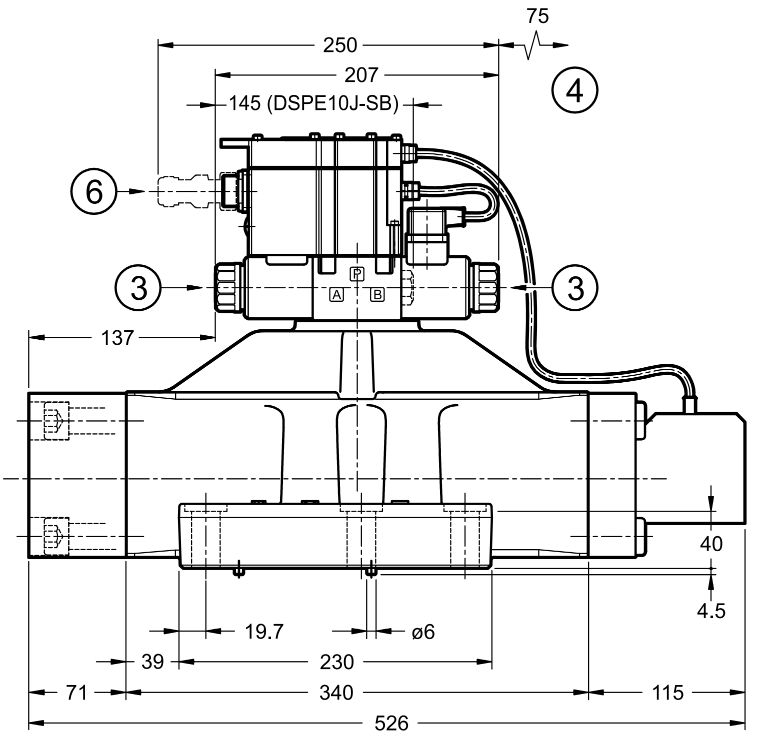
Valve fastening: 6 SHC ISO 4762 screws M12x60

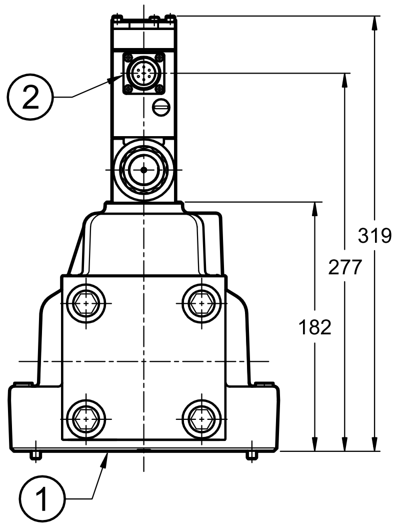
Tightening torque: 69 Nm (A8.8 screws)

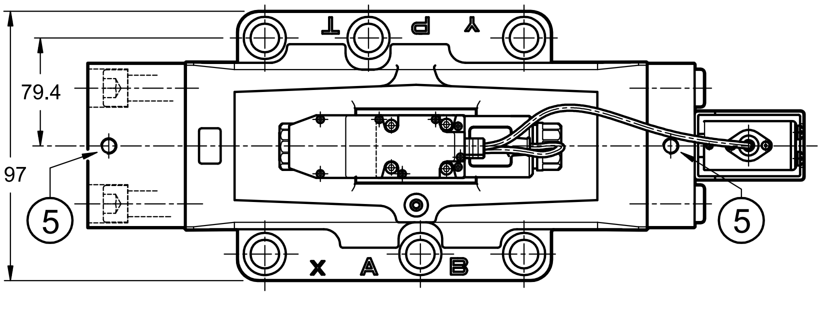
Threads of mounting holes: M12x20

13 - OVERALL AND MOUNTING DIMENSIONS DSPE10J / DSPE11J

dimensions in mm







NOTES:

- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 14.
- Mounting surface at par. 15.
- It is recommended to not disassemble the transducer.

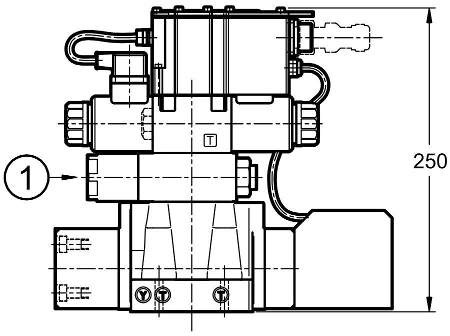
Valve fastening: 6 SHC screws ISO 4762 M20x70
Tightening torque: 330 Nm (A8.8 screws)
Threads of mounting holes: M20x40

1	Mounting surface with sealing rings: **DSPE10J** 4 OR type 4150 (37.59x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore **DSPE11J** 4 OR type 4212 (53.57x3.53) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection
3	Manual override embedded in the solenoid tube
4	Coil removal space
5	N. 2 M12 holes for eyebolts lifting
6	Mating connector. **To be ordered separately.** See paragraph 18

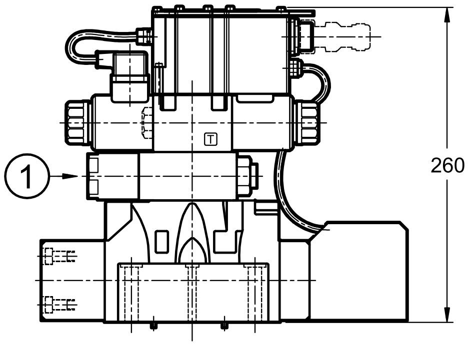
14 - OVERALL AND MOUNTING DIMENSIONS OF DSPE*J WITH PILOTING TYPE Z

dimensions in mm

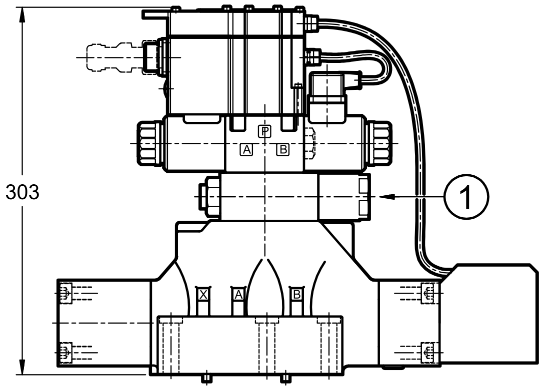
DSPE5J



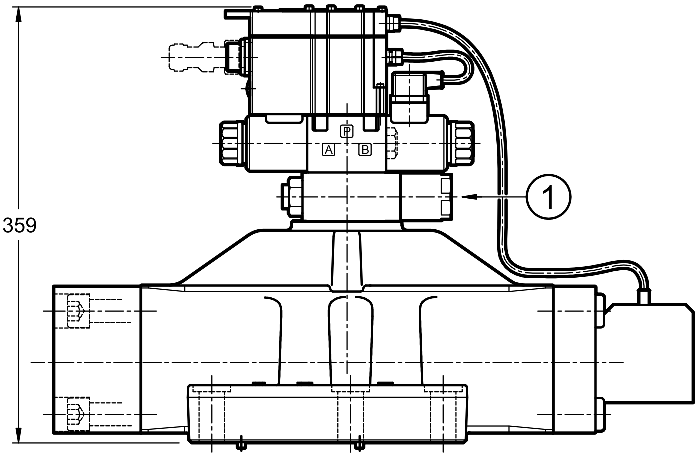
DSPE7J



DSPE8J



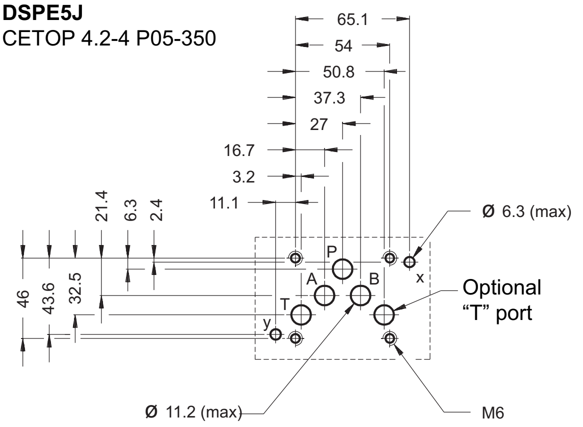
DSPE10J / DSPE11J



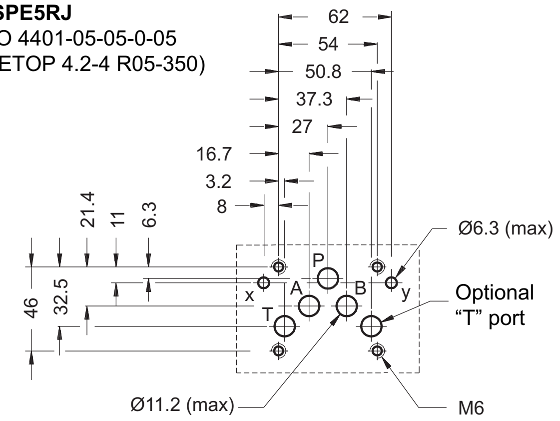
1	30 bar fixed adjustment pressure reducing valve

15 - MOUNTING SURFACES

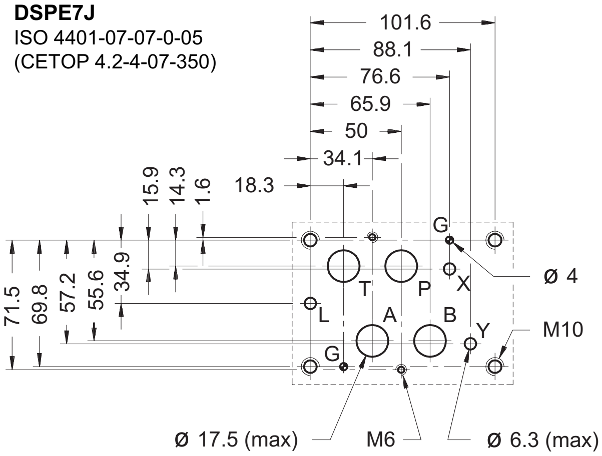
DSPE5J
CETOP 4.2-4 P05-350



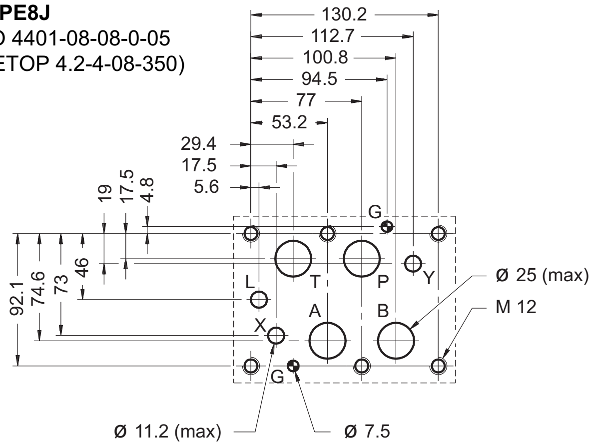
DSPE5RJ
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



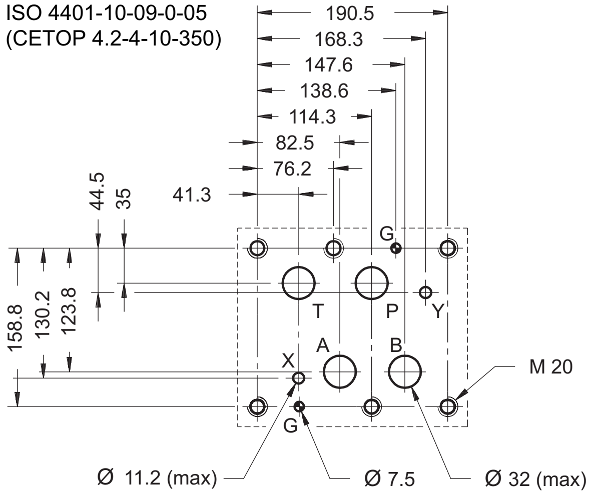
DSPE7J
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSPE8J
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

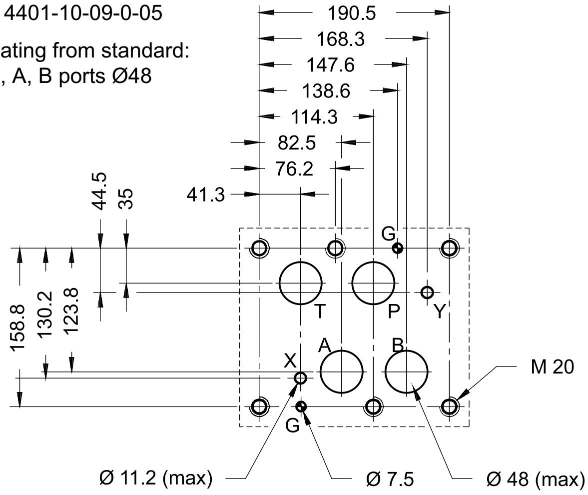


DSPE10J
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



DSPE11J
ISO 4401-10-09-0-05

deviating from standard:
P, T, A, B ports Ø48



16 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

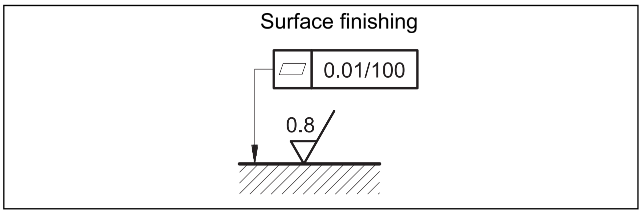
The fluid must be preserved in its physical and chemical characteristics.

17 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Ensure that there is no air in the hydraulic circuit.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

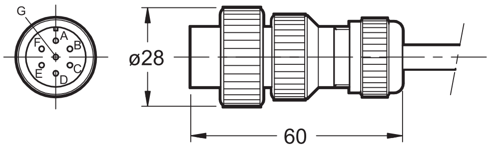


18 - ACCESSORIES

(to be ordered separately)

18.1 - Mating connector

These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.



So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic offers a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**

18.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

18.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

19 - SUBPLATES

(see catalogue 51 000)

	DSPE5J	DSPE7J	DSPE8J	DSPE10J DSPE11J
Type with rear ports	PME4-AI5G	PME07-AI6G	-	-
Type with side ports	PME4-AL5G	PME07-AL6G	PME5-AL8G	-
P, T, A, B ports dimensions X, Y ports dimensions	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP	-

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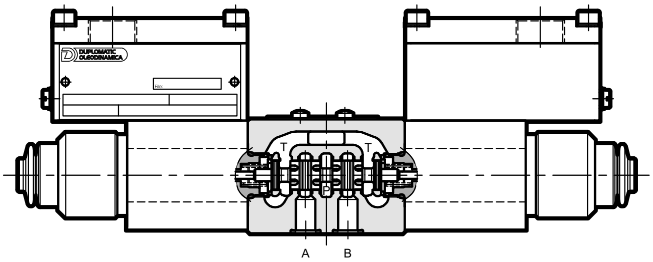
DS(P)E*K*

EXPLOSION-PROOF PROPORTIONAL DIRECTIONAL VALVES ATEX, IECEx, INMETRO

DSE3K*	**ISO 4401-03**
DSPE5K*	**CETOP P05**
DSPE5RK*	**ISO 4401-05**
DSPE7K*	**ISO 4401-07**
DSPE8K*	**ISO 4401-08**
DSPE10K*	**ISO 4401-10**

OPERATING PRINCIPLE



- These explosion proof directional valves are available in size ISO 4401-03 for direct operated type. Pilot operated valves are available in CETOP P05, ISO 4401-05, ISO 4401-07, ISO 4401-08 and ISO 4401-10 sizes.
- They are compliant with ATEX, IECEx and INMETRO requirements and are suitable for use in potentially explosive atmospheres, for surface plants or mines.
- A low temperature version (up to -40 °C) is also available.
- The DSE3K* valves are supplied with a finishing surface treatment (zinc-nickel) suitable to ensure a salt spray resistance up to 600 hours; for DSPE*K* valves, this finishing is available upon request.
- **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

PERFORMANCES (obtained with viscosity of 36 cSt at 50°C and electronic control card)		**DSE3K***	**DSPE5K* DSPE5RK***	**DSPE7K***	**DSPE8K***	**DSPE10K***
Max operating pressure: P - A - B ports T ports	bar	350 210	350 see paragraph 7			
Controlled flow rate with Δp 10 bar P-T	l/min	see par. 2	see paragraph 5			
Step response		see paragraph. 6				
Hysteresis	% of Q $_{max}$	<6% (PWM 200Hz)	< 4% (PWM 100 Hz)			
Repeatability	% of Q $_{max}$	< ±1,5%	< ± 2%			
Electrical characteristics		see paragraph 9				
Temperature ranges (ambient and fluid)	°C	see data sheet 02 500				
Fluid viscosity range	cSt	10 ÷ 400				
Fluid contamination degree	According to ISO 4406:1999 class 18/16/13					
Recommended viscosity	cSt	25				
Mass single solenoid valve double solenoid valve	kg	1,9 2,8	7,5 8,3	9,9 10,7	16,1 16,9	52,8 53,5

1 - IDENTIFICATION OF DIRECT OPERATED VALVE DSE3K*

1.1 - Identification code

D	S	E	3		-				/	10		-		K9		/		

Direct operated solenoid valve

Electric proportional control

Size: ISO 4401-03

Explosion-proof certification:
See table 1.2

Spool type:
C = closed centers
A = open centers

Spool nominal flow rate (see table par. 1.2)

Solenoid position
(omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

Series No.:
(the overall and mounting dimensions do not change from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection: by terminal block

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
T03 = 1/2” NPT - ANSI B1.20.1
(ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2
not available for INMETRO
S03 = 1/2” NPT - ANSI B1.20.1
(ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
CK = knob manual override
(only for DC version)
CH = lever manual override.
Dimensions for CB and CH at par. 18

Option: **/T5**
version in T5 temperature class.
Omit if not required.

NOTE: The zinc-nickel standard finishing surface treatment is suitable to ensure a salt spray resistance up to 600 hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards)

1.2 - Names of valves per certification

	ATEX		IECEx		INMETRO	
for gases for dusts	**KD2**	II 2GD	**KXD2**	IECEx Gb IECEx Db	**KBD2**	INMETRO Gb INMETRO Db
for mines	**KDM2**	I M2	**KXDM2**	IECEx Mb	**KBDM2**	INMETRO Mb

NOTE: Refer to the technical data sheet 02 500 for marking, operating temperatures and available versions.

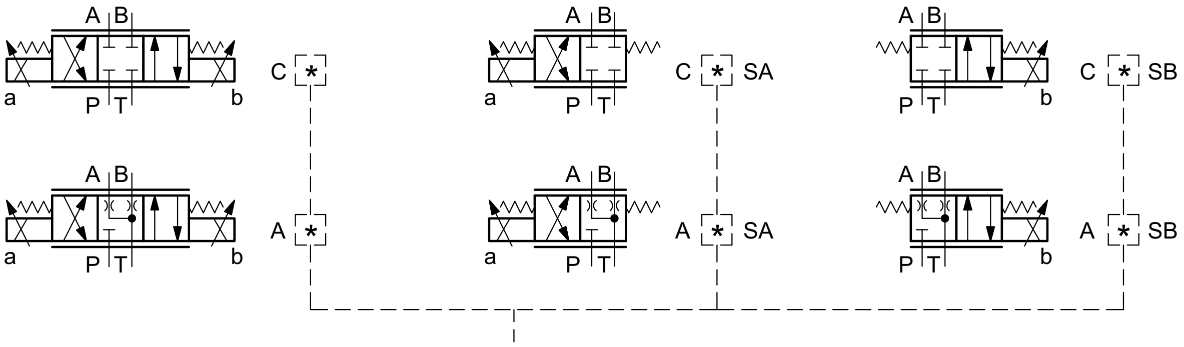
1.3 - Available configurations

Valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, nominal flow rate.

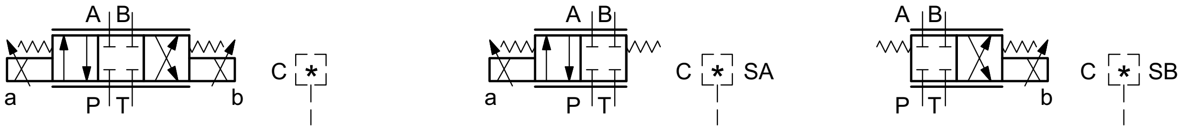
2 solenoids configuration:
3 positions with spring centering

“**SA**” configuration: 1 solenoid on side A.
2 positions (central + external) with spring centering

“**SB**” configuration: 1 solenoid on side B.
2 positions (central + external) with spring centering



*	Nominal flow with Δp10 bar P→T
04	4 l/min
08	8 l/min
16	16 l/min
16/08	16 (P→A) / 08 (B→T) l/min
26	26 l/min
26/13	26 (P→A) / 13 (B→T) l/min



*	Nominal flow with Δp10 bar P→T
01R	1 l/min

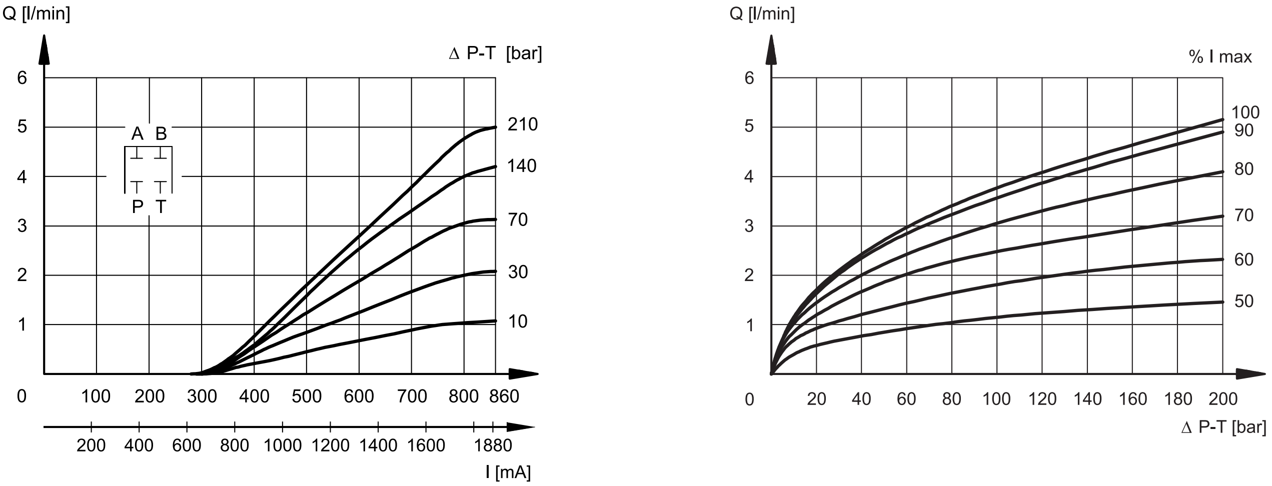
2 - DSE3K* CHARACTERISTIC CURVES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

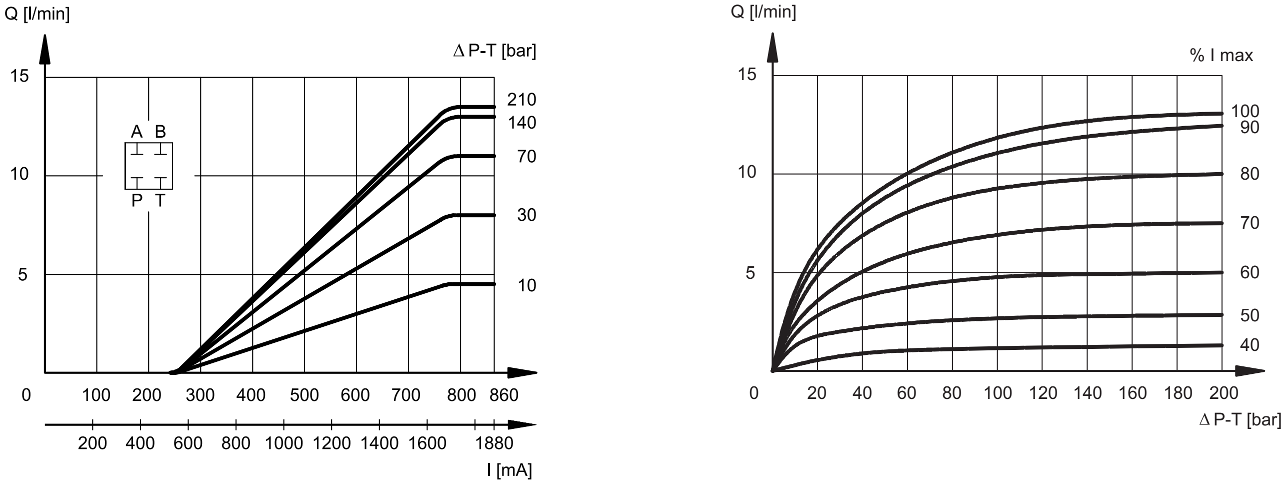
Typical flow control characteristics, according to current supply to the solenoid.

The reference Δp values are measured between ports P and T on the valve.

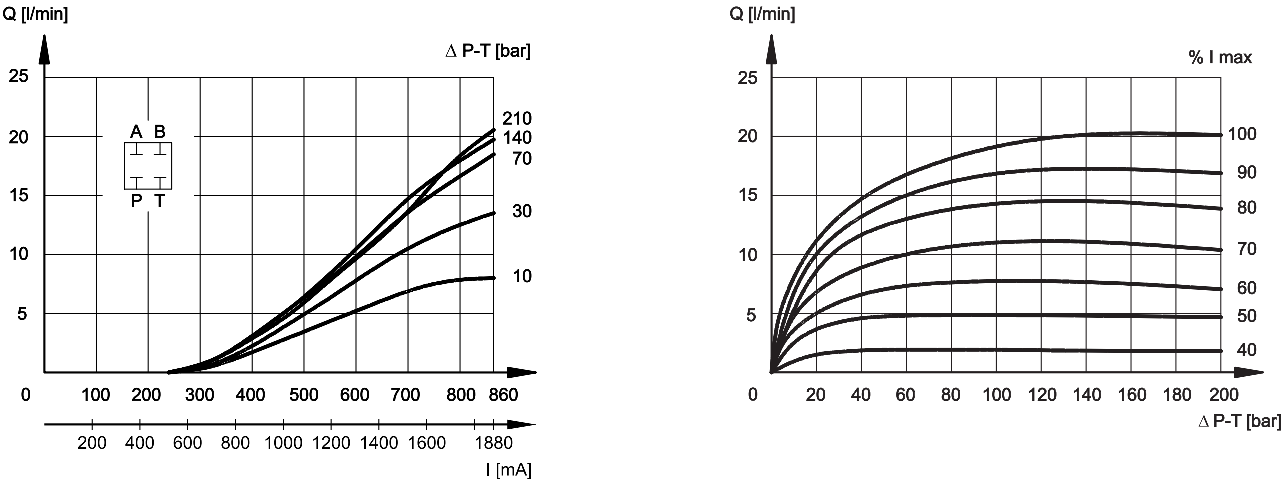
SPOOL TYPE C01R



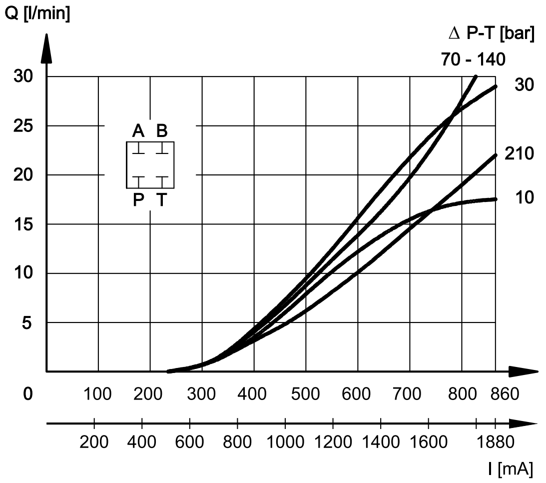
SPOOL TYPE C04

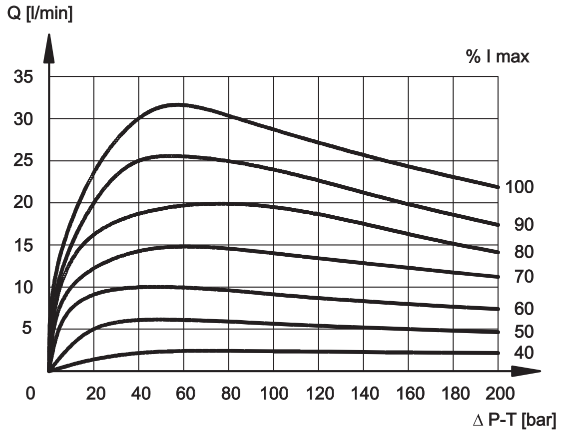


SPOOL TYPE C08

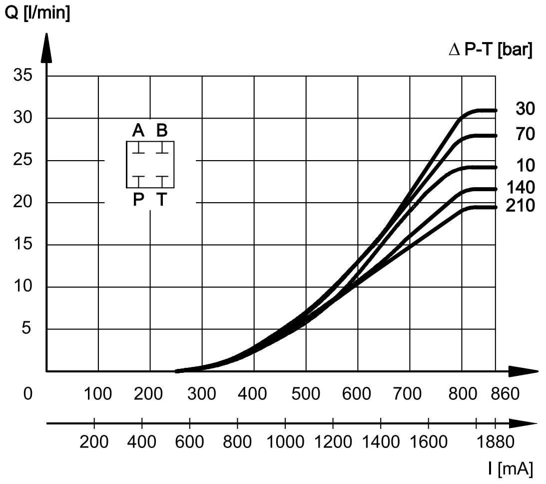


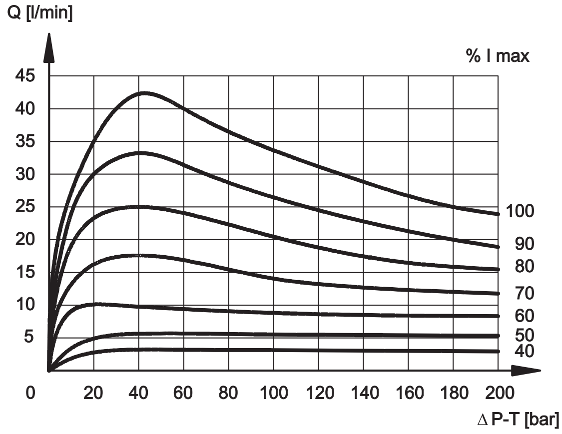
SPOOL TYPE C16



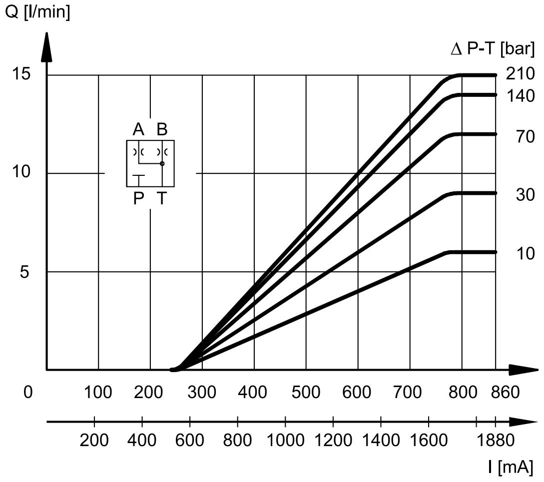


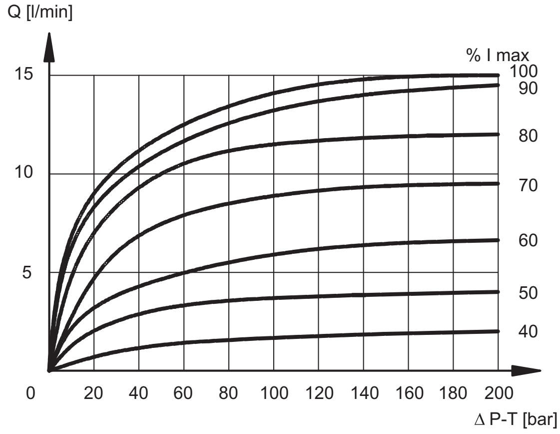
SPOOL TYPE C26





SPOOL TYPE A04





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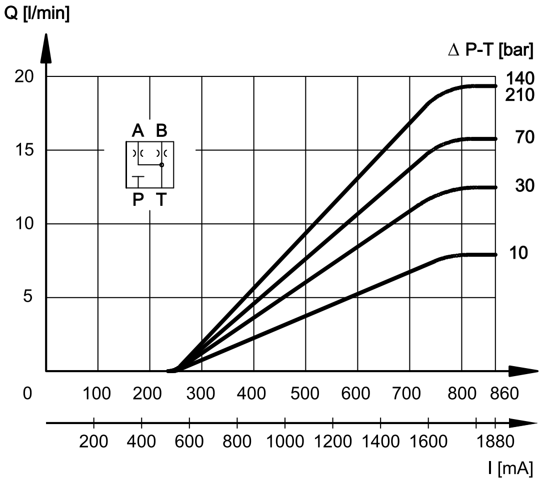
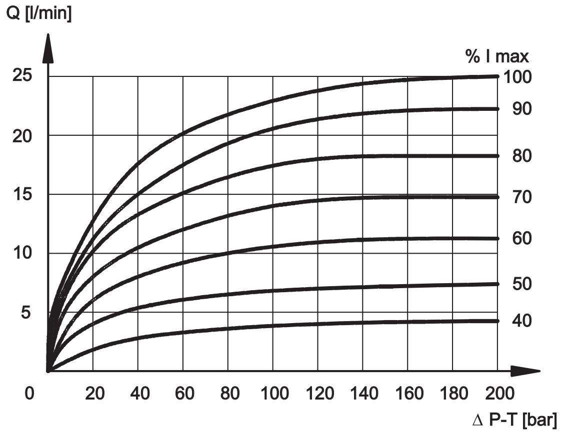
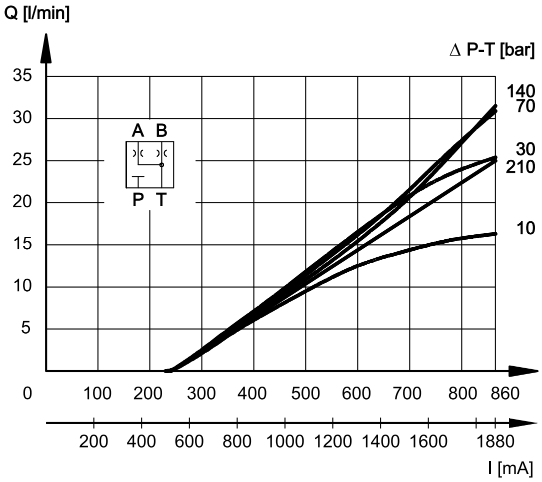
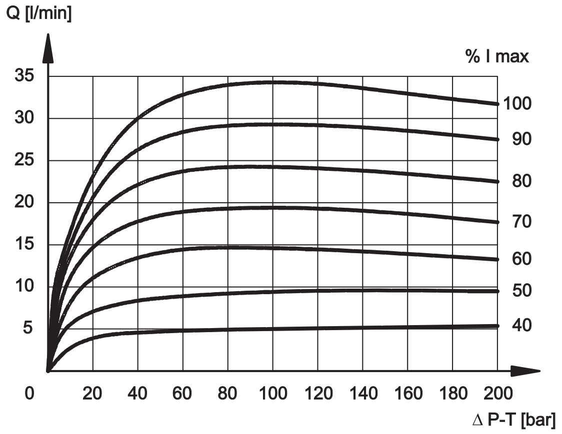


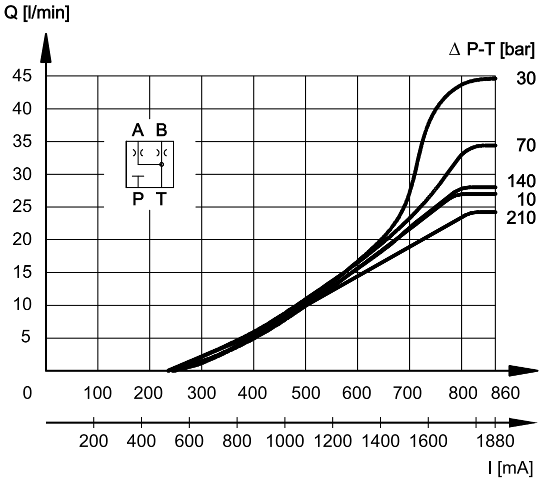


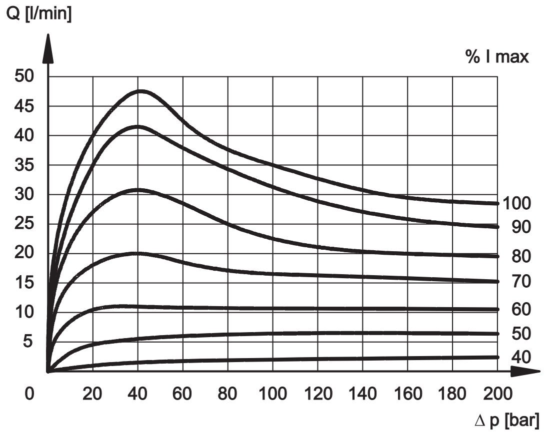
SPOOL TYPE A16





SPOOL TYPE A26

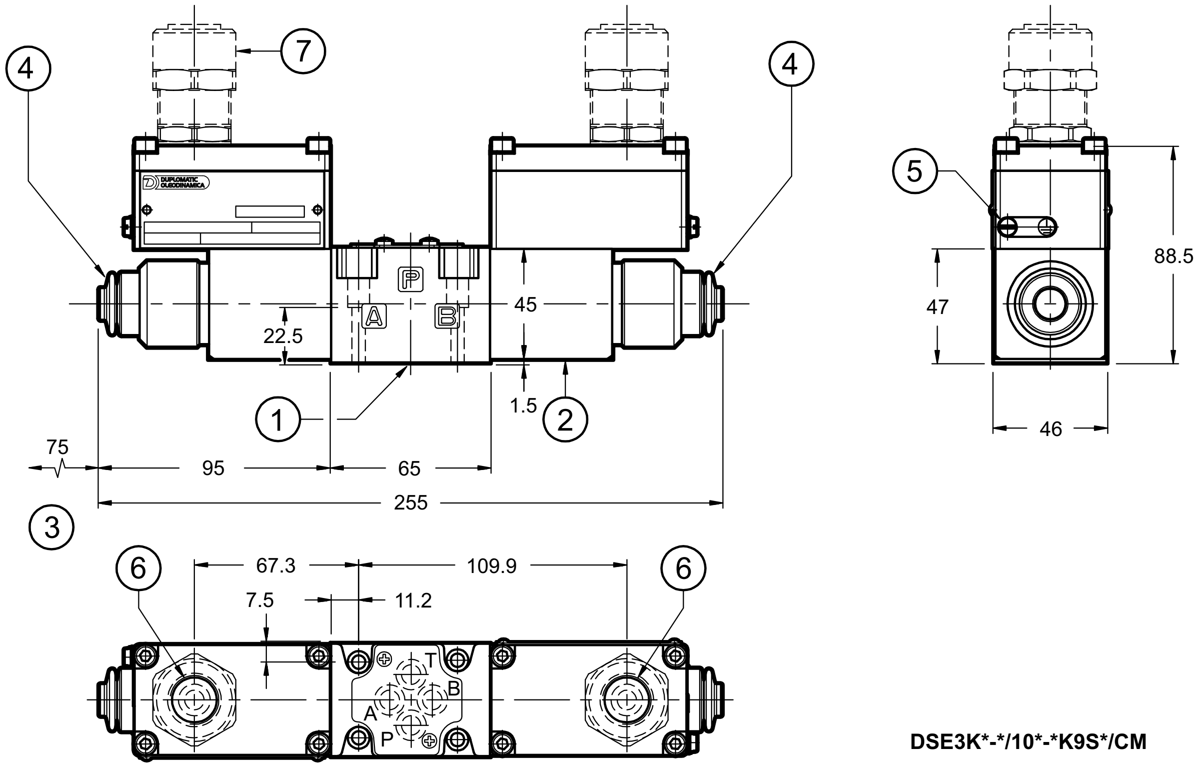




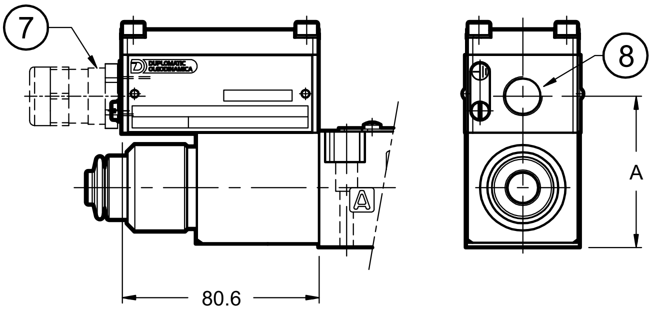
3 - DSE3K* OVERALL AND MOUNTING DIMENSIONS

DSE3K*-A*/10*-*K9T*/CM
DSE3K*-C*/10*-*K9T*/CM

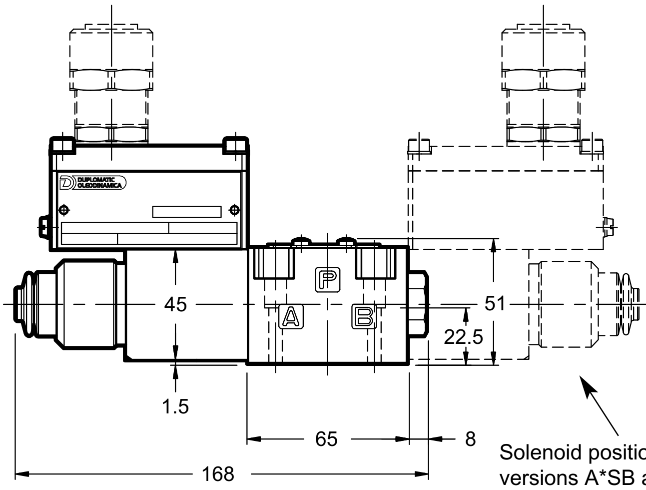
dimensions in mm



DSE3K*-*/10*-*K9S*/CM



DSE3K*-A*SA/10*-*K9T*/CM
DSE3K*-C*SA/10*-*K9T*/CM



Solenoid position for versions A*SB and C*SB

Side port type	Dimension A
S01, S04	60.5
S02, S03	60

1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see par. 19
8	Side port for cable gland

Valve fastening: 4 SHC screws ISO 4762 M5x30
Tightening torque: 5 Nm (A8.8 screws)
Threads of mounting holes: M5x10

4 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES DSPE*K*

4.1 - Identification code

D	S	P	E			-				/	10		-			/		K9		/			

Pilot operated directional valve

Electric proportional control

Size:
5 = CETOP P05
5R = ISO 4401-05
7 = ISO 4401-07
8 = ISO 4401-08
10 = ISO 4401-10

Explosion-proof certification:
See table 1.2

Spool type:
C = closed centres
A = open centres
RC = regenerative closed centres
RA = regenerative open centres

Spool nominal flow rate (see table par. 4.2)

Configurations for single solenoid version (omit for double solenoid version):
SA = 1 solenoid for cross configuration
SB = 1 solenoid for parallel configuration

Series No.: (the overall and mounting dimensions remain unchanged from 10 to 19)

Seals:
For temperature range -20 / +80 °C
N = NBR seals for mineral oil (standard)
V = FPM seals for special fluids
For temperature range -40 / +80 °C
NL = seal for low temperatures (for mineral oil)

Piloting:
I = internal
E = external
Z = internal piloting with 30 bar fixed adjustment pressure reducing valve

Drainage:
I = internal
E = external

Nominal solenoid voltage:
D12 = 12V DC
D24 = 24V DC

Coil electrical connection: by terminal block

Connection type for cable gland
upper connection:
T01 = M20x1.5 - ISO 261
T02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
T03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
side connection:
S01 = M20x1.5 - ISO 261
S02 = Gk 1/2 - UNI EN 10226-2 not available for INMETRO
S03 = 1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1)
S04 = M16x1.5 - ISO 261

Manual override:
CM = boot protected
standard for both N and V seals
not available for NL seals
CB = blind ring nut
standard for NL seals
available upon request for both N and V seals
see dimensions at paragraph 18

Option: **/T5**
version in T5 temperature class.
Omit if not required.

Option: surface treatment not standard.
Omit if not required
(see **NOTE**)

NOTE: the valves are supplied with standard surface treatment of phosphating black for the main body and zinc-nickel for the pilot body. Upon request we can supply these valves with full zinc-nickel surface treatment, suitable to ensure a salt spray resistance up to 600 h (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

For full zinc-nickel surface treatment add **/W7** at the end of the identification code.

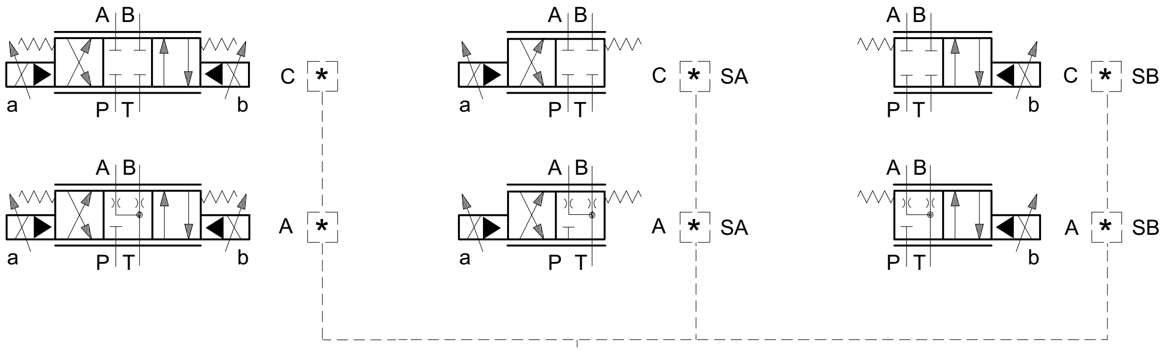
4.2 - Configurations

The valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

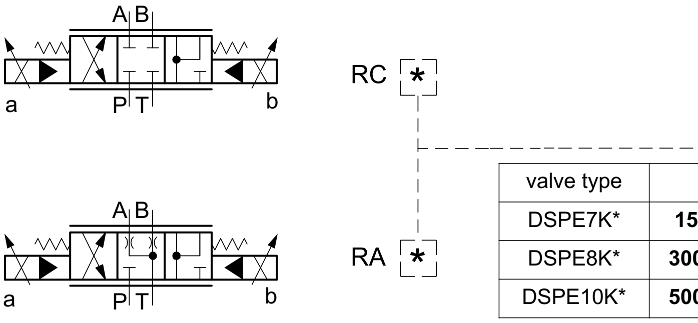
Configuration 2 solenoids:
3 positions with spring centering

1 solenoid for cross configuration “**SA**”:
2 positions (central + external)
with spring centering

1 solenoid for parallel configuration “**SB**”:
2 positions (central + external)
with spring centering



valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE5K* DSPE5RK*	**80**	80 l/min
	80/40	80 (P-A) / 40 (B-T) l/min
DSPE7K*	**100**	100 l/min
	150	150 l/min
	150/75	150 (P-A) / 75 (B-T) l/min
DSPE8K*	**200**	200 l/min
	300	300 l/min
	300/150	300 (P-A) / 150 (B-T) l/min
DSPE10K*	**350**	350 l/min
	500	500 l/min
	500/250	500 (P-A) / 250 (B-T) l/min



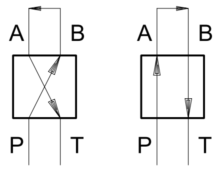
valve type	*	nominal flow rate with Δp 10 bar P-T
DSPE7K*	**150/75**	150 (P-A) / 75 (B-T) l/min
DSPE8K*	**300/150**	300 (P-A) / 150 (B-T) l/min
DSPE10K*	**500/250**	500 (P-A) / 250 (B-T) l/min

5 - CHARACTERISTIC CURVES OF PILOT OPERATED SOLENOID VALVES DSPE*K*

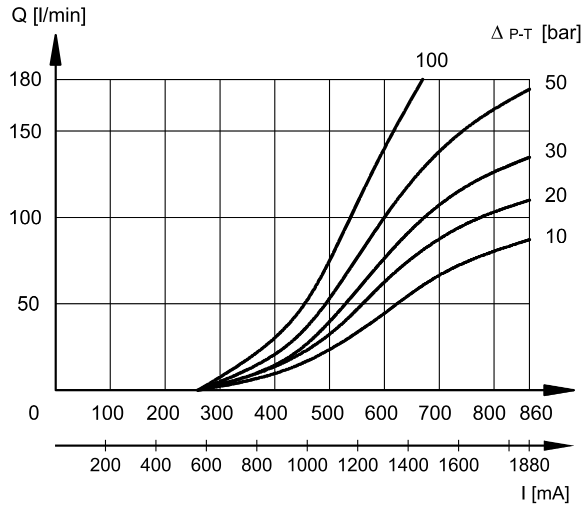
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves at constant Δp according to current supply to the solenoid, measured for the available spool types.

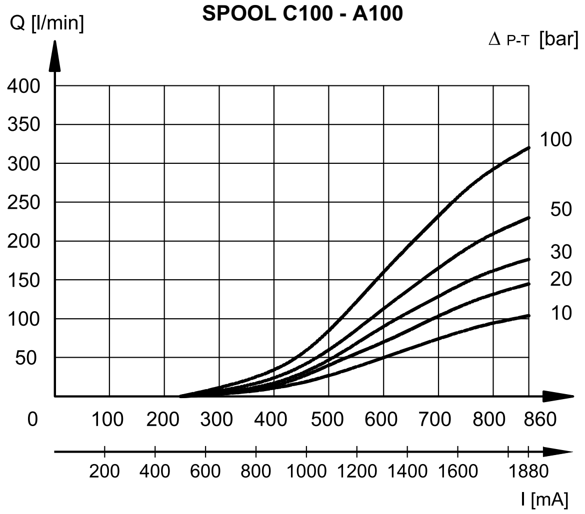
The reference Δp values are measured between valve ports P and T.

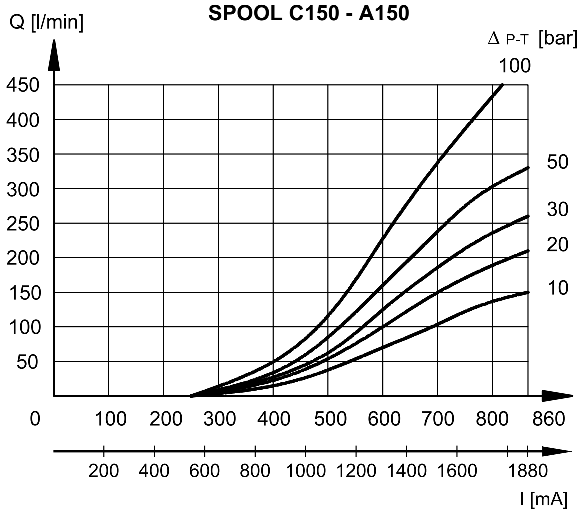


5.1 - Characteristic curves DSPE5K* and DSPE5RK

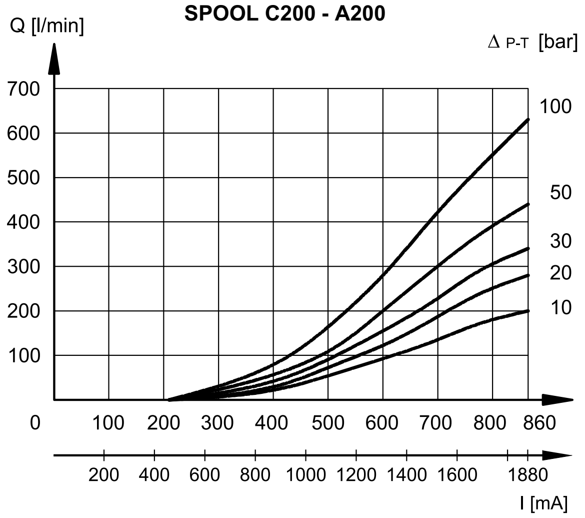


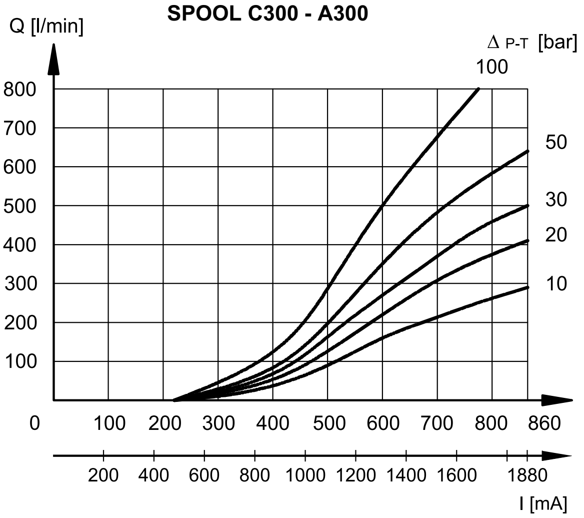
5.2 - Characteristic curves DSPE7K*


SPOOL C100 - A100


SPOOL C150 - A150

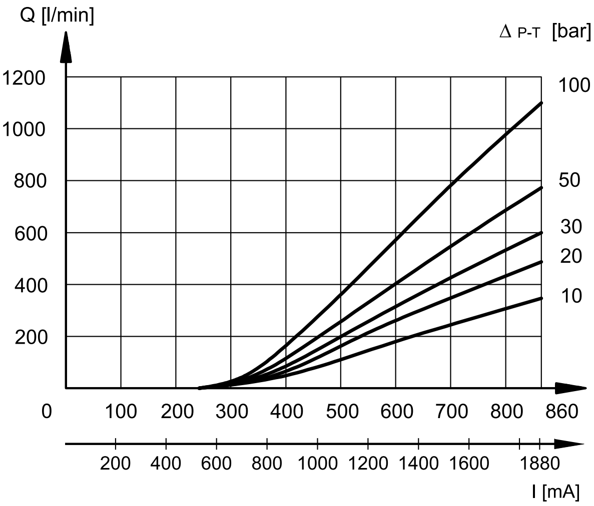
5.3 - Characteristic curves DSPE8K*


SPOOL C200 - A200

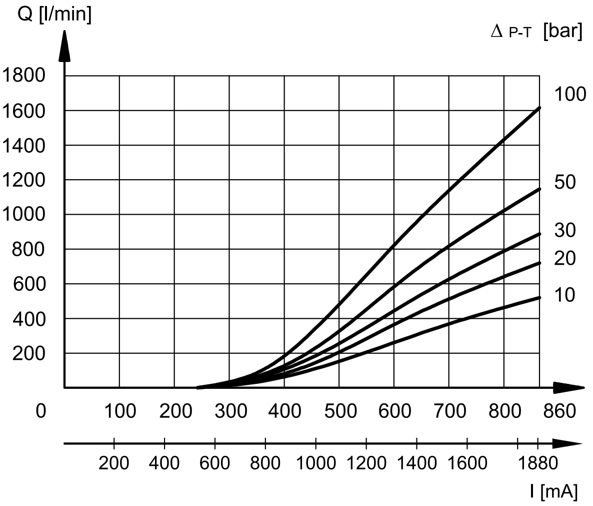

SPOOL C300 - A300

5.4 - Characteristic curves DSPE10K*

SPOOL C350 - A350



SPOOL C500 - A500



6 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Step response is the time taken for the valve to reach 90% of the set pressure value following a step change of reference signal.

The table shows the typical step response tested with static pressure 100 bar.

REFERENCE SIGNAL	0 → 100%	100 → 0%
	Step response [ms]	
DSE3K*	50	40
DSPE5K* and DSPE5RK*	50	40
DSPE7K*	80	50
DSPE8K*	100	70
DSPE10K*	200	120

7 - HYDRAULICS CHARACTERISTICS

(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

FLOWS		**DSPE5K* DSPER5K***	**DSPE7K***	**DSPE8K***	**DSPE10K***
Max flow rate	l/min	180	450	800	1600
Piloting flow requested with operation 0 →100%	l/min	3	5	9	13
Piloting volume requested with operation 0 →100%	cm^3	1,7	3,2	9,1	21,6

PRESSURES	MIN	MAX
Piloting pressure on X port	30	210 (**NOTE**)
Pressure on T port with interal drain	–	10
Pressure on T port with external drain	–	250

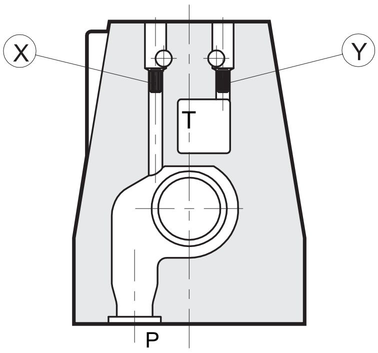
NOTE: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure. Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered.

Add the letter **Z** to the identification code to order this option (see par. 4.1). Consider that, by adding the pressure reducing valve, the overall dimensions increase 40 mm in height.

8 - PILOTING AND DRAINAGE

DSPE*K* valves are available with piloting and drainage, both internal and external. The version with external drainage allows for a higher back pressure on the outlet.

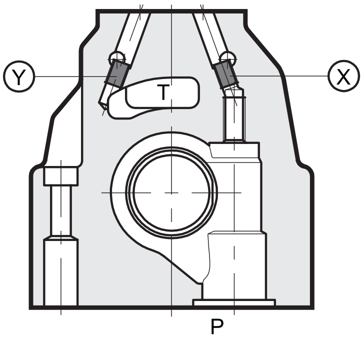
DSPE5K*
DSPE5RK*



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

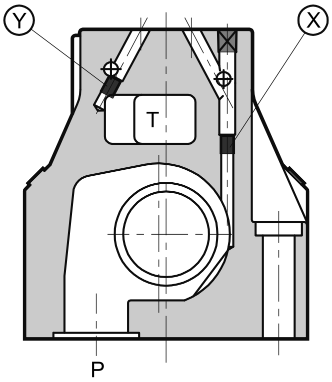
TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

DSPE7K*



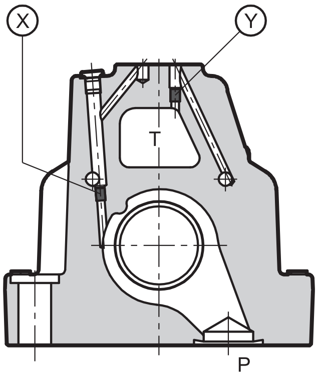
X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

DSPE8K*



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

DSPE10K*



X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

9 - ELECTRICAL CHARACTERISTICS

(values ± 5%)

NOMINAL VOLTAGE	V DC	**12**	**24**
RESISTANCE (AT 20°C)	Ω	3,4	15,6
NOMINAL CURRENT	A	1,88	0,86

DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	According to 2014/30/EU
CLASS OF PROTECTION: Atmospheric agents Coil insulation (VDE 0580)	IP66 / IP68 class H

9.1 - Wiring

In order to realise the electrical connection of the coil, it is necessary to access the terminal block (1) unscrewing the 4 screws (2) that fasten the cover (3) with the box (4) that contains the terminal block.

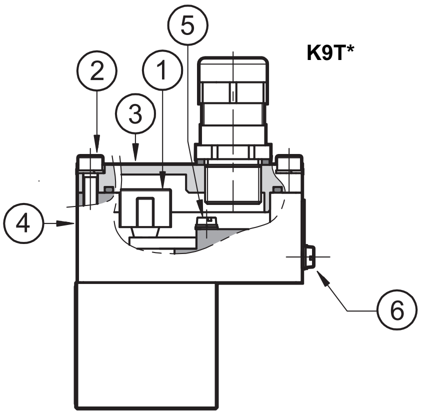
The electrical connection is polarity-independent.

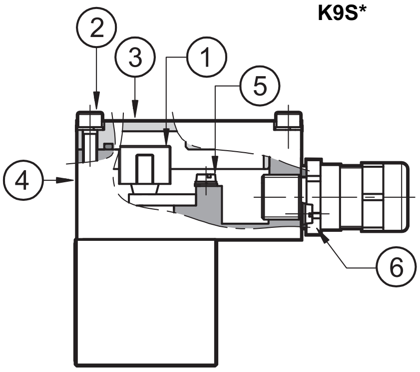
By doing electrical connection it is important to connect also the grounding point (5) in the terminal block box (M4 screws), through suitable conductors with the general grounding line of the system.

On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements included in a potentially explosive environment (the maximum resistance between the elements must be 100 Ω), is guaranteed.

At the end of the electrical wiring, it is necessary to reassemble the cover (3) on the box (4), checking the correct positioning of the seal located in the cover seat and fastening the 4 M5 screws with a torque of 4.9 ÷ 6 Nm.

Electrical wiring must be done following in compliance with standards about protection against explosion hazards





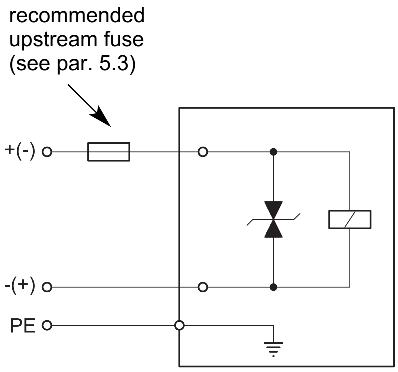
Characteristics of the cables connectable for wiring are indicated in the table below:

Function	Cable section
Operating voltage cables connection	max 2.5 mm²
Connection for internal grounding point	max 2.5 mm²
Connection for external equipotential grounding point	max 6 mm²

Cables for wiring must be non-armoured cables, with external covering sheath and must be suitable for use in environments with temperatures from - 20 °C to +110 °C (for valves either with N or V seals) or from - 40 °C to +110 °C (for valves with NL seals).

Cable glands (which must be ordered separately, see paragraph 19) allow to use cables with external diameter between 8 and 10 mm.

9.2 - Electrical diagrams



9.3 - Overcurrent fuse and switch-off voltage peak

Upstream of each valve, an appropriate fuse (max 3 x In according to IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping, as short-circuit protection, must be connected. The cut-off power of the fuse must correspond or exceed the short circuit current of the supply source. The fuse or the protective motor must be placed outside the dangerous area or they must be protected with an explosion-proof covering.

In order to safeguard the electronic device to which the valve is connected, there is a protection circuit in the coil, that reduces voltage peaks, which can occur when inductances are switched off.

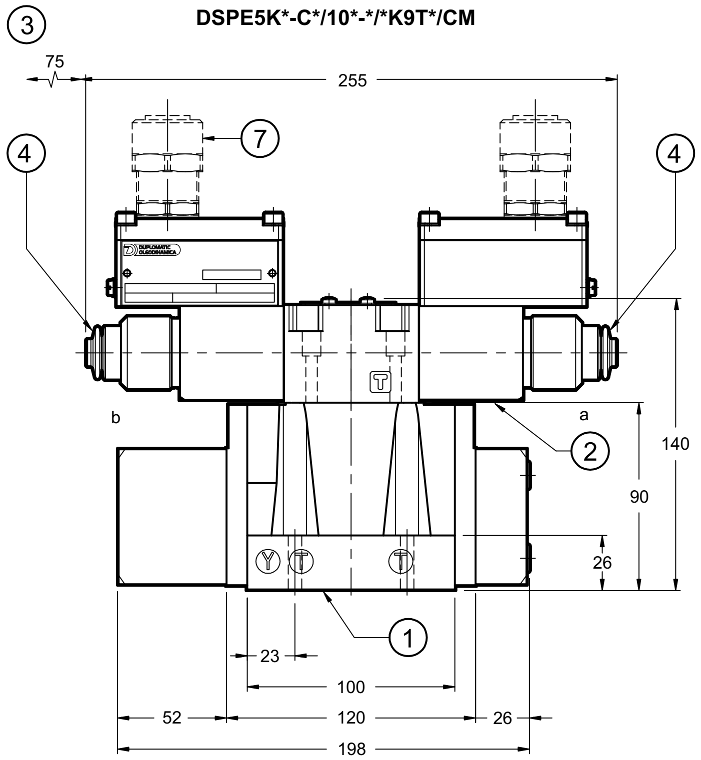
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

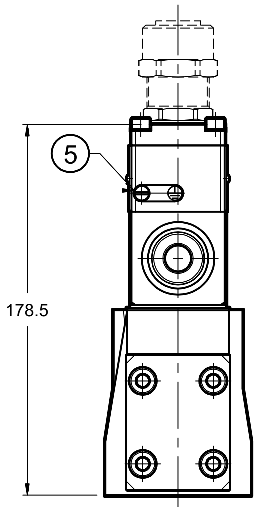
Coil type	Nominal voltage [V]	Rated current [A]	**Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]**	Maximum voltage value upon switch off [V]	Suppressor circuit
D12	12	1,88	2,5	- 49	Transient voltage suppressor bidirectional
D24	24	0,86	1,25	- 49	

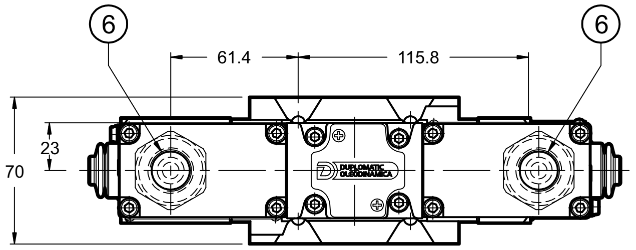
10 - DSPE5K* AND DSPE5RK* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

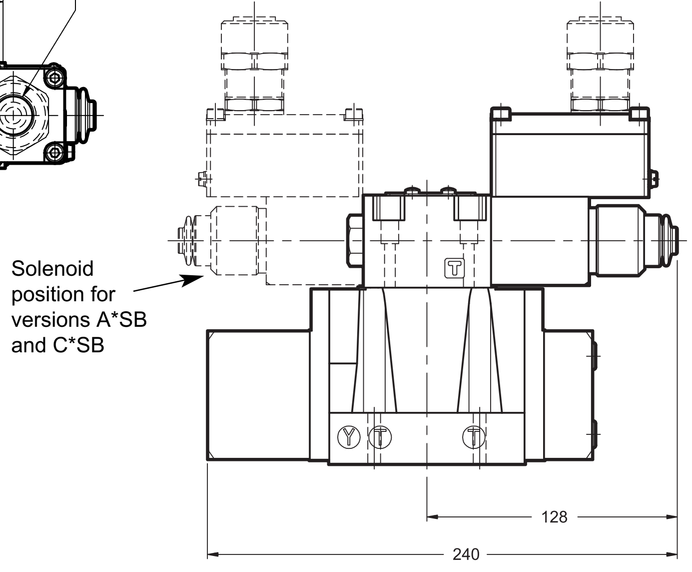
DSPE5K*-A*/10*-*/*K9T*/CM
DSPE5K*-C*/10*-*/*K9T*/CM







DSPE5K*-A*SA/10*-*/*K9T*/CM
DSPE5K*-C*SA/10*-*/*K9T*/CM



1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 2 OR type 2037 (9.25x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see paragraph 19

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

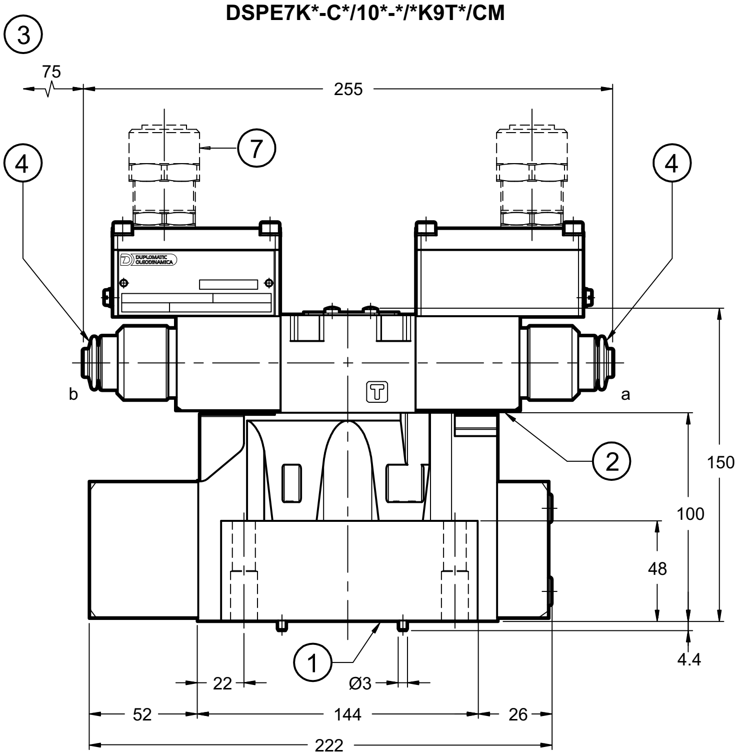
NOTE 2: for side port cable gland see paragraph 14.

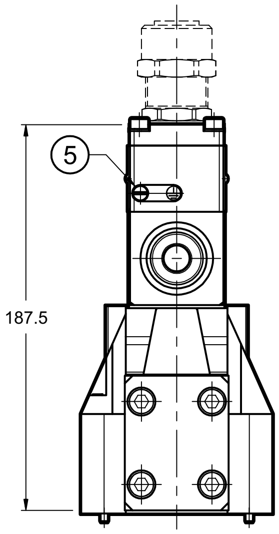
Valve fastening: 4 SHC ISO 4762 screws M6x35
Tightening torque: 8 Nm (A8.8 screws)
Threads of mounting holes: M6x10

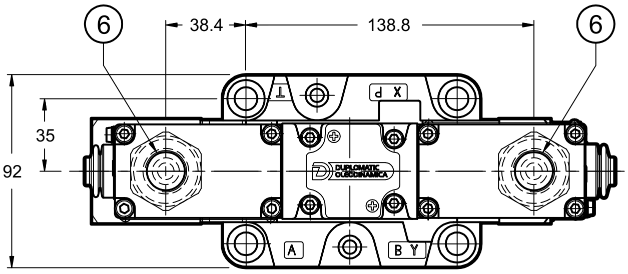
11 - DSPE7K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

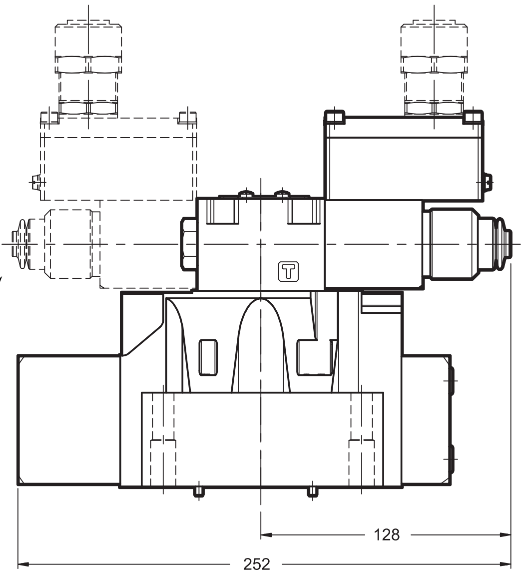
DSPE7K*-A*/10*-*/*K9T*/CM
DSPE7K*-C*/10*-*/*K9T*/CM







DSPE7K*-A*SA/10*-*/*K9T*/CM
DSPE7K*-C*SA/10*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

NOTE 2: for side port cable gland see paragraph 14.

1	Mounting surface with sealing rings: 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see paragraph 19

Valve fastening: 4 SHC screws ISO 4762 M10x60
2 SHC screws ISO 4762 M6x60

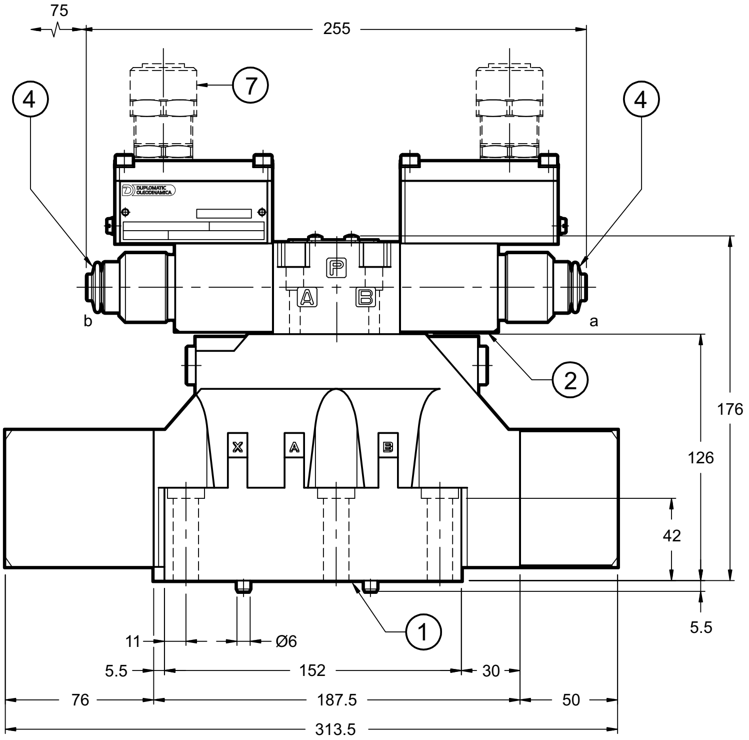
Tightening torque: M10x60: 40 Nm (A8.8 screws)
M6x60: 8 Nm (A8.8 screws)

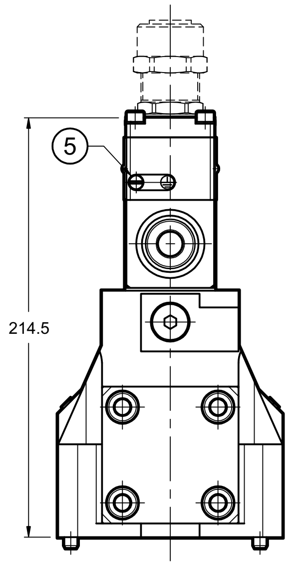
Threads of mounting holes: M6x18; M10x18

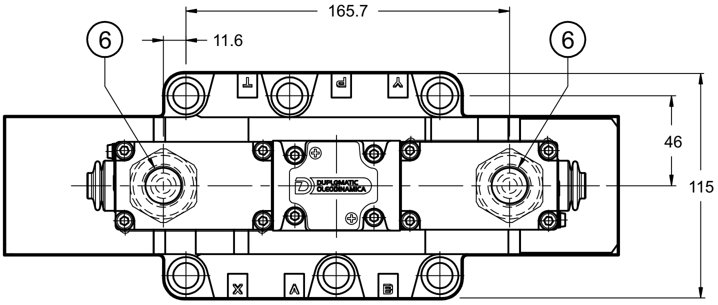
12 - DSPE8K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

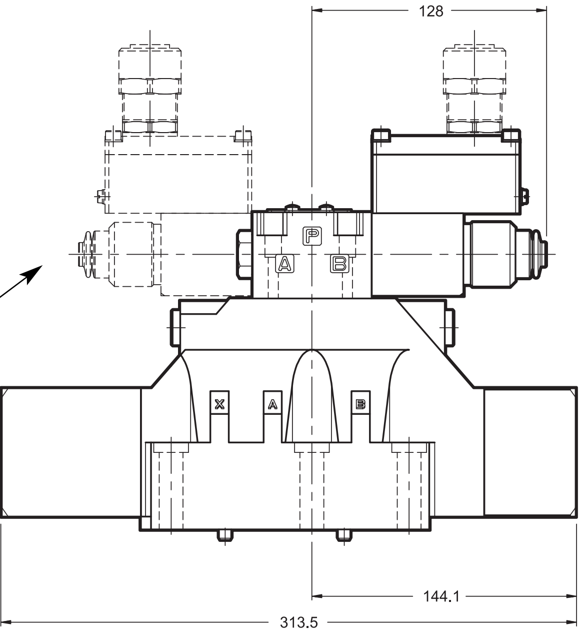
DSPE8K*-A*/10*-*/*K9T*/CM
DSPE8K*-C*/10*-*/*K9T*/CM







DSPE8K*-A*SA/10*-*/*K9T*/CM
DSPE8K*-C*SA/10*-*/*K9T*/CM



Solenoid position for versions A*SB and C*SB

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

NOTE 2: for side port cable gland see paragraph 14.

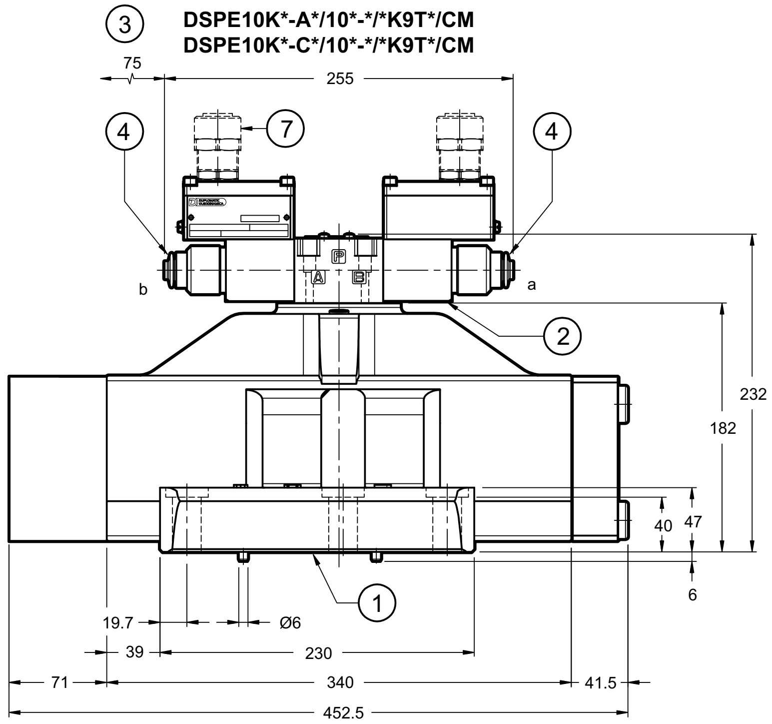
1	Mounting surface with sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see paragraph 19

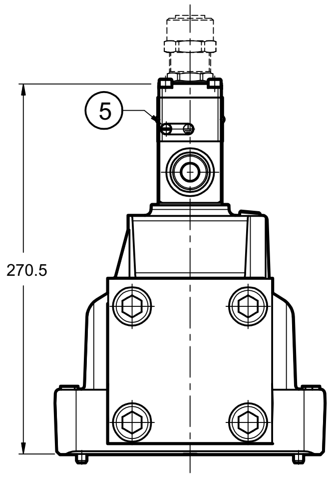
Valve fastening: 6 SHC ISO 4762 screws M12x60
Tightening torque: 69 Nm (A8.8 screws)
Threads of mounting holes: M12x20

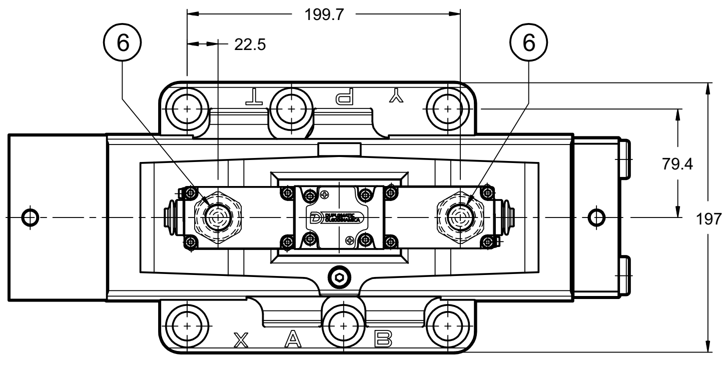
13 - DSPE10K* OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DSPE10K*-A*/10*-*/*K9T*/CM
DSPE10K*-C*/10*-*/*K9T*/CM

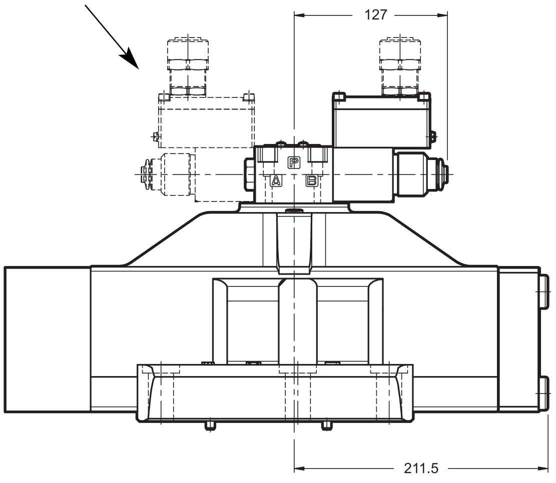






DSPE10K*-A*SA/10*-*/*K9T*/CM
DSPE10K*-C*SA/10*-*/*K9T*/CM

Solenoid position for versions A*SB and C*SB



1	Mounting surface with sealing rings: 4 OR type 4150 (37.59x3.53) - 90 shore 2 OR type 3081 (20.24x2.62) - 90 shore
2	Explosion-proof coil
3	Minimum clear space required
4	Manual override, boot protected (**standard for both N and V seals**) - for blind ring nut dimensions (standard for NL seals) see par. 18
5	Terminal for supplementary GND connection
6	Upper port for cable gland
7	Cable gland. To be ordered separately, see paragraph 19

NOTE 1: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

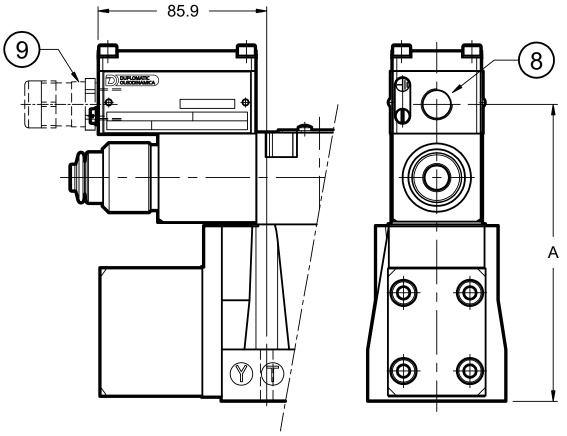
NOTE 2: for side port cable gland see paragraph 14.

Valve fastening: 6 SHC screws ISO 4762 M20x70
Tightening torque: 330 Nm (A8.8 screws)
Threads of mounting holes: M20x40

14 - DSPE*K*-*K9S* (SIDE CONNECTION) OVERALL AND MOUNTING DIMENSIONS

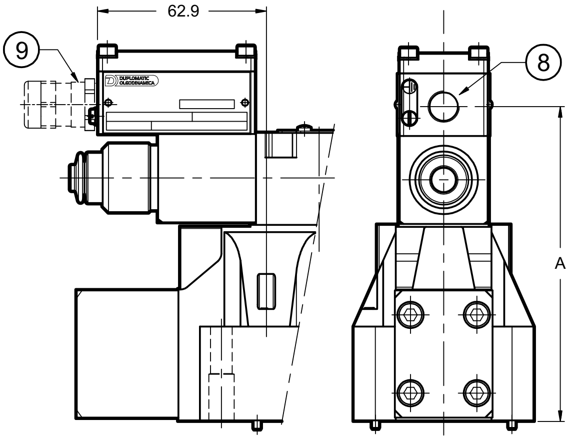
dimensions in mm

DSPE5K*-*K9S*
DSPE5RK*-*K9S*



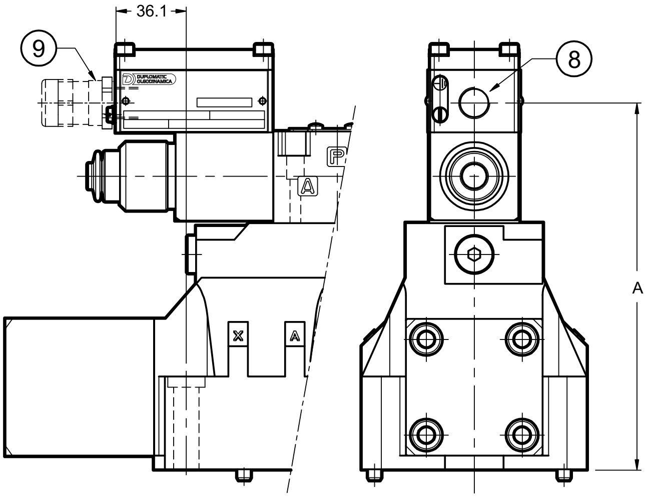
Side port type	Dimension A
S01, S04	150.5
S02, S03	150

DSPE7K*-*K9S*



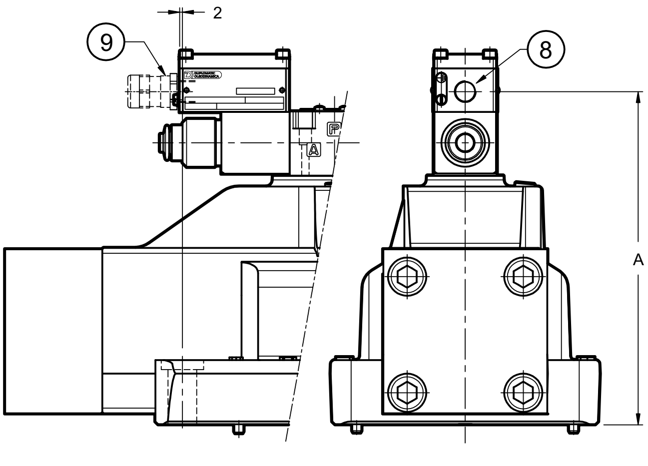
Side port type	Dimension A
S01, S04	157.5
S02, S03	157

DSPE8K*-*K9S*



Side port type	Dimension A
S01, S04	186.5
S02, S03	186

DSPE10K*-*K9S*

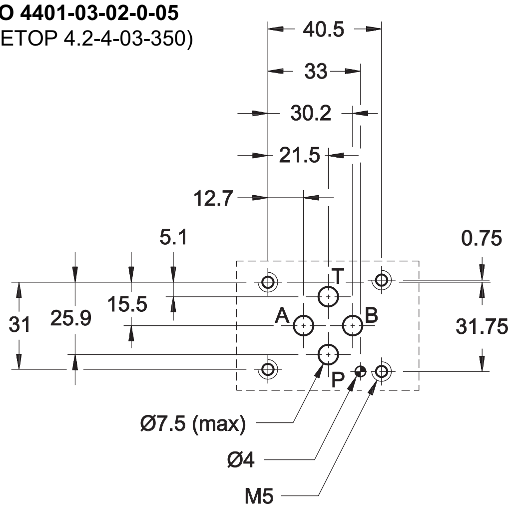


Side port type	Dimension A
S01, S04	242.5
S02, S03	242

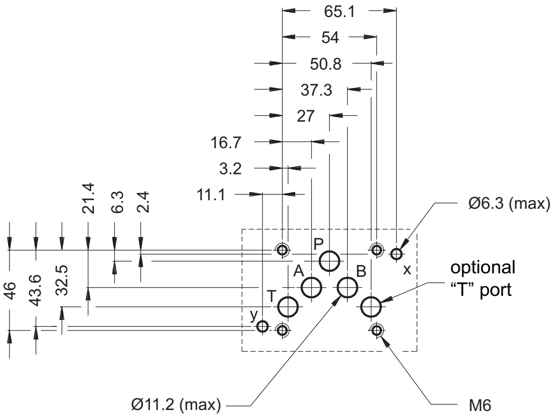
8	Side port for cable gland
9	Cable gland. To be ordered separately, see par. 19

15 - MOUNTING SURFACES

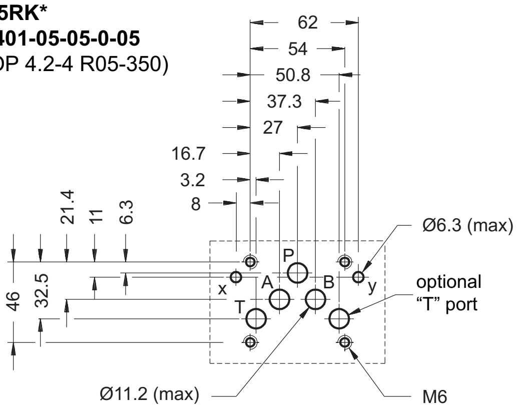
DSE3K*
ISO 4401-03-02-0-05
(CETOP 4.2-4-03-350)



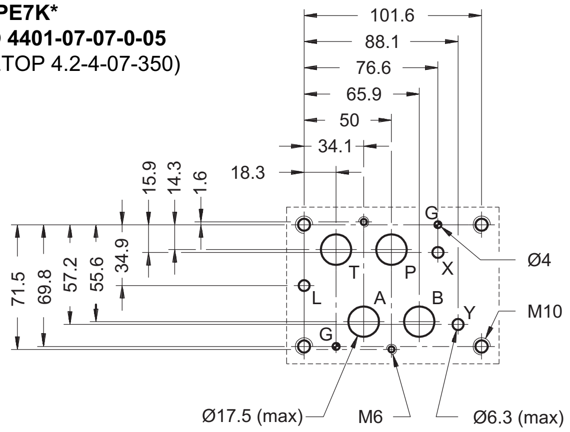
DSPE5K*
CETOP 4.2-4 P05-350



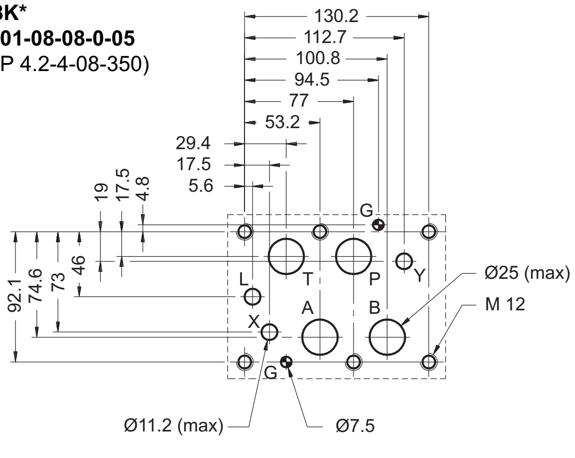
DSPE5RK*
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



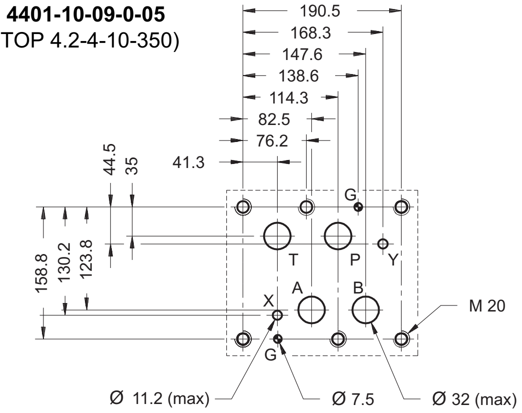
DSPE7K*
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DSPE8K*
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



DSPE10K*
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



16 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

17 - INSTALLATION

⚠ **Installation must adheres to instructions reported in the *Use and Maintenance manual*, always attached to the valve. Unauthorized interventions can be harmful to people and goods because of the explosion hazards present in potentially explosive atmospheres.**

The valves can be installed in any position without impairing correct operation.

Valve fastening takes place by means of screws or tie rods, laying the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

If the minimum values of planarity or smoothness are not met, fluid leakages between valve and mounting surface can easily occur.

18 - MANUAL OVERRIDES

18.1 - CB - Blind ring nut

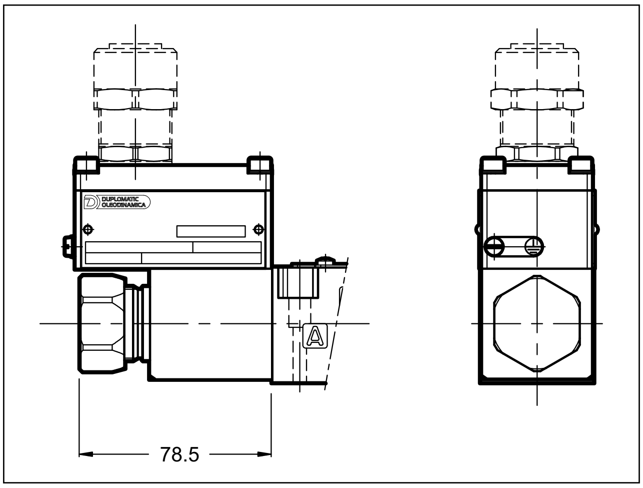
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

To access the manual override loose the ring nut and remove it; then reassemble hand tightening, until it stops.

Activate the manual override always and only with non-sparking tools suitable for use in potentially explosive atmospheres.

More information on safe use of explosion-proof components are provided in the instruction manual, always supplied with the valve.

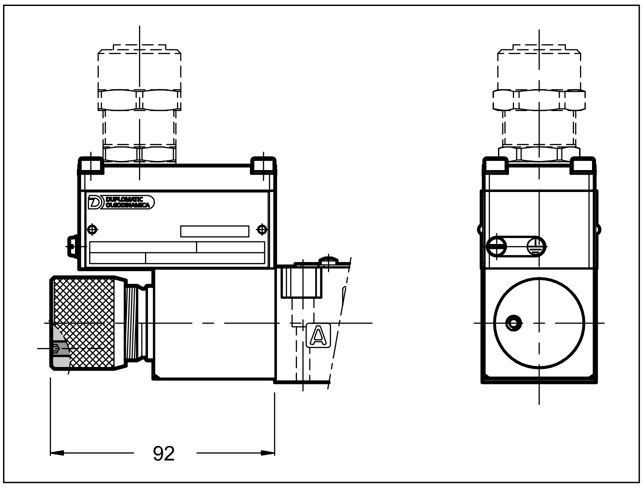
⚠ **CAUTION!: The manual override doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.**



18.2 - CK Knob manual override

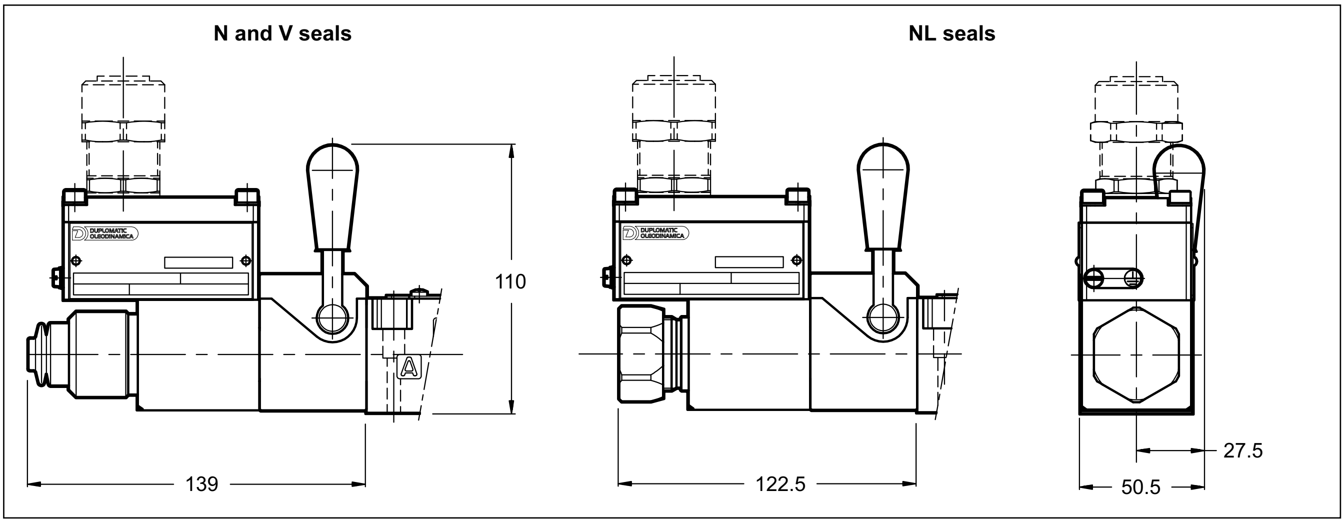
When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing. Available for DC valves only.

Spanner: 3 mm



18.3 - CH - Lever manual override

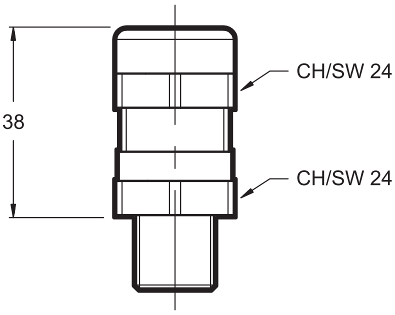
The seals choice leads the type of the standard ring nut to be mounted. The lever device is always placed at valve side A.



19 - CABLE GLANDS

Cable glands must be ordered separately; Duplomatic offers some types of cable glands with the following features:

- version for non-armoured cable, external seal on the cable (suitable for Ø8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb; INMETRO Gb, Db, Mb certified
- cable gland material: nickel brass
- rubber tip material: silicone
- ambient temperature range: -70 ºC ÷ +220 ºC
- protection degree: IP66/IP68
- Tightening torque: 15 Nm



To order, list the description and the code of the version chosen from among those listed below:

Description: CGK2/NB-01/10

Code: 3908108001

M20x1.5 - ISO 261 male thread, suitable for coils with T01 and S01 connections. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Description: CGK2/NB-02/10

Code: 3908108002

Gk 1/2 - UNI EN 10226-2 male thread, suitable for coils with T02 and S02 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-03/10

Code: 3908108003

1/2” NPT - ANSI B1.20.1 (ex ANSI B2.1), suitable for coils with T03 and S03 connections. The customer must apply LOCTITE® 243™ threadlocker or similar between the cable gland connection thread and the coil in order to ensure IP66/IP68 protection degree.

Description: CGK2/NB-04/10

Code: 3908108004

M16x1.5 - ISO 261 male thread, suitable for coils with S04 connection. It is supplied equipped with silicone seal, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

20 - ELECTRONIC CONTROL UNITS

NOTE: electronic control units offered are not explosion proof certified; therefore, they must be installed outside the classified area.

DSE3K* - * * SA DSE3K* - * * SB

EDM-M112	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M142	for solenoid 12V DC		

DSE3K* - A* DSE3K* - C*

EDM-M212	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M242	for solenoid 12V DC		

DSPE*K* - * * SA DSPE*K* - * * SB

EDM-M111	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M141	for solenoid 12V DC		

DSPE*K* - A* DSPE*K* - C*

EDM-M211	for solenoid 24V DC	DIN EN 50022 rail mounting	see cat. 89 250
EDM-M241	for solenoid 12V DC		

21 - SUBPLATES

(see catalogue 51 000)

	DS3K*	**DSP5K***	**DSP7K***	**DSP8K***
Type with rear ports	PMMD-AI3G	PME4-AI5G	PME07-AI6G	-
Type with side ports	PMMD-AL3G	PME4-AL5G	PME07-AL6G	PME5-AL8G
P, T, A, B ports dimensions X, Y ports dimensions	3/8” BSP -	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1 ½” BSP 1/4” BSP

NOTE: Subplates (to be ordered separately) do not contain neither aluminium nor magnesium at a higher rate than the value allowed by norms according to ATEX directive for categories II 2GD and I M2.

The user must take care and make a complete assessment of the ignition risk, that can occur from the relative use in potentially explosive environments.

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Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

EXPLOSION-PROOF CLASSIFICATION for

SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

pressure valves

RQM*K*-P	**21 515**
PRE(D)*K*	**81 315**
ZDE3K*	**81 515**
DZCE*K*	**81 605**

directional valves

D*K*	**41 515**
DS(P)E*K*	**83 510**

GENERAL INFO

This informative technical datasheet displays information about **classification and marking** of Duplomatic explosion-proof valves range.

Duplomatic offers valves with the following certifications:

ATEX	**II 2G**	**II 2D**	**I M2**
IECEx	**Gb**	**Db**	**Mb**
INMETRO	**Gb**	**Db**	**Mb**

Instructions for use and maintenance can be found in the related manuals, always supplied toghether with valves.

1 - ATEX CLASSIFICATION AND TEMPERATURES

Duplomatic certificates the combination valve-coil for the valves suitable for application and installation in potentially explosive atmospheres, according to ATEX directive; the supply always includes the declaration of conformity to the directive and the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environments.

Coils assembled on these valves have been separately certified according to ATEX directive and so they are suitable for use in potentially explosive atmospheres.

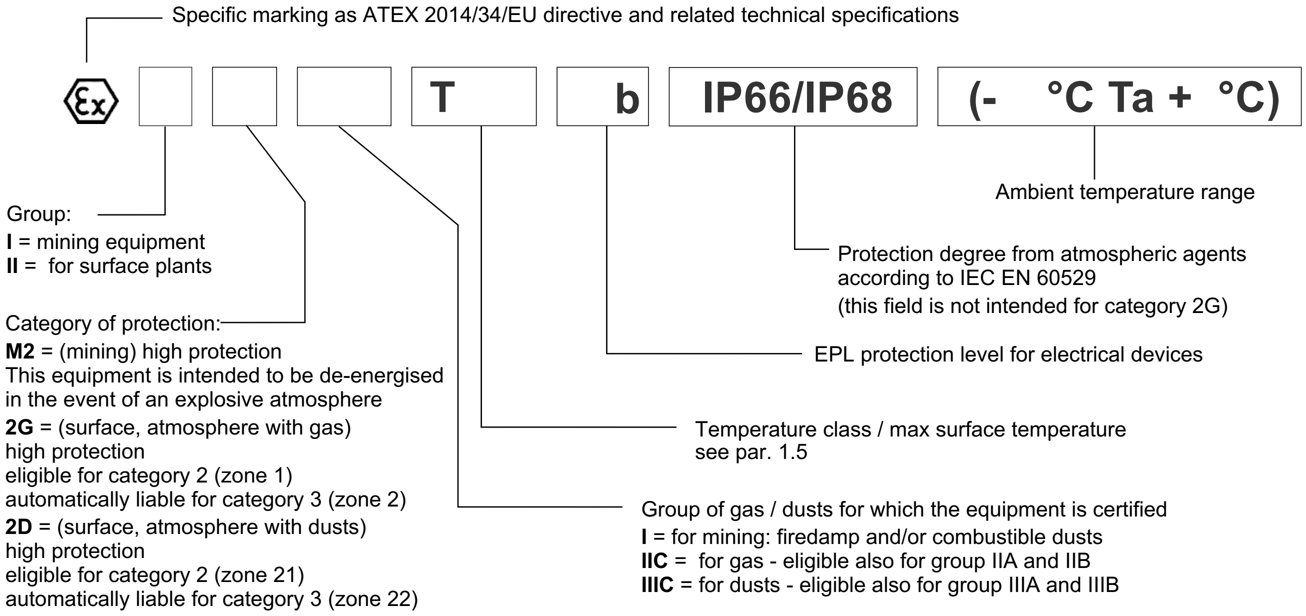
1.1 - ATEX classification for valves

Type examination certificate: CEC 13 ATEX 030-REV.2
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

ATEX II 2G ATEX II 2D	***KD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
ATEX I M2	***KDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

1.2 - ATEX marking for valves

valve code		**N and V seals**	**NL seals**
***KD2**	for gas	Ex II 2G IIC T4 Gb (-20°C Ta +80°C)	Ex II 2G IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex II 2D IIIC T154°C Db IP66/IP68 (-20°C Ta +80°C)	Ex II 2D IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KD2 /T5**	for gas	Ex II 2G IIC T5 Gb (-20°C Ta +55°C)	Ex II 2G IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex II 2D IIIC T129°C Db IP66/IP68 (-20°C Ta +55°C)	Ex II 2D IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KDM2**	mining	Ex I M2 I T150°C Mb IP66/68 (-20°C Ta +75°C)	Ex I M2 I T150°C Mb IP66/68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Ambient temperature range

Group:
I = mining equipment
II = for surface plants

Protection degree from atmospheric agents according to IEC EN 60529
(this field is not intended for category 2G)

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

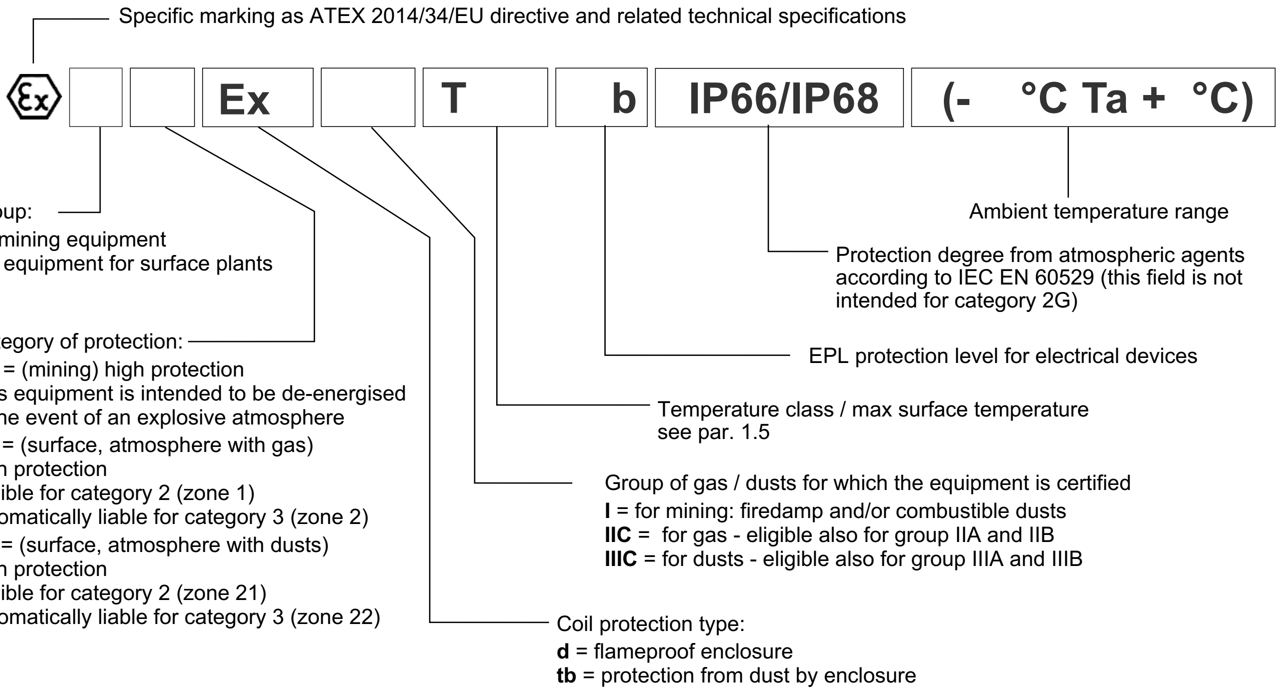
1.3 - ATEX classification of the coils

The coil of the explosion-proof valves is ATEX certified itself an as such is identified with its own tag, carries the relative ATEX marking. **The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).**

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

1.4 - ATEX marking on coils

for valve type ***KD2**	for gas	II 2G Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	II 2D Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
for valve type ***KD2 /T5**	for gas	II 2G Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	II 2D Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
for valve type ***KDM2**	mining	I M2 Ex d I T150°C Mb IP66/IP68 (-40°C Ta +75°C)



Specific marking as ATEX 2014/34/EU directive and related technical specifications

Group:
I = mining equipment
II = equipment for surface plants

Category of protection:
M2 = (mining) high protection
This equipment is intended to be de-energised
in the event of an explosive atmosphere
2G = (surface, atmosphere with gas)
high protection
eligible for category 2 (zone 1)
automatically liable for category 3 (zone 2)
2D = (surface, atmosphere with dusts)
high protection
eligible for category 2 (zone 21)
automatically liable for category 3 (zone 22)

Ambient temperature range

Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for category 2G)

EPL protection level for electrical devices

Temperature class / max surface temperature
see par. 1.5

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Coil protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

1.5 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

The valves in group II can also be used for less limiting temperature classes (surface temperature allowed higher).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
ATEX II 2G ATEX II 2D	***KD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
ATEX I M2	***KDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

2 - IECEx CLASSIFICATION AND TEMPERATURES

The IECEx certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with IECEx certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex db” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

2.1 - IECEx classification

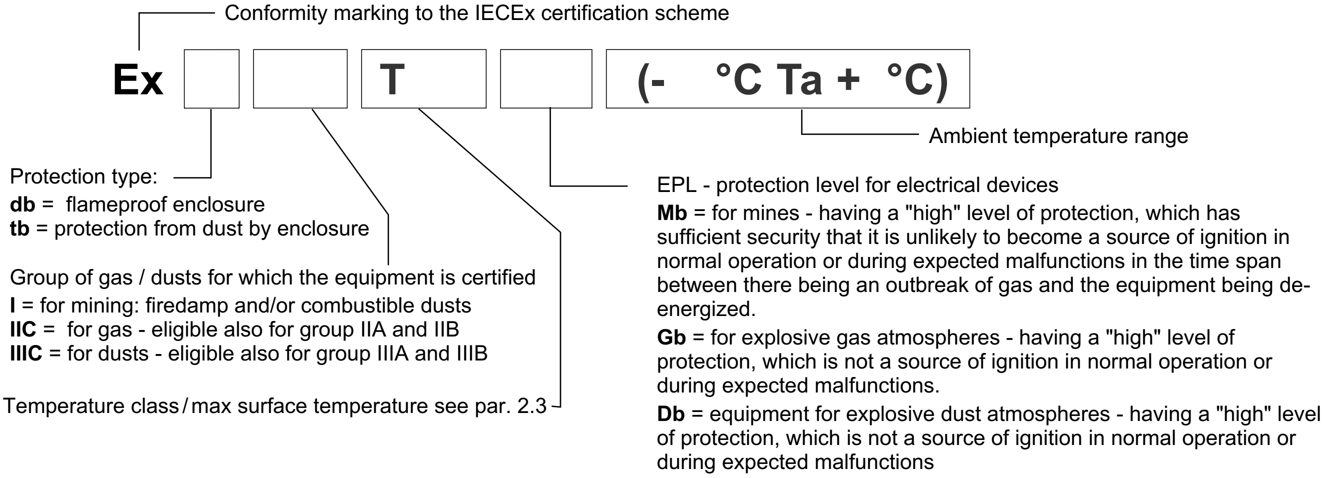
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

IECEx Gb IECEx Db	***KXD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
IECEx Mb	***KXDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

2.2 - IECEx marking

There is a plate with the IECEx mark on each coil.

***KXD2** valves	for gas	Ex db IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T135°C Db (-40°C Ta +80°C)
***KXD2 /T5** valves	for gas	Ex db IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T100°C Db (-40°C Ta +55°C)
***KDM2** valves	mining	Ex db I Mb (-40°C Ta +80°C)



Conformity marking to the IECEx certification scheme

Ambient temperature range

Protection type:
db = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 2.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

2.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
IECEx Gb IECEx Db	***KXD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T135°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KXD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T100°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
IECEx Mb	***KXDM2**	of ambient	-20 / +80 °C	-40 / +80 °C	-	-
		of fluid				

3 - INMETRO CLASSIFICATION AND TEMPERATURES

The INMETRO certification requires the classification of the electrical equipment only.

Duplomatic supplies valves with INMETRO certified coils, suitable for application and installation in potentially explosive atmospheres. The mechanical construction of the coil housing is made in order to ensure its resistance to possible internal explosion and to avoid any explosion propagation to the outside environment, matching an “Ex d” type protection (explosion-proof coil).

Moreover, the solenoid is designed to maintain its surface temperature below the limits specified to the relevant class.

The supply always includes the operating and maintenance manual, that contains all the information needed for a correct use of the valve in potentially explosive environment.

3.1 - INMETRO classification

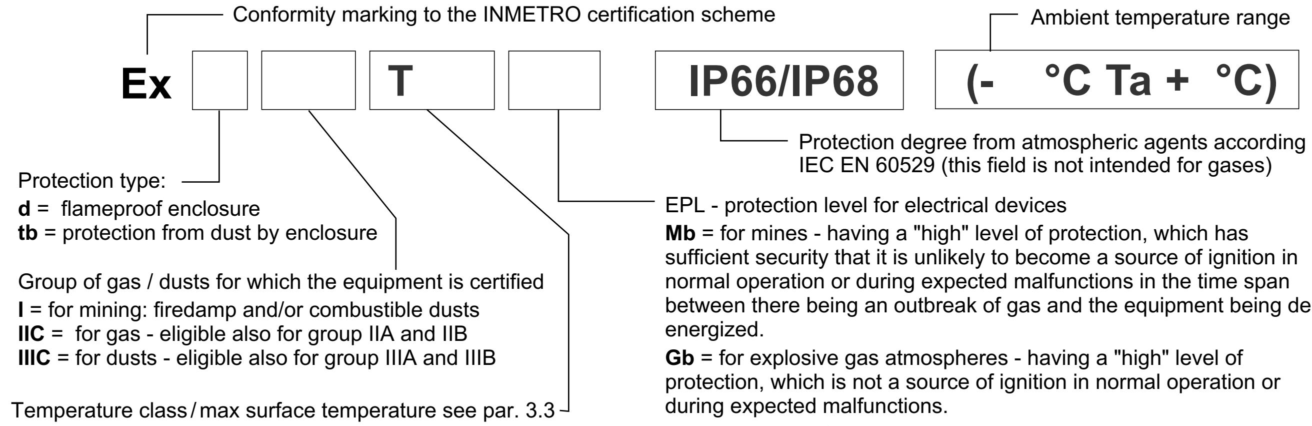
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

INMETRO Gb INMETRO Db	***KBD2**	equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur occasionally.
INMETRO Mb	***KBDM2**	equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by firedamp and/or combustible dust. This equipment is intended to be de-energised in the event of an explosive atmosphere.

3.2 - INMETRO marking

There is a plate with the INMETRO mark on each coil.

***KBD2** valves	for gas	Ex d IIC T4 Gb (-40°C Ta +80°C)
	for dusts	Ex tb IIIC T154°C Db IP66/IP68 (-40°C Ta +80°C)
***KBD2 /T5** valves	for gas	Ex d IIC T5 Gb (-40°C Ta +55°C)
	for dusts	Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C)
***KBDM2** valves	mining	Ex d I T150° Mb IP66/IP68 (-40°C Ta +75°C)



Protection degree from atmospheric agents according to IEC EN 60529 (this field is not intended for gases)

Protection type:
d = flameproof enclosure
tb = protection from dust by enclosure

Group of gas / dusts for which the equipment is certified
I = for mining: firedamp and/or combustible dusts
IIC = for gas - eligible also for group IIA and IIB
IIIC = for dusts - eligible also for group IIIA and IIIB

Temperature class / max surface temperature see par. 3.3

EPL - protection level for electrical devices
Mb = for mines - having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.
Gb = for explosive gas atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Db = equipment for explosive dust atmospheres - having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions

3.3 - Operating temperatures

These valves are classified according to their maximum surface temperature (EN 13463-1), which must be lower than the ignition temperature of the gases, vapors and dusts for which the area in which they will be used is classified.

Valves for surface plants can also be used for less limiting temperature classes (higher surface temperature allowed).

		temperature range	**N and V seals**	**NL seals**	Temperature class	eligible also for
INMETRO Gb INMETRO Db	***KBD2**	of ambient	-20 / +80 °C	-40 / +80 °C	T4 (gas) T154°C (dusts)	T3, T2, T1 T200°C and higher
		of fluid				
	***KBD2 /T5**	of ambient	-20 / +55 °C	-40 / +55 °C	T5 (gas) T129°C (dusts)	T4, T3, T2, T1 T135°C and higher
		of fluid	-20 / +60 °C	-40 / +60 °C		
INMETRO Mb	***KBDM2**	of ambient	-20 / +75 °C	-40 / +75 °C	T150°C	-
		of fluid				

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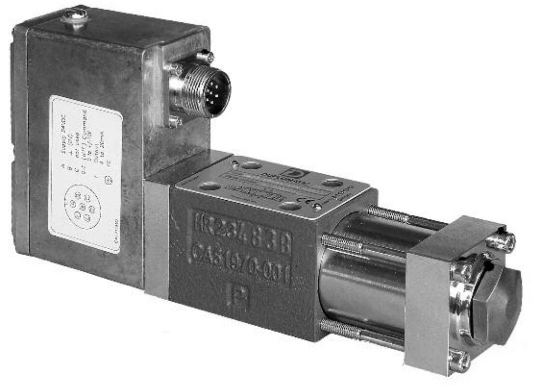
DXJ3

ELECTRO-HYDRAULIC SERVOVALVE WITH INTEGRATED ELECTRONICS

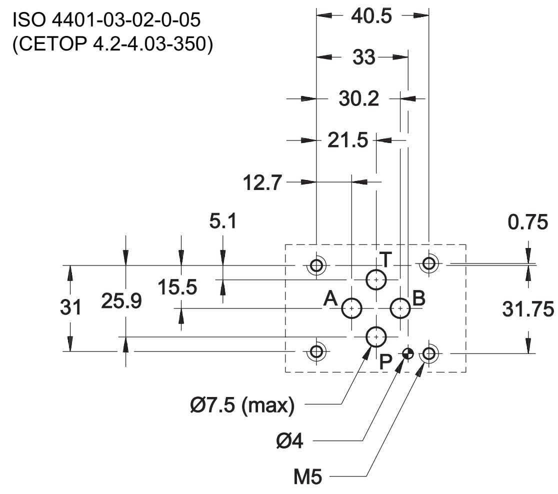
SERIES 10



SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

p max **350** bar
Q max (see performances table)

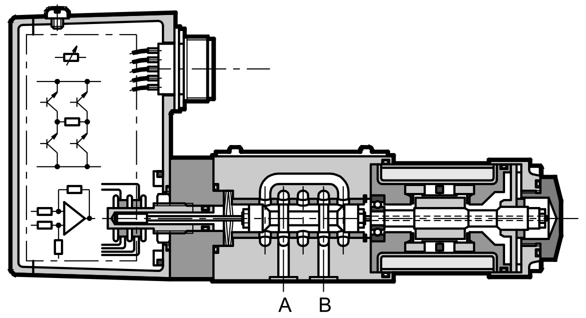
MOUNTING SURFACE



PERFORMANCES (with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure Ports P - A - B Port T	bar	 350 50
Rated flow Q nom (with Δp 70 bar P - T)	l/min	5 - 10 - 20 - 40
Null leakage flow (with p = 140 bar)	l/min	≤ 3% of Q nom
Hysteresis	% In	< 0,2
Threshold	% In	< 0,1
Thermal drift (with ΔT= 50°C)	% In	< 1,5
Response time	ms	≤ 12
Vibration on the three axes	g	30
Electric features	see paragraph 3	
Protection degree according CEI EN 60529	IP 65	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)	
Recommended viscosity	cSt	25
Mass	kg	2,5

OPERATING PRINCIPLE



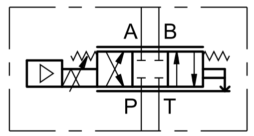
— The DXJ3 valve is a four-way servo-proportional valve where the spool moves inside a sleeve. This valve has a direct drive with a linear force motor resulting in high dynamic performances which are independent of system pressure. The spool position is controlled by a linear transducer (LVDT) with closed loop which ensures high precision and repeatability.

— It is available in four different flow rate control ranges up to 40 l/min, with spools with zero overlap and a mounting surface in compliance with ISO 4401 (CETOP RP 121H) standards.

— The valve is featured by integrated electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit does not require any adjustment other than the possible electronic regulation of the zero.

— Suitable for control applications with closed loop of position, velocity and pressure. With a loss of power or with a zero reference signal, the spool goes automatically at rest-position. In this position the valve has a minimum leakage, depending on the operating pressure (see the performances table).

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	X	J	3	-	D	0	L		/	10		/	E0	K11

Servo-proportional valve with bushing spool (DX)

Integrated electronics and position feedback (J)

Rated size ISO 4401-03 (CETOP 03) (3)

Symmetric spool (D)

Spool with zero overlap (0)

Spool with a linear flow rate curve (L)

Rated flow (with p = 70 bar P - T)
05 = 5 l/min **20** = 20 l/min
10 = 10 l/min **40** = 40 l/min

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged) (10)

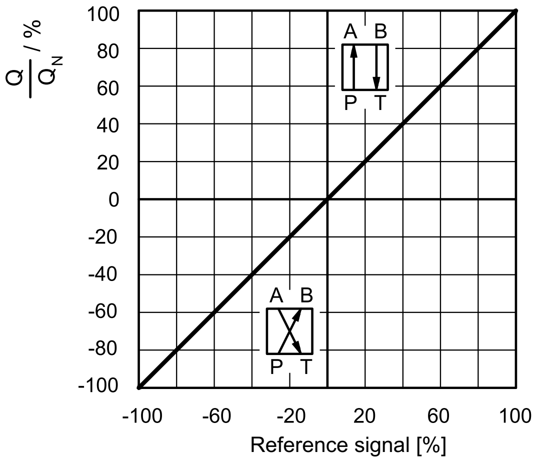
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Reference signal: ±10V (other signals available on request) (E0)

6 + PE pole connector (K11)

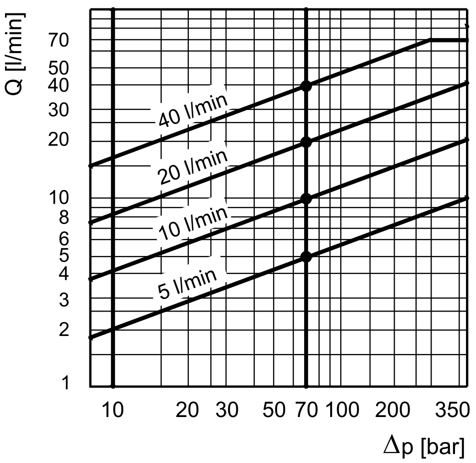
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

REFERENCE / FLOW RATE CURVE



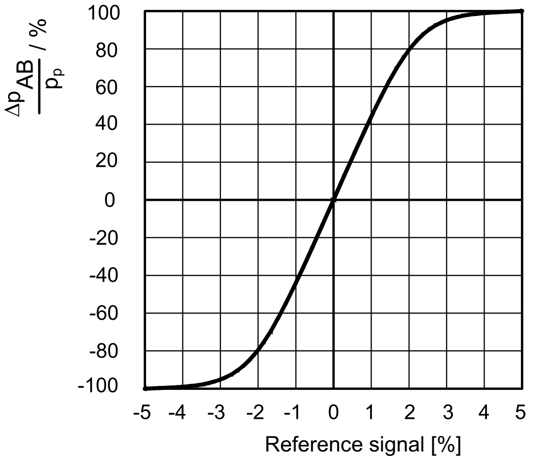
Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO ΔP

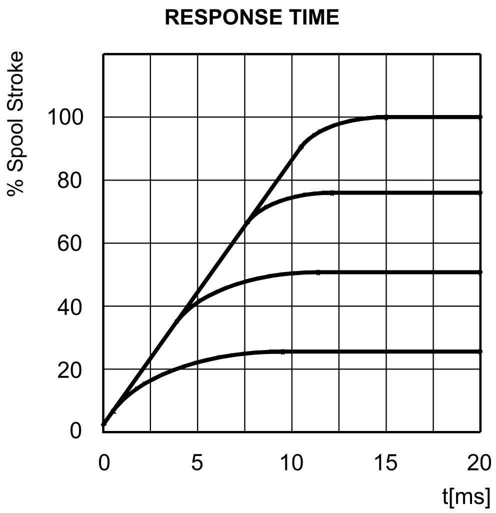


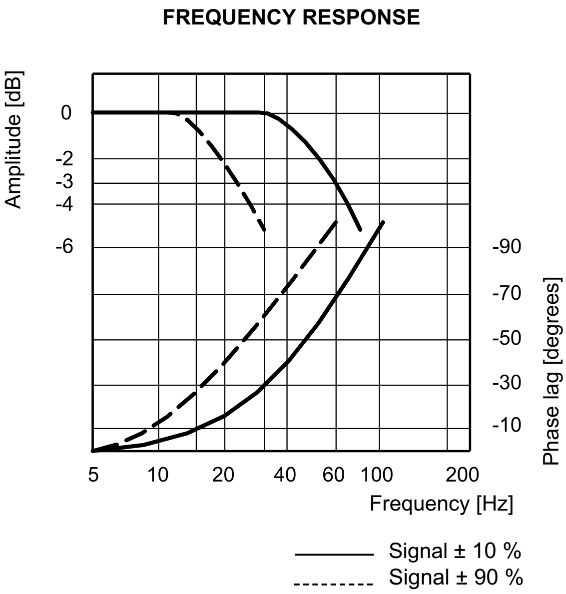
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN



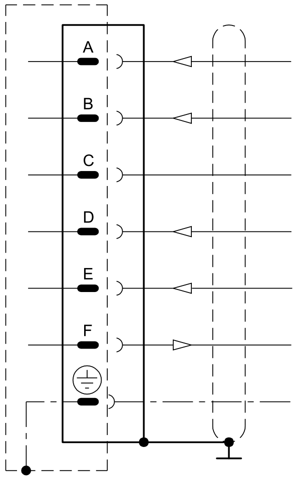
The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal. In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.


RESPONSE TIME


FREQUENCY RESPONSE

3 - ELECTRICAL FEATURES

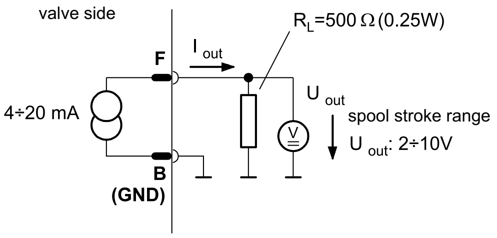
CONNECTION WIRING



Pin	Values	Function	NOTES
A	24 VDC	Supply	From 19 to 32 VDC $I_{A\ MAX}$ = 1,2 A
B	0 V	Signal ground	0 V
C	----	Not used	----
D	± 10 V	Input rated command	R_e = 10 kΩ (see **NOTE 1**)
E	0 V	Input rated command	----
F	4 ÷ 20 mA	Spool position	R_L = from 300 to 500 Ω (see **NOTE 2**)
PE	----	Protective earth	----

NOTE 1: The input stage is a differential amplifier. With positive reference signal connected to pin D, valve opening P - A e B - T is achieved. With a zero reference signal the spool is in centred position. The spool stroke is proportional to U_D - U_E. If only one command signal is available (single-end), pin E must be connected to pin B (0V ground).

NOTE 2: The spool position value can be measured at pin F (see diagram right). The position signal output goes from 4 to 20 mA. The centered position is at 12 mA, while 20 mA corresponds to 100% valve opening P - A and B - T. This monitoring allows to detect a cable break when I_F = 0V.



General requirements:
- External fuse = 1,6 A
- Minimum cross-section of all leads ≈0,75 mm²
- When making electric connections to the valve (shield, protective earth) appropriate measures must be taken to ensure that locally different earth potentials do not results in excessive ground currents.
- The differential and the spool position signal lines must be connected to the mating connector housing at valve side and to the 0V (signal ground) at cabinet side.
- **EMC**: meets the requirements of EN 55011:1998, class B, and the immunity regulation according to EN 61000-6-2:1998

4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

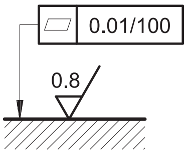
The fluid must be preserved in its physical and chemical characteristics.

5 - INSTALLATION

The DXJ3 valve can be installed in any position without impairing its correct operation.

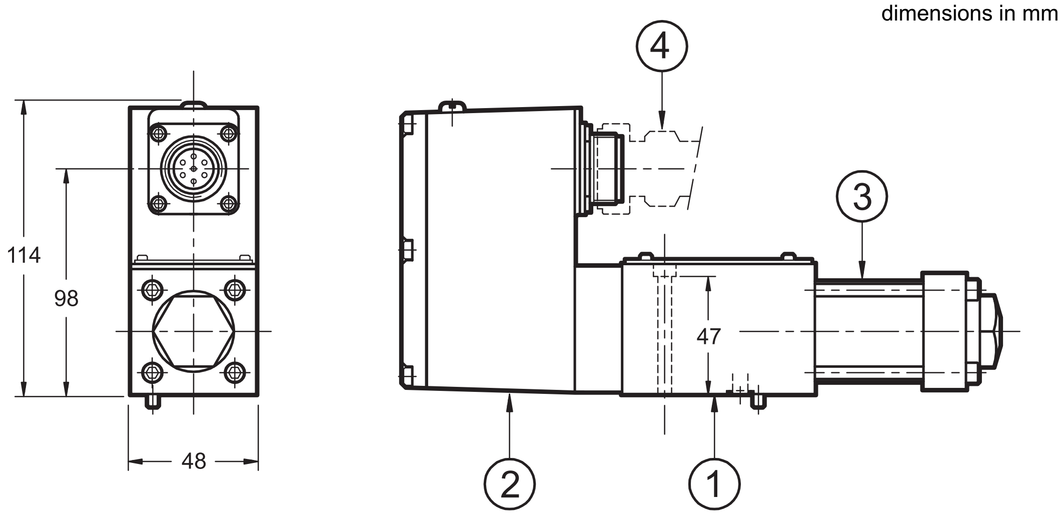
The valve is fixed by means of screws on a flat surface with planarity between 0,01 mm over 100 mm and roughness R_a <0,8 µm. If the minimum values are not observed, the fluid can easily leak between the valve and the mounting surface. While mounting pay attention to the environment and valve cleanliness.

Surface finishing



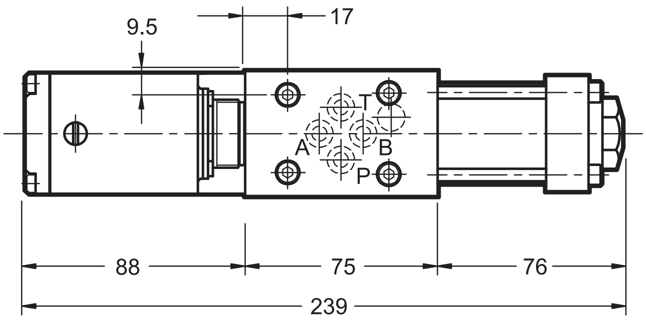
6 - OVERALL AND MOUNTING DIMENSIONS

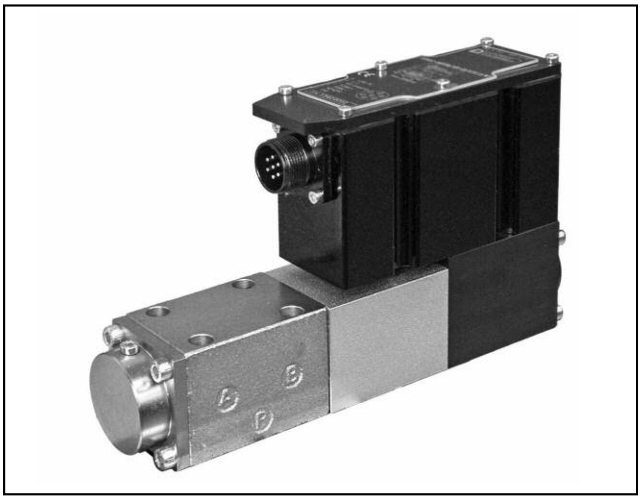
dimensions in mm



1	Mounting surface with sealing rings: N. 4 OR type 2037 (9.25x1.78) - 90 Shore N. 1 OR type 2031 (7.66x1.78) - 90 Shore
2	Integrated electronics
3	Linear force motor
4	Electric connector 7 pins DIN 43563 - IP67 PG11 EX7S/L/10 cod. 3890000003 (**to be ordered separately**)

Fastening bolts: 4 bolts SHC M5 x 55 - ISO 4762
Torque: 8,5 Nm





DXE3J

HIGH RESPONSE SERVO-PROPORTIONAL VALVE WITH FEEDBACK AND INTEGRATED ELECTRONICS

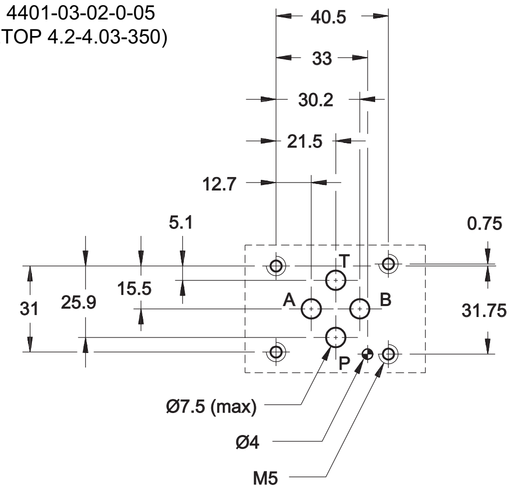
SERIES 30

SUBPLATE MOUNTING
ISO 4401-03 (CETOP 03)

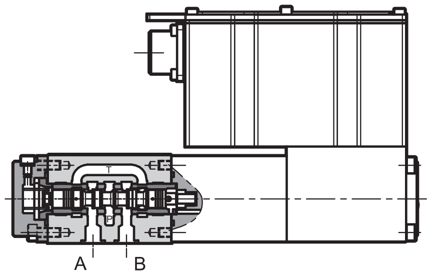
p max **350** bar
Q max **70** l/min

MOUNTING INTERFACE

ISO 4401-03-02-0-05
(CETOP 4.2-4.03-350)



OPERATING PRINCIPLE



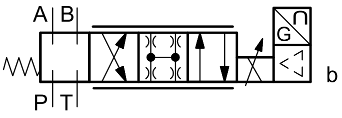
- The DXE3J valve is a four-way (3 + fail-safe position) servo-proportional valve where the spool moves inside a sleeve. It is operated by a proportional solenoid highly dynamic, which achieves high performance and not requires pilot pressure. The spool position is controlled by a linear transducer (LVDT) in closed loop which ensures high precision and repeatability.
- It is available in four different flow ranges up to 40 l/min, with spools with zero overlap.
- The valve is featured by integral electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit does not require any adjustment other than the possible electronic regulation of the zero.
- Suitable for control applications with closed loop of position, velocity and pressure. With a power down or without the enable input, the spool moves automatically at fail-safe position.

PERFORMANCES

(with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure Ports P - A - B Port T	bar	350 250
Rated flow Q nom (with Δp 70 bar P - T)	l/min	5 - 10 - 20 - 40
Hysteresis	% In	< 0,2
Threshold	% In	< 0,1
Thermal drift (with ΔT= 40 °C)	% In	< 1,0
Response time (0-100%)	ms	≤ 10
Vibration on the three axes	g	30
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)	
Recommended viscosity	cSt	25
Mass	kg	2,6

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

D	X	E	3	J	-				/	30		-		K11	

Servo-proportional valve with spool in sleeve

Electric proportional control

Size ISO 4401-03

On-board electronic and position feedback

Spools with linear flowrate curve
LZ = zero overlap for low leakage (**standard**)
LU = zero overlap for higher gain

Rated flow (with Δp = 70 bar P - T)
05 = 5 l/min
10 = 10 l/min
20 = 20 l/min
40 = 40 l/min

Fail safe type
F1 = closed centre
F3 = float
FC = cross centre

Series No.
(from 30 to 39 sizes and mounting dimensions remain unchanged)

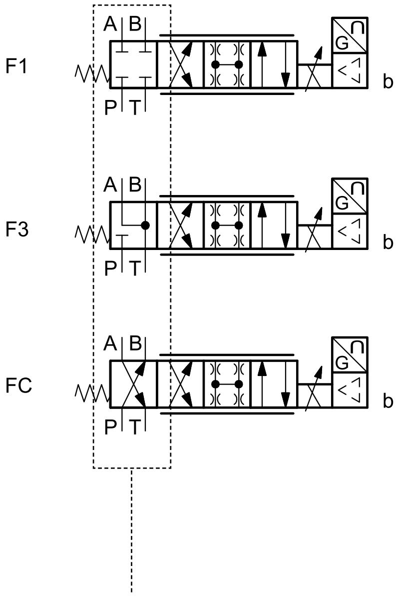
Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Command value:
E0 = voltage ±10 V
E1 = current 4 ÷ 20 mA

6 + PE pole connector

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

2 - SPOOLS



leakage flow in fail safe position at 100 bar [cm^3/min]		
F1	P → A	20
	P → B	30
	A → T	30
	B → T	30
F3	P → A	20
	P → B	30

flow rate	spool type	fail safe type		
		F1	**F3**	**FC**
05	LZ	■	■	-
	LU	□	□	-
10	LZ	■	■	-
	LU	□	□	-
20	LZ	■	■	■
	LU	□	□	-
40	LZ	■	■	■
	LU	□	□	-

■ available □ on request
- not available

FAIL SAFE POSITION

When a power failure occurs, the electronics de/energize the solenoid and the spool will take the fail safe position by means of the centering springs.

3 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

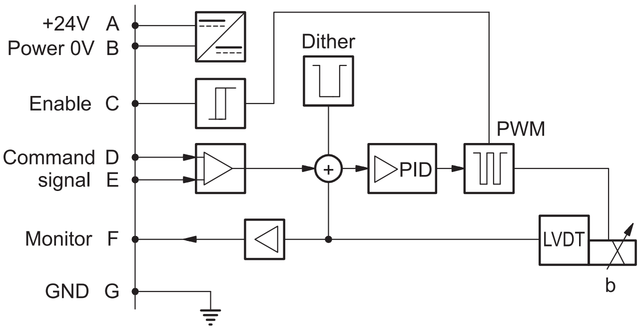
4 - ELECTRICAL CHARACTERISTICS

4.1 - Electrical on board electronics

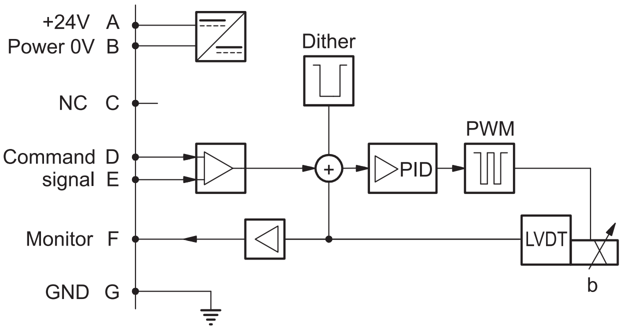
Duty cycle		100% (continuous operation)
Protection class according to EN 60529		IP65 / IP67
Supply voltage	V DC	24 (from 19 to 35 VDC), ripple max 3 Vpp
Power consumption	VA	35
Maximum solenoid current	A	2.6
Fuse protection, external		(fast), max current 4A
Command signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signals: voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Communication		LIN-bus Interface (with the optional kit)
Connection		7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2		According to 2004/108/EC standards

4.2 - On-board electronics diagrams

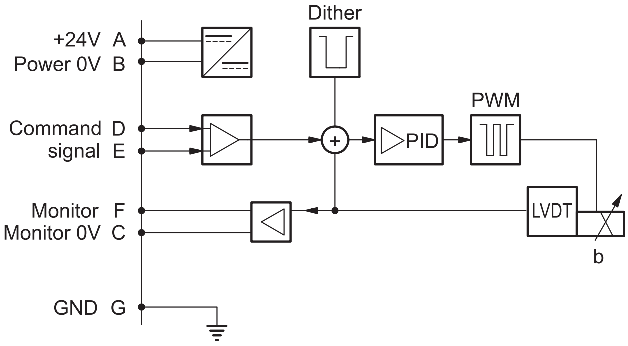
VERSION **A** - External Enable



VERSION **B** - Internal Enable

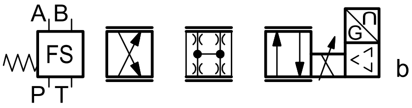


VERSION **C** - 0V Monitor

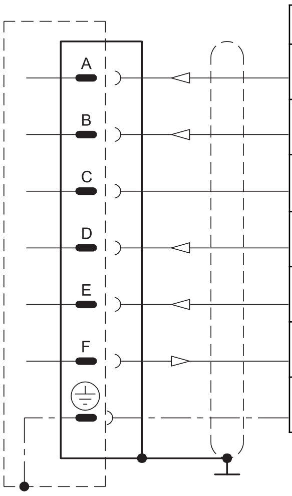


5 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal must be between -10V and +10V. The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**

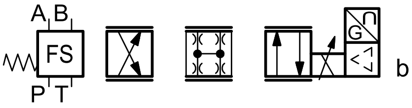


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

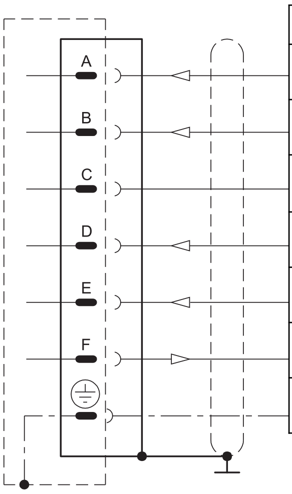
6 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B anc C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**

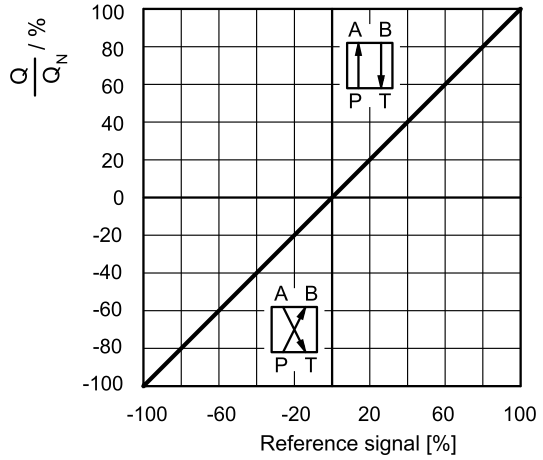


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

7 - CHARACTERISTIC CURVES

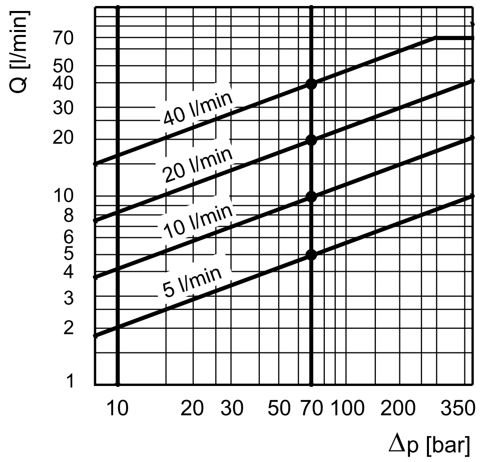
(measured with viscosity of 36 cSt at 50°C)

REFERENCE / FLOW RATE CURVE



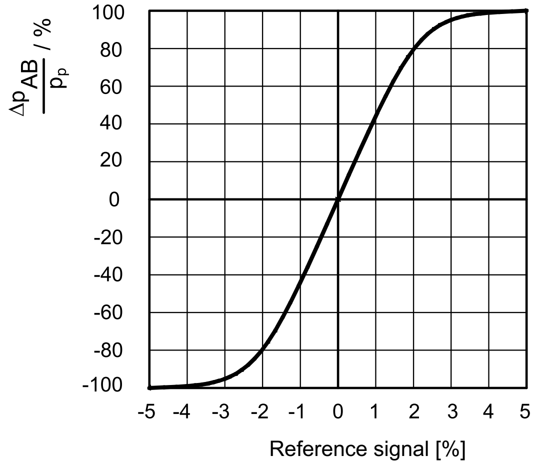
Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO Δp



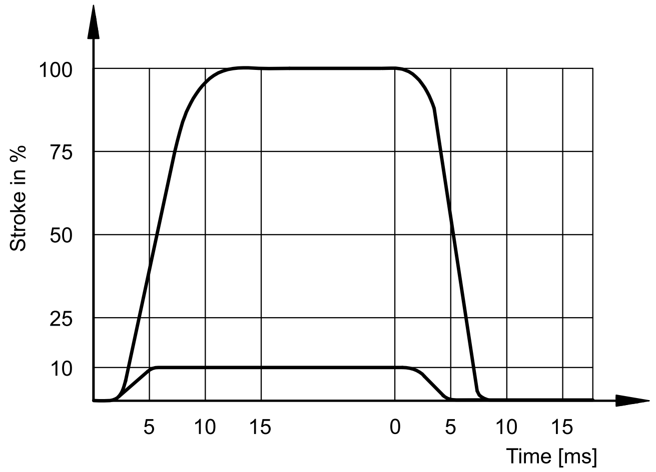
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN (LZ)

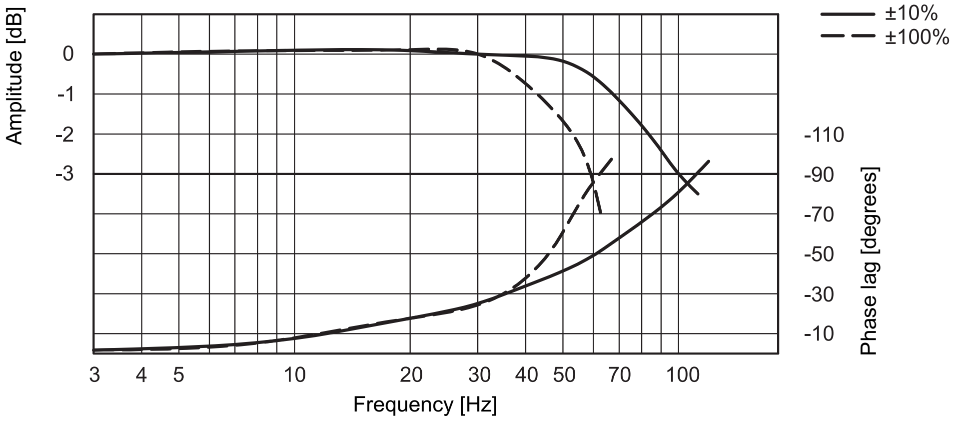


The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal. In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

RESPONSE TIME

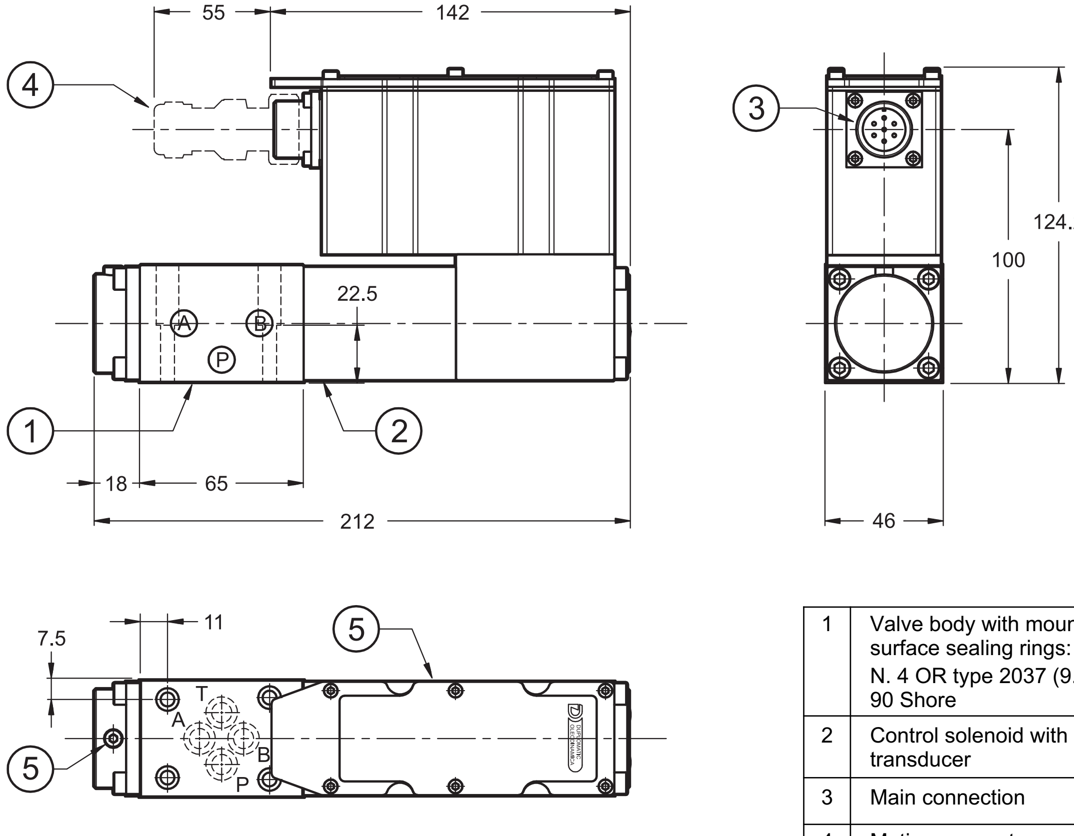


FREQUENCY RESPONSE



8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



1	Valve body with mounting surface sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Control solenoid with position transducer
3	Main connection
4	Mating connector. **To be ordered separately.** See paragraph 9
5	Air breather. Allen key: 3 Tightening torque 2.5 Nm

Fastening bolts: 4 SHC screws M5 x 30
Torque: 5 Nm ± 10% (A8.8)

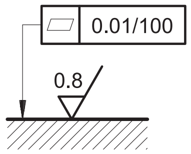
9 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.

Surface finishing



10 - ACCESSORIES

(to be ordered separately)

10.1 Mating connector

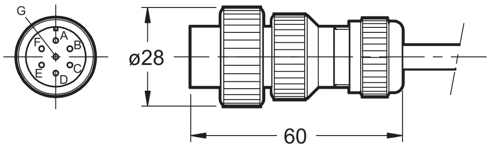
These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic can provide a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**



10.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

10.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

11 - SUBPLATES

(see catalogue 51 000)

PMMD-AI3G rear ports
PMMD-AL3G side ports
Ports dimensions: P, T, A, B: 3/8” BSP

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

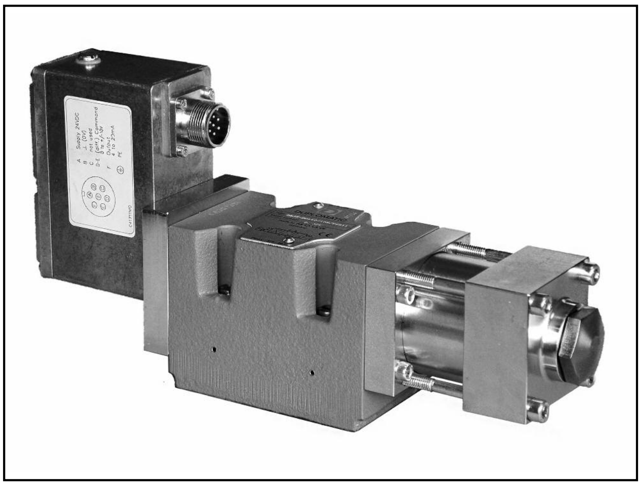
DXJ5

ELECTRO-HYDRAULIC SERVOVALVE WITH INTEGRATED ELECTRONICS

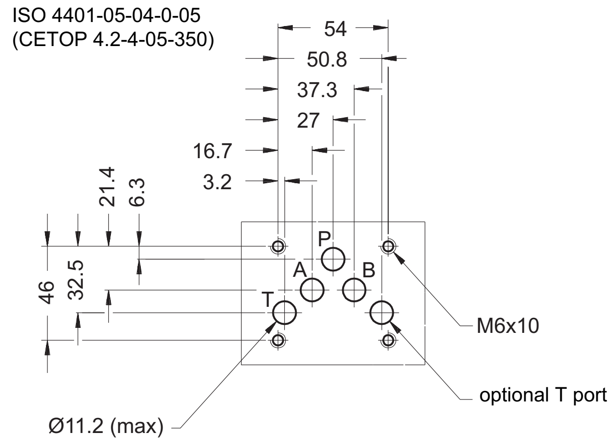
SERIES 10

SUBPLATE MOUNTING
ISO 4401-05 (CETOP R05)

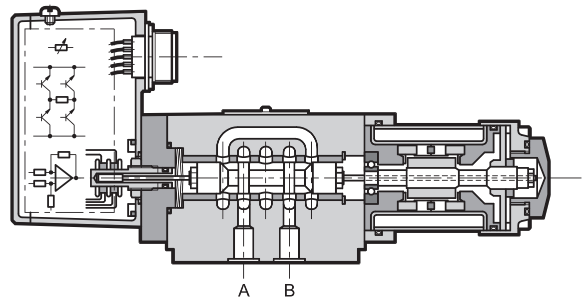
p max **350** bar
Q max (see performances table)



MOUNTING SURFACE



OPERATING PRINCIPLE



— The DXJ5 is a four-way servo-proportional valve where the spool moves inside a sleeve. This valve has a direct drive with a linear force motor resulting in high dynamic performances independent of system pressure. A linear transducer (LVDT) with closed loop controls the spool position, ensuring high precision and repeatability.

— It is available in four different flow rate control ranges up to 100 l/min, with spools with zero overlap and a ISO 4401 (CETOP RP 121H) mounting surface.

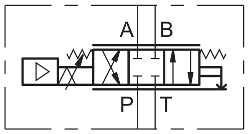
— The valve is featured by integrated electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit does not require any adjustment other than the possible electronic regulation of the zero.

— Suitable for control applications with closed loop of position, velocity and pressure. With a loss of power or with a zero reference signal, the spool goes automatically at rest-position. In this position the valve has a minimum leakage, depending on the operating pressure (see the performances table).

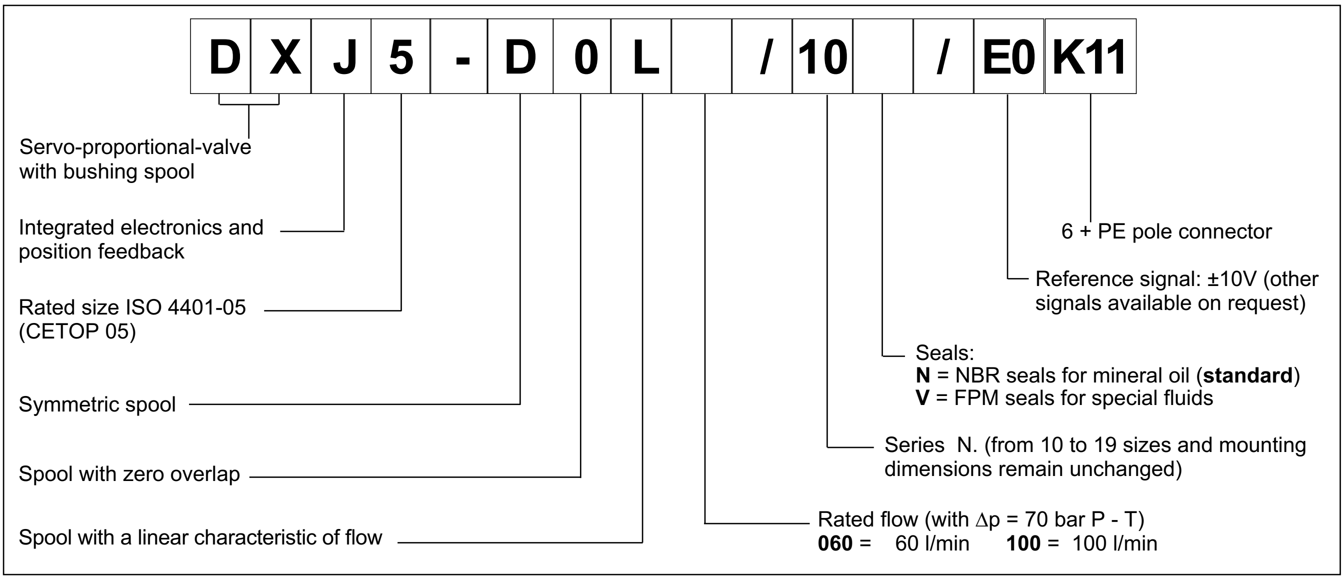
PERFORMANCES (with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure Ports P - A - B Port T	bar	 350 50
Rated flow Q nom (with Δp 70 bar P - T)	l/min	60 ÷ 100
Null leakage flow (with p=140 bar)	l/min	≤ 3% of Q nom
Hysteresis	% In	< 0,2
Threshold	% In	< 0,1
Thermal drift (with ΔT= 50°C)	% In	< 1,5
Response time	ms	≤ 20
Vibration on the three axes	g	30
Electric features	see paragraph 3	
Protection degree according CEI EN 60529	IP 65	
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)	
Recommended viscosity	cSt	25
Mass	kg	6,3

HYDRAULIC SYMBOL



1 - IDENTIFICATION CODE

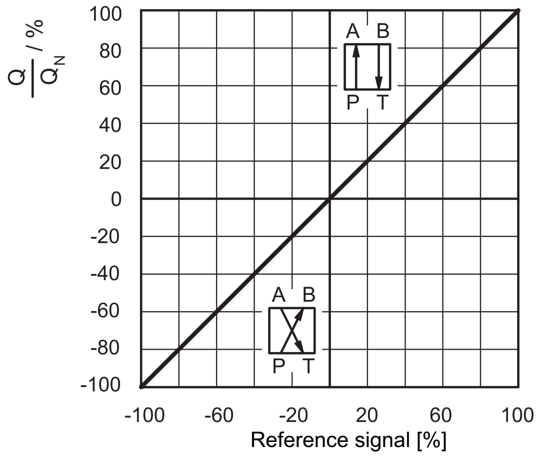


D X J 5 - D 0 L [ ] / 10 [ ] / E0 K11

- DX: Servo-proportional-valve with bushing spool
- J: Integrated electronics and position feedback
- 5: Rated size ISO 4401-05 (CETOP 05)
- D: Symmetric spool
- 0: Spool with zero overlap
- L: Spool with a linear characteristic of flow
- Rated flow (with Δp = 70 bar P - T)
  060 = 60 l/min **100** = 100 l/min
- 10: Series N. (from 10 to 19 sizes and mounting dimensions remain unchanged)
- Seals:
  N = NBR seals for mineral oil (**standard**)
  V = FPM seals for special fluids
- E0: Reference signal: ±10V (other signals available on request)
- K11: 6 + PE pole connector

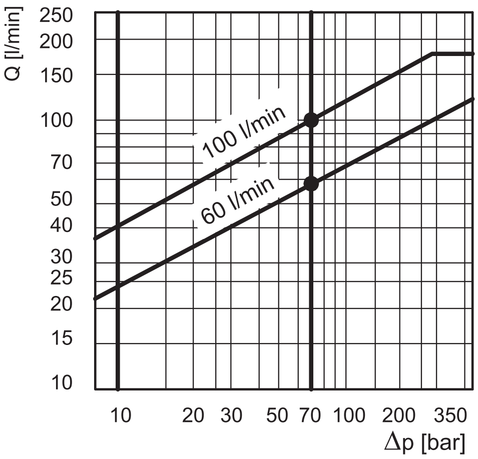
2 - CHARACTERISTIC CURVES (measured with viscosity of 36 cSt at 50°C)

REFERENCE / FLOW RATE CURVE



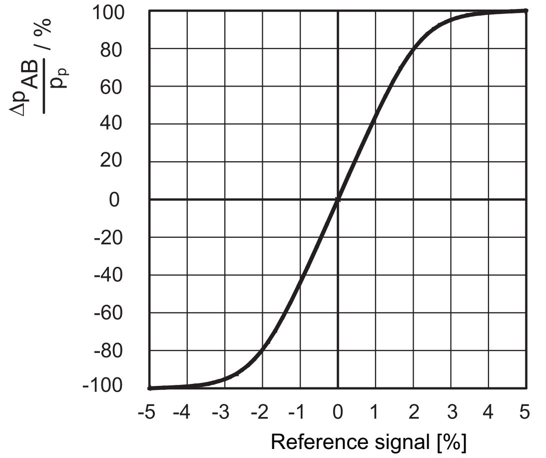
Typical flow rate curves at constant Δp = 70 bar P-T according to the reference signal.
NOTE: with positive reference signal connected to pin D the valve regulates P - A / B - T.

FLOW RATE CURVE ACCORDING TO ΔP



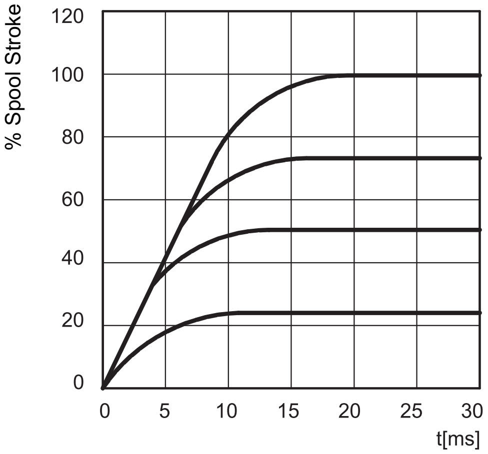
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.

PRESSURE GAIN

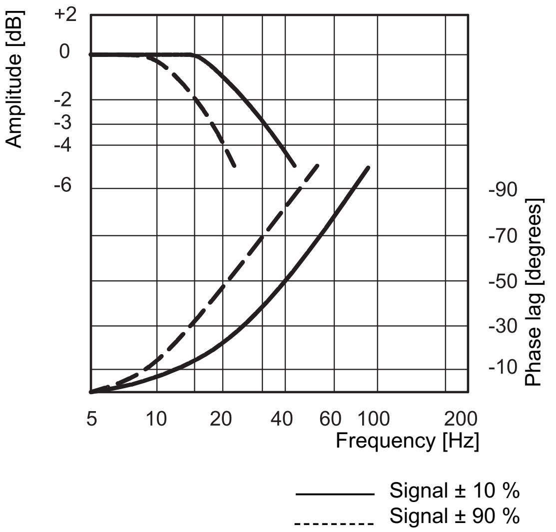


The diagram on the left shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal. Practically, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

STEP RESPONSE

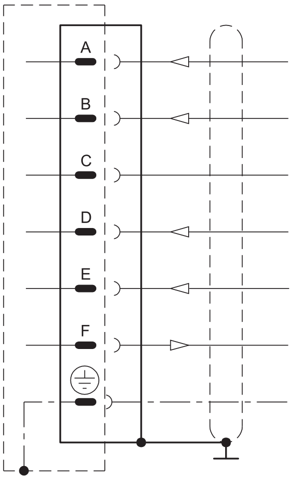


FREQUENCY RESPONSE



3 - ELECTRICAL FEATURES

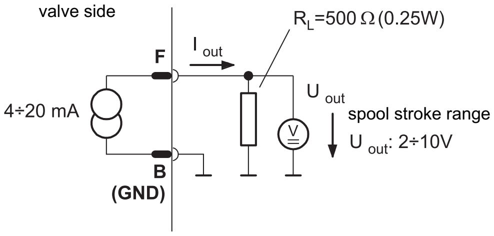
CONNECTION WIRING



Pin	Values	Function	NOTES
A	24 VDC	Supply	From 19 to 32 VDC $I_{A\ MAX.}$ = 2,2 A
B	0 V	Signal ground	0 V
C	----	Not used	----
D	± 10 V	Input rated command	R_e = 10 kΩ (see **NOTE 1**)
E	0 V	Input rated command	----
F	4 ÷ 20 mA	Spool position	R_L = from 300 to 500 Ω (see **NOTE 2**)
PE	----	Protective earth	----

NOTE 1: The input stage is a differential amplifier. With positive reference signal connected to pin D, valve opening P - A e B - T is achieved. With a zero reference signal the spool is in centred position. The spool stroke is proportional to U_D - U_E. If only one command signal is available (single-end), pin E must be connected to pin B (0V ground).

NOTE 2: The spool position value can be measured at pin F (see diagram right). The position signal output goes from 4 to 20 mA. The centered position is at 12 mA, while 20 mA, corresponds to 100% valve opening P - A and B - T. This monitoring allows to detect a cable break when I_F = 0V.



General requirements:

- External fuse = 2,5 A
- Minimum cross-section of all leads ≈ 0,75 mm^2
- When making electric connections to the valve (shield, protective earth) appropriate measures must be taken to ensure that locally different earth potentials do not results in excessive ground currents.
- The differential and the spool position signal lines must be connected to the mating connector housing at valve side and to the 0V (signal ground) at cabinet side.
- **EMC**: meets the requirements of EN 55011:1998, class B, and the immunity regulation according to EN 61000-6-2:1998

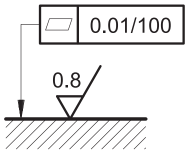
4 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.
The fluid must be preserved in its physical and chemical characteristics.

5 - INSTALLATION

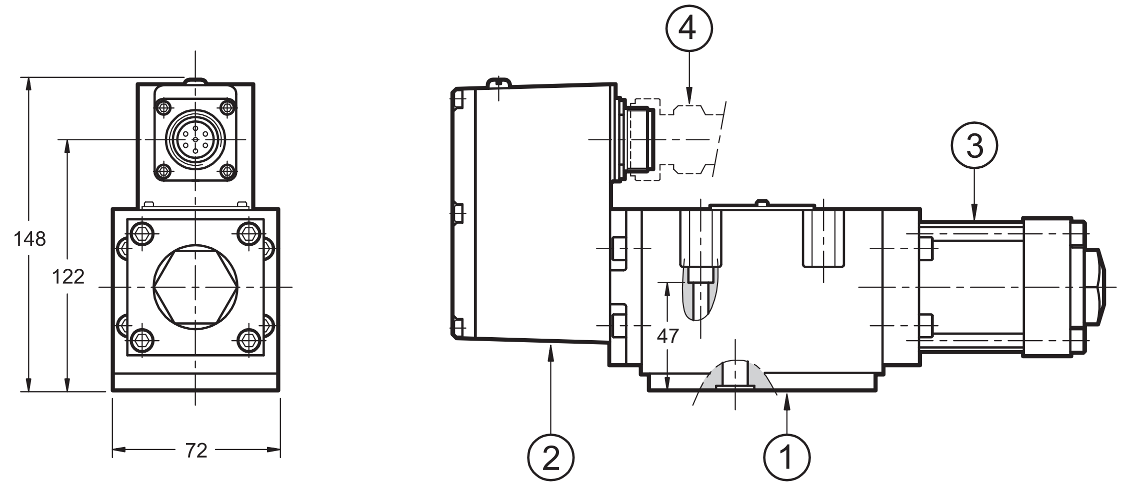
The DXJ5 valve can be installed in any position without impairing its correct operation.
The valve is fixed by means of screws on a flat surface with planarity between 0,01 mm over 100 mm and roughness R_a < 0,8 µm. If the minimum values are not observed, the fluid can easily leak between the valve and the mounting surface. While mounting pay attention to the environment and valve cleanliness.

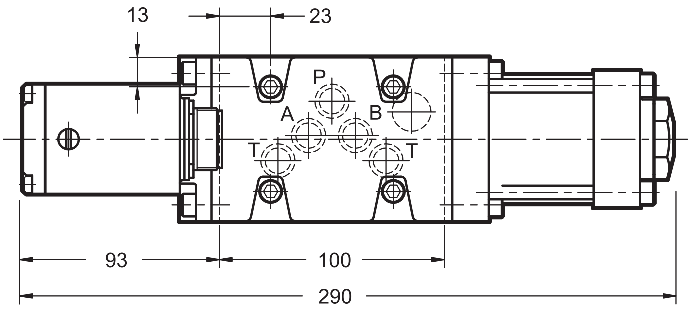
Surface finishing



7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm





1	Mounting surface with sealing rings: N. 5 OR type 2050 (12.42x1.78) - 90 Shore N. 1 OR type 2037 (9.25x1.78) - 90 Shore
2	Integrated electronics
3	Linear force motor
4	Electric connector 7 pins DIN 43563 - IP67 PG11 EX7S/L/10 cod. 3890000003 (**to be ordered separately**)

Fastening bolts: 4 bolts SHC M6 x 60 - ISO 4762
Torque: 13 Nm

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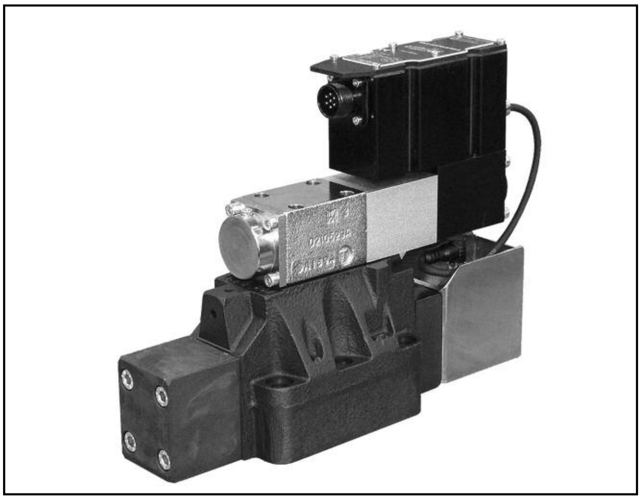


DXPE*J

DIRECTIONAL CONTROL VALVE PILOT OPERATED, WITH OBE AND FEEDBACK

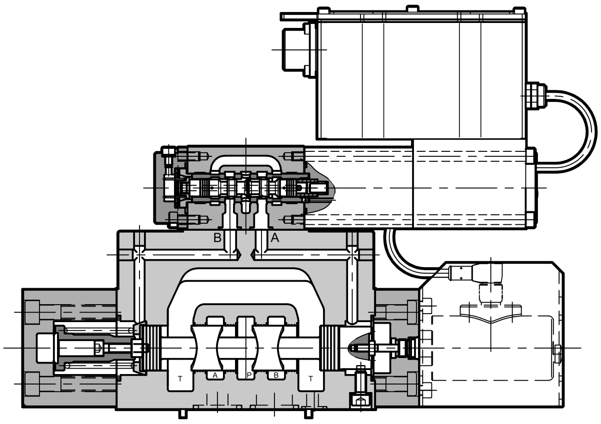
SERIES 30

SUBPLATE MOUNTING

DXPE5J	**CETOP P05**
DXPE5RJ	**ISO 4401-05**
DXPE7J	**ISO 4401-07**
DXPE8J	**ISO 4401-08**

p max (see performance table)
Q max (see performance table)

OPERATING PRINCIPLE



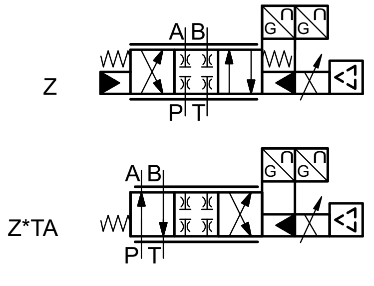
- DXPE*J are directional control valves operated by a servo-proportional pilot, with mounting surface compliant with ISO 4401 standards.
- The spool position is controlled by a linear transducer LVDT in closed loop, which ensures high precision and repeatability. In the event of switch-off or inactive electronics the main spool is set to a fail-safe position by springs.
- The valve is featured by integral electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit does not require any adjustment.
- The valve is easy to install. The driver directly manages digital settings. In the event of special applications, you can customize the settings using the optional kit (see par. 15.3).

PERFORMANCES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

		DXPE5J DXPE5RJ	DXPE7J	DXPE8J
Max operating pressure: P - A - B ports T - X - Y ports	bar	350 250		
Controlled flow with Δp 10 bar P-T	l/min	100	220	400
Hysteresis	% Q_{max}	< 0,2%		
Repeatability	% Q_{max}	± 0,1%		
Electrical characteristics		see paragraph 3		
Ambient temperature range	°C	-20 / +60		
Fluid temperature range	°C	-20 / +80		
Fluid viscosity range	cSt	10 ÷ 400		
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)			
Recommended viscosity	cSt	25		
Mass	kg	8	10,5	17

HYDRAULIC SYMBOLS (typical)



1 - IDENTIFICATION CODE

D	X	P	E		J	-				/	30		-			/		K11		

Proportional directional valve with high-response pilot

Nominal size:
5 = CETOP P05
5R = ISO 4401-05 (CETOP R05)
7 = ISO 4401-07 (CETOP 07)
8 = ISO 4401-08 (CETOP 08)

Digital integrated electronics for valves with feedback

Spool type:
Z* = zero overlap
Z*TA = zero overlap
See paragraph 2 for operation and available flow rates.
Other spool types (C, A..) are available upon request.

Series No.
(the overall and mounting dimensions remain unchanged from 30 to 39)

Seals:
N = NBR seals for mineral oil (**standard**)
V = FPM seals for special fluids

Piloting: **I** = internal
E = external

Drainage: **I** = internal
E = external

Reference signal:
E0 = voltage ± 10 V
E1 = current 4 ÷ 20 mA

Main connector:
6 pin + PE

Pin C function:
A = external enable
B = internal enable
C = 0V monitor

Option:
/ W7 = Zinc-nickel surface treatment
Omit if not required.
(see par. 1.1)

1.1 - Surface treatments

The standard valve is supplied with surface treatment of phosphating black.

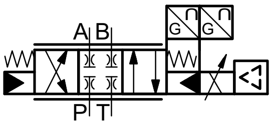
The zinc-nickel finishing makes the valve suitable to ensure a salt spray resistance up to **600** hours (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

2 - AVAILABLE CONFIGURATIONS

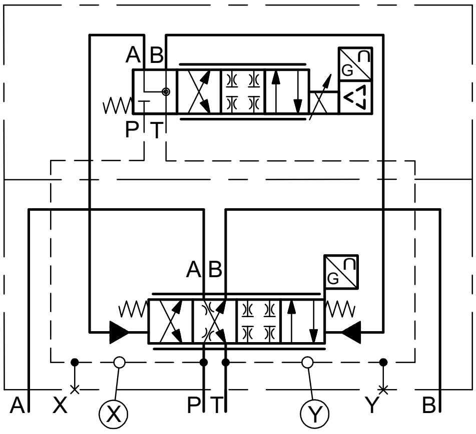
The valve configuration depends on the combination of spool type and rated flow.

3 positions with spring centering

Z



detailed symbol



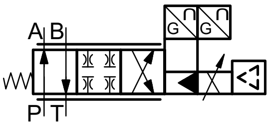
valve type	Z*	Controlled flow with Δp 10 bar P-T
DXPE5J DXPE5RJ	**100**	100 l/min
DXPE7J	**120**	120 l/min
	220	220 l/min
DXPE8J	**250**	250 l/min
	400	400 l/min

OFFSET POSITION

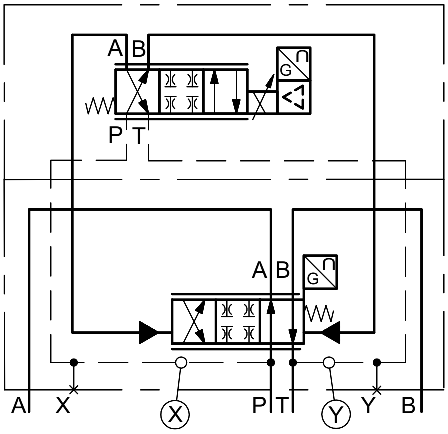
After electrical swith-off or Enable signal swich-off (version K11A) the main spool moves to springs offset position, with limited opening (1%... 6% of main spool stroke in direction P-B / A-T)

3 positions with spring offset

Z*TA



detailed symbol



valve type	Z*TA	Controlled flow with Δp 10 bar P-T
DXPE5J DXPE5RJ	**100**	100 l/min
DXPE7J	**120**	120 l/min
	220	220 l/min
DXPE8J	**250**	250 l/min
	400	400 l/min

FAIL SAFE POSITION

After electrical swith-off or Enable signal swich-off (version K11A) the main spool moves by spring to the fail-safe position P - A / B -T, wide open.

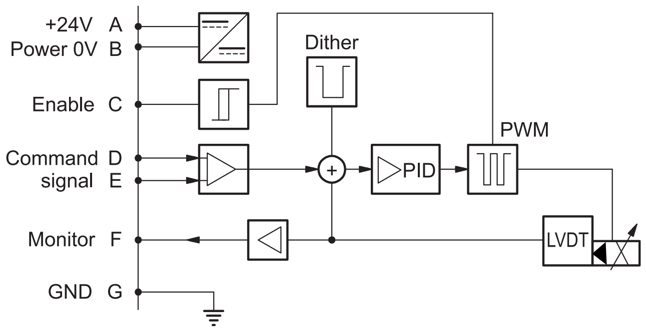
3 - ELECTRICAL CHARACTERISTICS

3.1 - Electrical on board electronics

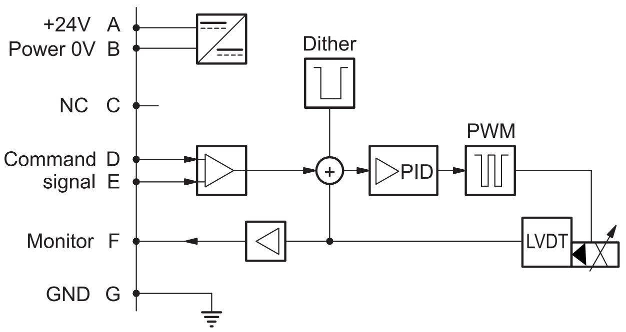
Duty cycle			100% (continuous operation)
Protection class according to EN 60529			IP65 / IP67
Supply voltage		V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption		VA	35
Maximum solenoid current		A	2.6
Fuse protection, external			(fast), max current 4A
Command signals:	voltage (E0) current (E1)	V DC mA	±10 (Impedance Ri > 11 kOhm) 4 ÷ 20 (Impedance Ri = 58 Ohm)
Monitor signals:	voltage (E0) current (E1)	V DC mA	±10 (Impedance Ro > 1 kOhm) 4 ÷ 20 (Impedance Ro = 500 Ohm)
Managed breakdowns			Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure
Communication			LIN-bus Interface (with the optional kit)
Connection			7 - pin MIL-C-5015-G (DIN-EN 175201-804)
Electromagnetic compatibility (EMC) emissions EN 61000-6-4 immunity EN 61000-6-2			According to 2014/30/UE standard

3.2 - On-board electronics diagrams

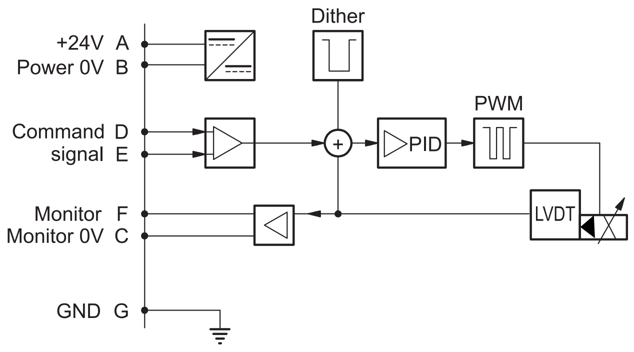
VERSION **A** - External Enable



VERSION **B** - Internal Enable

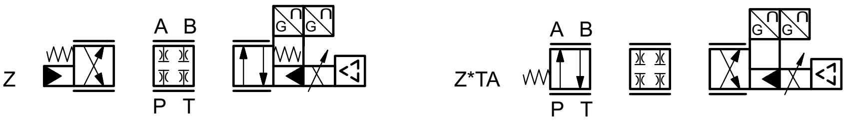


VERSION **C** - 0V Monitor

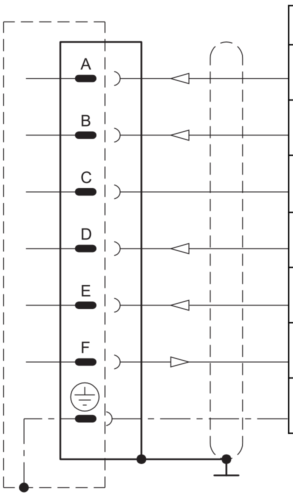


4 - VERSIONS WITH VOLTAGE COMMAND (E0)

The reference signal must be between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**-10V**	**0V**	**+10V**	**COMMAND**	**-10V**	**0V**	**+10V**
MONITOR	**-10V**	**0V**	**+10V**	**MONITOR**	**--10V**	**0V**	**+10V**

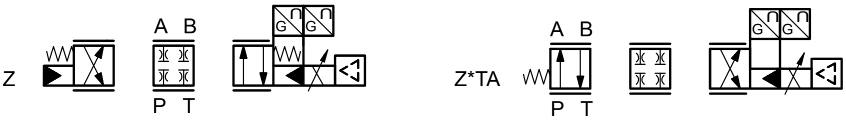


Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	± 10 V	Command (differential input)		
E	0 V	PIN D reference		
F	± 10 V	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

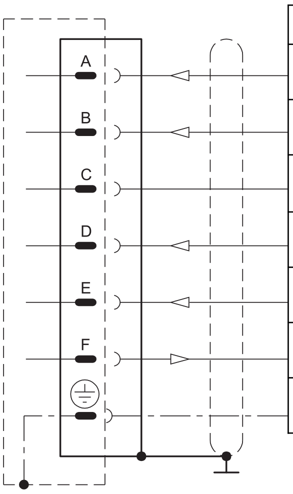
5 - VERSIONS WITH CURRENT COMMAND (E1)

The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



COMMAND	**4 mA**	**12 mA**	**20 mA**	**COMMAND**	**4 mA**	**12 mA**	**20 mA**
MONITOR	**4 mA**	**12 mA**	**20 mA**	**MONITOR**	**4 mA**	**12 mA**	**20 mA**



Pin	Values	version A	version B	version C
A	24 V DC	Supply Voltage		
B	0 V			
C		Enable 24 V DC	not used -	PIN F reference 0 V
D	4 ÷ 20 mA	Command		
E	0 V	PIN D reference		
F	4 ÷ 20 mA	Monitor (0V reference: pin B)		Monitor
PE	GND	Ground (Earth)		

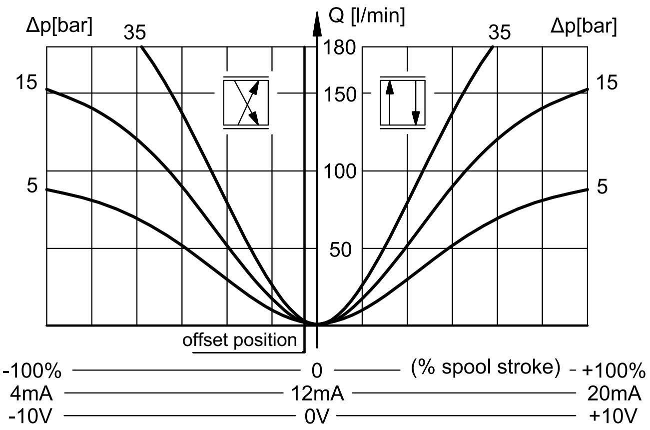
6 - CHARACTERISTIC CURVES

(with mineral oil with viscosity of 36 cSt at 50°C)

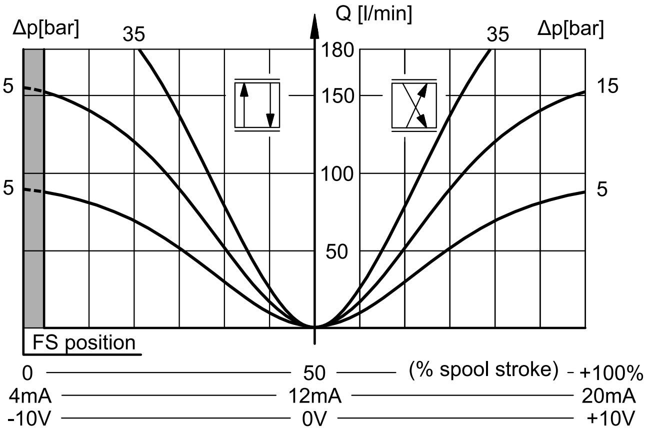
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools.
The Δp values are measured per land.

6.1 - Characteristic curves DXPE5J and DXPE5RJ

SPOOL Z100

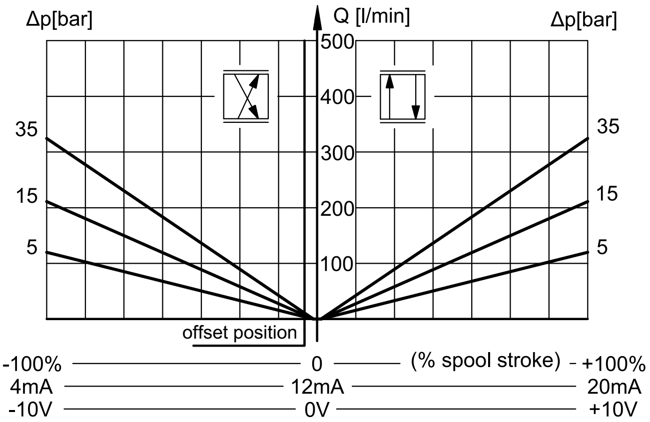


SPOOL Z100TA

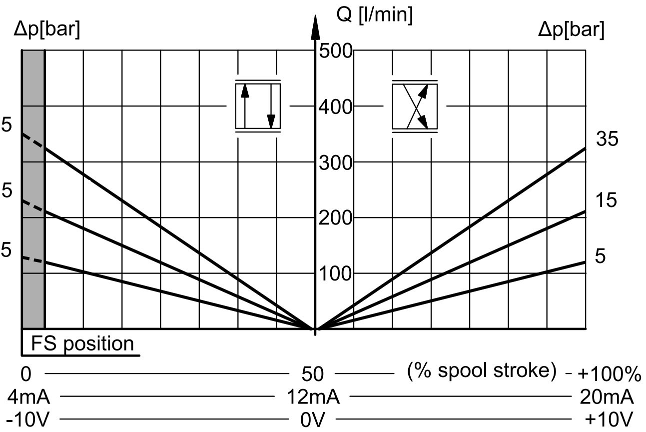


6.2 - Characteristic curves DXPE7J

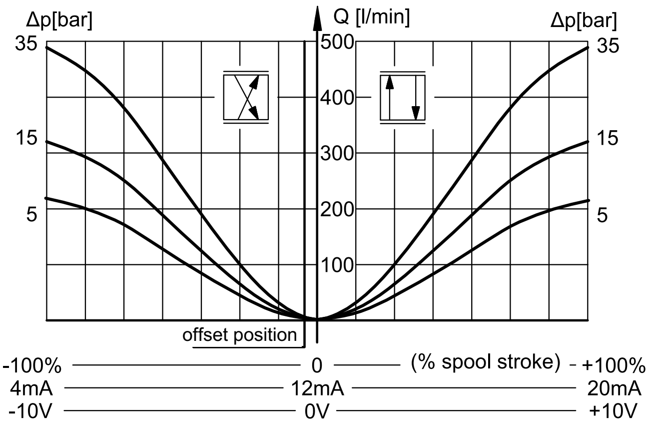
SPOOL Z120



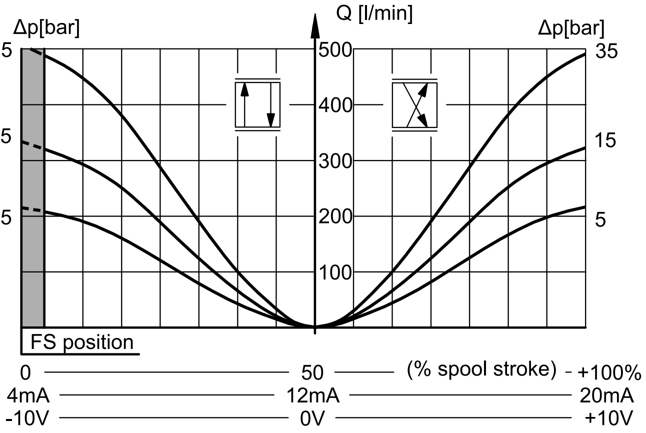
SPOOL Z120TA



SPOOL Z220

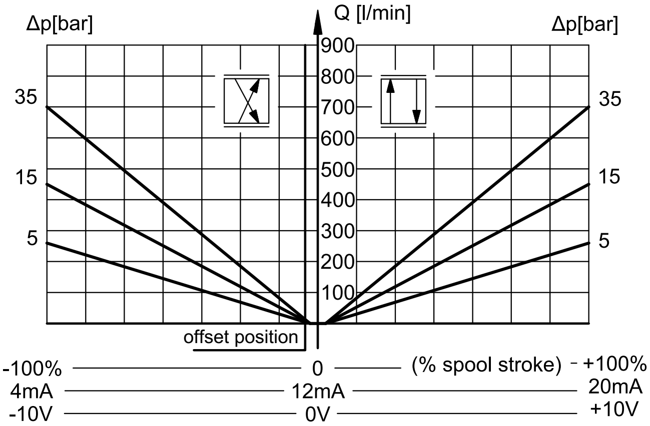


SPOOL Z220TA

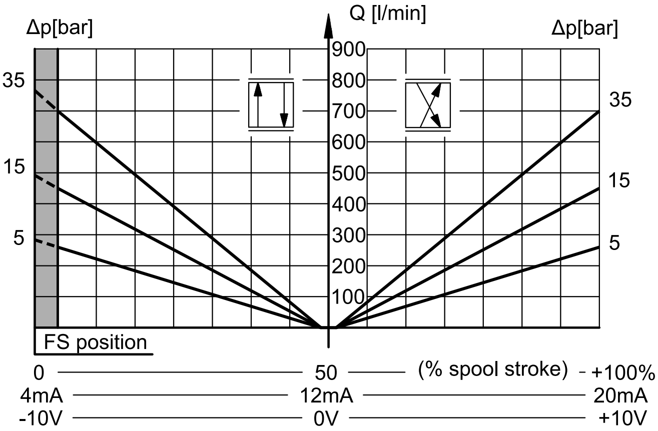


6.3 - Characteristic curves DXPE8J

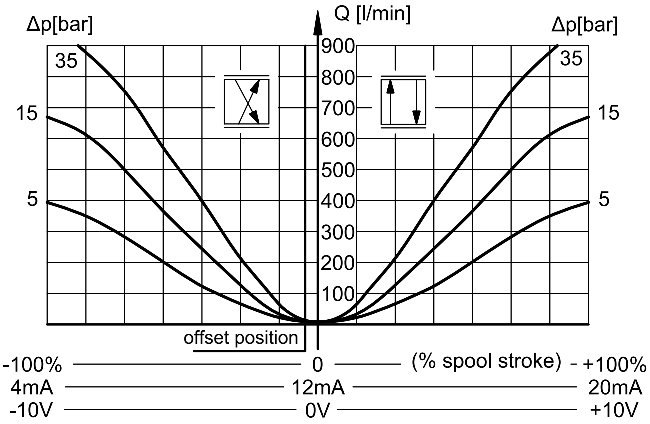
SPOOL Z250



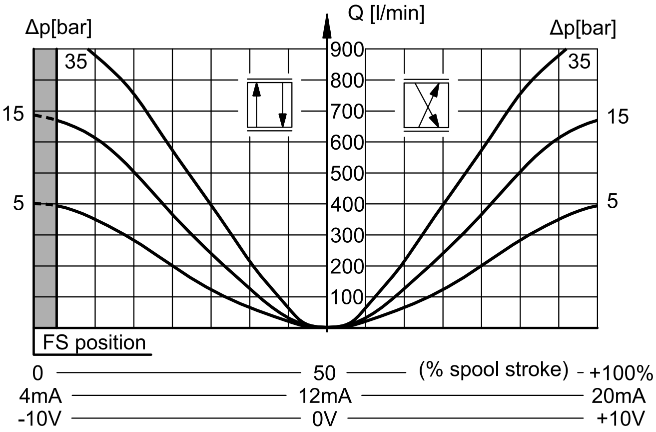
SPOOL Z250TA



SPOOL Z400



SPOOL Z400TA



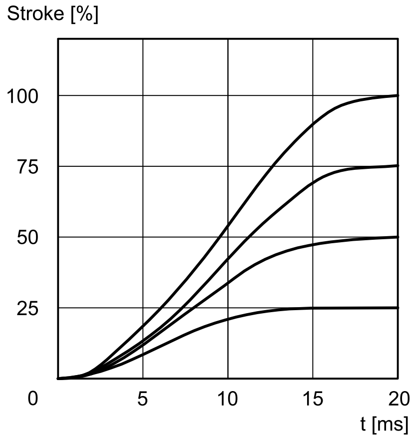
7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C)

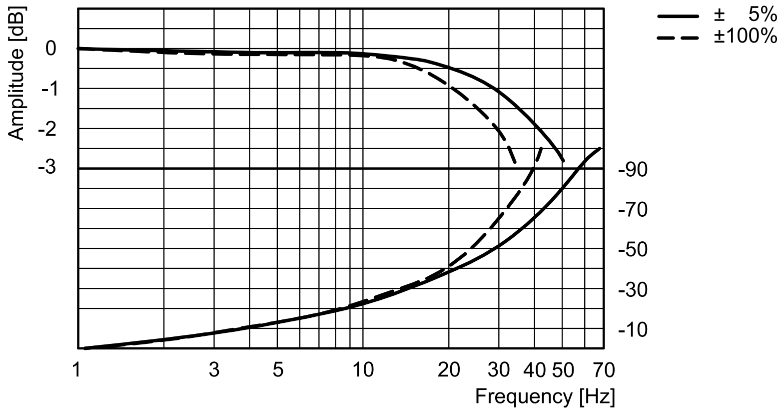
The tables shows the typical step response tested with static pressure 100 bar.

7.1 - DXPE5J and DXPE5RJ

RESPONSE TIME

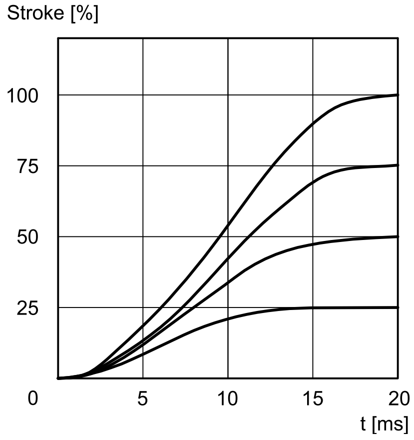


FREQUENCY RESPONSE

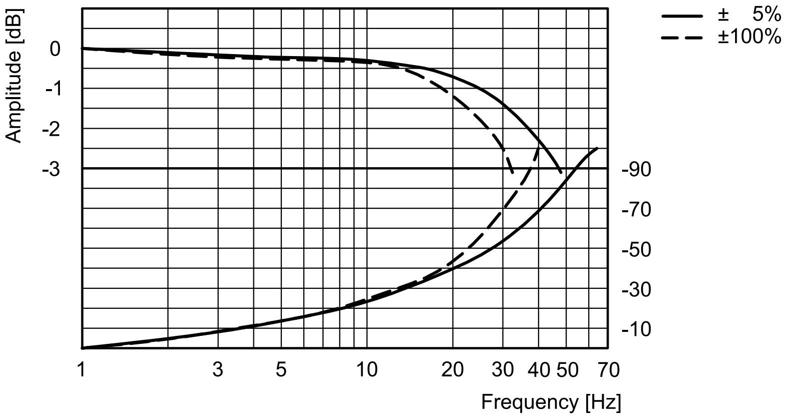


7.2 - DXPE7J

RESPONSE TIME

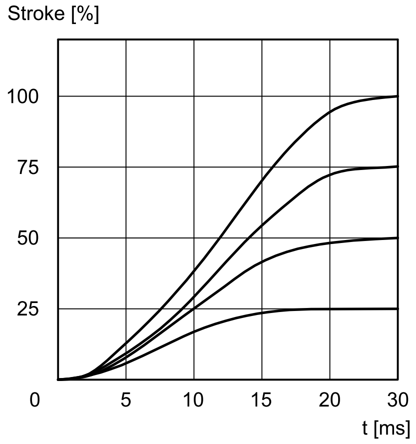


FREQUENCY RESPONSE

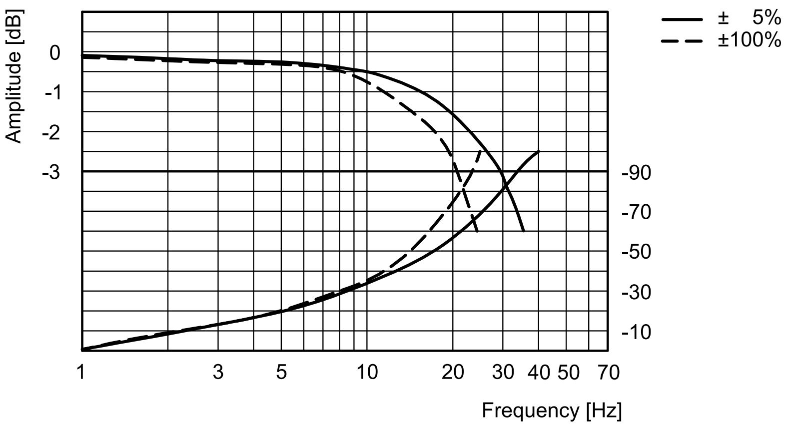


7.3 - DXPE8J

RESPONSE TIME



FREQUENCY RESPONSE



8 - HYDRAULIC CHARACTERISTICS

(with mineral oil with viscosity of 36 cSt at 50°C)

		DXPE5J DXPER5J	DXPE7J	DXPE8J
Max flow rate	l/min	180	450	900
Piloting flow requested with operation 0 →100%	l/min	7	13	28
Piloting volume requested with operation 0 →100%	cm^3	1,7	3,2	10

8.1- Piloting and drainage

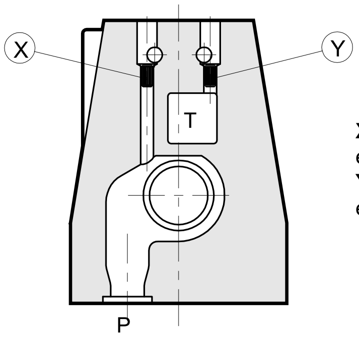
The DXPE*J valves are available with piloting and drainage, both internal and external. The version with external drainage allows a higher back pressure on the unloading. The version with external pilot with reduced pressure must be used when higher pressures are needed.

TYPE OF VALVE		Plug assembly	
		X	Y
IE	INTERNAL PILOT AND EXTERNAL DRAIN	NO	YES
II	INTERNAL PILOT AND INTERNAL DRAIN	NO	NO
EE	EXTERNAL PILOT AND EXTERNAL DRAIN	YES	YES
EI	EXTERNAL PILOT AND INTERNAL DRAIN	YES	NO

PRESSURES (bar)

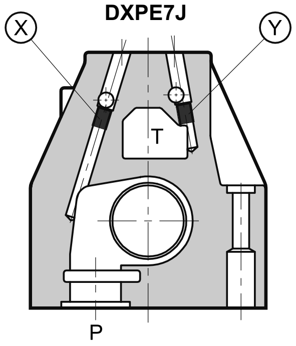
Pressure	MIN	MAX
Piloting pressure on X port	15	250
Pressure on T port with internal drain	-	30
Pressure on T port with external drain	-	250

DXPE5J and DXPE5RJ

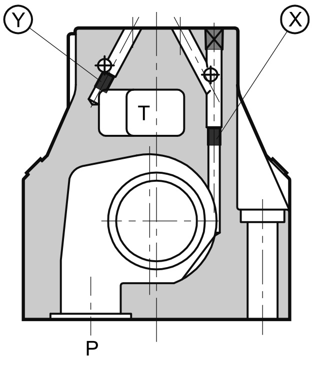


X: M5x6 plug for external pilot
Y: M5x6 plug for external drain

DXPE7J



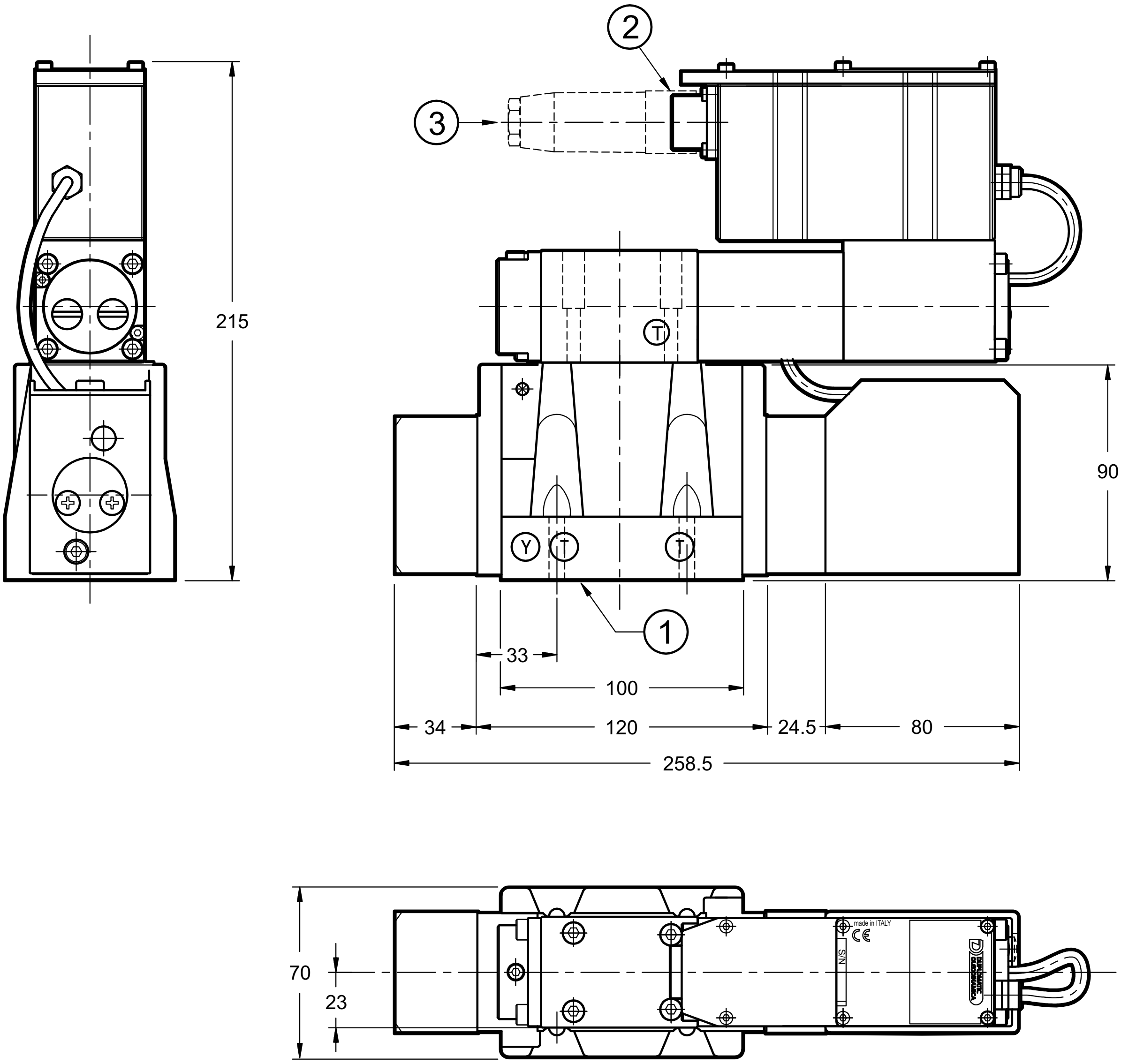
DXPE8J



X: M6x8 plug for external pilot
Y: M6x8 plug for external drain

9 - OVERALL AND MOUNTING DIMENSIONS DXPE5J AND DXPE5RJ

dimensions in mm



NOTES:

See mounting surface at section 12.

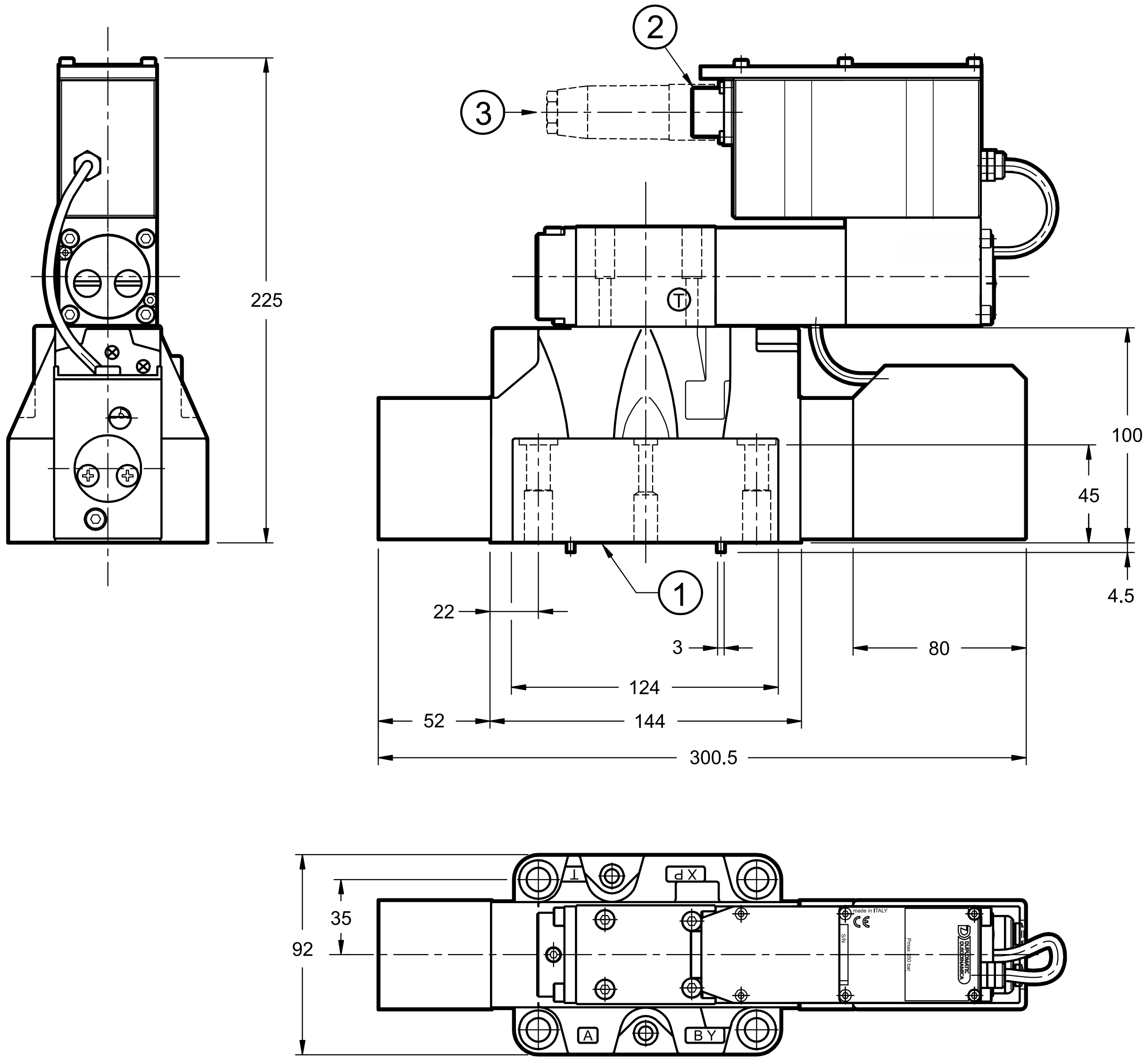
- Do not dismantle the transducers.

1	Mounting surface with sealing rings: 5 OR type 2050 (12.42x1.78) - 90 Shore 1 OR type 2037 (9.25x1.78) - 90 Shore
2	Main connection
3	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

Valve fastening: N. 4 bolts M6x35 - ISO 4762
Tightening torque: 8 Nm (bolts A 8.8)
Threads of mounting holes: M6x10

10 - OVERALL AND MOUNTING DIMENSIONS DXPE7J

dimensions in mm



NOTES:

See mounting surface at section 12.

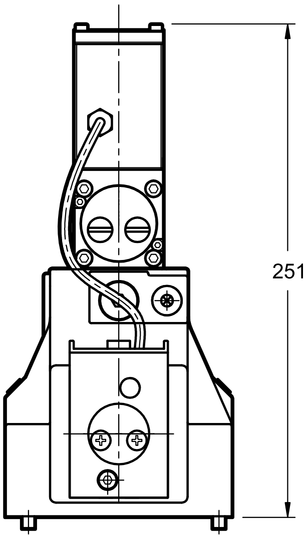
- Do not dismantle the transducers.

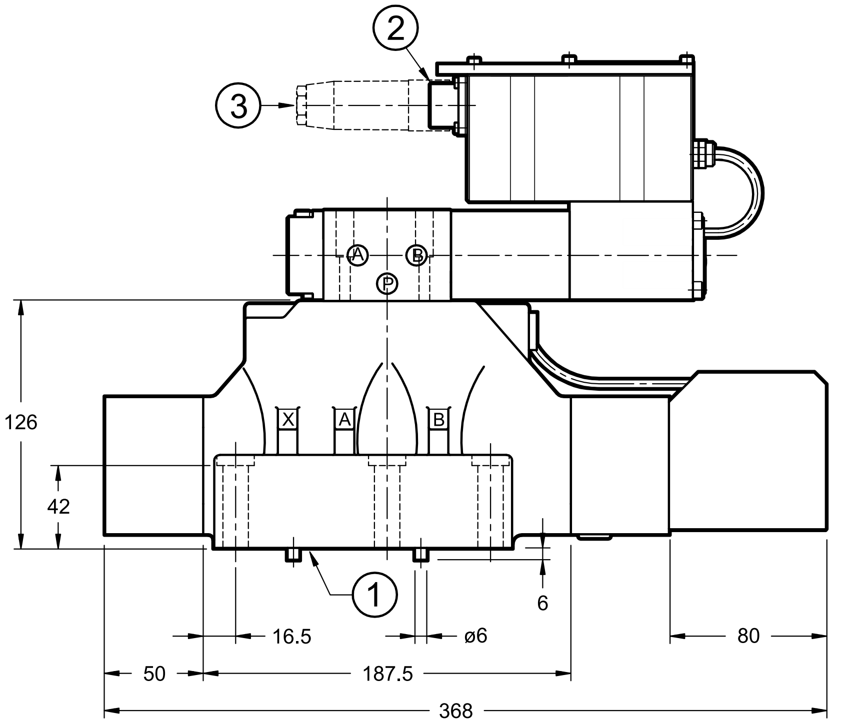
Valve fastening:	N. 4 bolts M10x60 - ISO 4762 N. 2 bolts M6x60 - ISO 4762
Tightening torque	M10x60: 40 Nm (bolts A 8.8) M6x60: 8 Nm (bolts A 8.8)
Threads of mounting holes: M6x18; M10x18	

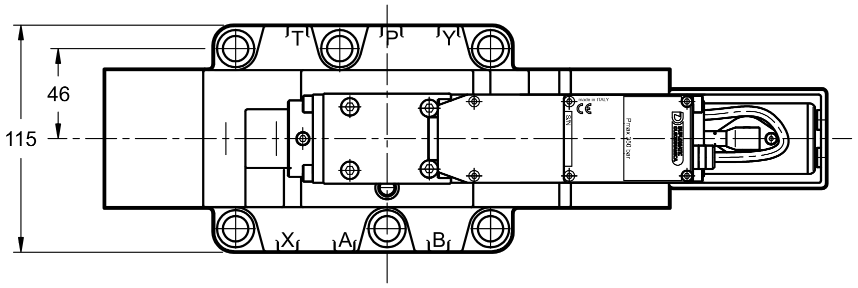
1	Mounting surface with sealing rings. 4 OR type 130 (22.22X2.62) - 90 Shore 2 OR type 2043 (10.82x1.78) - 90 Shore
2	Main connection
3	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

11 - OVERALL AND MOUNTING DIMENSIONS DXPE8J

dimensions in mm







NOTES:

See mounting surface at section 12.

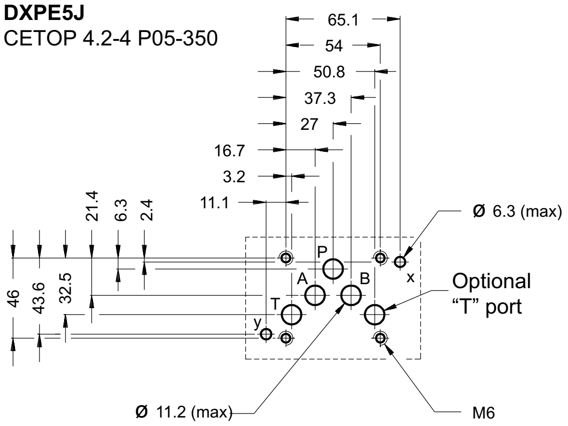
- Do not dismantle the transducers.

1	Mounting surface with sealing rings: 4 OR type 3118 (29.82x2.62) - 90 Shore 2 OR type 3081 (20.24x2.62) - 90 Shore
2	Main connection
3	Electrical connector 7 pin DIN 43563 - IP67 PG11 EX7S/L/10 code 3890000003 **(to be ordered separately)**

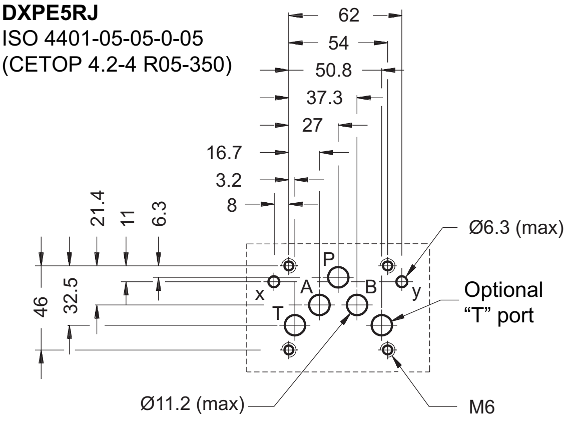
Fastening of single valve: N. 6 bolts M12X60 - ISO 4762
Tightening torque: 69 Nm (bolts A 8.8)
Threads of mounting holes: M12X20

12 - MOUNTING SURFACES

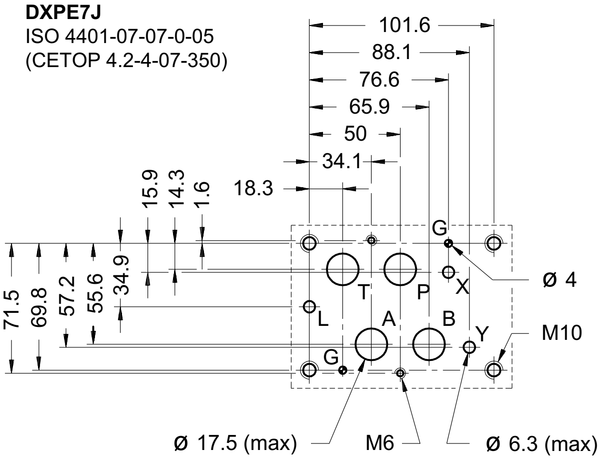
DXPE5J
CETOP 4.2-4 P05-350



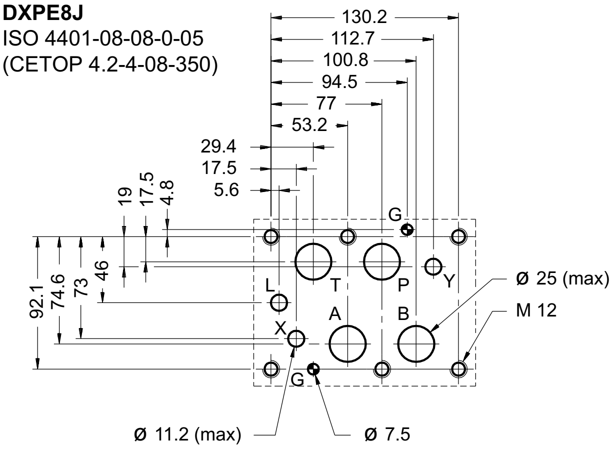
DXPE5RJ
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



DXPE7J
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)



DXPE8J
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)



13 - HYDRAULIC FLUIDS

Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals. For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other kinds of fluid such as HFA, HFB, HFC, please consult our technical department.

Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics.

The fluid must be preserved in its physical and chemical characteristics.

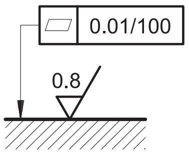
14 - INSTALLATION

The valves can be installed in any position without impairing correct operation.

Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols. If minimum values are not observed, fluid can easily leak between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.

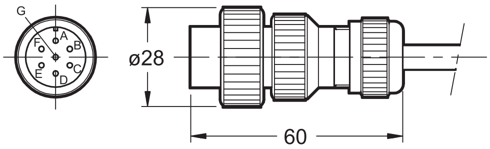
Surface finishing



15 - ACCESSORIES

(to be ordered separately)

15.1 Mating connector



These valves have a plug for 7-pin mating connector, that is placed on the box of the integral motion control.

⚠ So as to avoid electromagnetic troubles and comply with the electromagnetic compatibility regulation EMC, it is recommended the use of a metal connector.

If a plastic connector is used, make sure that the protection characteristics IP and EMC of the valve are guaranteed.

Duplomatic can provide a metal cable connector type MIL-C-5015-G (EN 175201-804).

name: **EX7S/L/10** code **3890000003**

15.2 - Connection cables size

Power supply:
- up to 20 m cable length : 1,0 mm^2
- up to 40 m cable length : 1,5 mm^2

Signal: 0,50 mm^2

A suitable cable would have 7 isolated conductors, a separate screen for the signal wires and an overall screen.

15.3 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, see catalogue 89850.

16 - SUBPLATES

(see catalogue 51 000)

		DXPE5J	DXPE7J	DXPE8J
with rear ports		PME4-AI5G	PME07-AI6G	-
with side ports		PME4-AL5G	PME07-AL6G	PME5-AL8G
thread of ports:	P - T - A - B X - Y	3/4” BSP 1/4” BSP	1” BSP 1/4” BSP	1½” BSP 1/4” BSP

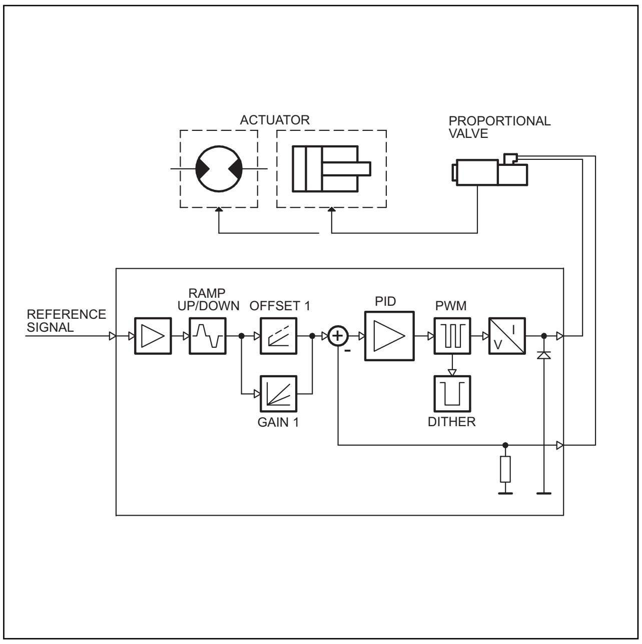
EDC-1

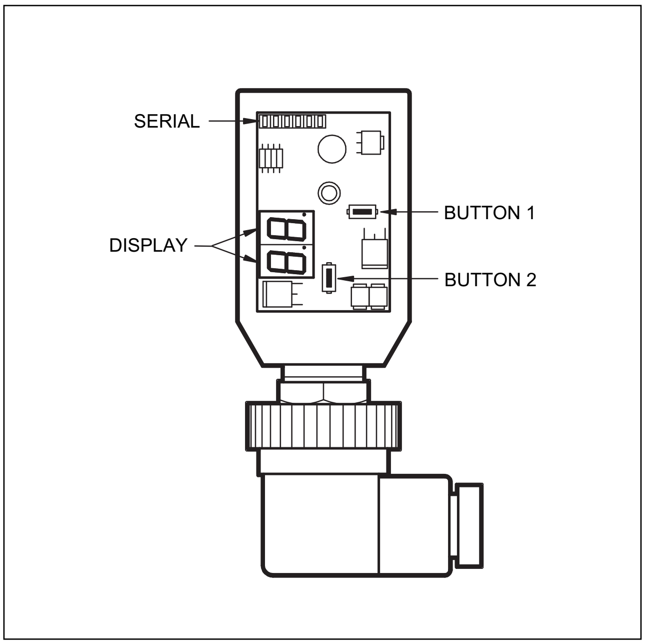
DIGITAL ELECTRONIC CONTROL UNIT FOR OPEN-LOOP SINGLE SOLENOID PROPORTIONAL VALVES

SERIES 10

PLUG VERSION

OPERATING PRINCIPLE

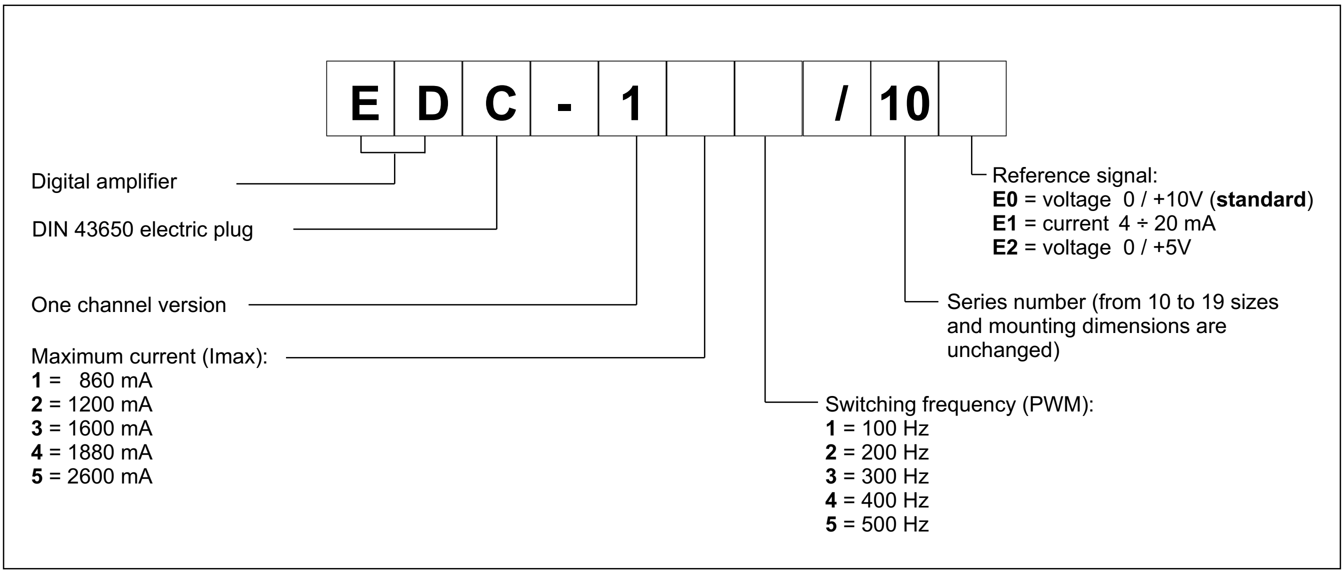




TECHNICAL CHARACTERISTICS

Power supply	V DC	10 ÷ 30 - ripple included
Required power	W	min 20 - max 40 (see paragraph 2.1)
Output current	mA	min 800 - max 2600 (see paragraph 1)
Power supply electrical protections		overload over 33V polarity inversion
Output electrical protections		short-circuit
Analogue electrical protections		up to 30 V DC
Available reference signals (selectable from the jumper)	0 ÷ 10V 0 ÷ 5V 4 ÷ 20 mA	input impedance 100 kΩ input impedance 100 kΩ input impedance max 500 Ω
Connector type		DIN 43650
Electromagnetic compatibility (EMC): - EMISSIONS CEI EN 61000-6-4 - IMMUNITY CEI EN 61000-6-2		according to 2004/108/CEE standards (see paragraph 5 - **NOTE 1**)
Protection to atmospheric agents (CEI EN 60529)		IP 65 - 67
Operating temperature range	°C	-20 / +70
Mass	kg	0,10

1 - IDENTIFICATION CODE



Digital amplifier

DIN 43650 electric plug

One channel version

Maximum current (Imax):
1 = 860 mA
2 = 1200 mA
3 = 1600 mA
4 = 1880 mA
5 = 2600 mA

Switching frequency (PWM):
1 = 100 Hz
2 = 200 Hz
3 = 300 Hz
4 = 400 Hz
5 = 500 Hz

Series number (from 10 to 19 sizes and mounting dimensions are unchanged)

Reference signal:
E0 = voltage 0 / +10V (**standard**)
E1 = current 4 ÷ 20 mA
E2 = voltage 0 / +5V

The EDC-1 connector is a digital amplifier controlling open loop proportional valves. The unit supplies a variable current proportionally to the reference signal and independently of temperature variations or load impedance, with a resolution of 1% on 2600 mA (the full scale value).
The PWM stage on the solenoid power supply makes it possible to reduce the valve hysteresis thus optimising control precision. The connector is customizable with different maximum current sizes and switching frequencies (PWM), optimized according to the valve to be controlled.
Setting is possible by buttons and display inside the case, or with a notebook by RS232 with the software EDC-PC, (see par. 6.2)

2 - FUNCTIONAL SPECIFICATIONS

Electric power supply

The connector requires a power supply of 10 ÷ 30 V DC (terminals 1 and 2).

NOTE: The value of the power supply voltage on the connector must be higher than the rated working voltage of the solenoid to be controlled.

The power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

The power required by the connector depends on the power supply voltage and on the maximum value of the supplied current (it is determined by the card version). In general a conservative value of the required power can be considered as the product of V x I.

Example: a connector with a maximum current = 800 mA and a power supply voltage of 24 V DC requires a power of about 20W. In case of a card with a maximum current =1600 mA and a power supply voltage of 24 V DC the used power is equal to 38.5 W.

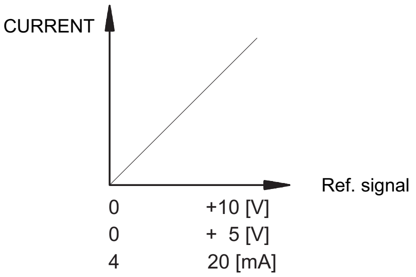
2.2 - Electrical protection

The connector is protected against overvoltage and polarity inversion.

On the output a protection against any short circuit is foreseen.

2.3 - Reference signal

The connector accepts voltage reference signals with 0 ÷ 10V and 0 ÷ 5V, in 4 ÷ 20 mA current, from an external generator (PLC, CNC) or external potentiometer.
See paragraph 7 for electric connections referring to the different connector versions.



3 - SIGNALS

3.1 - POWER ON (Power supply)

Display indicate the connector is ON and with +24V DC.

4 - ADJUSTMENTS

There are two way adjustments: variables view and parameters editing. The first one enables the real time monitoring of the control values, for both required and read current, on both channels. The second modality enables the operating parameters view and editing.

4.1 - Variables view

The card is switched on at the variables view modality, and it shows the first variable value, that is the U1 parameter (reference signal).
Pushing button (1) the current to solenoid is displayed. By means of (1) key, the different variables can be selected. Each time a variable is selected, its short name appears for approximately one second.
By briefly pressing the keys, the current variable name appears for approximately one second.

The variables that can be selected are:

U1: Reference signal:
0 + 10V
0 + 5V
4 ÷ 20mA (displayed as 2 ÷ 10)

C1: current required according to the applied reference signal, expressed in ampere, ranging between 0 and 2.6 A

All the mentioned parameters can be viewed on the two digits display, located on the connector front panel.
The selected value has to be read as follows (example for EDC-15*/10E* card):

REFERENCE		DISPLAY U1		DISPLAY C1	
(V)	(mA)	(V)		(Ampere)	
0	4	0.0	2.0	40	(mA)
5	12	5.0	6.0	13	(A)
10	20	10.	10.	26	(A)

4.2 - PARAMETERS EDITING

To access the parameter editing, press the key (2) for at least 3 seconds.
The first parameter displayed is G1. To modify it, press the key (1) for two seconds, until the display starts blinking. Use the key (2) to increase the value and the key (1) to decrease it. To save the new value, press both the keys. The display stops blinking.
Pressing the key (2) again is possible to scroll all the parameters. To modify some parameters, repeat the steps above-mentioned for the G1 parameter.

The parameters that can be selected are:

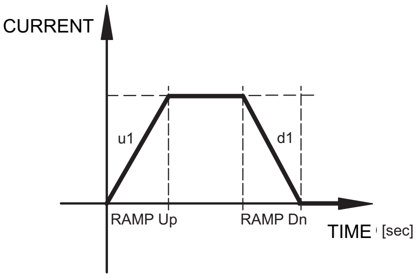
G1: “I Max” current, expressed in milliampere.
It sets the maximum current to the solenoid, when the reference signal is at the maximum value of +10 V (or 20 mA). It is used to limit the maximum value of the hydraulic size controlled by the valve.
Default value = Imax
Range = 50 ÷ 100% of Imax

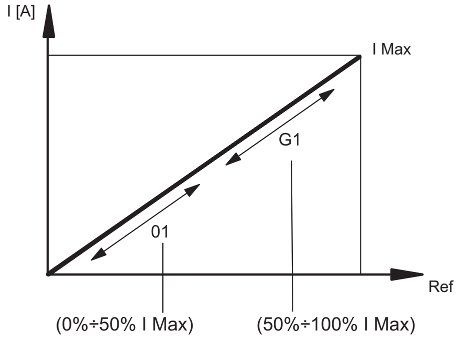
o1: “I Min” current, expressed in milliampere.
It sets the offset current to the solenoid, when the reference signal exceeds the limit of 0,1 V (or 0,1 mA). It is used to null the insensitiveness area of the valve (dead band).
Default value = 0%
Range = 0 ÷ 50% of Imax

u1: “Ramp Up” increasing ramp time, expressed in seconds.
It sets the current increasing time, for a variation from 0 to 100% of the input reference.
It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = 00 sec.
Range = 00 ÷ 50 sec.

d1: “Ramp Dn” decreasing ramp time, expressed in seconds.
It sets the current decreasing time, for a variation from 100% to 0 of the input reference. It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = 00 sec.
Range = 00÷ 50 sec.

Fr: PWM frequency, in Hertz.
It sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability. The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = PWM (according to version card)
Range = 50 ÷ 500Hz





4.3 - ERROR SIGNAL

EE: breakdown cable error on 4 ÷ 20 mA signal (threshold 3 mA).
Reset the alarm turning off the +24 V DC cable.

5 - INSTALLATION

The connector type electronic unit is suitable for direct assembly on the solenoid of the relative proportional valve. The 4-core connection cable (0,5 mm^2 individual wire section) is supplied pre-wired and in a standard length of 2.5 m (DIN 47100 standard).

NOTE 1
To observe EMC requirements it's important that the control unit electrical connection is in compliance with the wiring diagram of chapter 7. As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electrical motors, inverters and electrical switches).

In environments where there are critical electromagnetic interferences, a complete protection of the connection wires can be requested.

6 - START UP, CONTROL SETTINGS AND SIGNAL MEASUREMENT

6.1 - Set up

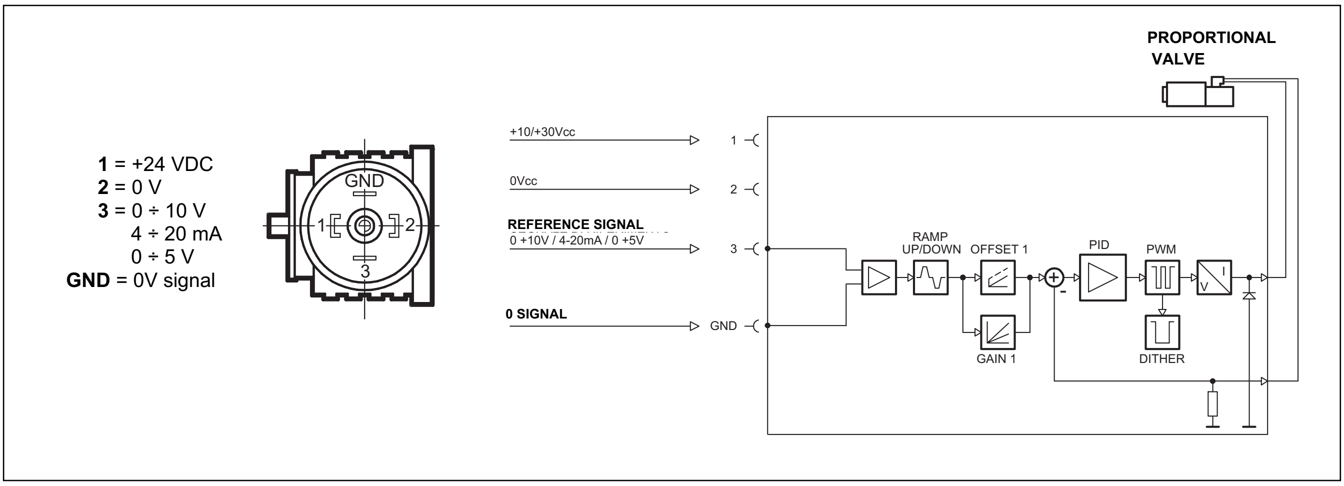
Settings can be changed by either acting on the (1) and (2) keys located on the card front panel, or using the EDC-PC hardware and software kit.

6.2 - EDC-PC Software

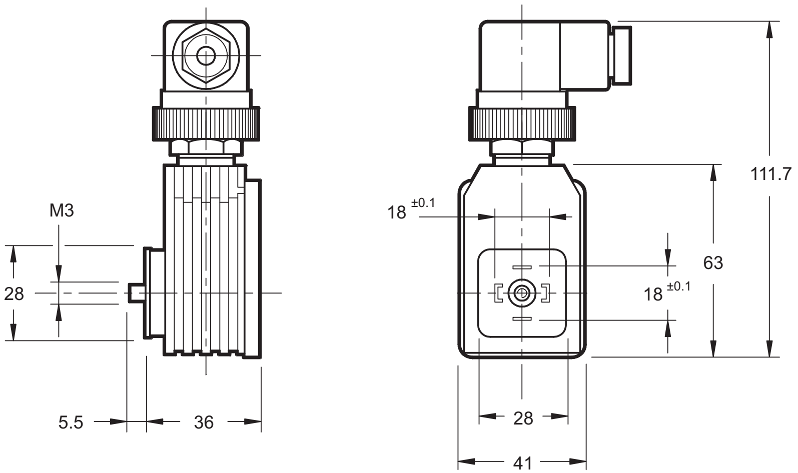
The relevant hardware and software kit (to be ordered separately) allows to read the values and to set the connector easily.

The software communicates, through a flat cable, to the relevant connector placed in the EDC-1 panel, behind the protecting gate. The EDC-PC software compatibility is guaranteed only on Windows 2000 and Windows XP operating systems.

7 - WIRING DIAGRAM



8 - OVERALL AND MOUNTING DIMENSIONS



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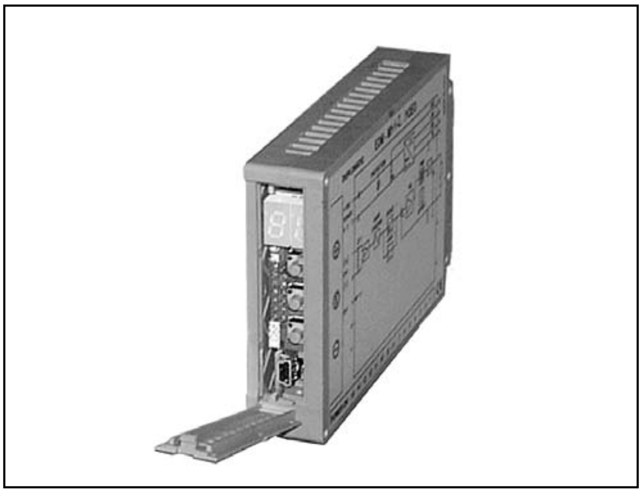


EDM-M*

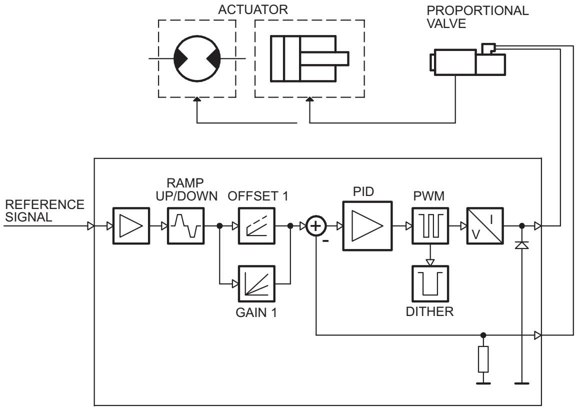
DIGITAL AMPLIFIER FOR OPEN LOOP PROPORTIONAL VALVES

SERIES 20

EDM-M1 single solenoid
EDM-M2 double solenoid
EDM-M3 two single solenoids
independent channels

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



The EDM-M* card is a digital amplifier for open loop proportional valves control. It is designed for rail mounting type: DIN EN 50022.

The unit supplies a variable current in proportion to the reference signal and independently of temperature variations or load impedance.

The PWM stage on the solenoid power supply allows the reduction of the valve hysteresis, thus optimising control precision. The unit is available in three main versions, to control single solenoid valves (M1), double solenoid valves (M2) and valves with two independent channels controlling two single solenoid valves (M3). Each version is available with different maximum current settings and switching frequencies (PWM), optimised according to the relevant valve.

The parameters adjustment is carried out either through keyboard and display, placed on the front panel, or with a notebook, via RS232 or via USB converter (EDMPC/20 software).

TECHNICAL CHARACTERISTICS

Power supply	V DC	10 ÷ 30 ripple included
Required power	W	min 20 - max 40 (see paragraph 3.1)
Output current	mA	min 800 - max 2600 (see paragraph 1)
Power supply electrical protections		over load over 33V polarity inversion
Output electrical protections		short-circuit
Analogue electrical protections		up to 30V DC due to incorrect power supply connection
Available reference signals	0 ÷ 10V ±10V 4 ÷ 20 mA	input impedance 10-100 kΩ input impedance 10-100 kΩ input impedance max 500 Ω
Additional output ports		±10V DC to supply 50 + 50 mA to external potentiometer
Electromagnetic compatibility (EMC)		according to 2004/108/CE standards (see paragraph 6 - **NOTE 1**)
Housing material		thermoplastic polyamide
Housing dimensions	mm	120 x 93 x 23
Connector		Plug-in terminal block with tightening screws: 15 poles
Operating temperature range	°C	-20 / +70
Mass	kg	0,15

1 - IDENTIFICATION CODE

E	D	M	-	M					/	20	

Digital amplifier
for rail mounting DIN EN 50022

for open loop

Versions:
1 = for single solenoid proportional valves
2 = for double solenoid proportional valves
3 = 2 channels for an independent control of two single solenoid valves

Max current (I Max):
(first channel for EDM - M3 version)
1 = 860 mA **3** = 1600 mA **5** = 2600 mA
2 = 1200 mA **4** = 1880 mA

Only for EDM-M3 version, omit for other versions
Max current (I Max) second channel:
1 = 860 mA **3** = 1600 mA
2 = 1200 mA **4** = 1880 mA

Switching frequency (PWM):
1 = 100 Hz
2 = 200 Hz
3 = 300 Hz
4 = 400 Hz

Series N. (from 20 to 29 sizes and mounting dimensions remain unchanged)

Reference signal:
E0 = voltage 0 ÷ ±10V (standard)
E1 = current 4 ÷ 20 mA

2 - EDM-M, DUPLOMATIC VALVES AND DEFAULT SETTINGS

The card is preset at factory. The following table shows the default settings for the standard EDM versions and the Duplomatic valve to be coupled to. As shown at par. 1 different settings are possible. Apply for them at our Technical Dept.

CARDS FOR 24V VALVES

CARD					**COUPLING VALVES** (you can find the matches between valves names and catalogue numbers in the group 8 index)		
Name	**I Min** [mA]	**I Max** [mA]	**I Lim** [mA]	**PWM** [Hz]	**Name**	**single coil**	**double coil**
EDM-M111	200	860	1350	100	DSPE*, RPCED1, RPCED1-T3, RPCE2, RPCE3, BLS6, ZDE3, QDE3	▪	
EDM-M112	200	860	1350	200	DSE3, CRE, PRE*, PRE3, PRED3, MZE, DZCE*	▪	
EDM-M131	200	1600	2350	100	DSE5, QDE5	▪	
EDM-M211	200	860	1350	100	DSPE*, ZDE3, BLS6		▪
EDM-M212	200	860	1350	200	DSE3		▪
EDM-M231	200	1600	2350	100	DSE5		▪
EDM-M3312	200 200	1600 860	2350 1350	200	VPPM-*PQCE regulator	▪ ▪	

CARDS FOR 12V VALVES

CARD					**COUPLING VALVES** (you can find the matches between valves names and catalogue numbers in the group 8 index)		
Name	**I Min** [mA]	**I Max** [mA]	**I Lim (#)** [mA]	**PWM** [Hz]	**Name**	**single coil**	**double coil**
EDM-M141	300	1880	2700	100	DSPE*, BLS6	▪	
EDM-M142	300	1880	2700	200	DSE3, CRE, PRE*, PRE3, PRED3, MZE, DZCE*, ZDE3, QDE3	▪	
EDM-M151	500	2600	4000	100	DSE5, QDE5	▪	
EDM-M241	300	1880	2700	100	DSPE*, BLS6		▪
EDM-M242	300	1880	2700	200	DSE3, ZDE3		▪
EDM-M251	500	2600	4000	100	DSE5		▪

I Lim: Max output current from the card.

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

The card requires a power supply of between 10 and 30V DC ripple included (terminals 1 and 2).

NOTE: The value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

The power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.
The power required by the card depends on the power supply voltage and on the maximum value of the supplied current (it is determined by the card version).
In general a conservative value of the required power can be considered as the product of V x I.
Example: a card with a maximum current = 860 mA and a power supply voltage of 24V DC requires a power of about 20W. With a card with a maximum current =1600 mA and a power supply voltage of 24V DC, the used power is equal to 38,5W.

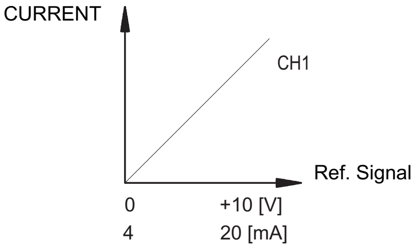
3.2 - Electrical protections

The card is protected against overvoltage and polarity inversion.
On the output a protection against any short circuit is foreseen.

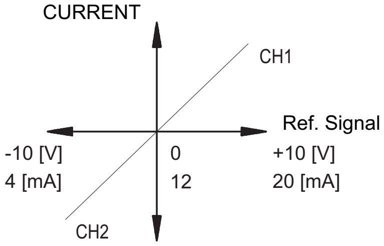
3.3 - Reference signal

The card accepts voltage reference signals 0 ÷ 10 V and ± 10 V, current reference signal 4 ÷ 20 mA, coming from an external generator (PLC, CNC) or from an external potentiometer powered by the card itself. The reference value depends on the card version as stated in the diagrams along side.
See paragraph 12 for the electric connections referring to the different card versions.

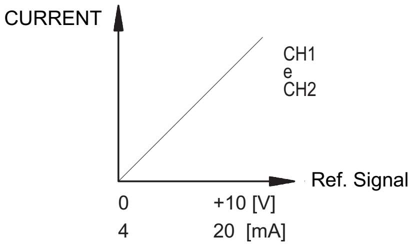
EDM-M1 VERSION



EDM-M2 VERSION



EDM-M3 VERSION



4 - SIGNALS

4.1 - Power ON (Power supply)

The two red displays indicates the card power supply:

ON - normal power supply

OFF - no power supply

FLASHING - see table at paragraph 12.

4.2 - Card ok output

The state of the card can be checked by means of the output “card ok OUTPUT”, located on pin 9 (referred to zero power supply, pin 15) with load resistance of 220 KΩ and max current 100 mA . When the card works normally, on this pin there is the same voltage as the power supply; when there is an anomaly, the output voltage is zero.

The anomalies could be:

- low voltage (lower than 10V)
- short circuit
- unconnected coil

If the output pin 9 is low, the control logic forbids the power outputs towards the solenoids. When the anomaly is settled, the card resets automatically.

5 - ADJUSTMENTS

There are two adjustments modalities: variables view and parameters editing. The first one enables the real time monitoring of the control values, for both the required and the read current, on both channels. The second modality enables the operating parameters view and editing.

5.1 - Variables view

The card is switched on at the variables view modality, and it shows the first variable value, that is the reference signal to channel 1.
By means of (+) and (-) keys, the different variables can be selected. Each time a variable is selected, its short name appears for approximately one second.
By briefly pressing the (E) key, the current variable name appears for approximately one second.

The variables that can be selected are:

U1: Reference signal to channel 1:

0 + 9,9 V 4 ÷ 20 mA	for single solenoid
- 9,9 / 0 / +9,9 V 4 / 12 / 20 mA	for double solenoid

C1: current required for channel 1, according to the applied reference signal, expressed in ampere, ranging between 0 and 3.0 A

E1: current actually supplied by channel 1, expressed in ampere, ranging between 0 and 3.0 A

U2: Reference signal to channel 2:

0 + 9,9 V 4 ÷ 20 mA	for single solenoid
- 9,9 / 0 / +9,9 V 4 / 12 / 20 mA	for double solenoid

C2: current required for channel 2, according to the applied reference signal, expressed in ampere, ranging between 0 and 3.0 A

E2: current actually supplied by channel 1, expressed in ampere, ranging between 0 and 3.0 A

Only the variables of channel 1 (U1, C1 ed E1) will be viewed, if the card is set for a single solenoid valve.

All the mentioned parameters can be viewed on the display located on the card front panel. It is a two digits display.
The selected value has to be read as follows (example for EDM-M15*/20E* card):

REFERENCE (V)	REFERENCE (mA)	VAR. U1 (V)	VAR. C1/E1	VAR. U2 (V)	VAR. C2/E2
+10	20	10.	18. (A)		
+5	16	5.0	1.0 (A)		
0	12	00	40.(mA)		
0	12			0.0	40.(mA)
-5	8			5.0	1.0 (A)
-10	4			10.	1.8 (A)

5.2 - Parameters editing

By pressing the (-) key for longer than 1,5 seconds, it is possible to switch from the variables view modality to the parameters editing modality, and vice versa.
In the parameters editing modality, the different parameters can be selected, as in the previous modality, by briefly pressing (+) and (-) keys. Each time a parameter is selected, its short name appears for approximately one second.
By briefly pressing the (E) key, the current parameter name appears for approximately one second.

By pressing the (E) key for longer than 1,5 seconds, the parameters name flashes for approximately one second: by means of (+) and (-) keys, the parameter value can be edited. Each time one of these keys is pressed, the value is either increased or decreased of one unit; by holding the key pressed, the value is continuously increased.
Once the desired value is edited, exit by pressing the (E) key. The value is recorded in the EEPROM, the (+) and (-) keys resume their parameters selection function.
Once the parametrization cycle is completed, by pressing the (+) key more than 2 seconds and until displays blinking, all parameters are saved in EEPROM and the visualization goes back to variables view modality.

The parameters that can be selected are:

G1: “I Max” current, expressed in milliampere.
It sets the maximum current to the solenoid of channel 1, when the reference signal is at the maximum value of +10 V (or 20 mA). It is used to limit the maximum value of the hydraulic size controlled by the valve.
Default value = see paragraph 2

o1: “I Min” current, expressed in milliampere.
It sets the offset current to the solenoid of channel 1, when the reference signal exceeds the limit of 0,1 V (or 0,1 mA). It is used to null the insensitiveness area of the valve (dead band).
Default value = see paragraph 2
Range = 0 ÷ 50% of I Max

r1 “Max Ramp” - Ramp time, expressed in seconds.
It sets the time it takes to the current supplied by channel 1 to go from zero to the maximum value, in the case of a reference signal variation from zero to 100% and vice versa. It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = see paragraph 2
Range = 00 ÷ 20 sec.

u1: “Ramp Up” increasing time, expressed in % of the r1 ramp time. It sets the current increasing time on channel 1, for a variation from 0 to 100% of the input reference.
Default value = 99%
Range = 00 ÷ 99%

d1: “Ramp Dn” - decreasing time, expressed in % of the ramp time. It sets the current decreasing time on channel 1, for a variation from 100% to 0 of the input reference.
Default value = 99%
Range = 00 ÷ 99%

G2: “I Max” - current, expressed in milliampere.
It sets the maximum current to the solenoid of channel 2, when the reference signal is at the maximum value.
Default time = see paragraph 2

o2: “I Min” - current, expressed in milliampere.
It sets the offset current to the solenoid of channel 2.
Default value = see paragraph 2
Range = 0 ÷ 50% of Imax

r2: “Max Ramp” - Ramp time, expressed in seconds.
It sets the time it takes to the current supplied by channel 1 to go from zero to the max value, in the case of a reference signal variation from zero to 100% and vice versa. It is used to slow down the valve response time in the case of a sudden variation of the reference signal.
Default value = see paragraph 2
Range = 00 ÷ 20 sec.

u2: “Ramp Up” increasing time, expressed in % of the r2 ramp time. It sets the current increasing time on channel 2, for a variation from 0 to 100% of the input reference.
Default value = 99%
Range = 00 ÷ 99%

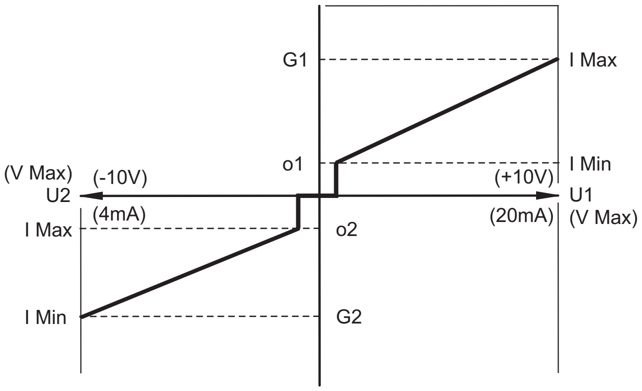
d2: “Ramp Dn” decreasing time, expressed in % of the r2 ramp time. It sets the current decreasing time on channel 2, for a variation from 100% to 0 of the input reference.
Default value = 99%
Range = 00 ÷ 99%

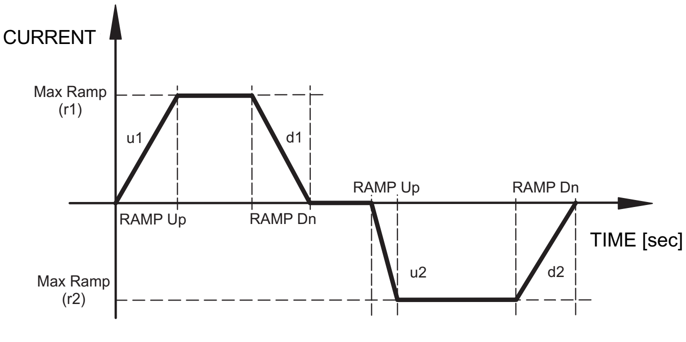
Fr: “PWM Freq” - PWM expressed in Hertz.
It sets the PWM frequency, which is the pulsating frequency of the control current. The PWM decrease improves the valve accuracy, decreasing the regulation stability. The PWM increase improves the regulation stability, causing a higher hysteresis.
Default value = PWM (according to card version)
Range = 50 ÷ 400Hz

U1 and **U2**: They represent the set point full scale.
By means of this parameter (that is modifiable only via software) it is possible to keep the same resolution, even if the set point is lower than 10V.
Example: with a card EDM-M121 with command 10V and with parameter set as standard, the output current charge is 1200 mA. If “U” is set with a value of 500, the output current charge will be 600 mA.

If the card is set for a single solenoid valve, only the channel 1 parameters will be viewed.

Parameters that can be modified in EDM-M2 version





6 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.
The wiring connections are on the terminal strip located on the bottom of the electronic control unit.
It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1
To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of paragraphs 8 - 9 - 10 and 11 of this catalogue.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

7 - CONTROL SETTINGS AND SIGNAL MEASUREMENT

7.1 - Setting device

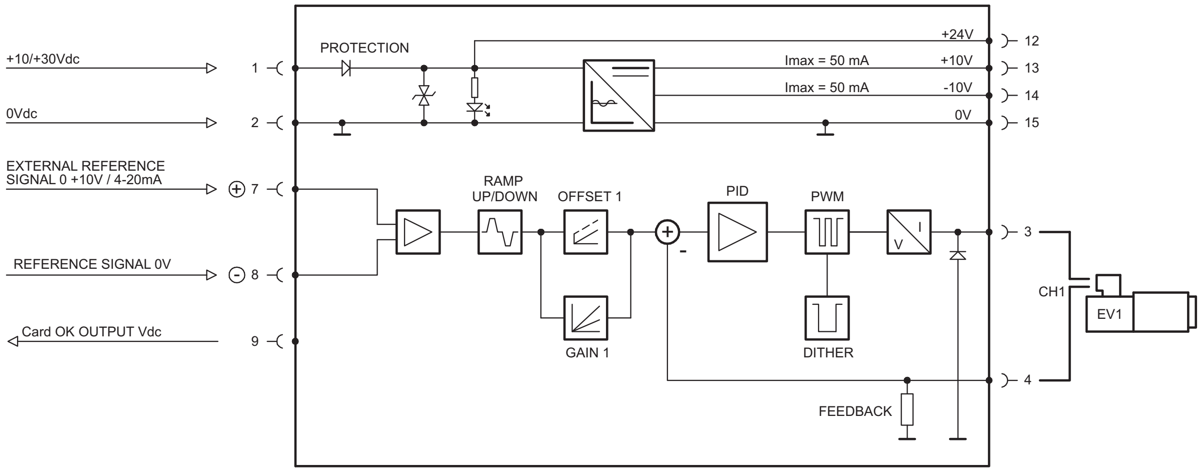
Settings can be changed by either acting on the (+) (E) (-) keys located on the card front panel, or by means of the EDMPC/20 hardware and software kit.

7.2 - EDMPC/20 hardware and software kit (code 3898201010)

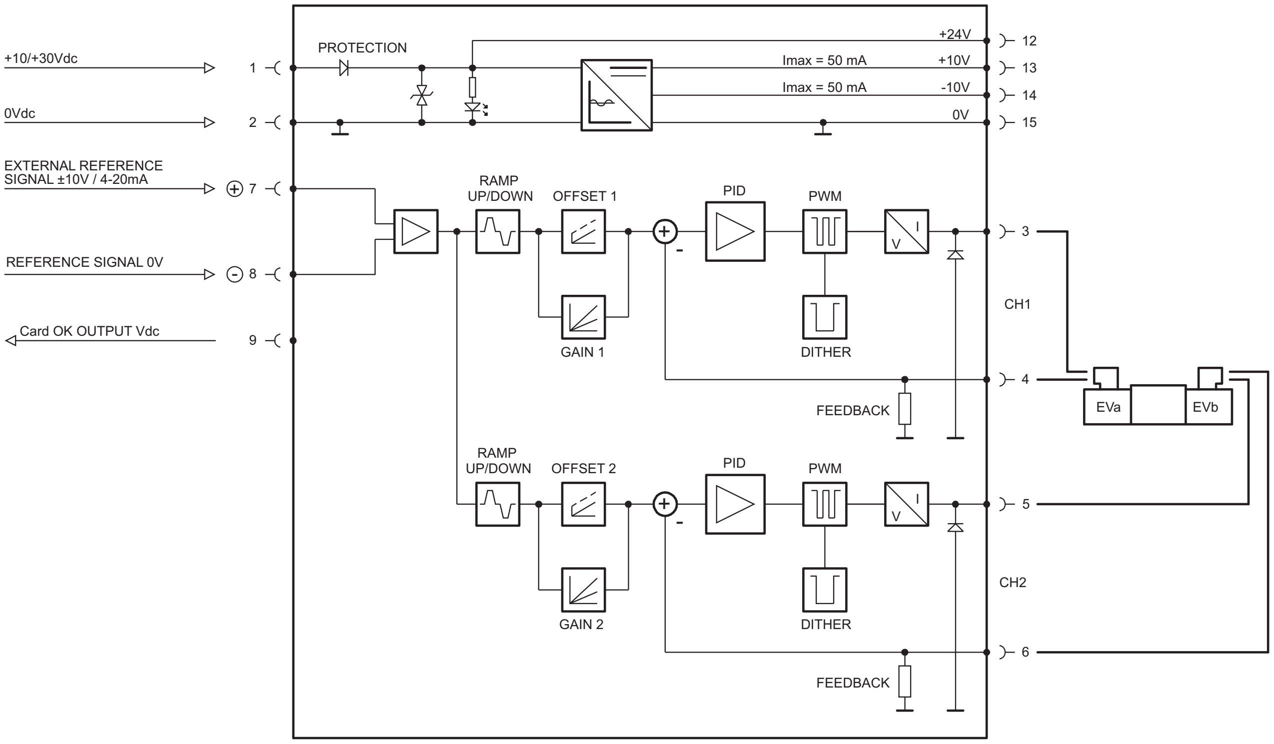
The relevant hardware and software kit (to be ordered separately) enables the signals measurement and the card operations.
The software communicates, through a flat cable, to the relevant mini USB connector on the EDM card front panel, behind the protecting gate.
The supply includes:
- a communication cable (L=1 meter) for connecting the EDM card to the PC RS232 port;
- a converter from RS232 to USB.

The EDM-PC software compatibility is guaranteed only on Windows 2000 and Windows XP operating systems.

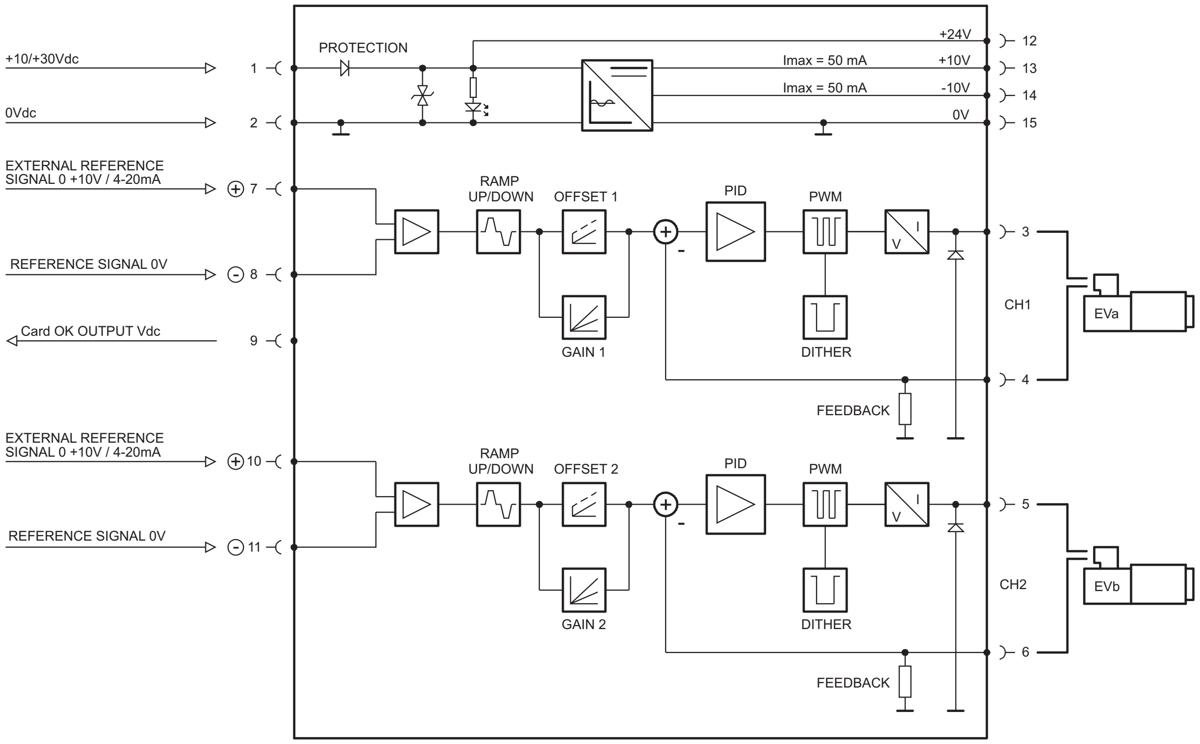
8 - EDM-M1 CARD CIRCUIT AND WIRING DIAGRAM



9 - EDM-M2 CARD CIRCUIT AND WIRING DIAGRAM

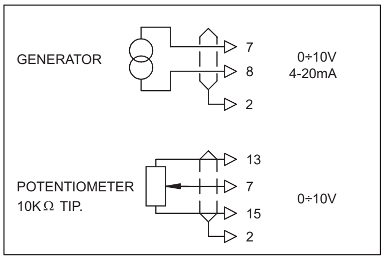


10 - EDM-M3 CARD CIRCUIT AND WIRING DIAGRAM

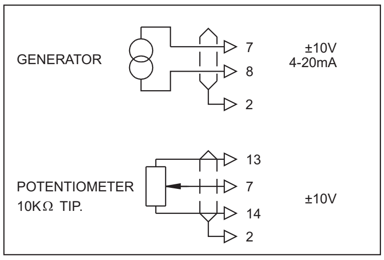


11 - WIRING DIAGRAM FOR REFERENCE SIGNAL

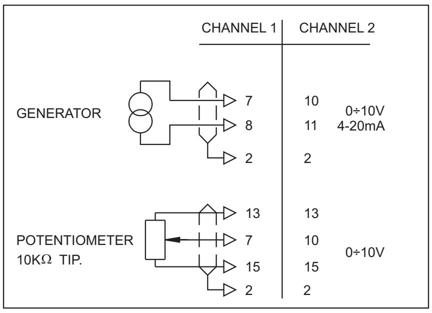
EDM-M1



EDM-M2



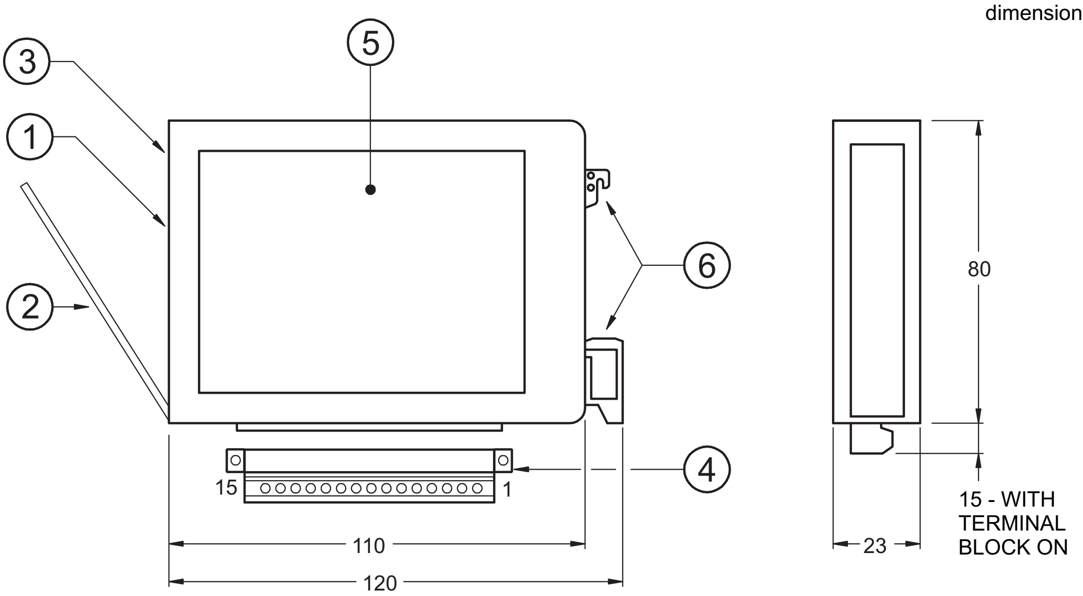
EDM-M3



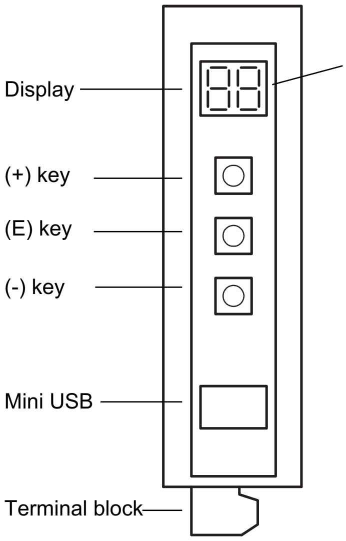
NOTE: the pin 8 (and 11 for EDM-M3 version) must be connected to pin 15 (0V), when the potentiometer is used as reference signal. This is recommended also when the generator has a pure differential output (not connected to ground).

12 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



FRONT PANEL



DISPLAYED CODE:

A1 current lower than 3,5 mA on input 1

A2 current lower than 3,5 mA on input 2

A3 output 1 in short circuit

A4 output 2 in short circuit

A5 output 1 solenoid disconnected

A6 output 2 solenoid disconnected

A7 power supply voltage lower than 10V

NOTE: the displayed code is eliminated removing the cause.

1	Display and mini USB side
2	Buttons protecting gate
3	Display - for card power supply and faults displaying
4	Plug-in 15-pole terminal strip with downwards cables output and fastening bolts
5	Screen printing with card circuit and wiring diagram
6	Connection for rails DIN EN 50022

DUPLOMATIC OLEODINAMICA S.p.A.
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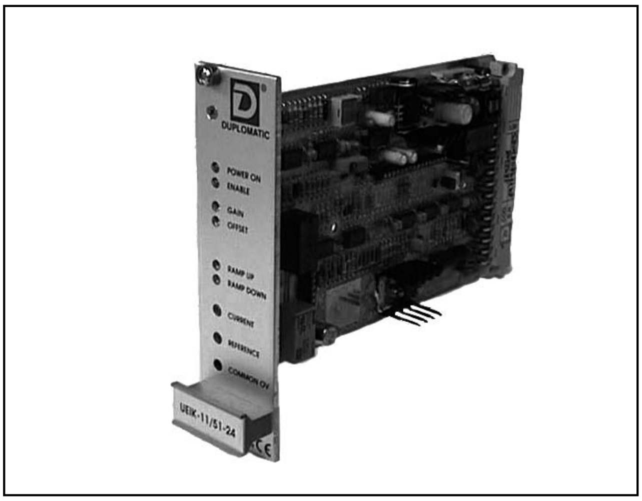
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



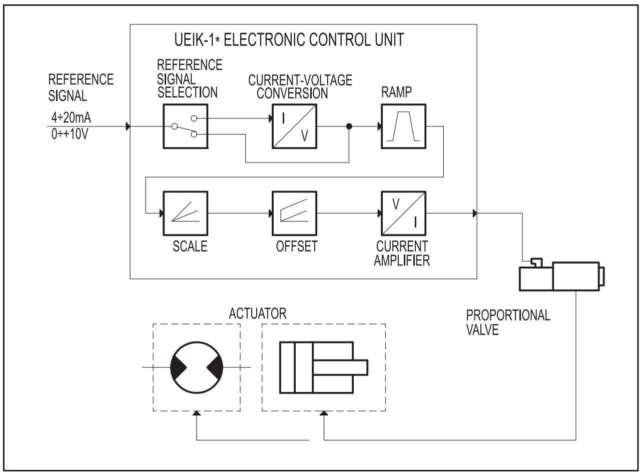
UEIK-1*

ELECTRONIC CONTROL UNIT FOR OPEN LOOP SINGLE SOLENOID PROPORTIONAL VALVE

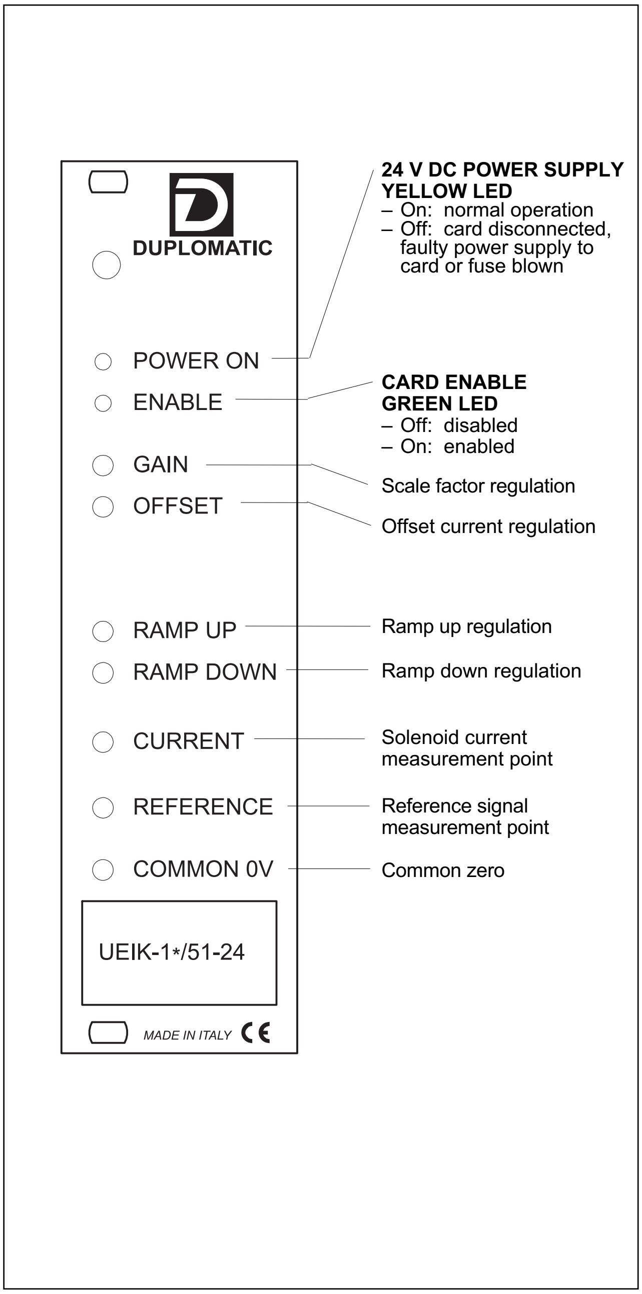
SERIES 51

EUROCARD TYPE

FUNCTIONAL BLOCK DIAGRAM



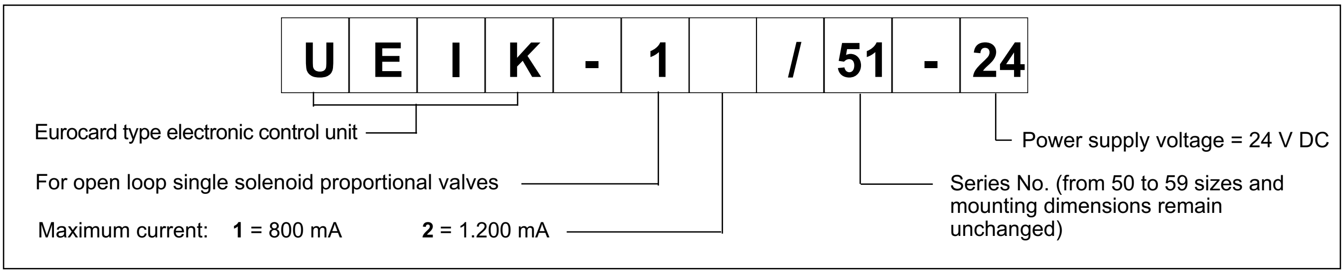
FRONT PANEL



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	See par. 2.1	
Output current	See par. 3.3	
Power supply electrical protection	– overload – polarity inversion	
Reference signal: – Voltage – Current	 V mA	 0 / +10 4 ÷ 20
Input reference signal impedance: – Voltage – Current	 kΩ Ω	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE** 1)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x35	
Connector interface	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,20

1 - IDENTIFICATION CODE



Eurocard type electronic control unit

For open loop single solenoid proportional valves

Maximum current: **1** = 800 mA **2** = 1.200 mA

Power supply voltage = 24 V DC

Series No. (from 50 to 59 sizes and mounting dimensions remain unchanged)

The UEIK-1* card is an electronic control unit Eurocard type for open loop single solenoid proportional valves.

The unit supplies a variable current in proportion to the reference signal and independently of temperature variations or load impedance.

The PWM stage on the solenoid power supply makes it possible to reduce valve hysteresis thus optimising control precision. The front panel is fitted with LEDs to indicate card functions and potentiometers to optimize control.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of between 22 and 30 V DC (pin 2a/2c - 4a/4c) and a power of: 20W (UEIK-11) - 29W (UEIK-12). Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.
A 2A fast-acting fuse is fitted for power circuit protection.

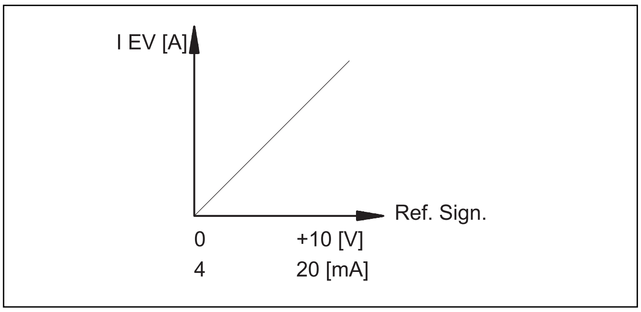
2.3 - Reference signal

The card accepts voltage reference signals (0 to +10V) or current reference signals (4÷20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 Ω.

See para. 9 for electrical connections.

The diagram shows characteristics of current supplied according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - POWER ON

The green LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.2 - ENABLE

A 22 to 30 V DC enable command on pin 24c is required for card operation.
The condition of the card enable is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.3 - GAIN (Scale factor regulation)

The "GAIN" potentiometer enables regulation of the relation between the set reference value and maximum current supplied to the solenoid and therefore the hydraulic parameter controlled by the valve.

The maximum current of the card is limited to 1,0A (UEIK-11) - 1,2A (UEIK-12). See par. 6 for default values.

Rotate clockwise to increase current.

3.4 - OFFSET (Offset current regulation)

The "OFFSET" potentiometer enables regulation of the offset current of the valve. It is used to eliminate the insensitivity zone (dead zone) of the valve.
The regulation field is from 0 to 0,5A (UEIK-11) - from 0 to 0,65A (UEIK-12).

The offset current is activated when the reference signal exceeds the threshold of + 150 mV (or 4,25 mA).
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.5 - RAMP UP / RAMP DOWN (Ramp regulation)

"RAMP UP" and "RAMP DOWN" potentiometers, in a range from 0,03 to 7 sec., regulates the time required to reach the supplied current according to a step change of the reference signal up or down.

It is possible, in this way, to control the valve response time, adjusting it to the requirements of the hydraulic circuit and the machine cycle.

Ramps can be inhibited by transmitting a 22 to 30 V DC exclusion command to pin 16a. In this case, the ramp residual time is 10 ms.

Rotate clockwise to increase ramp time.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT (Solenoid current measurement point)

Enables voltage reading of current supplied to the solenoid.
Reading conversion: 1V DC = 1A (UEIK-11)
0,82V DC = 1A (UEIK-12).

4.2 - REFERENCE (Reference signal measurement point)

Enables reading in voltage of reference signal sent to the card. Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = 0 V 20 mA = - 10V.

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.

It is recommended to use cable sections of 1 to 2,5 mm^2, depending on their length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of par. 9.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic unit is supplied factory set.
The setting conditions are:

- "GAIN" regulation: +10V (or 20 mA) reference signal corresponding to a current supply of 0,7 A to the solenoid.
- "OFFSET" regulation: zero
- "RAMP UP" and "RAMP DOWN" regulation: minimum
- position SW1 on V
- position SW2 on S
- position SW3 on AA
- switching frequency (PWM) = 200Hz (UEIK-11)
  100Hz (UEIK-12).

7 - START-UP AND CONTROL SETTINGS

If required, it is possible to change the settings as follows:

a) OFFSET CURRENT ADJUSTMENT

- Set "GAIN" potentiometer to minimum.
- Enter reference signal at maximum value (+10V or 20 mA).
- Set the "OFFSET" potentiometer so that the valve is positioned at the start of the work zone.

b) SCALE FACTOR ADJUSTMENT

- Enter the reference signal at maximum value (+10V or 20 mA).
- Set "GAIN" potentiometer so that the controlled hydraulic parameter reaches the maximum required value.

NOTE: The maximum current value must be compatible with the maximum current prescribed by the technical table of the connected proportional valve.

c) RAMP REGULATION

- Regulate the "RAMP UP" and "RAMP DOWN" potentiometers to obtain gradual valve operation required with a reference signal variation.

8 - CARD CIRCUIT SETTINGS

The overall and mounting dimensions diagram in par. 10 shows three switch banks: SW 1 - SW 2 - SW 3 which enable the card to be set up as required.

NOTE: Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL (SW 1 bank comprising three individual switches)

- select V for voltage reference signal
- select I for current reference signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

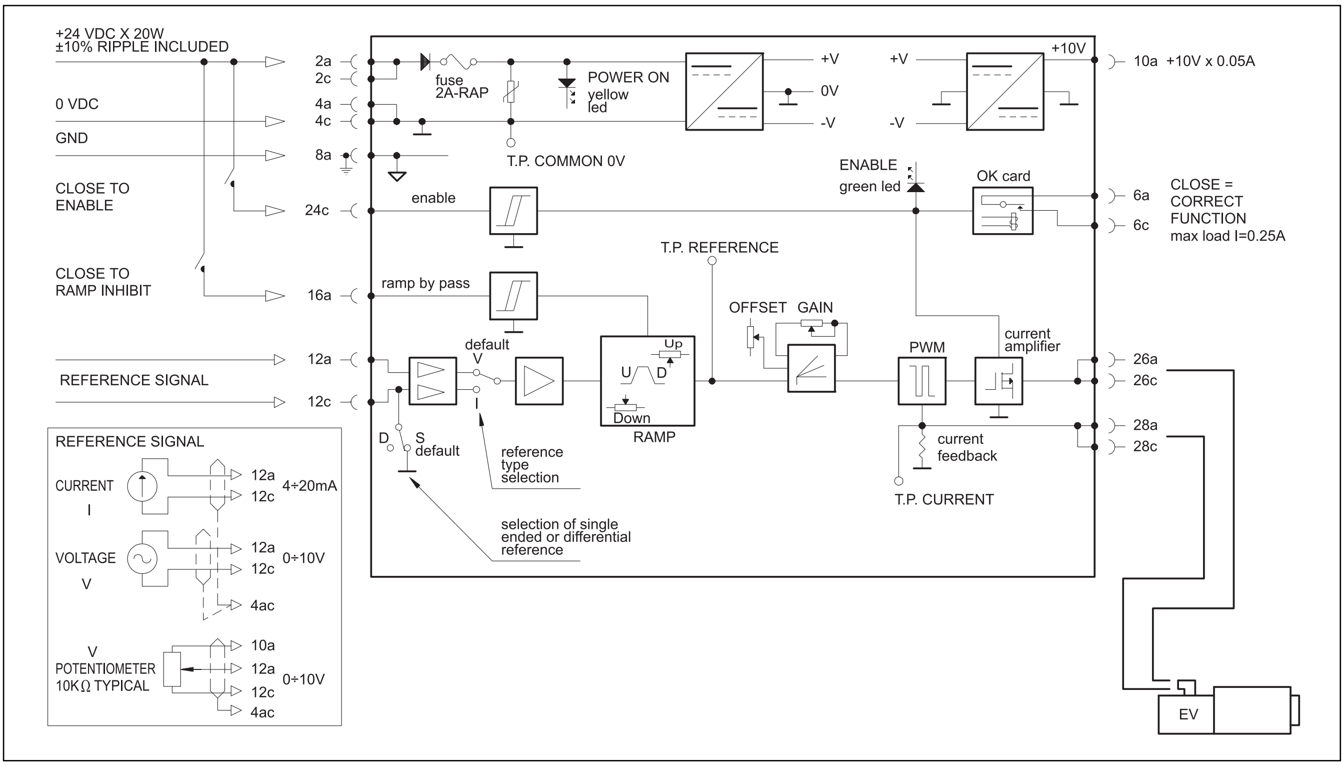
- select S for single ended reference signal. This condition is obligatory in the case where the reference signal is generated with an external potentiometer fed by the card itself.
- select D for differential reference signal. This condition is preferable in the case where the reference signal comes from a PLC or CNC analogic outlet.

NOTE: The SW 3 bank, comprising two individual switches, must always be set at AA as per standard default conditions.

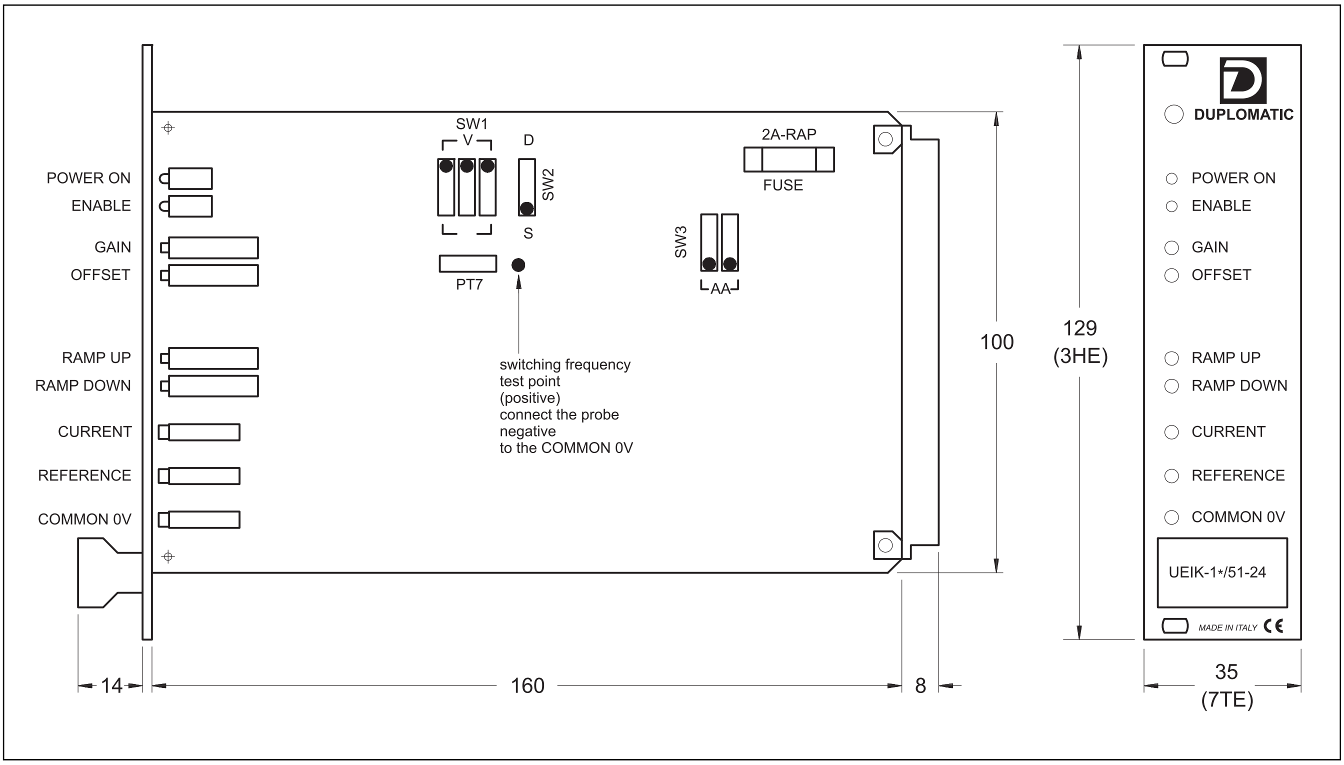
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 370 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysteresis value.
Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



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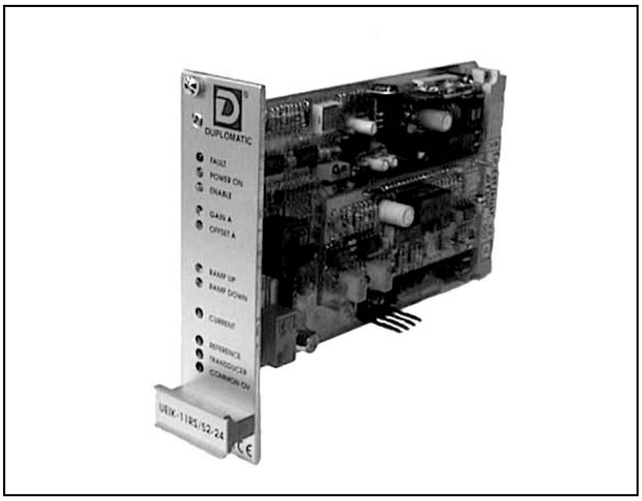
UEIK-11RS*

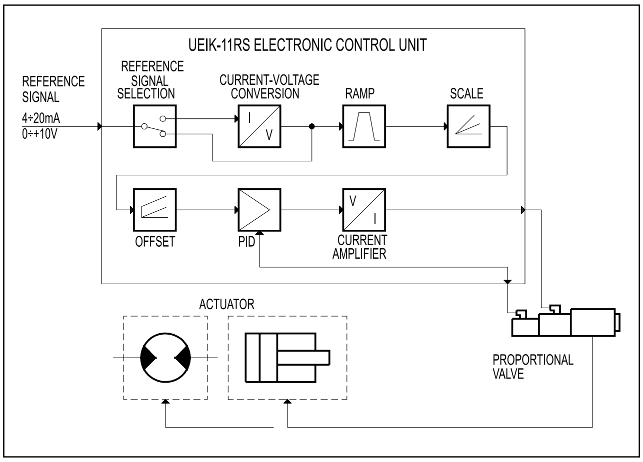
ELECTRONIC CONTROL UNIT FOR SINGLE SOLENOID PROPORTIONAL VALVE WITH POSITION FEEDBACK

SERIES 52



EUROCARD TYPE

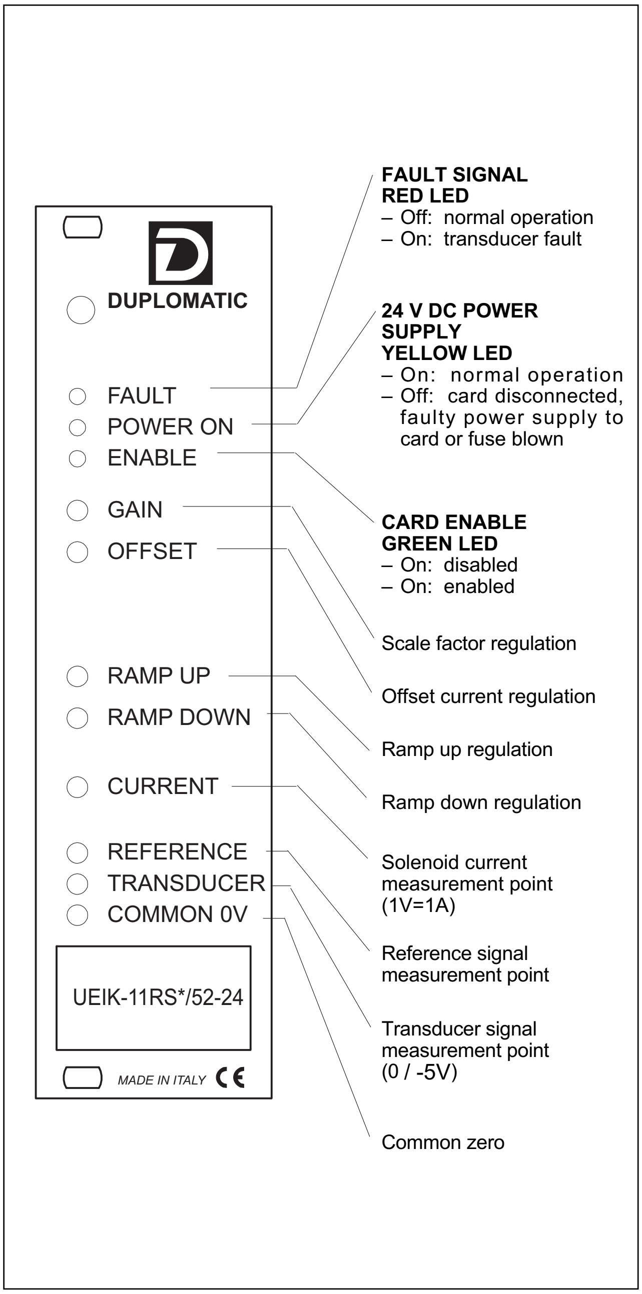
FUNCTIONAL BLOCK DIAGRAM



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	W	20 ÷ 45
Output current	see par. 3.4	
Power supply electrical protections	– overload – polarity inversion	
Reference signal: – Voltage – Current	 V mA	 0 ÷ +10 4 ÷ 20
Input reference signal impedance: – Voltage – Current	 KΩ Ω	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x35	
Connector edge	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,20

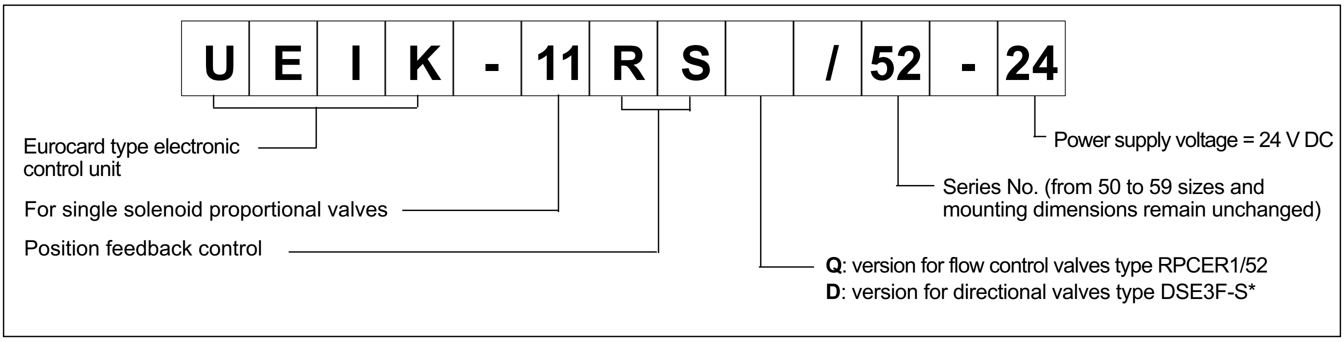
FRONT PANEL



UEIK-11RS*

SERIES 52

1 - IDENTIFICATION CODE



The UEIK-11RS*/52 card is an electronic control unit Eurocard type for closed loop control of single solenoid proportional valves with positional feedback control.

The card controls the position of the valve spool according to the reference input signal enabling linear regulation and reduced hysteresis.

The front panel is fitted with LEDs to indicate card functions and potentiometers to optimise control.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of 22-30 V DC and 20 ÷ 45 W (pin 2a/2c - 4a/4c).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.

A 3,15A fast-acting fuse is fitted for power circuit protection.

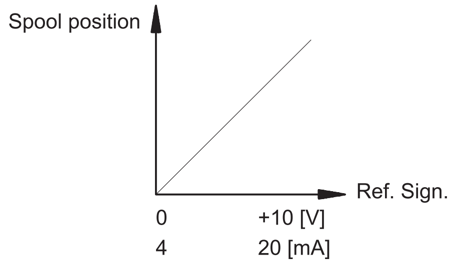
2.3 - Reference signal

The card accepts voltage reference signals (0 ÷ +10V) or current signals (4÷20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 Ω.

See par. 9 for electrical connections.

The diagram shows characteristics of valve spool position according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - FAULT

The red LED indicates operation of the position transducer:
OFF - normal operation
ON - transducer fault or electrical connection failure. In this case the current supply to the solenoid is shut off and the valve is set at the rest position, the ENABLE LED switches off and the OK card relay contact opens (6a - 6c pin)

3.2 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.3 - ENABLE

From 22 to 30 V DC (pin 24c) enable command is required for card operation.
The condition of the card enable is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.
The green LED indicates:
ON - card enabled
OFF - card disabled

3.4 - GAIN (Scale factor regulation)

The “GAIN” potentiometer enables regulation of the relation between the set reference value and maximum current supplied to the solenoid and therefore the hydraulic parameter controlled by the valve.
The maximum current of the card is limited to 1A for RSQ version and to 1,8A for RSD version. See par. 6 for default values.
Rotate clockwise to increase current.

3.5 - OFFSET (Offset current regulation)

The “OFFSET” potentiometer enables regulation of the offset current of the valve. It is used to eliminate the insensitivity zone (dead zone) of the valve.
The regulation field is from 0 to 0,5A for RSQ version and from 0 to 0,9A for RSD version.

The offset current is activated when the reference signal exceeds the threshold of + 150 mV (or 4,25 mA).
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.6 - RAMP UP / RAMP DOWN (Ramp regulation)

"RAMP UP" and "RAMP DOWN" potentiometers, in a range from 0,03 to 7 sec., regulates the time required to achieve the supplied current according to a step change of the reference signal up or down.
It is possible, in this way, to control the valve response time, adjusting it to the requirements of the hydraulic circuit and the machine cycle.
Ramps can be inhibited by transmitting a 22 to 30 V DC exclusion command to pin 16a. In this case, the ramp residual time is 10 ms.
Rotate clockwise to increase ramp time.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT (Solenoid current measurement point)

Enables voltage reading of current supplied to the solenoid.
Reading conversion: 1V DC = 1A.

4.2 - REFERENCE (Reference signal measurement point)

Enables reading of reference signal sent to the card.
Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = 0V 20 mA = -10V.

4.3 - TRANSDUCER (Transducer signal measurement point)

Enables voltage reading of the valve spool position (0 / -5V).

5 - INSTALLATION

The card is designed for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.
It is recommended to use cable sections of 1 to 2,5 mm^2, depending on their length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of par. 9.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set. Standard settings are:

- "GAIN" regulation: +10V (or 20 mA) reference signal corresponding to maximum valve opening (transducer = -5V). In open loop "GAIN" regulation corresponds to a current supply of 1 A for RSQ version and 1,8 A for RSD version, to the solenoid with maximum reference signal.
- "OFFSET" regulation: zero
- "RAMP UP" and "RAMP DOWN" regulation: minimum
- position SW1 on V
- position SW2 on S
- position SW3 on AC
- position S1 on N
- switching frequency (PWM) = 230 Hz

7 - START-UP AND CONTROL SETTINGS

If required, settings can be adjusted as follows:

a) OFFSET CURRENT REGULATION

- Set "GAIN" potentiometer to minimum.
- Enter reference signal at maximum value (+10V or 20 mA).
- Set the "OFFSET" potentiometer so that the valve is positioned at the start of the work zone.

b) SCALE FACTOR REGULATION

- Enter the reference signal at maximum value (+10V or 20 mA).
- Set "GAIN" potentiometer so that the controlled hydraulic parameter reaches the maximum required value.

c) RAMP REGULATION

- Regulate the "RAMP UP" and "RAMP DOWN" potentiometers to obtain the gradual valve operation required with a reference signal variation.

8 - CARD CIRCUIT SETTINGS

The overall and mounting dimension diagram in par. 10 shows four switch banks: SW 1 - SW 2 - SW 3 and S1 which enable the card to be set up as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL
(SW 1 bank comprising three individual switches)

- select V for voltage signal
- select I for current signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL
(SW 2 bank comprising one individual switch)

- select S for single ended reference signal. This condition is obligatory in the case where the reference signal is generated with an external potentiometer fed by the card itself.
- select D for differential reference signal. This condition is preferable in the case where the reference signal comes from a PLC or CNC analogic outlet.

OPEN OR CLOSED LOOP SELECTION
(SW 3 bank comprising two individual switches)

- select AC for closed loop
- select AA for open loop.

TRANSDUCER POLARITY SELECTION
(SW 1 bank comprising one individual switch)

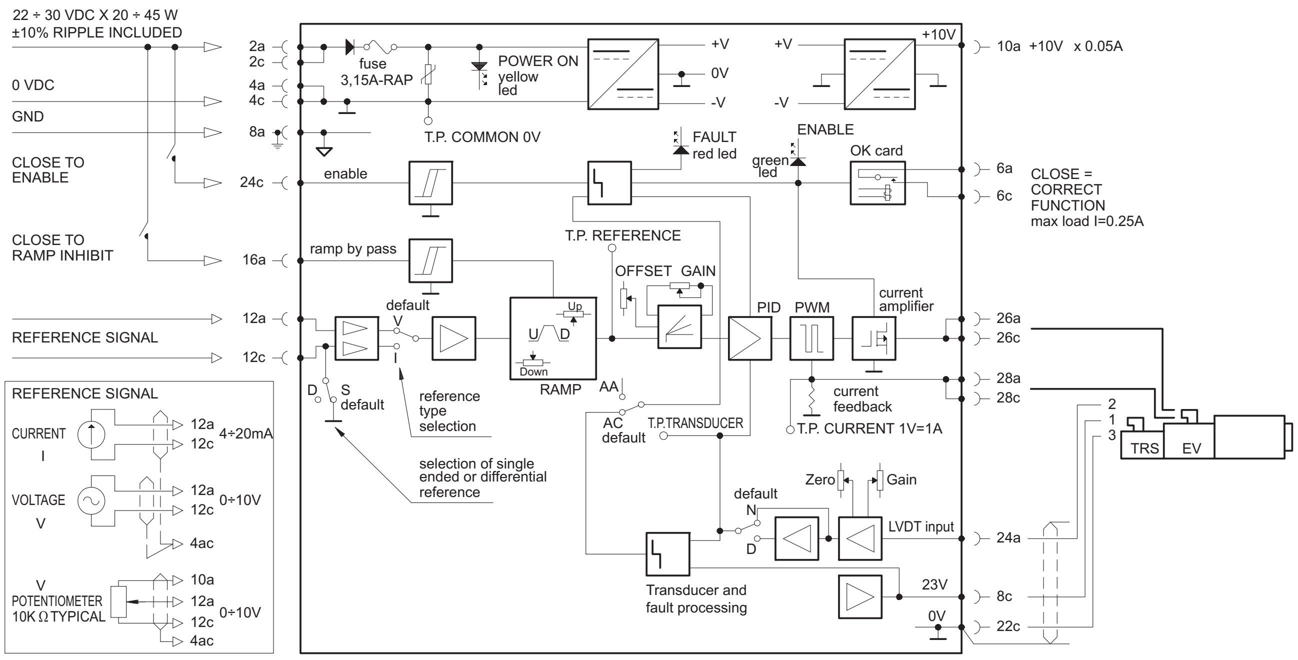
- select N for direct operated valve types DSE3F - RPCER1/52
- select D for piloted valves.

NB. In the event of transducer malfunction, AA can be selected to proceed with open loop operation. In this case, the ENABLE LED illuminates and the OK relay card contacts close and the FAULT LED remains lit to indicate alarm status.

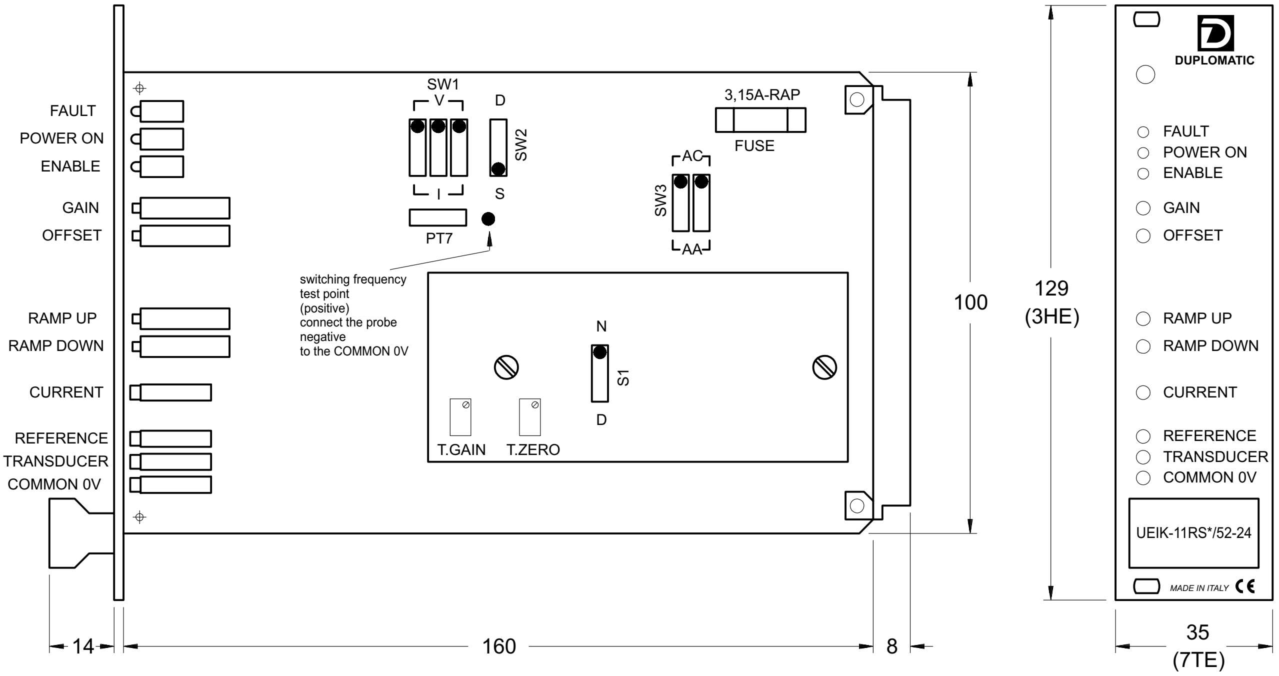
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 1600 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysteresis value.
Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



DUPLOMATIC OLEODINAMICA

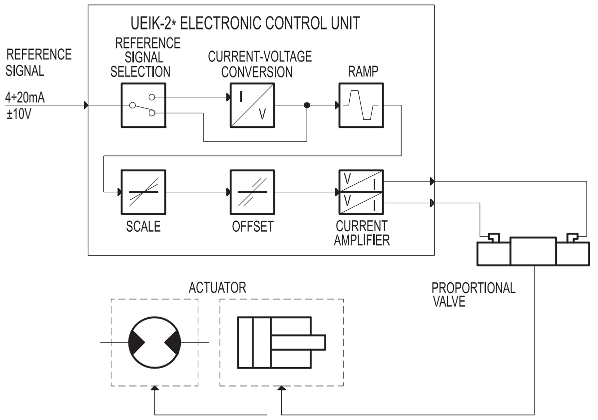
UEIK-2*

ELECTRONIC CONTROL UNIT FOR OPEN LOOP DOUBLE SOLENOID PROPORTIONAL VALVE

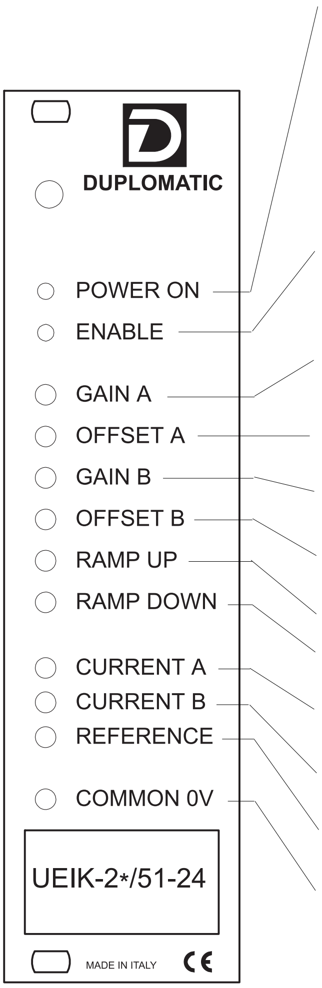
SERIES 51

EUROCARD TYPE

FUNCTIONAL BLOCK DIAGRAM



FRONT PANEL



24 V DC POWER SUPPLY YELLOW LED
- On: normal operation
- Off: card disconnected, faulty power supply to card or fuse blown

CARD ENABLE GREEN LED
- Off: disabled
- On: enabled

Solenoid A scale factor regulation

Solenoid A offset current regulation

Solenoid B scale factor regulation

Solenoid B offset current regulation

Ramp up regulation

Ramp down regulation

Solenoid A current measurement point

Solenoid B current measurement point

Reference signal measurement point

Common zero

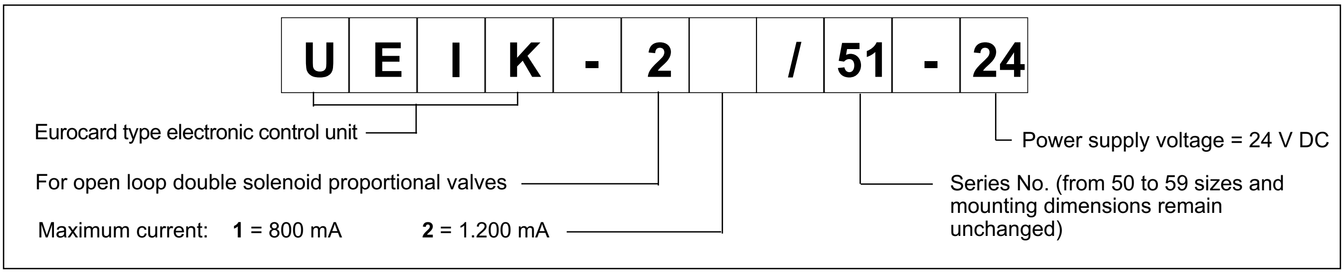
TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power		See par. 2.1
Output current		See par. 3.3
Power supply electrical protections		– overload – polarity inversion
Reference signal: – Voltage – Current	 V mA	 ± 10 4 ÷ 20
Input reference signal impedance: – Voltage – Current	 kΩ Ω	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size		Eurocard 100x160x35
Connector interface		DIN 41612-D 32 Male
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,27

UEIK-2*

SERIES 51

1 - IDENTIFICATION CODE



The UEIK-2* card is an electronic control unit Eurocard type for open loop of double solenoid proportional valves.

The unit supplies a variable current in proportion to the input reference signal and independently of temperature variations or load impedence.

The PWM stage on the solenoid power supply makes it possible to reduce valve hysteresis thus optimising control precision. The front panel is fitted with LEDs to indicate card functions and potentiometers to optimize control.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of between 22 and 30 V DC (pin 2a/2c - 4a/4c) and 20 W (UEIK-21) - 29 W (UEIK-22).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.

A 2A fast-acting fuse is fitted for power circuit protection.

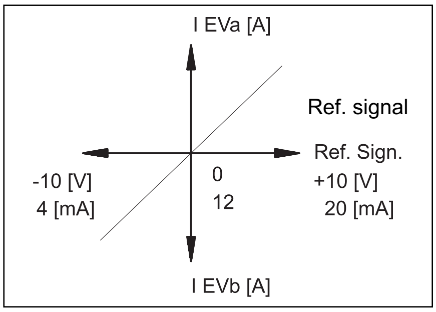
2.3 - Reference signal

The card accepts voltage reference signals (±10V) or current reference signals (4 ÷ 20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200Ω.

See paraagraph 9 for electrical connections.

The diagram shows characteristics of current supplied according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.2 - ENABLE

A 22 to 30 V DC on pin 24c enable command is required for card operation.
The condition of the enable card is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.3 - GAIN A / GAIN B
(Scale factor regulation of solenoids A and B)

“GAIN A” and “GAIN B” potentiometers enable regulation of the ratio between the set reference value and current supplied to solenoids A and B respectively. This enables independent regulation of the controlled parameter in the two valve hydraulic configurations.

The maximum current of the card is limited to 1,0A (UEIK-21) - 1,2A (UEIK-22). See par. 6 for default values.

Rotate clockwise to increase current.

3.4 - OFFSET A / OFFSET B
(Polarization current regulation of solenoids A and B)

“OFFSET A” and “OFFSET B” potentiometers enable regulation of the offset current of the valve solenoids A and B respectively.
They are used to eliminate the valve insensitivity zone (dead zone) in the two valve hydraulic figures.

The regulation range is from 0 to 0,5A (UEIK-21) - from 0 to 0,65A (UEIK-22).

The offset current is activated when the reference signal exceeds the threshold of ±150 mV.
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.5 - RAMP UP / RAMP DOWN (Ramp regulation)

“RAMP UP” and “RAMP DOWN” potentiometers, in a range from 0,03 to 7 sec., regulate the time taken to achieve the current for a step change of the reference signal up or down. They are independently adjusted and serve both solenoids.

This makes it possible to smooth valve response and adapt it to the requirements of the hydraulic system and the machine cycle.

Rotate clockwise to increase ramp time.

Ramps can be inhibited by transmitting a 22 to 30 V DC command to pin 16a. In this case, the ramp residual time is 10 ms.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT A / CURRENT B
(Current measurement points of solenoids A and B)

Measurement points for voltage readings of current supplied to solenoids A and B. Reading conversion is 1V DC = 1A (UEIK-21) and 0,82V DC = 1A (UEIK-22).

4.2 - REFERENCE (Reference signal measurement point)

Enables reading in voltage of reference signal sent to the card.

Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = +10V   20 mA = -10V.

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.

It is recommended to use cable sections of 1 to 2,5 mm^2, in function with their length, for power supply and solenoid connections. For other connections, it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1
To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of para.6.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set.

Standard settings are:

- "GAIN A" regulation: +10V (or 20 mA) reference signal corresponding to a current supply of 0,82 A to solenoid A.
- "GAIN B" regulation: -10V (or 4 mA) reference signal corresponding to a current supply of 0,82 A to solenoid B.
- "OFFSET A" or "OFFSET B" regulation: zero
- "RAMP UP" and "RAMP DOWN" regulation: minimum
- position SW1 on V
- position SW2 on S
- position SW3 on AA
- switching frequency (PWM) = 200Hz (UEIK-21)
  100Hz (UEIK-22)

7 - START-UP AND FRONTAL SETTINGS

If required, settings can be adjusted as follows:

a) OFFSET CURRENT REGULATION
(Note: the same procedure applies to channels A and B on the card)

- Set "GAIN A" or "GAIN B" potentiometer to minimum.
- Enter reference signal at maximum value:
  +10V (or 20 mA) for solenoid A
  - 10V (or 4 mA) for solenoid B.
- Regulate "OFFSET A" or "OFFSET B" potentiometer so that the valve is positioned at the start of the relative hydraulic configuration work zone.

b) SCALE FACTOR REGULATION
(**NOTE**: the same procedure applies to channels A and B on the card)

- Enter the reference signal at maximum value
  +10V (or 20 mA) for solenoid A
  - 10V (or 4 mA) for solenoid B.
- Adjust "GAIN A" and "GAIN B" potentiometers until the size controlled in the relative hydraulic configuration reaches the maximum required value.

NOTE: The maximum current value must be compatible with the maximum current prescribed by the technical table of the connected proportional valve.

c) RAMP REGULATION
- Regulate the "RAMP UP" and "RAMP DOWN" potentiometers to obtain the required valve smoothness of movement with a reference variation.

8 - CARD CIRCUIT SETTINGS

The overall dimension diagram in par. 10 shows three switch banks: SW 1 - SW 2 - SW 3 which enable card set up as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL (SW 1 bank comprising three individual switches)

- select V for voltage reference signal
- select I for current reference signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

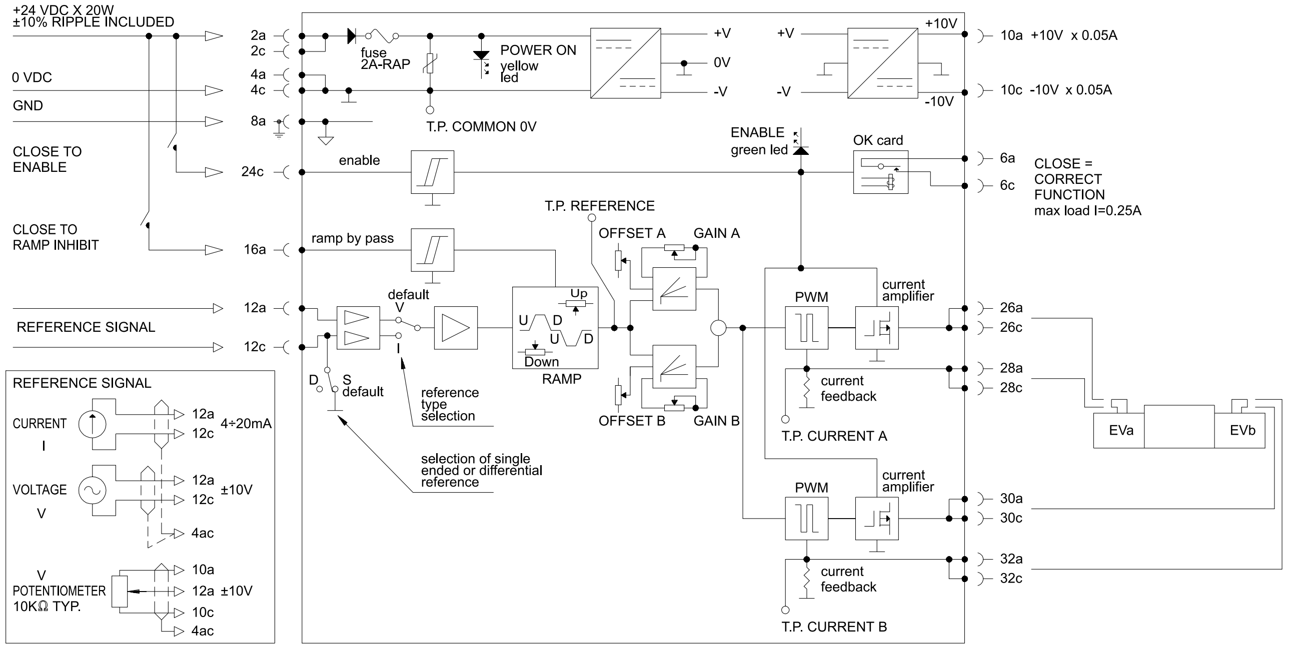
- select S for single ended reference signal. This condition is obligatory in the case that the reference signal is generated with an external potentiometer fed by the card itself.
- select D for differential reference signal. This signal is preferable in the case that the reference signal comes from a PLC or CNC analogic outlet.

NOTE: The SW 3 bank, comprising two individual switches, must always be set at AA as per standard supply conditions.

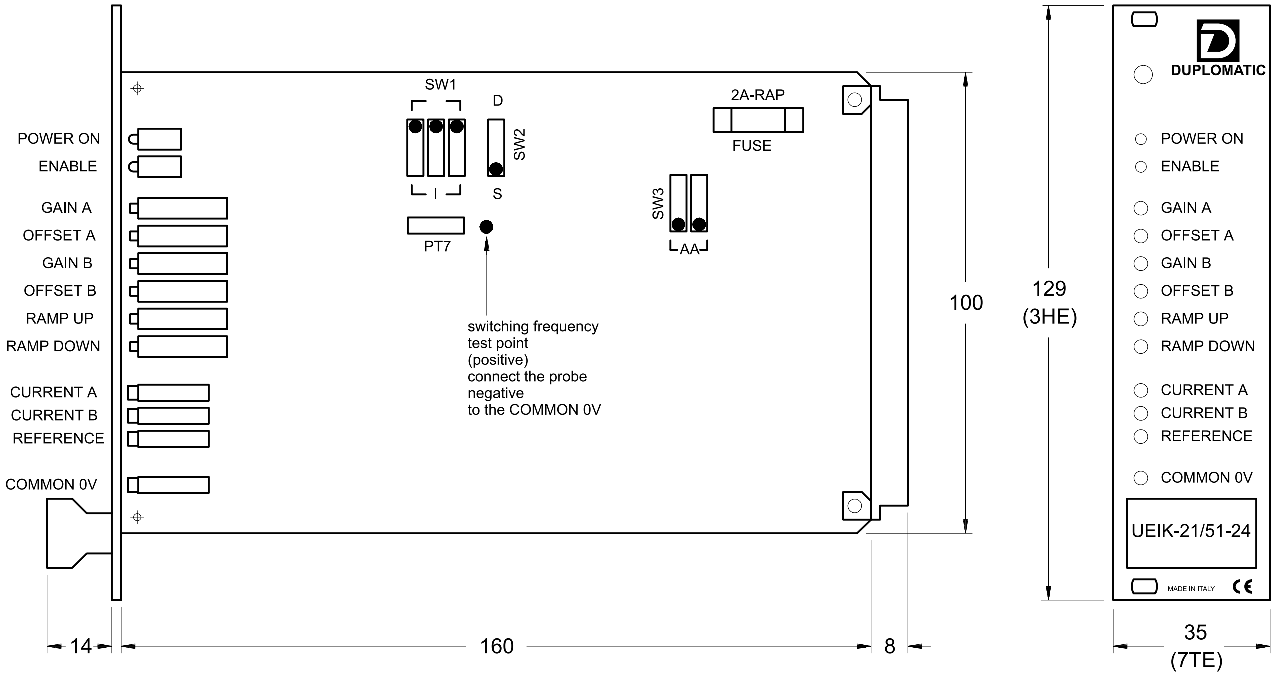
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 370 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysterisis value.
Clockwise rotation to increase thefrequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



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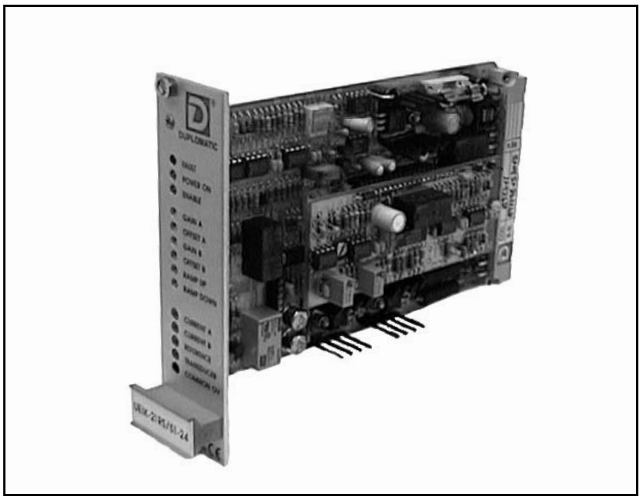


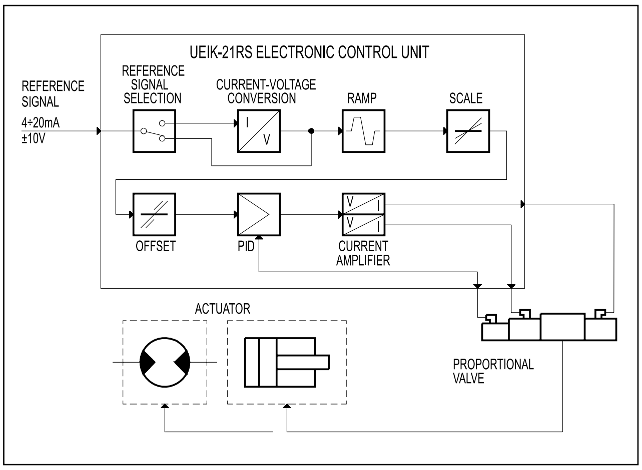
UEIK-21RSD

ELECTRONIC CONTROL UNIT FOR DOUBLE SOLENOID PROPORTIONAL VALVES WITH POSITION FEEDBACK

SERIES 52

EUROCARD TYPE

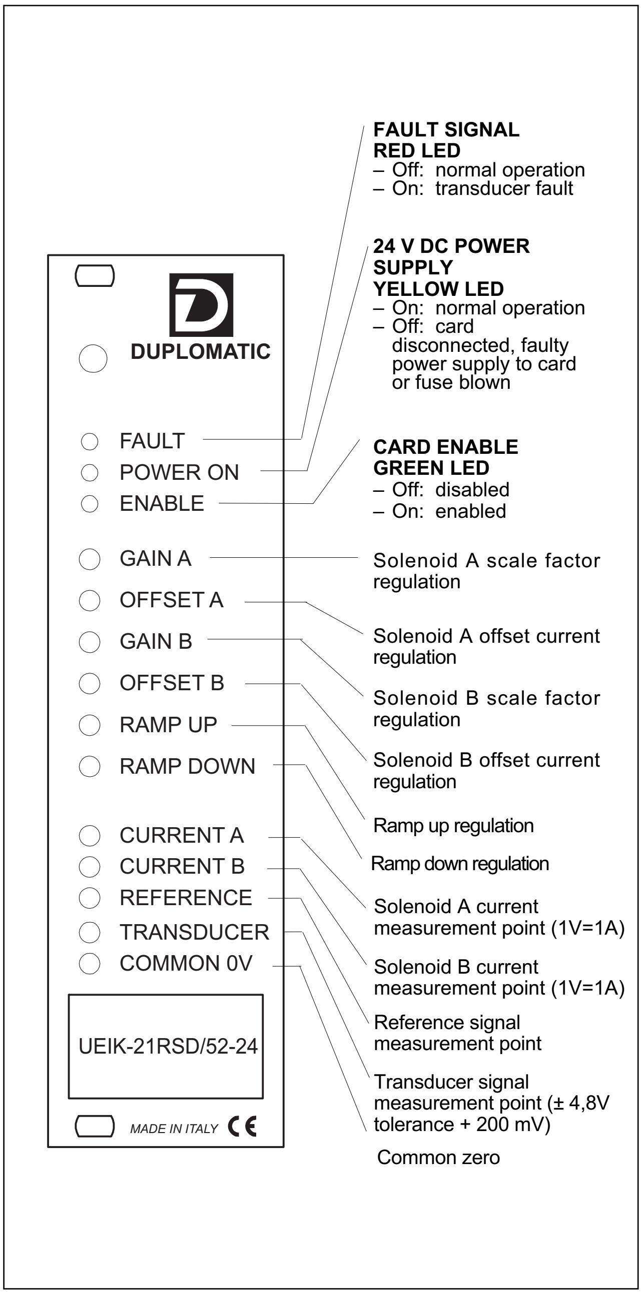
FUNCTIONAL BLOCK DIAGRAM



TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	W	45
Output current	see par. 3.4	
Power supply electrical protections	– overload – polarity inversion	
Reference signal: – Voltage – Current	 V mA	 ±10 4 ÷ 20
Input reference signal impedance: – Voltage – Current	 kΩ Ω	 10 250
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x35	
Connector interface	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,27

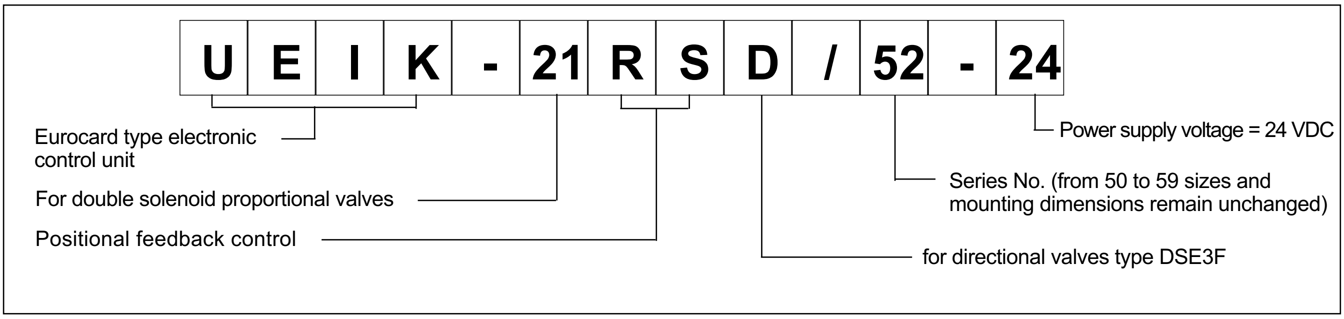
FRONT PANEL



UEIK-21RSD

SERIES 52

1 - IDENTIFICATION CODE



The UEIK-21RS card is an electronic control unit Eurocard type for closed loop control of double solenoid proportional valves with positional feedback control.

The unit controls the position of the valve spool according to the reference input signal ensuring linear regulation with minimum hysteresis.

The front panel is fitted with LEDs to indicate card functions and potentiometers to optimise performance.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of 22 - 30 V DC and 45 W (pin 2a/2c - 4a/4c).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.
A 3,15A fast-acting fuse is fitted for power circuit protection.

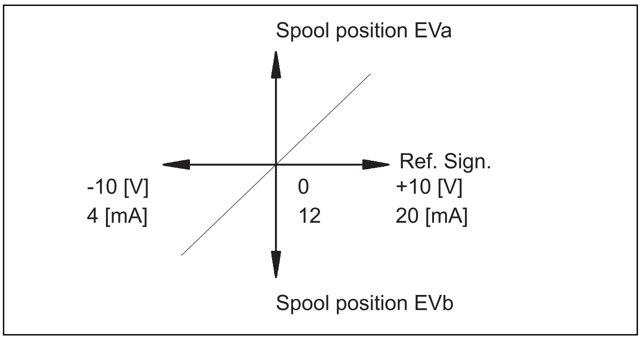
2.3 - Reference signal

The card accepts voltage reference signals (±10V) or current reference signals (4-20 mA).

N.B: If the signal is transmitted by potentiometer, please verify that this has a load of at least 200 Ω.

See par. 9 for electrical connections.

The diagram shows valve spool position characteristics according to the reference signal.



3 - SIGNALS AND ADJUSTMENT

3.1 - FAULT (Fault signal)

The red LED indicates operation of the positional transducer:
OFF - normal operation
ON - transducer fault or power supply failure. In the event of a FAULT, current to the solenoid is shut off and the valve is set at the hydraulic rest configuration, the ENABLE LED switches off and the OK card relay contact opens (6a and 6c pins).

3.2 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.3 - ENABLE

A 22 to 30 V DC on pin 24c enable command is required for card operation.
The condition of the enable card is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.4 - GAIN A / GAIN B
(Scale factor regulation of solenoids A and B)

"GAIN A" and "GAIN B" potentiometers enable regulation of the ratio between the set reference value and the valve spool position in the two hydraulic configurations controlled by solenoids A and B.
The maximum current of the card is limited to 1,8A.
See par. 6 for default values.
Rotate clockwise to increase current.

3.5 - OFFSET A / OFFSET B
(Offset current regulation of solenoids A and B)

"OFFSET A" and "OFFSET B" potentiometers enable regulation of the offset current of the solenoids A and B respectively with reference signal set at zero. They are used to eliminate the valve insensitivity zone (dead zone).

The regulation range is from 0 to 0,9A.

The offset current is activated when the reference signal exceeds the threshold of ±150 mV.
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.6 - RAMP UP / RAMP DOWN (Ramp regulation)

"RAMP UP" and "RAMP DOWN" potentiometers, in a range from 0,03 to 7 sec., regulate the time taken to achieve the current for a step change of the reference signal up or down. They are independently adjusted and serve both solenoids.
This makes it possible to smooth valve response and adapt it to the requirements of the hydraulic system and the machine cycle.

Rotate clockwise to increase ramp time.

Ramps can be inhibited by transmitting a 22 to 30 V DC command to pin 16a. In this case, the ramp residual time is 10 ms.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT A / CURRENT B
(Current measurement points of solenoids A and B)

Measurement points for voltage readings of current supplied to solenoids A and B. Reading conversion is 1V DC = 1A.

4.2 - REFERENCE (Reference signal measurement point)

Enables reading in voltage of reference signal sent to the card.
Reading is direct, but of opposite sign, with voltage reference while current conversion is: 4 mA = +10V 20 mA = -10V.

4.3 - TRANSDUCER (Transducer signal measurement point)

Enables voltage reading of the valve spool position (± 4,8V - tolerance +200 mV).

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.
It is recommended to use cable sections of 1 to 2,5 mm^2, in function with their length, for power supply and solenoid connections. For other connections, it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the connection scheme of par. 9.
As a general rule, the valve and the electronic unit connection wires must be keeped as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set. Standard settings are:

- "GAIN A" regulation: +10V (or 20 mA) reference signal corresponding to maximum valve opening in the hydraulic configuration controlled by solenoid A (transducer = -5V) .
- "GAIN B" regulation: -10V (or 4 mA) reference signal corresponding to maximum valve opening in the hydraulic configuration controlled by solenoid B (transducer = +5V).
  In open loop "GAIN A" and "GAIN B" regulations correspond to a current supply of 1,8 A to the solenoids A and B with maximum reference signal.
- "OFFSET A" or "OFFSET B" regulation: zero
- "RAMP UP" and "RAMP DOWN" regulation: minimum
- position SW1 on V
- position SW2 on S
- position SW3 on AC
- position S1 on N
- switching frequency (PWM) = 300 Hz

7 - START-UP AND CONTROL SETTINGS

a) OFFSET CURRENT REGULATION
(Note: the same procedure applies to channels A and B on the card)

- Set "GAIN A" and "GAIN B" potentiometers to minimum.
- Enter reference signal at maximum value:
  +10V (or 20 mA) for solenoid A
  - 10V (or 4 mA) for solenoid B.
- Regulate "OFFSET A" and "OFFSET B" potentiometers so that the valve is positioned at the start of the corresponding hydraulic configuration work zone.

b) SCALE FACTOR REGULATION
(Note: the same procedure applies to channels A and B on the card)

- Enter the reference signal at maximum value
  +10V (or 20 mA) for solenoid A
  - 10V (or 4 mA) for solenoid B.
- Set "GAIN A" and "GAIN B" potentiometers so that the controlled parameter in the relative hydraulic configuration reaches the maximum required value.

c) RAMP REGULATION

- Regulate the "RAMP UP" and "RAMP DOWN" potentiometers to obtain the required valve smoothness od movement with a reference position.

8 - CARD CIRCUIT SETTINGS

The overall dimension diagram in par. 10 shows four switch banks: SW 1 - SW 2 - SW 3 and S1 which enable card set up as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same direction.

SELECTION OF VOLTAGE OR CURRENT REFERENCE SIGNAL
(SW 1 bank comprising three individual switches)

- select V for voltage signal
- select I for current signal.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

- select S for single ended reference signal. This condition is obligatory in the case that the reference signal is generated with an external potentiometer fed by the card itself.
- select D for differential reference signal. This signal is preferable in the case that the reference signal comes from a PLC or CNC analogic outlet.

OPEN OR CLOSED LOOP SELECTION
(SW 3 bank comprising two individual switches)

- select AC for closed loop
- select AA for open loop.

TRANSDUCER POLARITY SELECTION
(SW 1 bank comprising one individual switch)

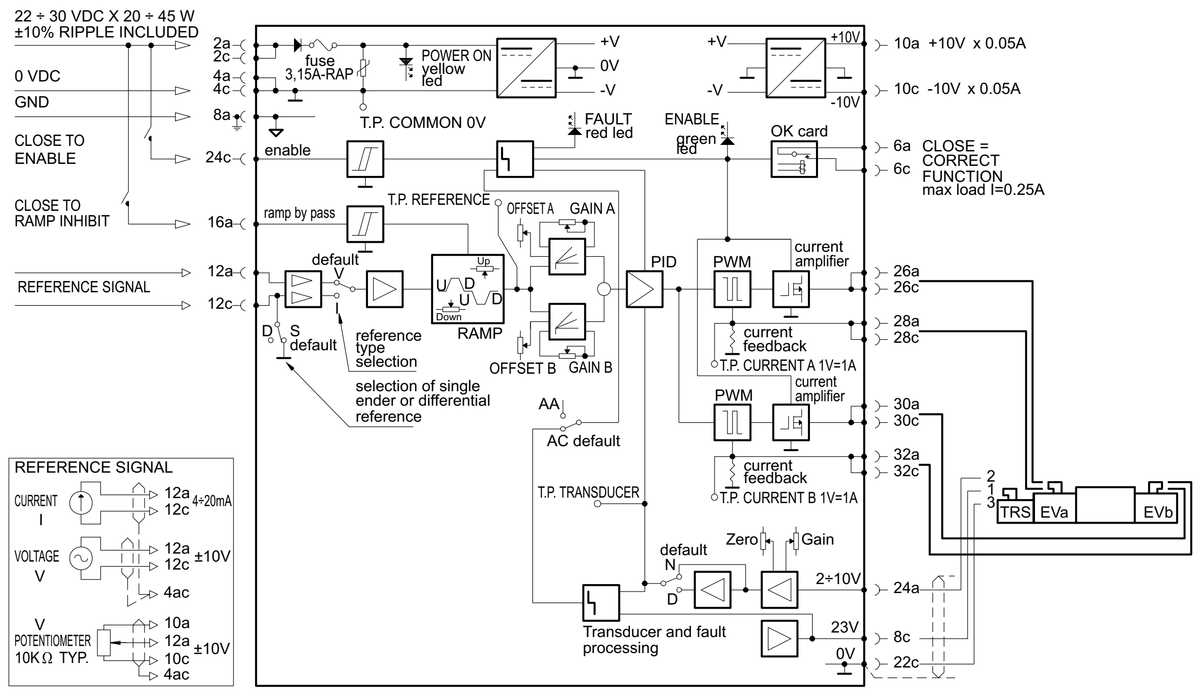
- select N for direct operated valve types DSE3F
- select D for piloted valves.

NB. In the event of transducer malfunction, AA can be selected to proceed with open loop operation. In this case, the ENABLE LED illuminates and the OK relay card contacts close and the FAULT LED remains lit to indicate alarm status.

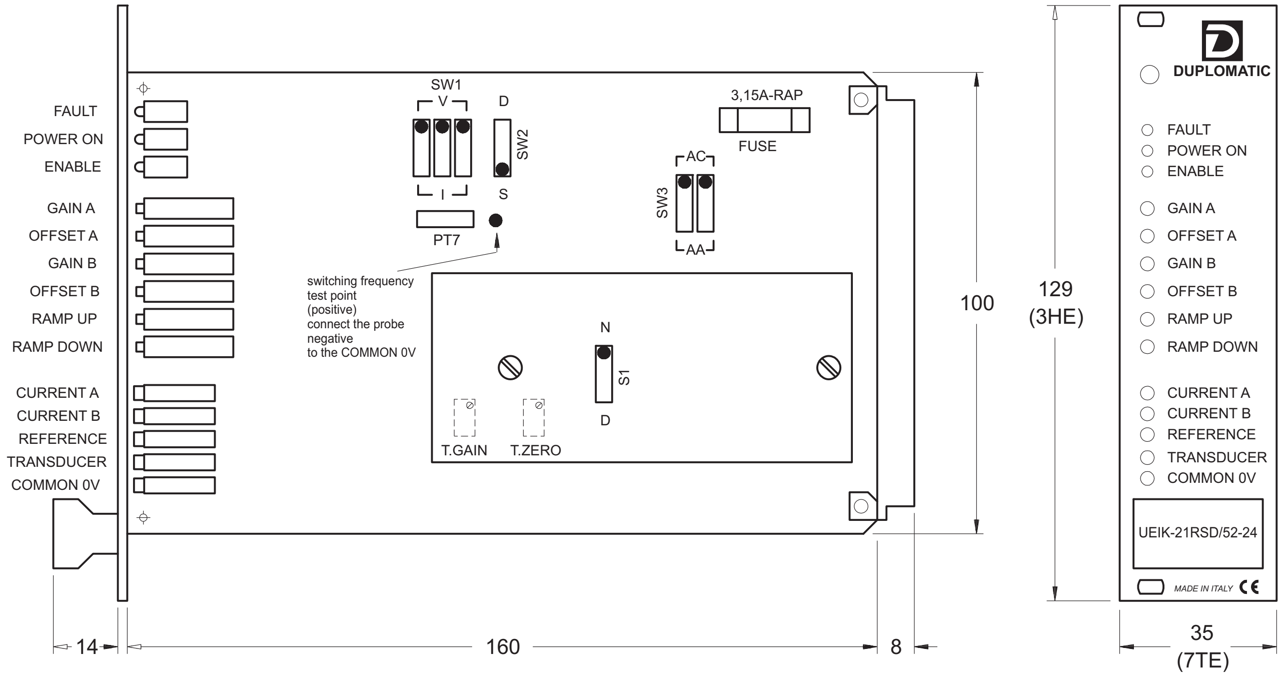
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10). The setting range is from 80 to 1600 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysterisis value. Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAMS



10 - OVERALL AND MOUNTING DIMENSIONS



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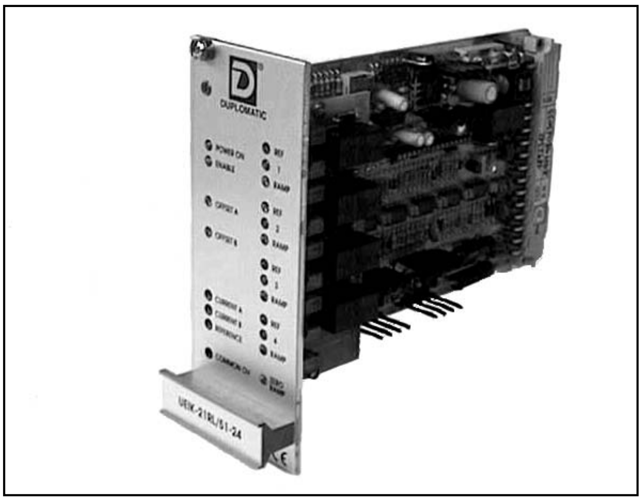


UEIK-2*RL

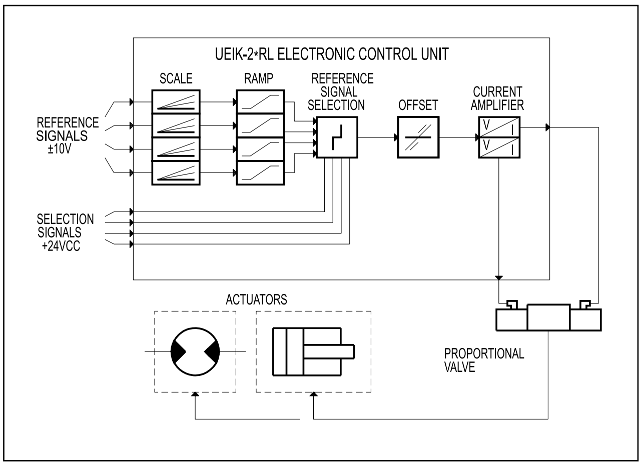
ELECTRONIC CONTROL UNIT FOR OPEN LOOP DOUBLE SOLENOID PROPORTIONAL VALVE

SERIES 51

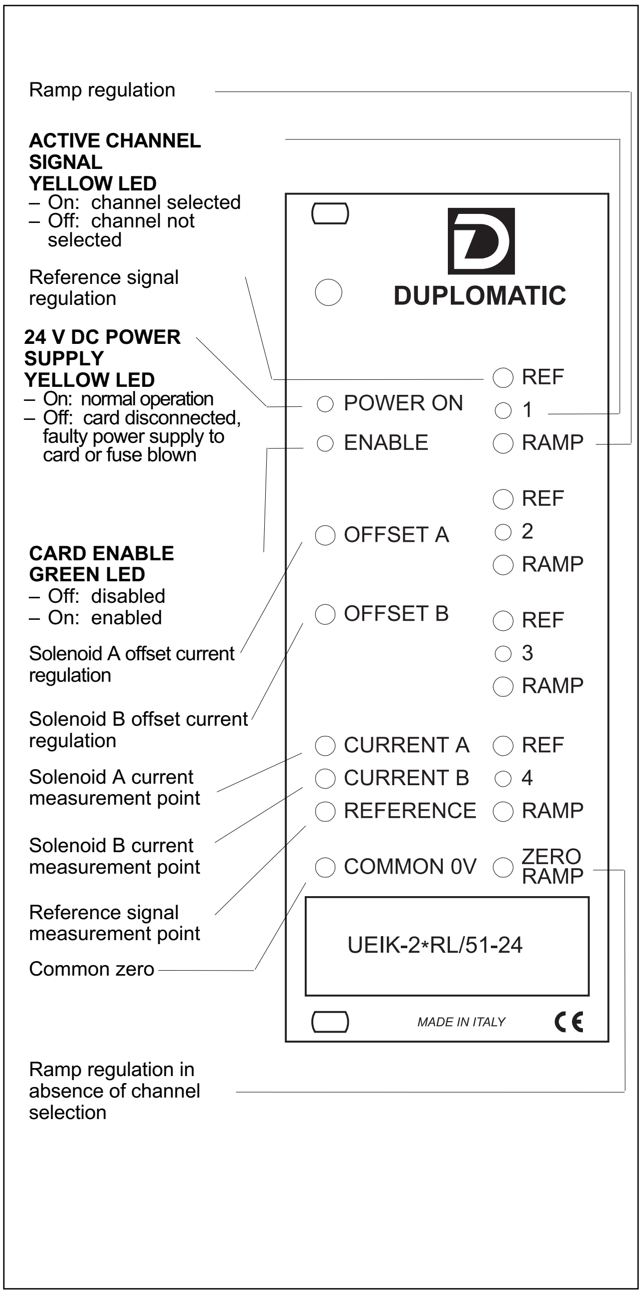
WITH REFERENCE SIGNAL AND RAMP SELECTION

EUROCARD TYPE

FUNCTIONAL BLOCK DIAGRAM



FRONT PANEL



Ramp regulation

ACTIVE CHANNEL SIGNAL YELLOW LED
- On: channel selected
- Off: channel not selected

Reference signal regulation

24 V DC POWER SUPPLY YELLOW LED
- On: normal operation
- Off: card disconnected, faulty power supply to card or fuse blown

CARD ENABLE GREEN LED
- Off: disabled
- On: enabled

Solenoid A offset current regulation

Solenoid B offset current regulation

Solenoid A current measurement point

Solenoid B current measurement point

Reference signal measurement point

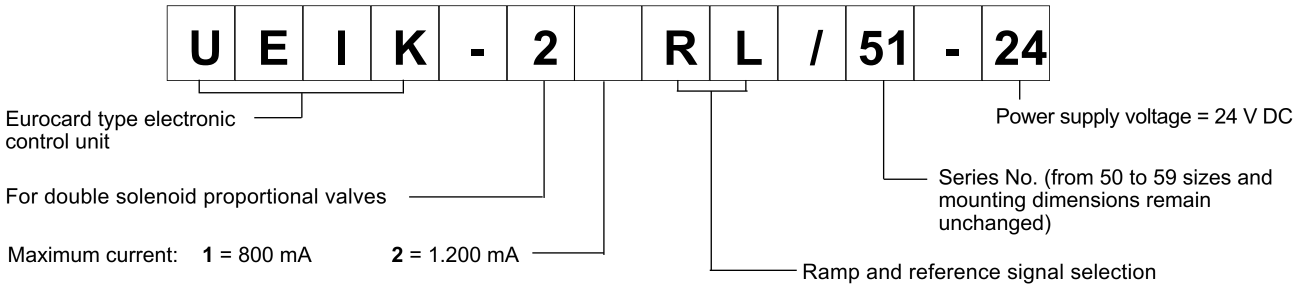
Common zero

Ramp regulation in absence of channel selection

TECHNICAL CHARACTERISTICS

Power supply	V DC	22 ÷ 30 Ripple included
Required power	see par. 2.1	
Output current	see par. 3.4	
Power supply electrical protections	– overload – polarity inversion	
No. of selectable channels	4	
Reference signal	V	± 10 adjustable for each channel
Electromagnetic compatibility (EMC) (see par. 5 - **NOTE 1**)		in compliance with 2004/108/CE
Card size	Eurocard 100x160x50	
Connector interface	DIN 41612-D 32 Male	
Operating temperature range	°C	0 ÷ 50
Mass	kg	0,3

1 - IDENTIFICATION CODE



The UEIK-2*RL card is an electronic control unit in Eurocard format for open loop control of double solenoid proportional valves, with selection in sequence of four different reference and ramp time regulation signals.

The unit is suitable for management of “fast-slow” work cycles.

The front panel is fitted with LEDs to indicate card functions and potentiometers to optimise performance.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Electric power supply

The card requires a power supply of between 22 and 30 V DC (pin 2a/2c - 4a/4c) and 20 W (UEIK21-RL) - 29 W (UEIK-22-RL).

Power supply voltage must be rectified and filtered, with maximum admissible ripple within the above voltage range.

2.2 - Electrical protection

The card is protected against overvoltage and polarity inversion.

A 2A fast-acting fuse is fitted for power circuit protection.

3 - SIGNALS AND ADJUSTMENT

3.1 - POWER ON

The yellow LED indicates card power supply:
ON - normal power supply
OFF - no power supply, faulty power supply or blown fuse

3.2 - ENABLE

A 22 to 30 V DC on pin 24c enable command is required for card operation.
The condition of the enable card is shown by both a visible LED on the front panel and as a contact available for the user on pins 6a and 6c.

The green LED indicates:
ON - card enabled
OFF - card disabled or failed

3.3 - OFFSET A / OFFSET B
(Polarization current regulation of solenoids A and B)

“OFFSET A” and “OFFSET B” potentiometers enable regulation of thepolarization current of the solenoids A and B respectively. They are used to eliminate the valve insensitivity zone (dead zone) in the two valve hydraulic configurations.

The regulation field is up between 0 and 0,5 A (UEIK-21-RL) and between 0 and 0,65 A (UEIK-22-RL).
The default value is zero.

The offset current is activated when the reference signal exceeds the threshold of ± 150 mV.
The offset is not active and only the polarization current equal to 25 mA is present beneath this threshold.

NOTE: The variation of the set value of the offset current causes a corresponding variation of the scale factor value.

Rotate clockwise to increase current.

3.4 - REF (Reference signal regulation)

The card enables settings by means of multi-turn potentiometers on the front panel (indicated by “REF”) of four different reference signal values (one per channel).

Solenoid A is controlled with positive reference of 0÷+10V, and solenoid B is controlled with negative reference signal of 0÷-10V.

Maximum output current, corresponding to the maximum potentiometers regulation, is limited to 1 A. See par. 6 for default settings.

Rotate clockwise to increase the reference signal by absolute values. See par. 9 for electrical connections.

One of the four channels can be selected automatically by transmitting a +24 V DC command to pin 18c (channel 1) - 18a (channel 2) - 20c (channel 3) - 20a (channel 4).

To obtain correct signal switching and continuous regulation with the selection of channels from 1 to 4, select the new channel before deactivating the previous one. A yellow LED illuminates on the front panel in correspondence to the channel selected.

NB. The system manages reference signals and ramp values of the channel with the highest selected number. To enable channel selection in reverse order (4 to 1) all previous channels must be deactivated.

3.5 - RAMP (Ramp regulation)

A “RAMP” potentiometer is associated with each of the channels to enable regulation of the time required to reach the current supplied according to the selected reference signal.
The regulation range is from 0,03 to 7 sec.
This makes it possible to smooth valve response and adapt it to the requirements of the hydraulic system and the machine cycle.
The “ZERO RAMP” potentiometer enables regulation of the valve deactivation time (current=0) when all channels are switched off.
Rotate clockwise to increase ramp time.

Ramps can be inhibited by transmitting a 22 to 30 V DC exclusion command to pin 16a. In this case, the ramp residual time is 10 ms.

4 - SIGNAL MEASUREMENT

4.1 - CURRENT A / CURRENT B
(Current measurement points of solenoids A and B)

Measurement points for voltage readings of current supplied to solenoids A and B.
Reading conversion is 1V DC = 1A (UEIK-21-RL) and
0,82 V DC = 1A (UEIK-22-RL).

4.2 - REFERENCE (Reference signal measurement point)

Enables reading of reference signal related to the selected channel, in voltage, but of the opposite sign.

5 - INSTALLATION

The card is suitable for assembly on a rack or a card holder with interface for connector types DIN 41612 - size D - 32 pole.

It is recommended to use cable sections of 1 to 2,5 mm^2, in function with their length, for power supply and solenoid connections. For other connections, it is advisable to use cables with a screened sheath connected to earth only on the card side.

NOTE 1
To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram of par. 9.
As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electricmotors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - DEFAULT CONDITIONS

The electronic control unit is supplied factory-set.

Standard settings are:

- “OFFSET” regulation: zero
- “REF” regulation:corresponding to 0,82A to A and B solenoids
- “RAMP” regulation: minimum
- position SW1 on V
- position SW2 on S
- position SW3 on AA
- switching frequency (PWM) = 200Hz (UEIK-21-RL) - 100Hz (UEIK-22-RL)

7 - START-UP AND FRONTAL SETTINGS

Settings can be modified and references can be regulated according to specific work cycles as follows:

a) OFFSET CURRENT REGULATION

- Select one of the channels connected to positive reference +10V (pin 10a).
- Regulate the relative potentiometer “REF” at a value between 200 and 300 mV (for reference signal see par. 4.2)
- Regulate the “OFFSET A” potentiometer so that the valve is positioned at the start of the work zone controlled by solenoid “A”.

Repeat the procedure by selecting a channel connected to the negative reference -10V (pin 10c) and regulate the “OFFSET B” potentiometer.

b) REFERENCE REGULATION

- Select a channel and regulate the relative “REF” potentiometer to obtain the required actuator speed.
- Repeat the procedure for all four channels to obtain the required speed cycle.

c) RAMP REGULATION

- Regulate the four “RAMP” potentiometers to obtain the required regulation smoothness during passage from one channel to another.
- Regulate the “ZERO RAMP” potentiometer to obtain regulation smoothness when all four channels are deactivated.

8 - CARD CIRCUIT SETTINGS

The overall dimension diagram in par. 10 shows three switch banks: SW 1 - SW 2 - SW 3 which enable card set mup as required.

NB. Each modification to switch settings must be carried out with the card disconnected from the power supply. The individual switches inside each bank must all be set in the same position.

SELECTION OF SINGLE ENDED OR DIFFERENTIAL REFERENCE SIGNAL (SW 2 bank comprising one individual switch)

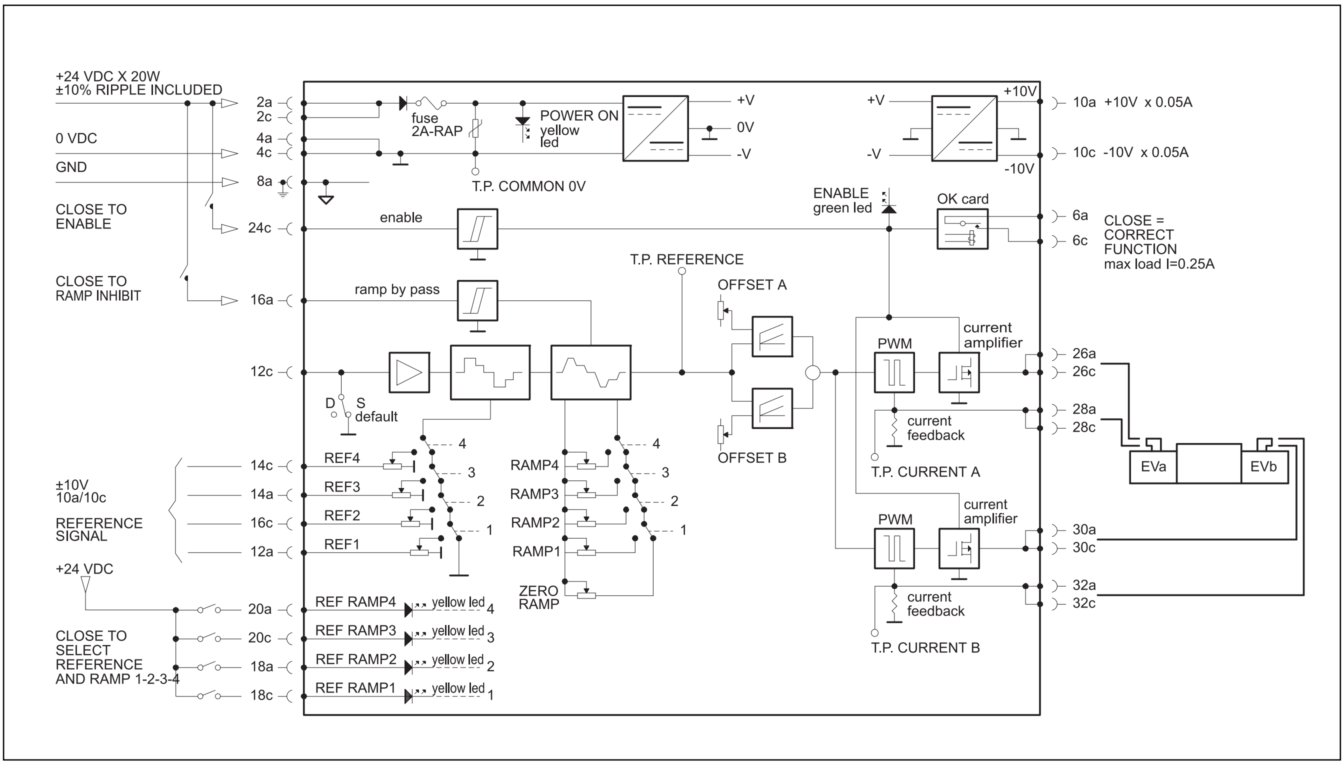
- select S for single ended. This condition is obligatory in the case that the reference signal is generated with the four potentiometers inside the card.
- by selecting D (differential), it is possible to add an external reference signal that can control the valve during the manual cycle.

- **SW 1 bank (comprising three individual switches) must always be set on V, as per standard supply conditions.**
- **SW 3 bank (comprising two individual switches) must always be set on AA, as per standard supply conditions.**

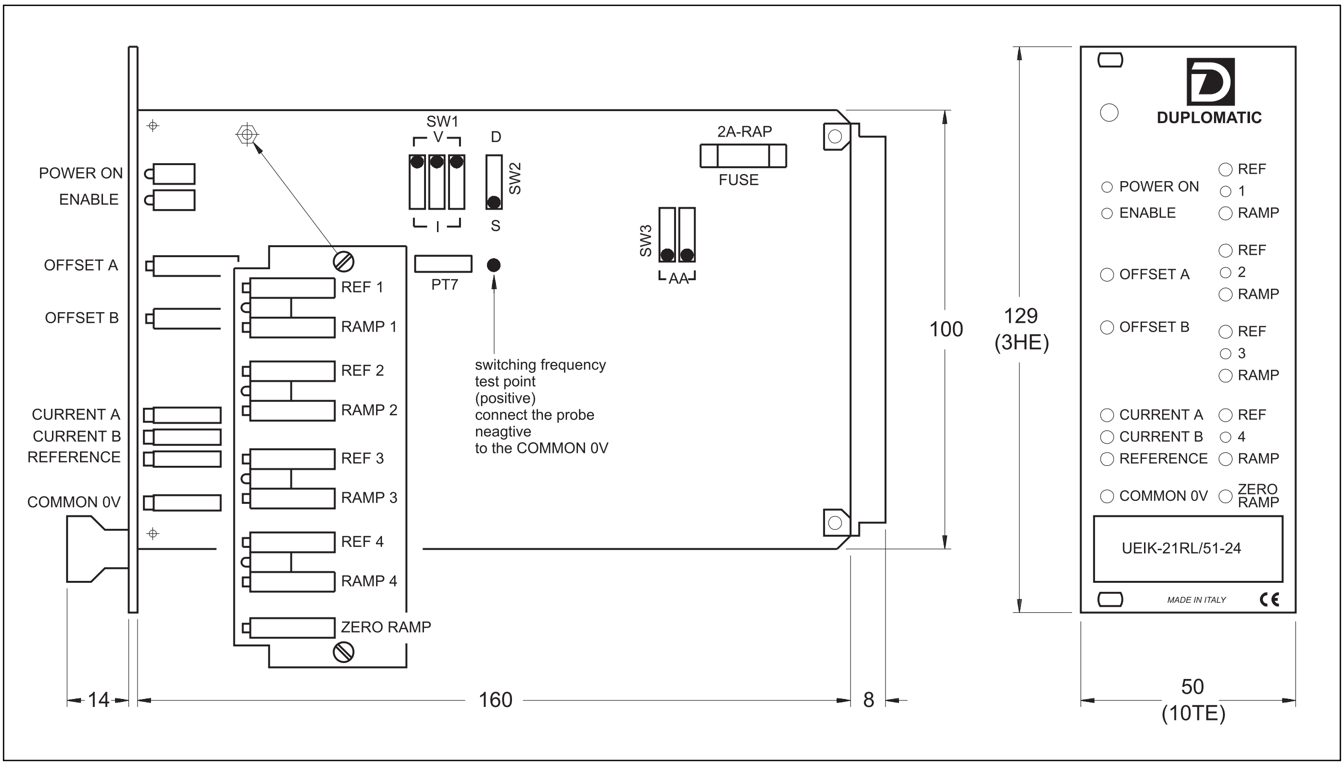
SWITCHING FREQUENCY ADJUSTMENT

It is possible to change the switching frequency (PWM) by acting on the trimmer PT7 (see par. 10).
The setting range is from 80 to 370 Hz.
An appropriate switching frequency adjustment allows reduction of the valve hysterisis value.
Clockwise rotation to increase the frequency.

9 - CARD CIRCUIT AND WIRING DIAGRAM



10 - OVERALL AND MOUNTING DIMENSIONS



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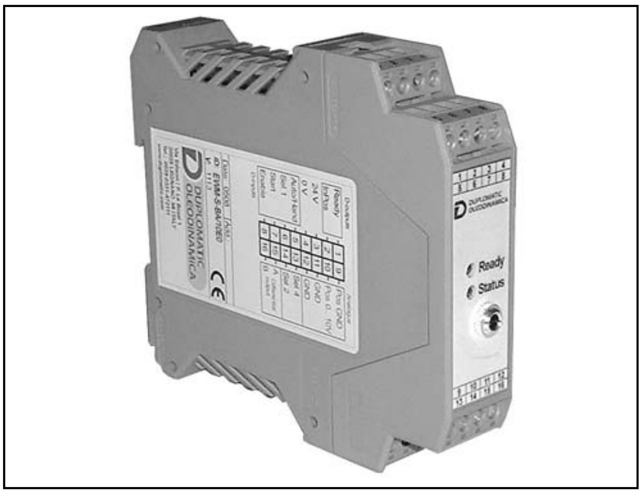


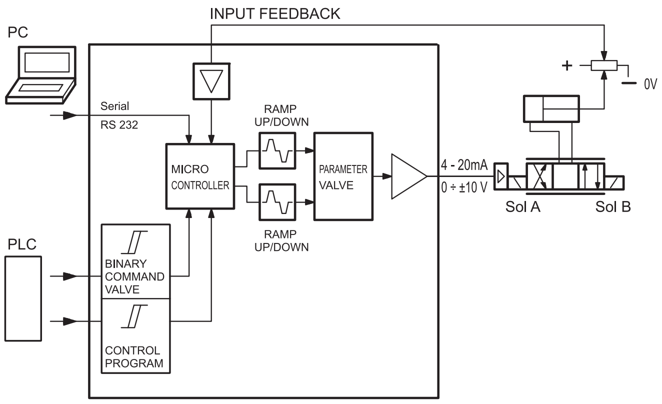
EWM-S-B*

DIGITAL CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



- The EWM-S-B* cards are designed for an easy stroke control of hydraulic actuators connected to a simple PLC with only I/O functions. The target position can be selected by a binary input up to 8 different position.
- Typical applications are positioning drives, handling axis and fast transportable drives (adaptation of non-linear valve characteristics).The card controls a directional proportional valve with integrated electronics. As option, an integrated power amplifier is available.
- This card allows an optimal use of overlapped and zero overlapped proportional valves.
- Internal function and failure are monitored with two digital output easy to read.
- The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 1,0 A (5 A for M2 version)
Current consumption: - E0 and E1 version - M2 version	mA A	100 + sensor power consumption depending from solenoid current. max 5A
Command value		binary command with 3 bit
Feedback value: - BA version - BI version	V mA	0 ÷ 10 (R_I = 90 kΩ) 4 ÷ 20 (R_I = 250 kΩ)
Output values: - E0 version - E1 version - M2 version	V mA A	±10 (max load 5 mA) 4 ÷ 20 (max load 390 Ω) 1,0 - 1,6 - 2,6
Position accuracy	%	0,01
Interface		RS 232 C
Electromagnetic compatibility (EMC) according to 2004/108/CE		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w) or 46 on M2 version
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E W M - S - B ☐ / 10 ☐

Digital card for closed loop systems
DIN EN 50022 rail mounting

Stroke control

Binary command value

A = Voltage feedback value 0 ÷ 10 V
I = Current feedback value 4 ÷20 mA

Output value:
E0 = voltage 0 ÷ ±10V (**standard**)
E1 = current 4 ÷ 20 mA
M2 = embedded power amplifier

Series No. (from 10 to 19 sizes and mounting dimensions remain unchanged)

This module supports the simple point-to-point positioning with hydraulic drives. Up to eight target positions (with related velocities) can be selected. The deceleration characteristics can be defined with the command CTRL, choosing between linear (LIN) or nearly square root (SQRT1) parameters. See at par.4, Adjustments.

The sampling time of the control loop is 1 ms.

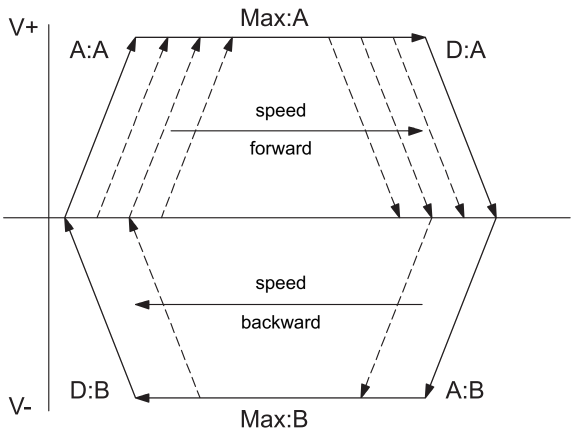
Two operating modes can be selected:

A - stroke depending deceleration, that means the control gain will be adjusted with the parameters D:A and D:B This is a time-optimal positioning structure with vey high stability.

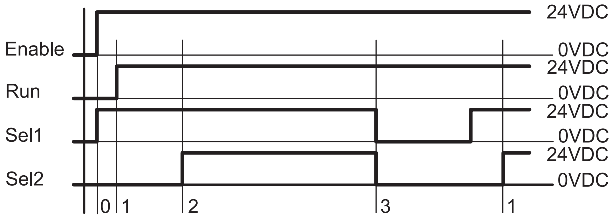
B - NC mode, where the position value is generated from the following error.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two contradictory requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P→A and B→T



Sequence of the positioning with 3 target position achievable with the EWM-S-B* cards :



S:0 and V:0 - Switching on and placement to parking position.
S:1 and V:1 - Initial positioning in the work cycle
S:2 and V:2 - Second target position
S:3 and V:3 - Return to the first position;
To begin, the external input START (RUN) must be enabled.

2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V , Low level: <4V, high level >12V with current <0,1A. See the block diagram at paragraph 8 for the electric connections.

2.4 - Feedback input values

The card accepts analogue feedback input. The feedback value must be 0 ÷ 10 V for EWM-S-BA*, and 4 ÷ 20 mA for EWM-S-BI* version.

2.5 - Output values

E0 version: output voltage 0 ±10 V
E1 version: output current 4 ÷ 20 mA
M2 version: Embedded power stage configurable via software with a value of 1, 1.6 or 2.6 A.

2.6 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel

Low level <4V High Level > 10 V Max 50 mA with load 200 Ω

3 - LED FUNCTIONS

There are two leds on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready (READY output).

- ON - The card is supplied
- OFF - No power supply
- FLASHING - Failure detected (internal or 4… 20 mA).
  Only if SENS = ON

YELLOW: Signal of the control error monitoring. (STATUS output)

- ON - No control error
- OFF - Error detected, depending of a parameter error.

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the command and its uses. The parameters changes depending on the card model.

STANDARD PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
s:i x	i= 0..7 x= 0..10000	- :0	- 0,01%	Definition of the target positions. The value **i** is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
vc:i x	i= 0..7 x= 0..10000	- :5000	- 0,01%	Definition of the target speeds. The value i is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
dsel x	x= on|off	off	-	Mode of the digital selection inputs. OFF: activation of the target position by a signal change (low to high) of the START input. ON: direct activation by the SELx inputs.
a:i x	i= A|B x= 1… 2000	:A 100 :B 100	ms ms	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = flow p-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B x= 10… 10000	:A 2500 :B 2500	0,01% 0,01%	Deceleration stroke depending on direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke will be sufficient.
ctrl x	x= lin|sqrt1 |sqrt2	sqrt1	-	Selection of the control function: **lin** = standard linear P-control, (**NOTE**) **sqrt1** = progressive time optimized deceleration curve **sqrt2** = sqrt1 with a higher gain in position
vramp x	x= 1… 2000	50	ms	Ramp time for velocity input.
vmode x	x= on|off	off	-	Activation of the NC-generator. The command position is generated by a velocity profile (internal or external preset of v). The axis drives more or less speed controlled.
th x	x= 100… 60000	5000	ms	Stroke time for 100% velocity and 100% nominal sensor stroke.
hand:i x	i= A|B x= -10000… 10000	:A 3300 :B -3300	0,01% 0,01%	Degree of output signal in manual mode
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation of positive overlapped proportional valves. Good adjustment will increase positioning accuracy.
max:i x	i= A|B x= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0… 2000	200	0,01%	Point to activate the deadband compensation (**min**). Also useful for reduced sensitivity in position with control valves.
inpos x	x= 2… 2000	200	0,01%	Range for the InPos signal (status output). (**NOTE**)
offset x	x= -2000… 2000	0	0,01%	The offset will be added to the command value.
pol x	x= +|-	+	-	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM

help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
din	-	-	-	Status of the digital inputs.
w, x, xw, u ,v	-	-	-	Actual signals: command value, actual value, process data, control divergence and reference value.
default	-	-	-	Preset values will be set.

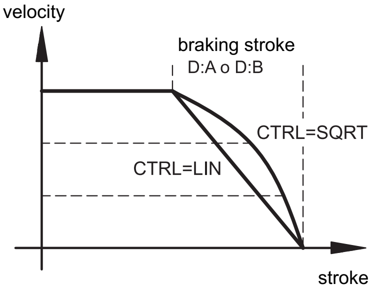
NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half “Inpos” value until setpoint value plus the half “Inpos” value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve. SQRT1: with small control error. control gain corresponds to 30000 / d:i ; SQRT2: control gain corresponds to 50000 / d:i



ADDITIONAL PARAMETERS ON VERSION BI*

Commands	Parameters	Defaults	Unit	Description
ain:i	i= X			Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (x = C) the corresponding input will be switched over to current automatically.
a, b, c, x	a= 0… 10000	: 1000	-	
	b= 0… 10000	: 1000	-	
	c= -10000… 10000	: 0	0,01%	
	x= V|C	: V	-	

ADDITIONAL PARAMETERS ON VERSION *M2

Command	Parameter	Defaults	Unit	Description
current x	x=0… 2	0	-	Selection of the output current range: **0** = 1,0 A **1** = 1,6 A **2** = 2,6 A
dfreq x	x= 60… 400	120	Hz	Dither frequency
dampl x	x= 0… 3000	500	0,01%	Dither amplitude. Typical values between 500 and 1200 (good experience were made with 700).
pwm x	x= 100… 7700	2600	Hz	PWM Frequency. PWM Frequencies of ≥2000 Hz improve the current loop dynamics. PWM Frequencies in the range of 100… 500 Hz will be used for low dynamic valves with high hysteresis. In this case, DAMPL must be zero.
ppwm x **ipwm x**	x= 0… 30 x= 1… 500	3 40	- -	PI-compensator for the current controller. Changes should be only done with good experience in optimizing of current loops. In some cases a PWM Frequency of >2500 Hz; PPWM can be increased to 7… 15. ATTENTION: The dither amplitude must be optimized after that.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on version M2. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

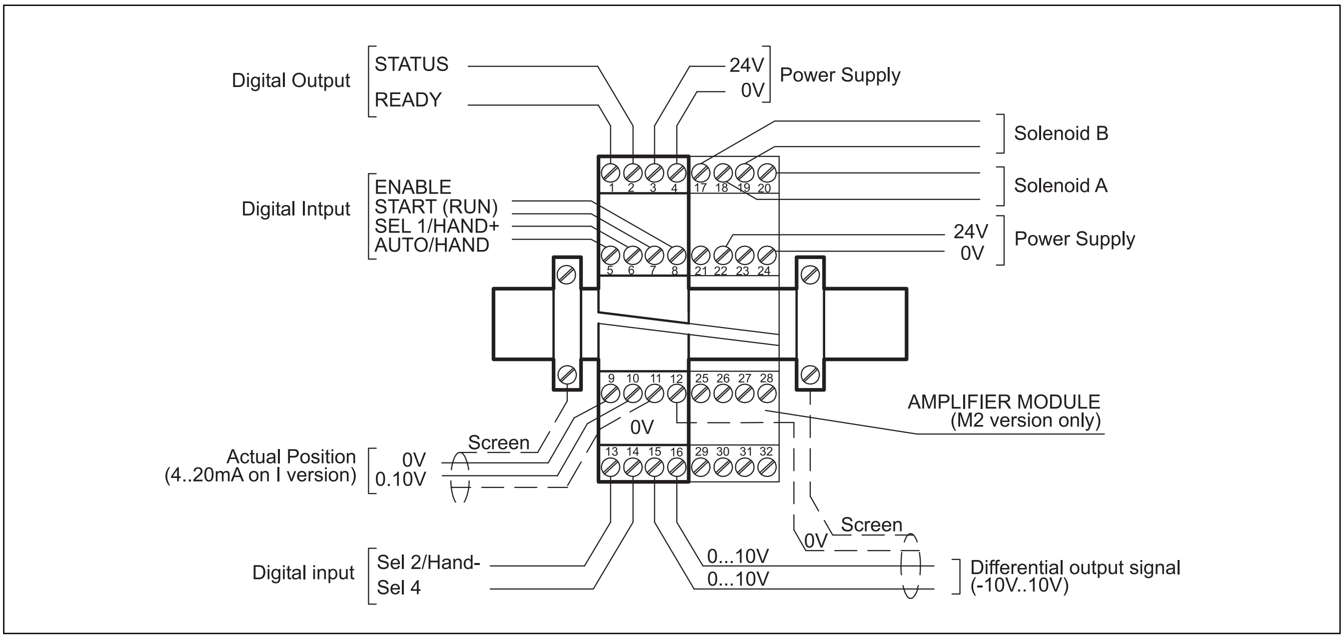
In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

The software kit includes a USB cable (2.70 mt length) to connect the card to a PC or notebook and the software. During the identification all information are read out of the module and the table input will be automatically generated. Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM OF EWM-S-B*



DIGITAL INPUT AND OUTPUT

PIN 1	READY output. This output is high when ENABLE is active and there is no sensor error. This output corresponds with the green led.
PIN 2	STATUS output. Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window. The output is only active if START = ON.
PIN 5	AUTO/HAND input ACTIVATED = automatic mode DEACTIVATED = hand mode.
PIN 6	SEL 1/HAND+ input: SEL 1 = Selection input 1 HAND+ = Hand mode (START = OFF), the axis drives with the programmed speed (parameter HAND:A). After the deactivation the command position is set to the actual position.
PIN 7	START (RUN) input: The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke
PIN 8	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.
PIN 13	SEL 2 / HAND- input: SEL 2 = Selection input 2 HAND- = (START = OFF), the axis drives with the programmed speed (parameter HAND:B). After the deactivation the command position is set to the actual position.
PIN 14	SEL 4- input: Selection input 4 - See schemes in the BINARY TABLE below

Address	0	1	2	3	4	5	6	7
SEL 1	0	1	0	1	0	1	0	1
SEL 2	0	0	1	1	0	0	1	1
SEL 4	0	0	0	0	1	1	1	1

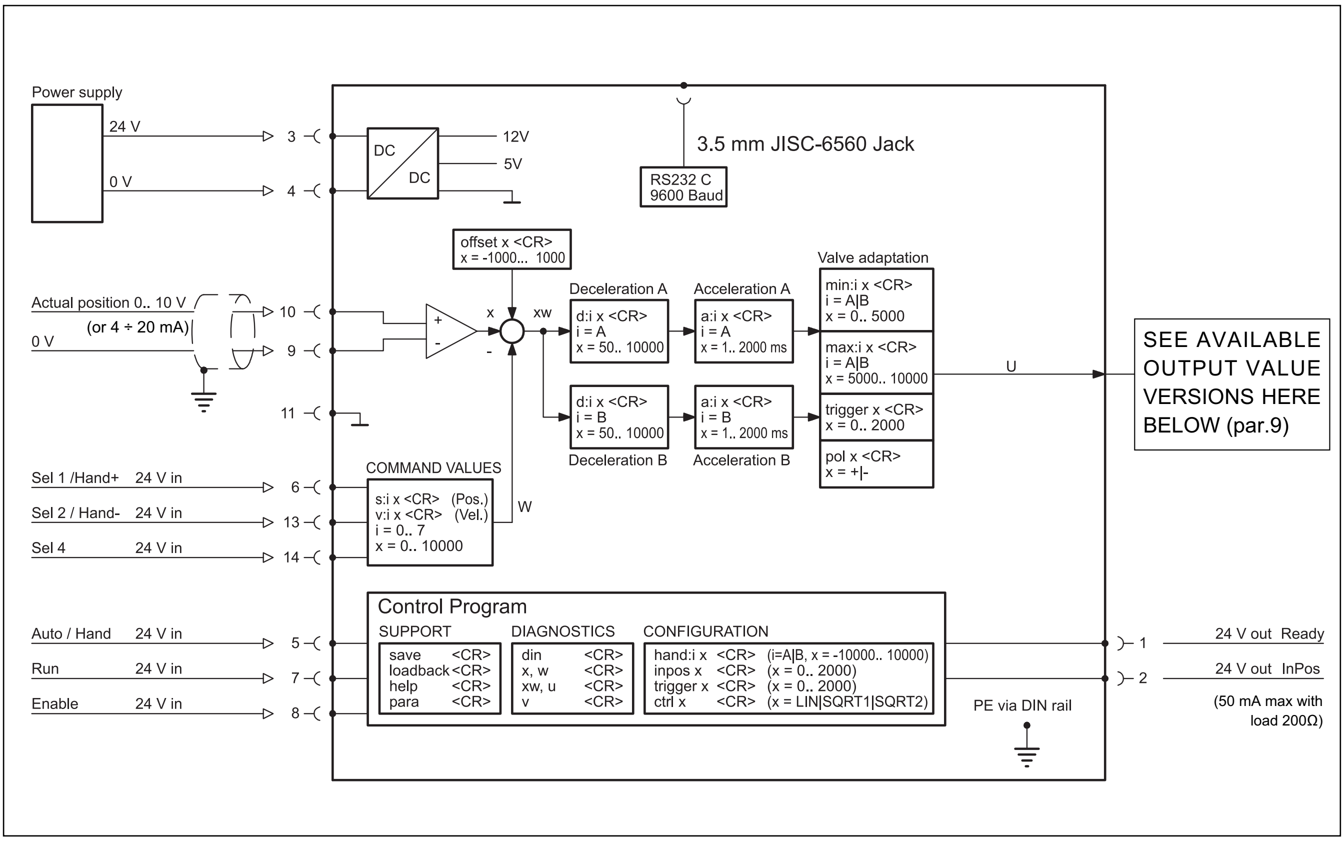
ANALOGUE INPUT

PIN 9/10	Actual position (feedback) value (X) range 0 ÷ 100% corresponds to 0 ÷ 10V (or 4 ÷ 20 mA)

ANALOGUE OUTPUT

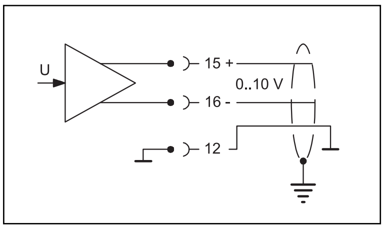
PIN 15/16	Differential output signal (U) ± 100% corresponds to ± 10V differential voltage, optionally (I-version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

8 - CARD BLOCK DIAGRAM

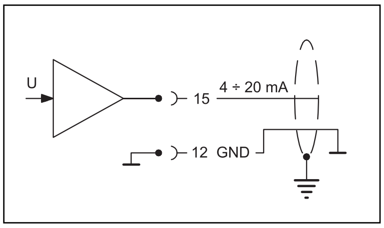


9 - AVAILABLE OUTPUT VALUE VERSIONS

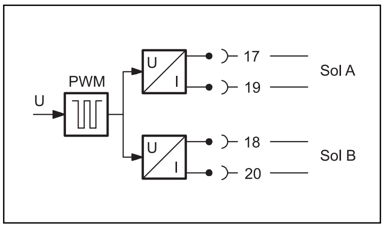
E0 VERSION



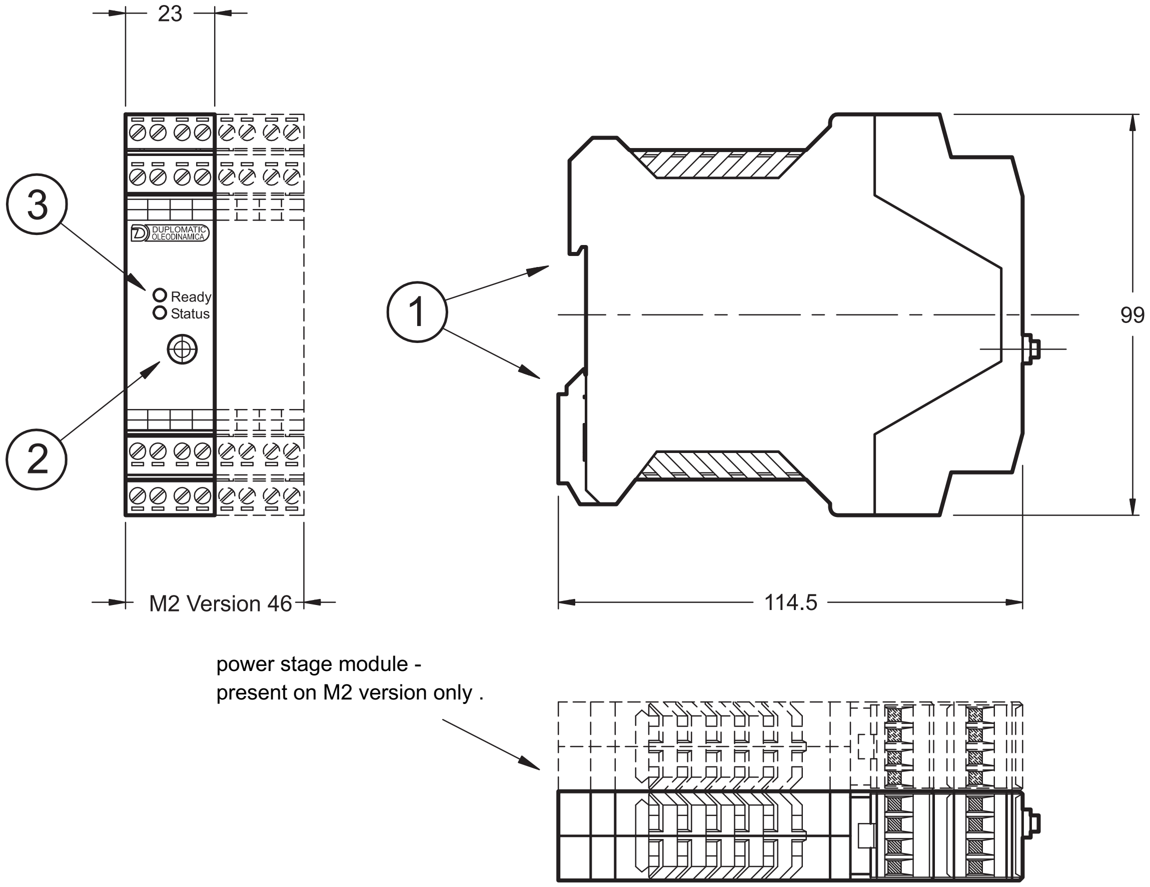
E1 VERSION



M2 VERSION



10 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

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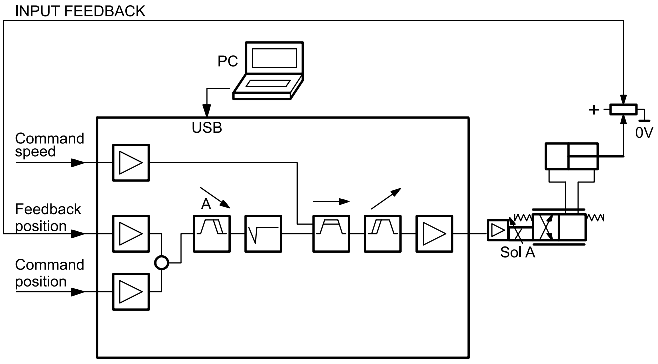
EWM-S-AA

ANALOGUE POSITIONING CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS WITH ANALOGUE FEEDBACK

SERIES 20

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



- This card is designed for positioning drive applications. It allows easy stroke positioning control of hydraulic actuators in closed loop systems.
- Velocity can be defined also by an external speed command.
- Card setup via software only, through an on-board USB-B port.
- The output value, voltage or current type, is configurable via software.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external:		1A medium time lag
Current consumption:	mA	100
Command position	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Position accuracy	%	0,003 incl. Oversampling
Command speed	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 90 kΩ)
Feedback value	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Output values	V mA	2x 0 ÷ 10 (max load 10 mA 2 kΩ) 4 ÷ 20 (max load 390 Ω)
Sample time	ms	1
Interface		USB-B 2.0
Electromagnetic compatibility (EMC) 2004/108/EC		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connections		USB-B (2.0) - 4x poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	S	-	A	A	/	20	E

Digital card for closed loop systems
DIN EN 50022 rail mounting

Stroke control

Analogue command value

Analogue feedback value

Output value in voltage or current, to be configured via software.

Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

2 - FEATURES OVERVIEW

Controller Functions

- Stroke positioning control in closed loop system
- Fine positioning - an accuracy of approx. 0.01% of the sensor stroke can be achieved
- 2 different operating modes:
  SDD – Stroke Depending Deceleration - time-optimal positioning structure with very high stability
  NC – Numerically Controlled - To follow the position profile
- Gain adjustment made via software
- PT1 filter to stabilize the control behaviour
- Emergency function (EOUT)
- Analogue signal command
- Analogue feedback input
- Velocity limited internally or by analogue input
- Simple and intuitive scaling of the sensor

Adaptation of the valve characteristic curve

- CTRL function to adapt the braking characteristics to positive and zero overlapped proportional valves
- Advanced deadband compensation: non-linearity compensation by a double-gain characteristics
- Drift compensation

Monitoring functions

- In-position error
- Cable break for feedback sensor and command signal
- 2 Digital output to read the status

Other characteristics

- Current or voltage output to be set via software
- Card configuration via software, through on-board USB port

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - External command position

The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.5 - External command speed

The card accepts an analogue input signal. The command speed can be 0 ÷ 10 V (RI = 90 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.6 - Feedback value

The card accepts analogue feedback input. The feedback value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.7 - Analogue output values

Output values can be in voltage or current, to be configured via software (parameter SIGNAL:U). The same parameter defines the polarity also.

Voltage: ± 10 V Differential output
(0 ÷ 10 V at PIN 15 and 0 ÷ 10 V at PIN 16).

Current: 4 ÷ 20 mA (PIN 15 to PIN 12).

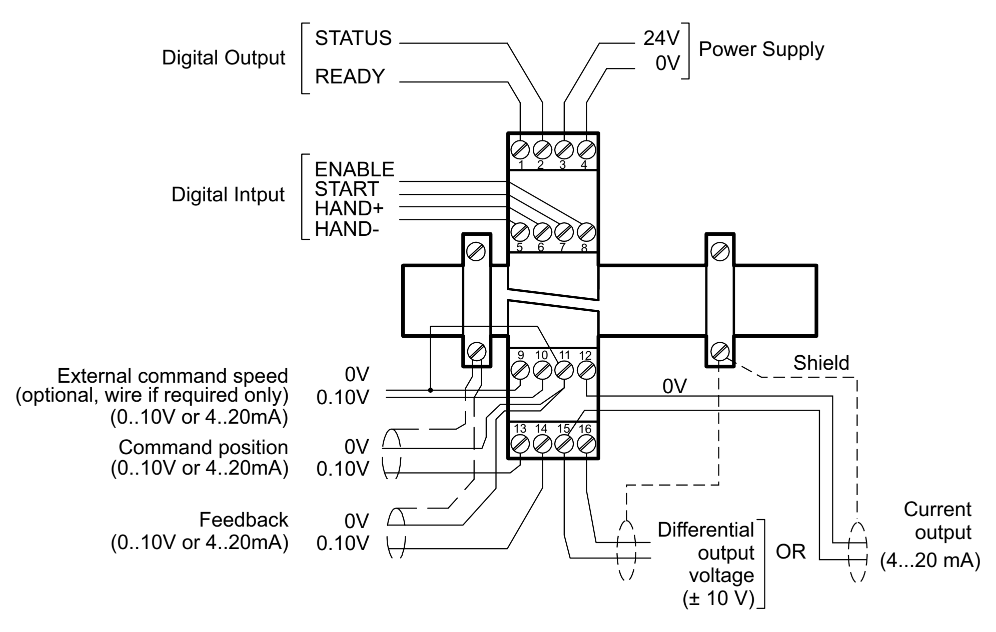
All analogue output have to be wired with screened cables.

3.8 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.

Low level < 2 V High Level > 12 V (max 50 mA).

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1	READY output. General operationality, ENABLE is active and there is no sensor error (by use of 4÷20 mA sensors). This output corresponds with the green LED.
PIN 2	STATUS output. Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater than the adjusted window. The output is only active if START = ON.
PIN 5	HAND- input Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.
PIN 6	HAND+ input: Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.
PIN 7	START (RUN) input: The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke.
PIN 8	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT

PIN 9/10	External command speed (V), range 0 ÷ 100 % corresponds to 0 ÷ 10 V or 4 ÷ 20 mA
PIN 11/13	Command position (W), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 11/14	Actual (feedback) value (X), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

ANALOGUE OUTPUT
voltage

PIN 16/15	Differential output (U) ± 100% corresponds to ± 10V differential voltage

current

PIN 12/15	±100% corresponds to 4 ÷ 20 mA

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system can be controlled in open loop, moving up and down the servo-cylinder with commands HAND+ and HAND- to facilitate the adjustment of the card and its calibration. With these functions the setting-up and the adjustments become easy.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7 and 8.

⚠ **WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.**

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at *standard* level, easier, or *expert*, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89410 ETM*.

7 - MAIN FEATURES

7.1 - Sequence of the positioning

The positioning process will be controlled by switching inputs. After enabling (ENABLE input), the command position is set to the actual position of the sensor and the axis is in closed loop position control mode.

The READY output indicates a general ready to operate.

The axis can be driven in manual mode with the digital inputs HAND+ or HAND- , at programmed velocity.

When the manual mode are switched off, the command position is set to the actual position and the system is in closed loop position control mode.

With START input, the analogue command input is active and new command positions will be taken over. The axis is immediately driving to this new position and indicates on the Inpos Output when the axis reaches the position. This output is active as long as the axis is within the InPos window or the START input is active.

The operating mode can be:

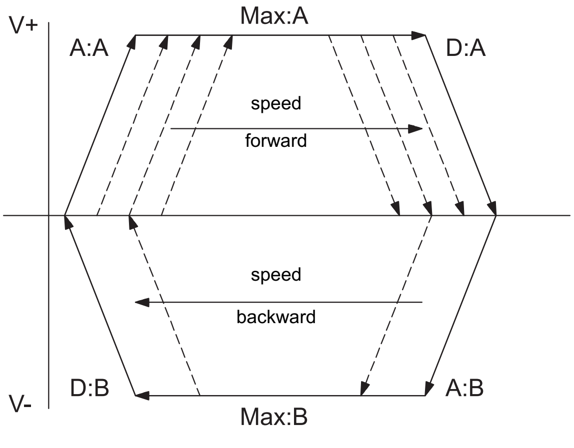
SDD - stroke depending deceleration - means the control gain will be adjusted. This is a time-optimal positioning structure with very high stability.

NC mode - the position value is generated from the following error.

The actuator position is measured by an analogue transducer and compared with a specified target position. The target position is adjusted with an external potentiometer or preset by an analogue input from an external controller (PLC). It's possible to define the axis speed also by an external command speed.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two clashing requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P→A and B→T



7.2 - Gain

The gain is settable and it's related with the braking distance (parameters available via software). Lower is the braking distance, higher is the gain.

7.3 - Emergency Output (EOUT)

This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The function can be deactivate.

7.4 - Adaptation of the braking characteristic to the valve type (CTRL).

The command CTRL controls the braking characteristic curve of the hydraulic axis. The deceleration can be set with linear or nearly square root characteristic.

With positive overlapped proportional valves one of the SQRT characteristics should be used, because of the linearization of the non-linear flow curve typical of these valves; if zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application.

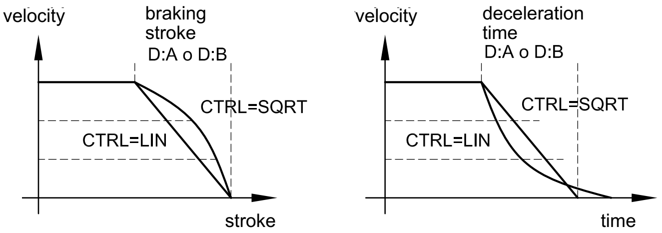
The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear characteristic (control gain corresponds to: 10000 / d:i).

SQRT1: Root function with small control error. (corresponds to 30000 / d:i);

SQRT2: Root function with higher gain corresponds to 50000 / d:i



7.5 - Adaptation of the output signal to the valve characteristic (TRIGGER).

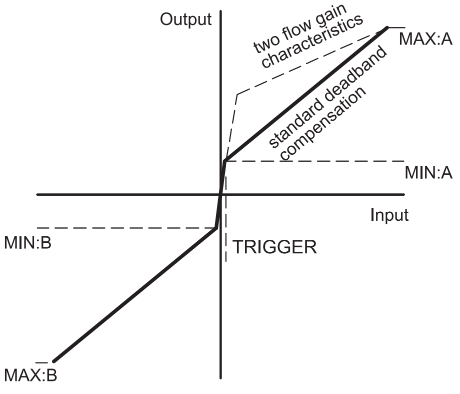
With TRIGGER command, the output signal is adapted to the valve characteristics.

The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

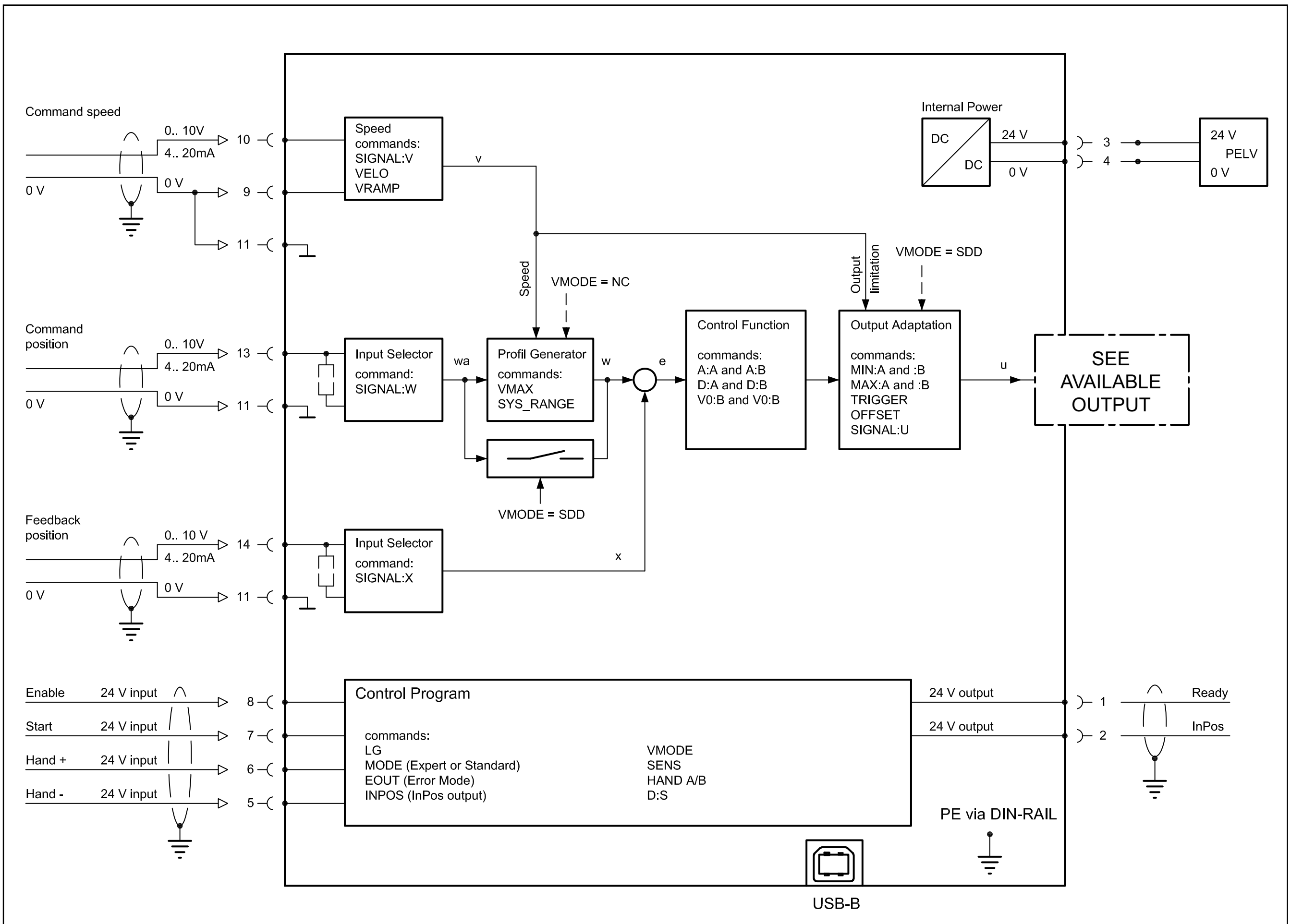
If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out at the power amplifier or at the positioning module.

If the deadband compensation value (MIN) is set too high, it influences the minimal velocity which cannot be adjusted any longer.

In extreme cases this causes to an oscillating around the closed loop controlled position.



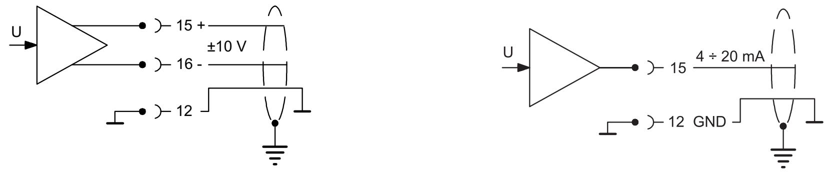
8 - CARD BLOCK DIAGRAM



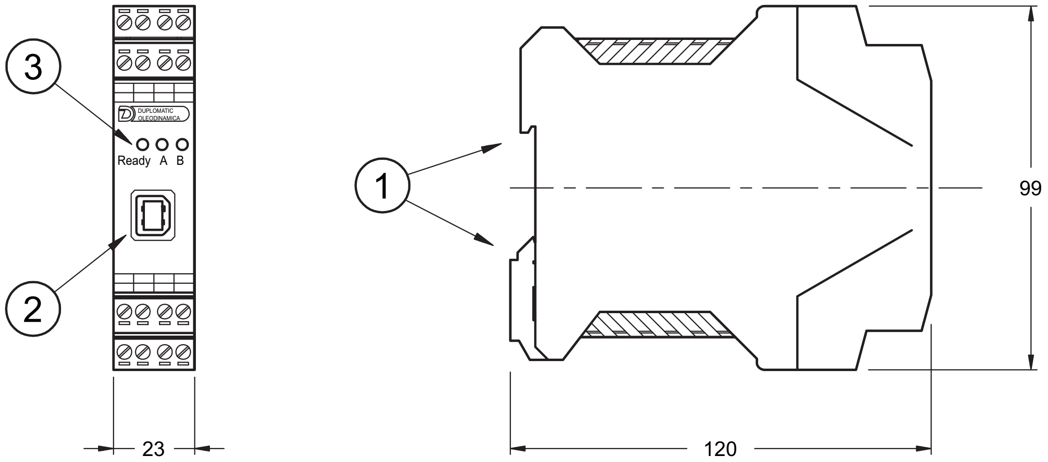
Output signals

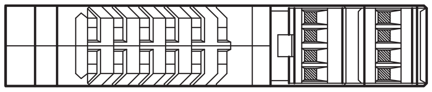
voltage

current



9 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	USB interface, for setup
3	LEDs for output signals

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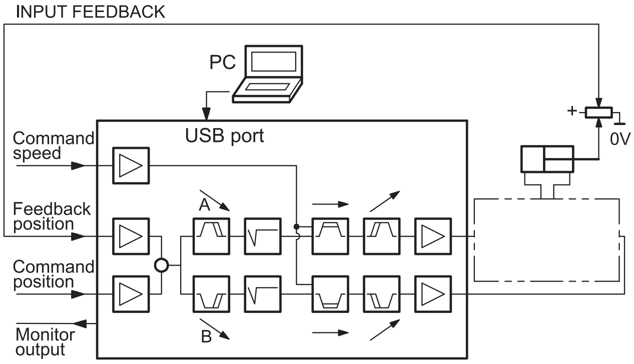
EWM-ST-AA

ANALOGUE POSITIONING CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS WITH ANALOGUE FEEDBACK AND DIGITAL SET-UP

SERIES 21

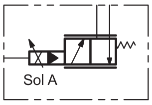
RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE

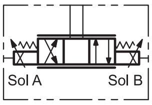


- This card is designed for steam turbine application. It allows easy stroke positioning control of hydraulic actuators in closed loop systems.
- Card setup via software only, through an on-board USB-B port.
- The card has a monitor output to DCS.
- It's available with integral power amplifier or current output.

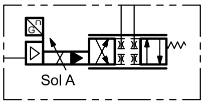
M1



M2



E1



TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external: M1 and M2 E1		3A medium time lag 1A medium time lag
Current consumption: M1 and M2 E1	A mA	3 < 100
Command position	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Position accuracy	%	0,01
Command speed	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 90 kΩ)
Feedback value	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Output value M1 and M2 E1	mA	500 ÷ 2600 4 ÷ 20
Sample time	ms	1
Interface		USB-B (2.0)
Electromagnetic compatibility (EMC) 2004/108/EC		Immunity EN 61000-6-2 Emissions EN 61000-6-4
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 46(w)
Connections		USB - 7x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	ST	-	A	A	/	21	

Digital card for closed loop systems
DIN EN 50022 rail mounting

Steam turbine

Analog command value

Analog feedback value

Output value:
M1 = embedded power amplifier for proportional valves with **single solenoid**
M2 = embedded power amplifier for directional proportional valves with **double solenoid**
E1 = current 4 ÷ 20 mA

Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

2 - FEATURES OVERVIEW

Controller Functions

- Stroke positioning control in closed loop system
- Fine positioning - an accuracy of approx. 0.01% of the sensor stroke can be achieved
- Control mode: SDD – Stroke Depending Deceleration time-optimal positioning structure with very high stability
- Gain adjustment made via software
- PT1 filter to stabilize the control behaviour
- Special functions for steam turbines control (CUTOFF)
- Emergency function (EOUT)
- Analog signal command
- Analog feedback input
- Velocity limited internally or by analog input
- Simple and intuitive scaling of the sensor

Adaptation of the valve characteristic curve

- CTRL function to adapt the braking characteristics to positive and zero overlapped proportional valves
- Advanced deadband compensation: non-linearity compensation by a double-gain characteristics
- Drift compensation

Monitoring functions

- In-position error
- Cable break for feedback sensor and command signal
- Solenoids monitored for M versions
- 2 Digital output to read the status
- Monitor output to DCS

Other characteristics

- Available with current output or integrated power amplifier
- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, freewheeling diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - External command position

The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.5 - External command speed

The card accepts an analogue input signal. The command speed can be 0 ÷ 10 V (RI = 90 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.6 - Feedback value

The card accepts analogue feedback input. The feedback value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.7 - Analog output values

E1 version: analog signal 4 ÷ 20 mA (Rmax = 390 Ω).

M1 and M2 versions: embedded power stage configurable via software with values between 500 and 2600 mA.

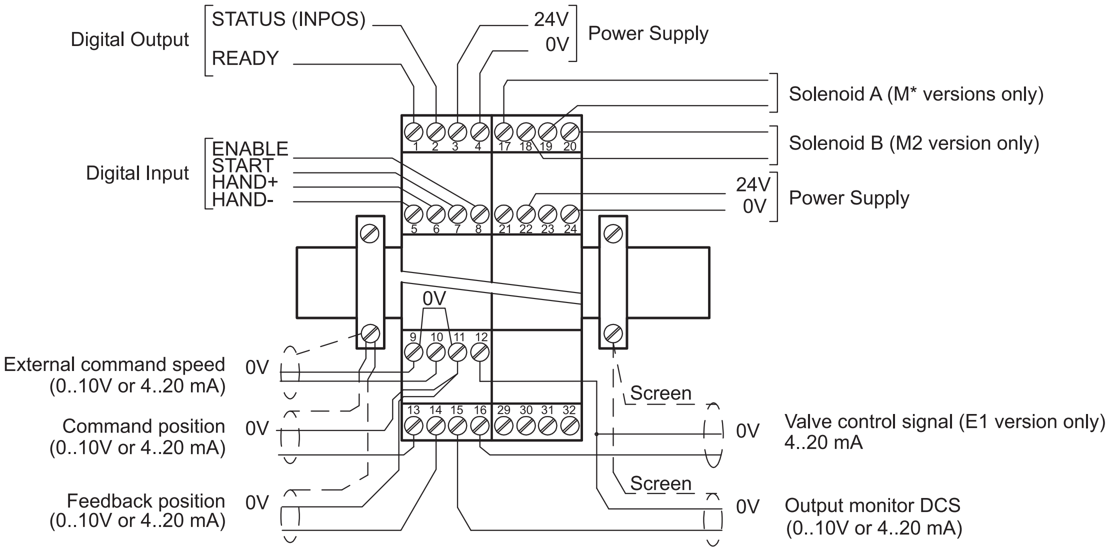
All analogue output have to be wired with screened cables.

3.8 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.

Low level < 2 V High Level > 12 V (50 mA).

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1	READY output ENABLE is active and there is no sensor errors. This output corresponds with the ‘Ready’ LED.
PIN 2	STATUS output Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater than the adjusted window. The output is only active if START = ON.
PIN 5	HAND- input Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.
PIN 6	HAND+ input Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.
PIN 7	START (RUN) input The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the system stops within the set emergency stopping distance.
PIN 8	ENABLE input: This digital input initializes the application and clear the errors. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT

PIN 9/10	External command speed (V) range 0 ÷ 100 % corresponds to 0 ÷ 10 V or 4 ÷ 20 mA
PIN 11/13	Command position (W) range 0 ÷ 100% corresponds to 0 ÷ 10 V or 4 ÷ 20 mA
PIN 11/14	Actual (feedback) value (X) range 0 ÷ 100% corresponds to 0 ÷ 10 V or 4 ÷ 20 mA

ANALOGUE OUTPUT

PIN 12/15	Monitor output to DCS current output ±100% corresponds to 0 ÷ 10 V or 4 ÷ 20 mA
PIN 12/16	**For E1 version only**: current output ±100% corresponds to 4 ÷ 20 mA

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

⚠ **WARNING! Plugs with free-wheeling diodes and LED indicators cannot be used with current controlled power outputs. They interfere with the current control and can destroy the output stage.**

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system can be controlled in open loop, moving up and down the servo-cylinder with commands HAND+ and HAND- to facilitate the adjustment of the card and its calibration. With these functions the setting-up and the adjustments become easy.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7, 8 and 10.

⚠ **WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.**

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at standard level, easier, or expert, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89411 ETM* for series 21.

7 - MAIN FEATURES

7.1 - Sequence of the positioning

The positioning process will be controlled by switching inputs. After enabling (ENABLE input), the command position is set to the actual position of the sensor and the axis is in closed loop position control mode.

The READY output indicates a general ready to operate.

The axis can be driven in manual mode with the digital inputs HAND+ or HAND- , at programmed velocity.

When the manual mode are switched off, the command position is set to the actual position and the system is in closed loop position control mode.

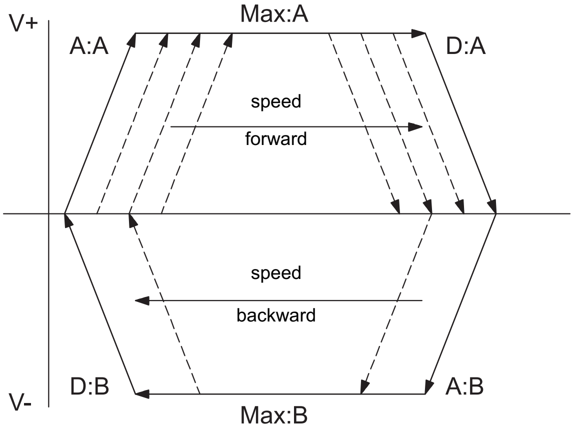
With START input, the analogue command input is active and new command positions will be taken over. The axis is immediately driving to this new position and indicates on the Inpos Output when the axis reaches the position. This output is active as long as the axis is within the InPos window or the START input is active.

The operating mode is SDD - stroke depending deceleration - means the control gain will be adjusted. This is a time-optimal positioning structure with very high stability.

The actuator position is measured by an analog transducer and compared with a specified target position. The target position is adjusted with an external potentiometer or preset by an analog input from an external controller (PLC). It’s possible to define the axis speed also by an external command speed.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two clashing requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P→A and B→T



7.2 - Gain

The gain is settable and it’s related with the braking distance (parameters available via software). Lower is the braking distance, higher is the gain.

7.3 - Forced closure/opening of the cylinder (CUTOFF)

This function handles the forced closure/opening of the cylinder, allowing you to set speed, direction and working area of the function.

7.4 - Emergency Output (EOUT and EOUTMODE)

This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The EOUTMODE parameter selects events which generate the EOUT ouput.

7.5 - Adaptation of the braking characteristic to the valve type (CTRL).

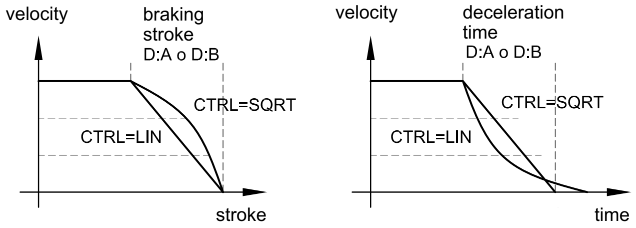
The deceleration characteristic is set with this parameter. In case of positively overlapped proportional valves the SQRT function should be used. The non-linear flow function of these valves is linearized by the SQRT function.

In case of zero lapped valves (control valves and servo valves) the LIN or SQRT1 function should be used regardless of the application. The progressive characteristic of the SQRT1 function has better positioning accuracy but can also lead to longer positioning times in individual cases.

LIN: Linear deceleration characteristic (gain is increased by a factor of 1).

SQRT1: Root function for braking curve calculation. The gain is increased by a factor of 3 (in the target position). This is the default setting.

SQRT2: Root function for braking curve calculation. The gain is increased by a factor of 5 (in the target position). This setting should only be used with a significantly progressive flow through the valve.



7.6 - Adaptation of the output signal to the valve characteristic (TRIGGER).

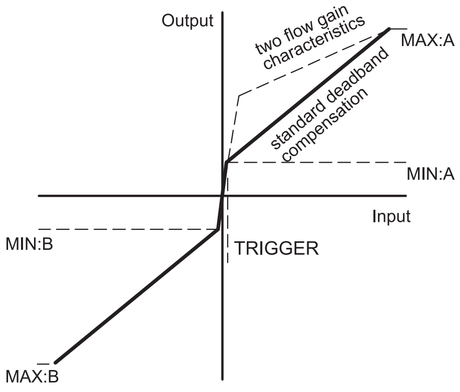
With TRIGGER command, the output signal is adapted to the valve characteristics.

The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

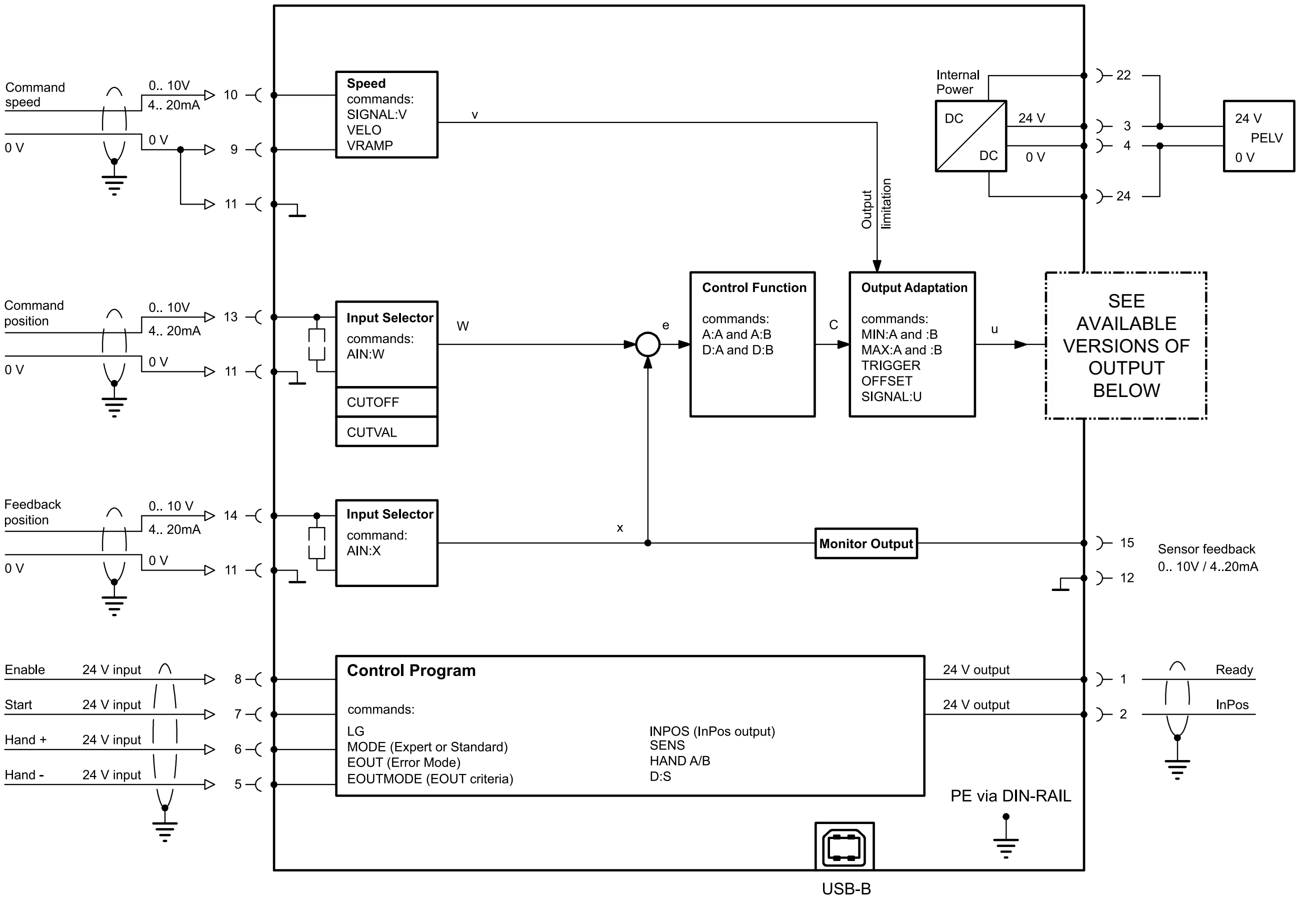
If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out at the power amplifier or at the positioning module.

If the deadband compensation value (MIN) is set too high, it influences the minimal velocity which cannot be adjusted any longer.

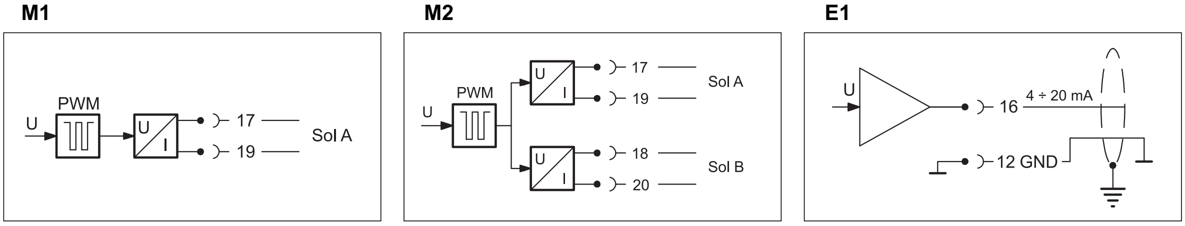
In extreme cases this causes to an oscillating around the closed loop controlled position.



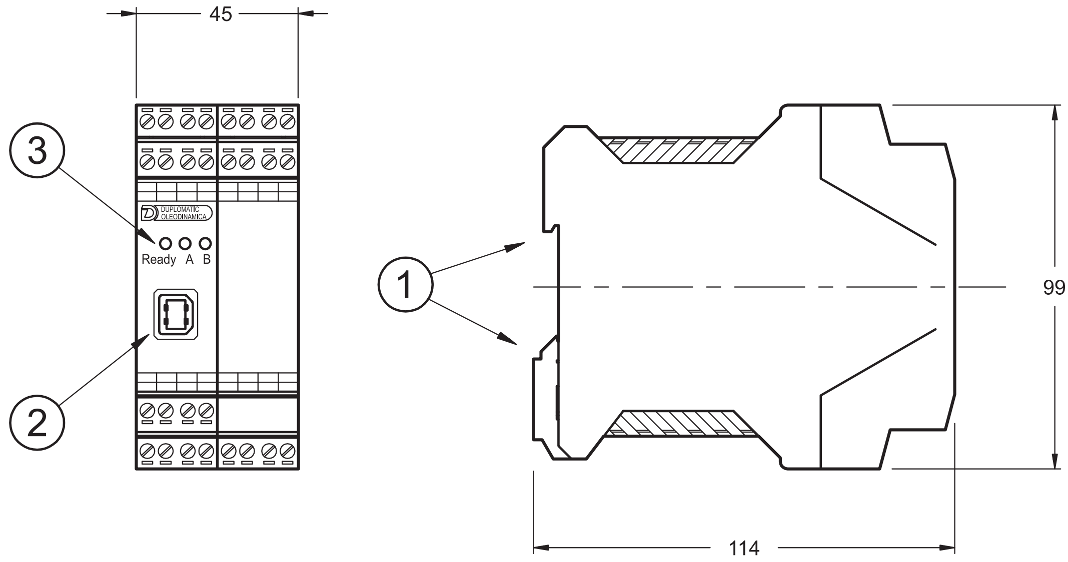
8 - CARD CIRCUIT DIAGRAM

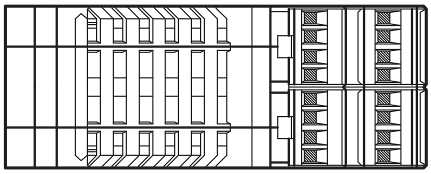


VERSIONS OF OUTPUT SIGNAL



9 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	USB interface, for setup
3	LEDs for output signals

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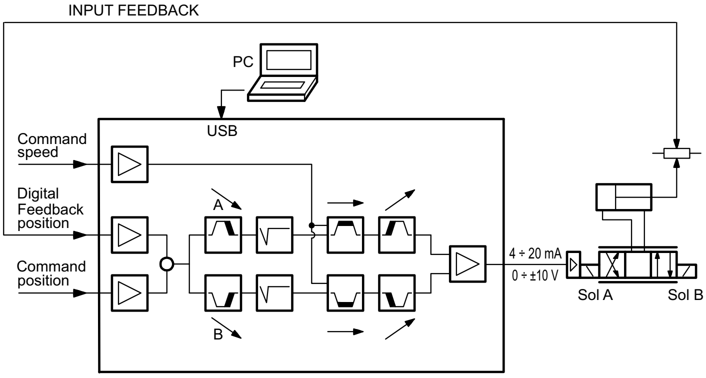
EWM-S-AD

ANALOGUE POSITIONING CARD FOR STROKE CONTROL IN CLOSED LOOP SYSTEMS WITH DIGITAL FEEDBACK

SERIES 20

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



— This card is designed for closed loop positioning of hydraulics actuators where an high accuracy is needed by means of a digital SSI sensor.

— The card controls a directional proportional valve with integrated electronics and allows an optimal use of overlapped and zero-overlapped proportional valves.

— The card has a monitor output to DCS.

— An additional input for analogue sensors is available.

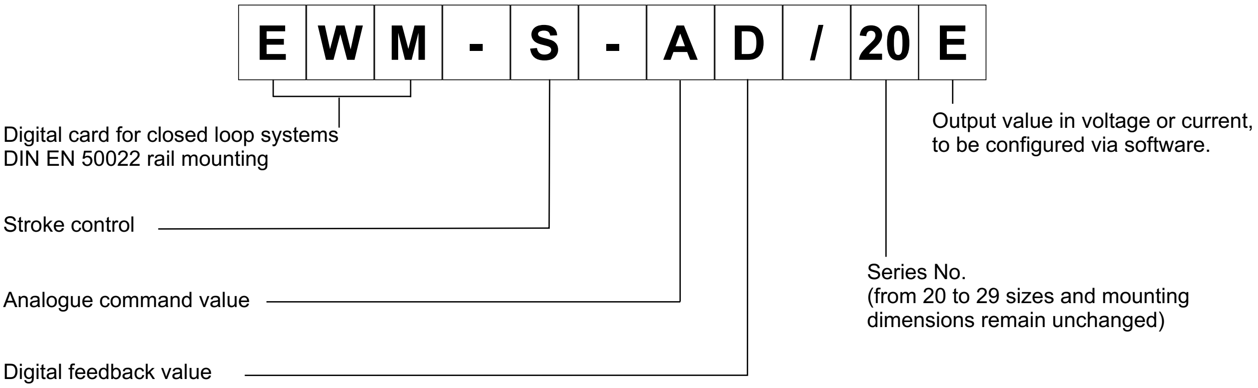
— The output value, voltage or current type, has to be configured via software.

— Card setup via software only, through an USB-B port.

TECHNICAL CHARACTERISTICS

Power supply	V DC	24 ÷ 30 ripple included
Fuse, external	A	1A medium time lag
Current consumption	mA	350 (technical data of the sensor have to be considered)
Command position	mA V	4 ÷ 20 (Rl = 240 Ω) 0 ÷ 10 (Rl = 25 kΩ)
Max position accuracy	µm	1
Command speed	V	0 ÷ 10 (Rl = 90 kΩ) 4 ÷ 20 (Rl = 240 Ω)
Feedback value		Digital sensor with SSI interface RS-422, 150kBaud
Output value	V mA	differential, ±10 (max load 10 mA 2 kΩ) 4 ÷ 20 (max load 390 Ω)
Interface		USB - B 2.0
Electromagnetic compatibility (EMC) 2004/108/EC		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 46(w)
Connections		USB-B (2.0) - 7x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



2 - FEATURES OVERVIEW

Controller Functions

- Stroke positioning control in closed loop system
- Fine positioning - 1µm resolution
- 2 different operating mode:
  SDD – Stroke Depending Deceleration - time-optimal positioning structure with very high stability
  NC – Numerically Controlled - To follow the position profile
- Gain adjustment made via software
- PT1 filter to stabilize the control behaviour
- Emergency function (EOUT)
- Analog signal command
- Digital feedback input
- Velocity limited internally or by analog input
- Safe and error-free data transmission
- As an alternative, the card can be set via software for operate with analogue sensors.
- Simple and intuitive scaling for analogue sensors

Adaptation of the valve characteristic curve

- CTRL function to adapt the braking characteristics to positive and zero overlapped proportional valves
- Advanced deadband compensation: non-linearity compensation by a double-gain characteristics
- Drift compensation

Monitoring functions

- In-position error
- Cable break for command signal and fault of feedback sensor
- 2 Digital output to read the status
- Monitor output to DCS

Other characteristics

- Output value in voltage or current, to be configured via software.
- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 24 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - External command position

The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.5 - External command speed

The card accepts an analogue input signal. The command speed can be 0 ÷ 10 V (RI = 90 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.6 - Feedback value

The card accepts a digital feedback input from a sensor with any SSI interface with RS422 specifications. Bit, code and resolution are settable via software.

The max sensor resolution is 0,001 mm.

Eventually an analog input could be used as feedback. The card accepts a 0 ÷ 10 V (Ri 25 kOhm) or 4 ÷ 20 mA (Ri = 240 Ohm)

3.7 - Analog output values

Output values can be in voltage or current, to be configured via software (parameter SIGNAL:U). The same parameter defines the polarity also.

Voltage: ± 10 V Differential output
(0 ÷ 10 V at PIN 15 and 0 ÷ 10 V at PIN 16).

Current: 4 ÷ 20 mA (PIN 15 to PIN 12).

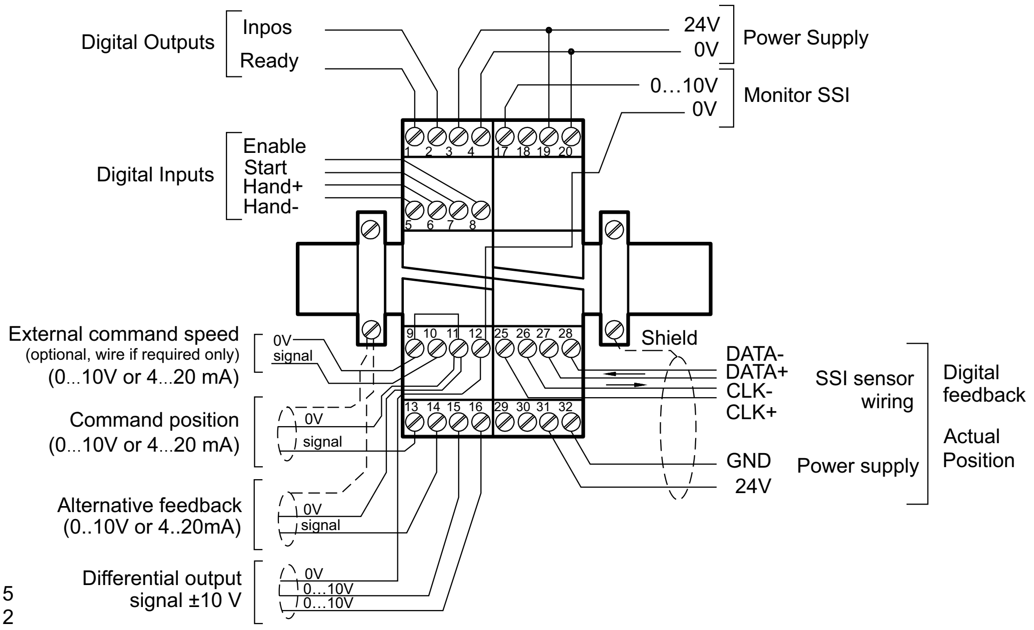
An analogue position value 0 ÷ 10 V (max load 10mA) is available at PIN 17 as sensor monitor reference.

3.9 - Digital Output

Two digital output are available, INPOS and READY, that are displayed by LED on the front panel.

Low level < 2 V High Level > 12 V (50 mA).

4 - WIRING DIAGRAM



Current version:
4…20 mA PIN 15
0 V PIN 12

DIGITAL INPUT AND OUTPUT

PIN 1	READY output. General operationality, ENABLE is active and there is no sensor error. This output corresponds with the green led.
PIN 2	STATUS output. Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater than the adjusted window. The output is only active if START = ON.
PIN 5	HAND- input Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.
PIN 6	HAND+ input: Hand mode (START = OFF), driving with the programmed velocity. After deactivation the actual value is taken over as command position.
PIN 7	START input: The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke.
PIN 8	Enable input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT

PIN 9/10	External command speed (V) range 0 ÷ 100 % corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 13/11	Command position (WA) range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 11/14	Alternative: analogue feedback value (X) range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

ANALOGUE OUTPUT
voltage

PIN 16/15	Differential output (U) ± 100% corresponds to ± 10V differential voltage

current

PIN 12/15	±100% corresponds to 4 ÷ 20 mA
PIN 12/17	Monitor of the SSI sensor position 0 ÷ 10V

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system can be controlled in open loop, moving up and down the servo-cylinder with commands HAND+ and HAND- to facilitate the adjustment of the card and its calibration. With these functions the setting-up and the adjustments become easy.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7 and 8.

WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at standard level, easier, or expert, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89420-115 ETM*.

7 - MAIN FEATURES

7.1 - Sequence of the positioning

The positioning process will be controlled by switching inputs. After enabling (ENABLE input), the command position is set to the actual position of the sensor and the axis is in closed loop position control mode.

The READY output indicates a general ready to operate.

The axis can be driven in manual mode with the digital inputs HAND+ or HAND- , at programmed velocity.

When the manual mode are switched off, the command position is set to the actual position and the system is in closed loop position control mode.

With START input, the analogue command input is active and new command positions will be taken over. The axis is immediately driving to this new position and indicates on the Inpos Output when the axis reaches the position. This output is active as long as the axis is within the InPos window or the START input is active.

Two operating modes can be selected:

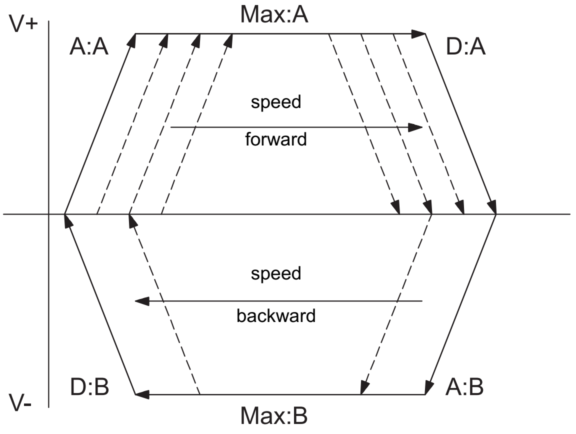
SDD - stroke depending deceleration - means the control gain will be adjusted. This is a time-optimal positioning structure with very high stability.

NC mode - the position value is generated from the following error.

The actuator position is measured by a transducer and compared with a specified target position. The target position is adjusted with an external potentiometer or preset by an analog input from an external controller (PLC). It’s possible to define the axis speed also by an external command speed.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two clashing requirements (short positioning time and high accuracy) have to be considered in the system design.

flow (volume) P→A and B→T



7.2 - Gain

The gain is settable and it’s related with the braking distance (parameters available via software). Lower is the braking distance, higher is the gain.

7.3 - Emergency Output (EOUT)

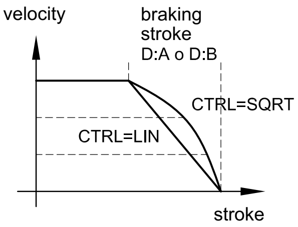
This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The function can be deactivate.

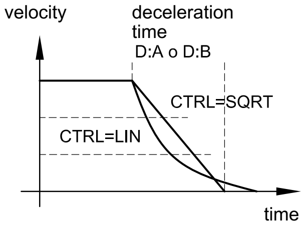
7.4 - Adaptation of the braking characteristic to the valve type (CTRL).

The deceleration characteristic is set with this parameter. In case of positively overlapped proportional valves the SQRT function should be used. The non-linear flow function of these valves is linearized by the SQRT function.

In case of zero lapped valves (control valves and servo valves) the LIN or SQRT1 function should be used regardless of the application. The progressive characteristic of the SQRT1 function has better positioning accuracy but can also lead to longer positioning times in individual cases.

LIN:	Linear deceleration characteristic (gain is increased by a factor of 1).
SQRT1:	Root function for braking curve calculation. The gain is increased by a factor of 3 (in the target position). This is the default setting.
SQRT2:	Root function for braking curve calculation. The gain is increased by a factor of 5 (in the target position). This setting should only be used with a significantly progressive flow through the valve.





7.5 - Adaptation of the output signal to the valve characteristic (TRIGGER).

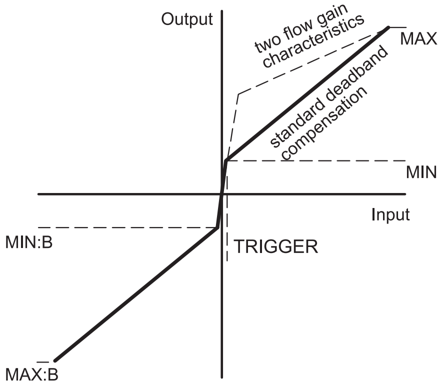
With TRIGGER command, the output signal is adapted to the valve characteristics.

The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

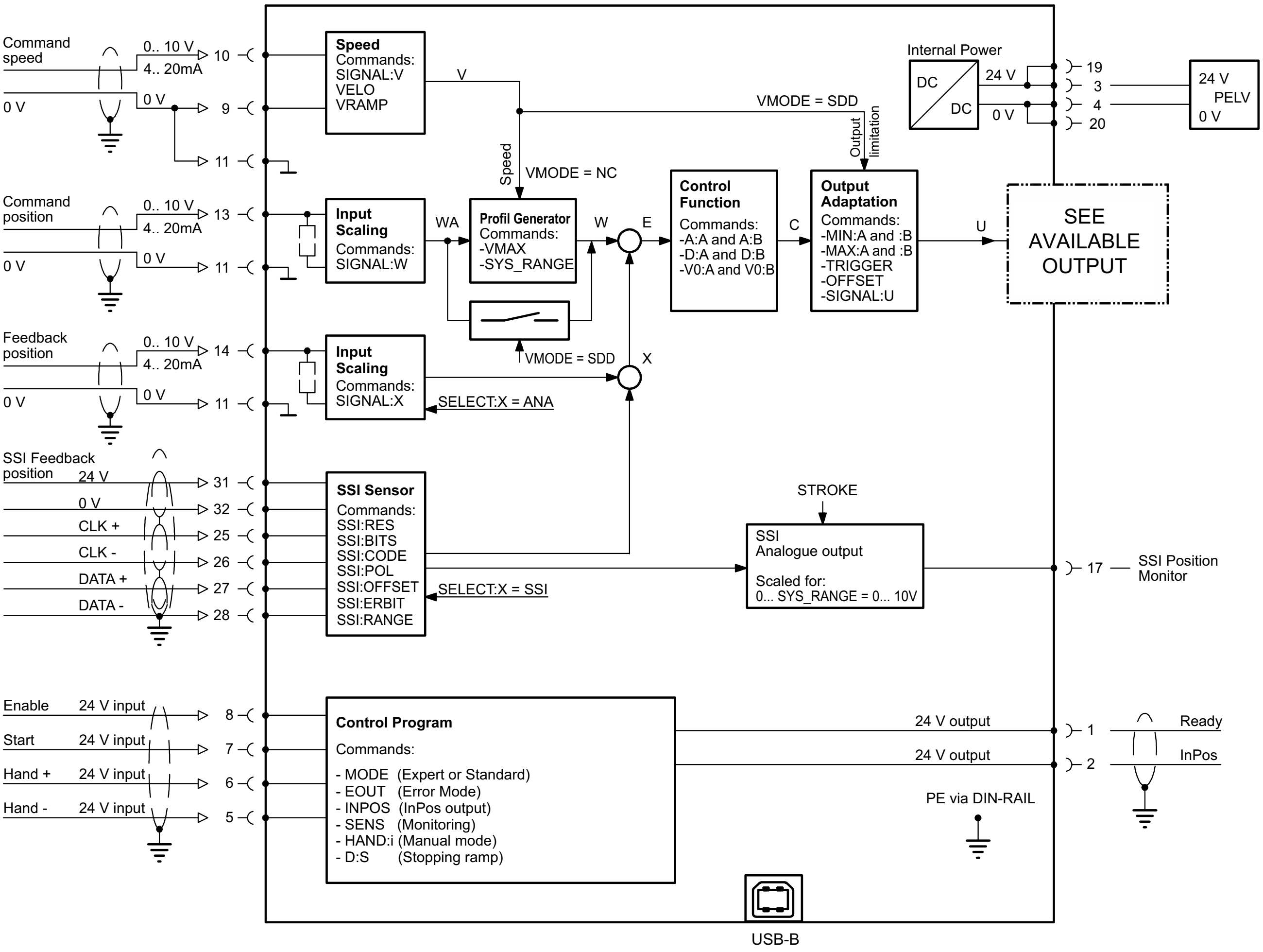
If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out at the power amplifier or at the positioning module.

If the deadband compensation value (MIN) is set too high, it influences the minimal velocity which cannot be adjusted any longer.

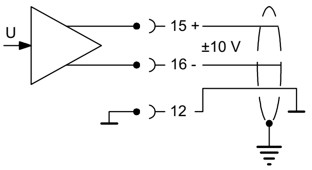
In extreme cases this causes to an oscillating around the closed loop controlled position.



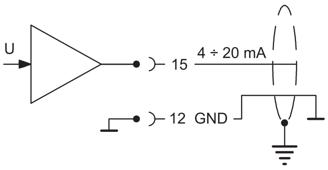
8 - STANDARD CARD BLOCK DIAGRAM



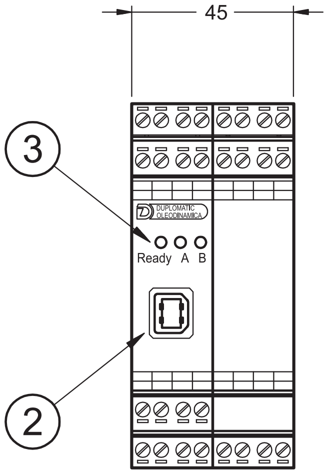
voltage

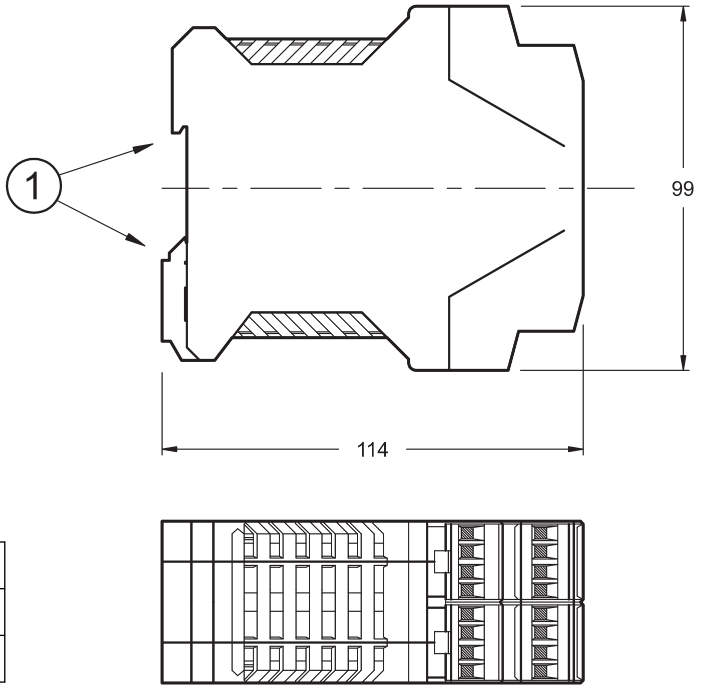


current



9 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	USB interface, for setup
3	LEDs for output signals

DUPLOMATIC OLEODINAMICA
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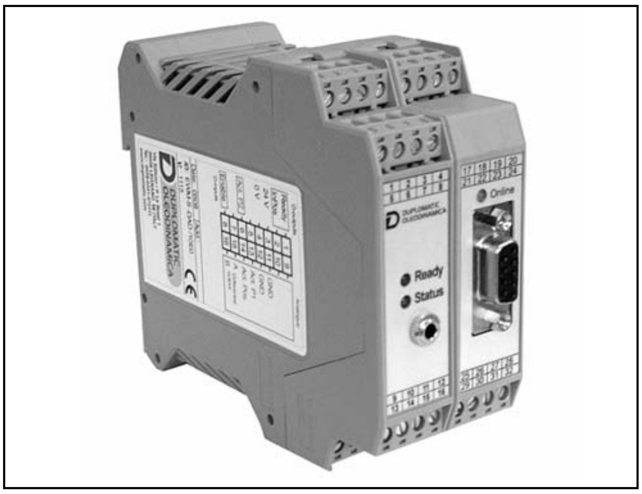
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com



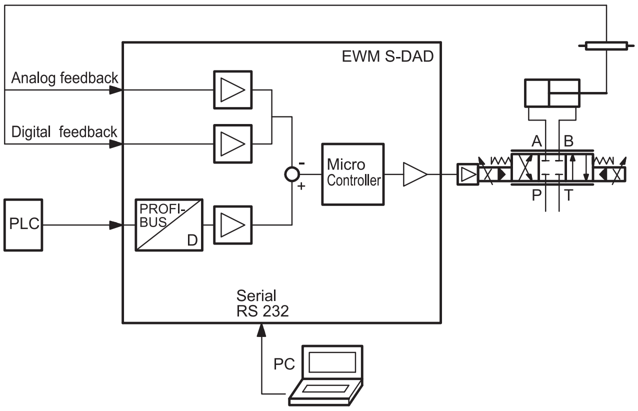
EWM-S-DAD

CARD FOR POSITIONING AND VELOCITY STROKE CONTROL WITH PROFIBUS COMMUNICATION INTERFACE

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



— This card has been developed to drive the positioning of the hydraulics actuators where an high accuracy is needed, using a digital sensor with SSI interface to measure the positions, or an analog sensor with an accuracy of up to 0,01%

— The card works as an axis controller and communicates with the PLC via the integrated Profibus interface.

— The card works in two ways: stroke depending deceleration or NC mode.

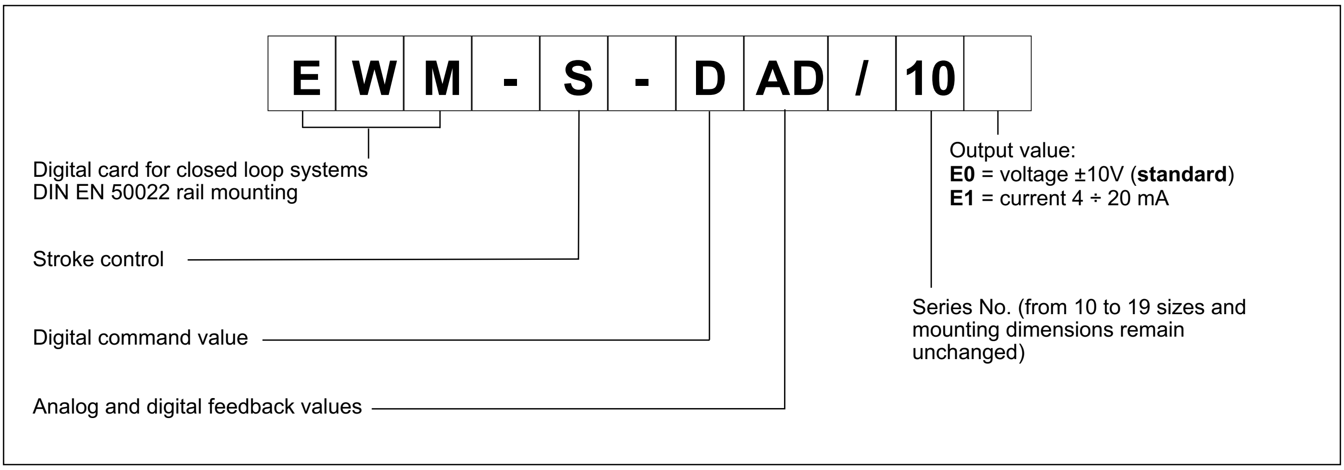
— The card allows an optimal use of overlapped and zero overlapped proportional valves.

— The card use the RS232C interface, and is settable via notebook, using the software kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	100+ sensor power consumption
Command value		via Profibus DP - ID number 1810h
Feedback value: - digital - analogue	SSI V mA	digital sensor with any interface SSI 0 ÷ 10 (R_I = 25 kΩ) 4 ÷ 20 (R_I = 250 Ω)
Position accuracy: - digital - analogue	%	± 2 bits of sensor resolution 0.01
Output value: - E0 version - E1 version	V mA	±10 (max load 5 mA) 4 ÷ 20 (max load 390 Ω)
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 46(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



The card EWM-S-DAD is an evolution of an analog model (EWM-S-AD). The customer can choose between two sensor types: analog or digital and the communication with the PLC is via Profibus DP.

With only a few parameters the controller can be optimized and the movement profile is preset via Profibus (position and velocity).

Sample time is 1 ms.

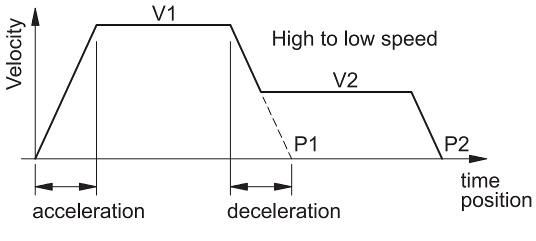
Here below an example of profile with a switch speed:

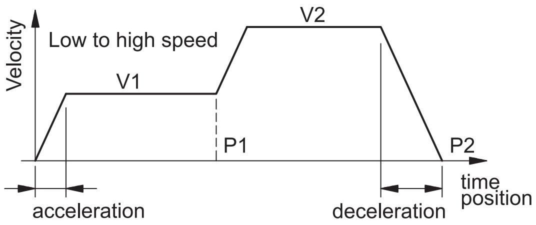
- the target position is command value 2 (P2) combined with velocity 2 (V2).
- the switch over position is command value 1 (P1), combined with velocity 1 (V1).

Switching over position from a high to a lower speed is calculated by the deceleration function and V2.

Switching over from a low to a high velocity is carried out at the position (P1) via the acceleration ramp; see below.

- If the positioning command value 2 (P2) is between the actual and the position command value 1 (P1), to position 2 (P2) can only be driven with speed 1 (V1).





2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes). It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

2.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input (ENABLE)

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V with current <50mA. See the block diagram at paragraph 8 for the electric connections.

2.4 - Command value

The card accepts the input via Profibus, ID number 1810h (see paragraph 4).

2.5 - Input feedback values

The card accepts analogue or digital feedback input. The digital sensor parameters are settable via software (see parameters table). with analogue feedback the signal must can be 0 ÷ 10 V (R_I = 25 kΩ) or 4 ÷ 20 mA (R_I = 250Ω) Analogue sensor max resolution is 0.001 mm.

2.6 - Output values

E0 version: output voltage 0 ±10 V (standard).
E1 version: output current 4 ÷ 20 mA with max load 390Ω.

2.7 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.
Low level <2V High Level > 10 V Max 50 mA with load 200Ω.

3 - LED FUNCTIONS

There are three leds on the card: one on the profibus module, that shows the online status of Profibus connection, and two on the other module:

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected (internal or 4… 20 mA).
Only if SENS = ON

YELLOW: Is the signal of the control error monitoring.

ON - No control error

4 - ADJUSTMENTS

On the EWM cards, the adjustment setting is possible only via software.

Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default settings, the measuring unit and an explanation of the commands and its uses. The parameters change depending on the card model.

EXAMPLE OF PARAMETERS TABLE

Command	Parameters	Defaults	Units	Group	Description
LG x	x= DE|GB	GB	-	STD	Changing language help texts.
MODE x	x=STD|EXP	STD	-	STD	Mode parameter.
TS x	x= 5..30	10	0,1 ms	EXP	Changing the controller sample time.
STROKE x	x= 10..10000	100	mm	STD	Working stroke or the sensor.
VS x	x= EXT|INT	INT	-	STD	Switch over between internal and external velocity preset.
VELO x	x= 1..10000	10000	0,01%	STD	Here the max velocity can be limited internally. The limitation function corresponds to the external velocity preset if VS was parameterized with EXT
VRAMP x	x= 10..5000	200	ms	VS=EXT	Ramp time for velocity input.
VMODE x	x= SDD|NC	SDD	-	EXP	Control structure for positioning process. SDD: stroke-dependent deceleration is activated. From the set deceleration point the drive then switches to control mode and moves accurately to the desired position. NC: In this mode a position profile is generated internally. The system always works under control and uses the following error to follow the position profile.
VMAX x	x= 1..3000	50	mm/s	VMODE=NC	Max velocity in NC mode.
EOUT x	x= -10000..10000	0	0,01%	EXP	When an input error occurs the adjusted value of 'EOUT' will be displayed at the output pin 15/16. A value less than 100 deactivates this function.
POL x	x= -|+	+	-	STD	For changing the output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
SENS x	x= ON|OFF|AUTO	AUTO	-	STD	Activation of the sensor and internal failure monitoring.
AIN:W **AIN:X**	A= -10000..10000 B= -10000..10000 C= -500..10000 X= V|C	A: 1000 B: 1000 C: 0 X: V	-	STD	Analogue output selection. **W** and **X** for the inputs and **V** = voltage, **C** = current. With the parameters **a**, **b** and **c** the inputs can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (**x** = **C**) the corresponding input will be switched over to current automatically.
A:A x **A:B x**	x= 1..5000 x= 1..5000	100 100	ms ms	STD	Acceleration time depending on direction. **A** indicates analogue output 15 and **B** indicates analogue output 16. Normally **A** = flow P-A, B-T and **B** = flow P-B, A-T.
D:A x **D:B x** **D:S x**	x= 1..10000 x= 1..10000 x= 1..10000	25 25 10	mm mm mm	VMODE=SDD	Deceleration stroke dependent from direction. The loop gain is calculated by the deceleration stroke. The shorter the higher. In case of instabilities longer deceleration stroke should be set Loop Gain = STROKE / D:A o STROKE / D:B.
V0:A x **V0:B x**	x= 1..200 x= 1..200	10 10	1/s 1/s	VMODE=NC	Loop Gain for NC mode: D:A = VMAX / V0:A e D:B = VMAX / V0:B Loop Gain = STROKE / D:A o STROKE / D:B.
CTRL x	x= lin|sqrt1|sqrt2	sqrt1	-	STD	Selection of the control function: (see **NOTE**) **lin** = standard linear P-control, **sqrt1** = progressive time optimized deceleration curve. **sqrt2** = sqrt1 with a higher gain in position.
HAND:A x **HAND:B x**	x= -10000..10000 x= -10000..10000	3330 -3330	0,01% 0,01%	STD	Hand speed (in manual mode) For the corresponding switch input the direction can be defined by the sign.
MIN:A x **MIN:B x**	x= 0..6000 x= 0..6000	0 0	0,01% 0,01%	STD	Zero point setting /following error compensation.
MAX:A x **MAX:B x**	x= 3000..10000 x= 3000..10000	10000 10000	0,01% 0,01%	STD	Maximum output signal limitation.
TRIGGER x	x= 0..4000	200	0,01%	STD	Trigger threshold for activating the following error compensation (MIN).
OFFSET x	x= -4000..4000	0	0,01%	STD	Offset value added to the output signal. (setpoint - actual value + offset).
INPOS x	x= 2..200000	200	µm	STD	Range for InPos signal. (See **NOTE**)

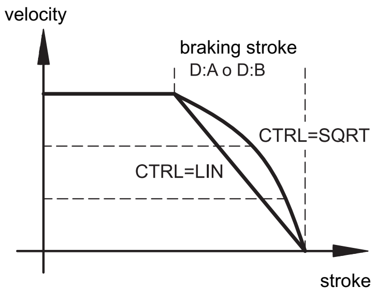
INPX x	x= ANA|SSI	ANA	-	STD	Sensor input changeover.
SSI:OFFSET x	x= -1000000… 1000000	0	µm	INPX=SSI	Position Offset.
SSI:POL x	x= +|-	+	-	INPX=SSI	Sensor polarity. To reverse the sensor working direction its polarity can be changed with this command.
SSI:RES x	x= 100… 10000	500	10 nm	INPX=SSI	Resolution of the sensor. The highest resolution (1000) corresponds to 1 µm. This sensor resolution is always used for the input data via Profibus and is needed for the internal calculations. (see **NOTE**)
SSI:BITS x	x= 8… 31	24	bits	INPX=SSI	Number of bits transmitted.
SSI:CODE x	x= GREY|BIN	GREY	-	INPX=SSI	Transmission coding.

NOTE about the CTRL command:: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
  SQRT1: with small control error. Control gain corresponds to 30000 / d:i ;
  SQRT2: control gain corresponds to 50000 / d:i



NOTE about the INPOS command: The INPOS command defines the window in relation to the stroke where the INPOS message is indicated. The monitored area is derived from the setpoint value minus the half “Inpos” value until setpoint value plus the half “Inpos” value. The positioning process is not influenced by this message. The controller remains active. In NC-mode this message has to be interpreted alternatively as following error.

NOTE about the SSIRES command: the standard of measurement is defined as increment/mm (inkr/mm). The maximum available resolution is equal to 1 µm that corresponds to a value 1000.

Example: A sensor with resolution 5µm has a resolution (0.005 mm) 5 times lower than the maximum set.
The SSIRES value is calculated as follows: *1000* (full scale ink) */ n* (sensor resolution in µm) = *1000 / 5 = 200*

5 - PROFIBUS COMMUNICATION

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate. The functionality is defined in IEC 61158. The Profibus address can be programmed with the EWMPC/10 software or online via the Profibus. A diagnostic LED indicates the online status.

5.1 - Data Sent

The card is set as follows:

Byte	Function	Comment
0	control word Hi	
1	control word Lo	actual not used
2	command position 1 Hi	
3	command position 1	
4	command position 1	
5	command position 1 Lo	
6	velocity 1 Hi	
7	velocity 1 Lo	
8	command position 2 Hi	active, if a second velocity is programmed (Bytes 13 and 14)
9	command position 2	
10	command position 2	
11	command position 2 Lo	
12	velocity 2 Hi	
13	velocity 2 Lo	
14	-	reserved
15	-	reserved

5.1.2 - Control words

The control words contain the following informations:

ENABLE:	Must be activated in addition to the hardware signal.
START:	In case of increasing edge the current command position is taken over, in case of deactivated START the system about a brake ramp is stopped.
HAND-:	Hand mode (START = OFF), driving with the velocity programmed with the HAND:B parameter according to the hydraulic symbol of the valve. After deactivation the actual value is taken over as command position.
HAND+:	Hand mode (START = OFF), driving with the velocity programmed with the HAND:A parameter according to the hydraulic symbol of the valve. After deactivation the actual value is taken over as command position.

Byte 0 - control word Hi		
bit	**Function**	
0		
1		
2		
3		
4	Hand-	1 = active
5	Hand+	1 = active
6	Start	1 = active
7	Enable (with hardware enable)	

The ENABLE bit is combined with the external enable input; that means that both signals must exist, in order to enable the axes..

5.1.3 - Position setpoint description

Command position: according to the sensor resolution.

Byte 2 to 5 - command position 1		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 5
from 8 to 15	Command position	Byte 4
from 16 to 23	Command position	Byte 3
from 24 to 31	Command position Hi byte	Byte 2

Byte 8 to 11 - command position 2		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 11
from 8 to 15	Command position	Byte 10
from 16 to 23	Command position	Byte 9
from 24 to 31	Command position Hi byte	Byte 8

Example of calculation of position control for SSI sensor resolution = 5 µm and 100% stroke = 300 mm.

Position setpoint = 150 mm (= 50% stroke)

STROKE • SSIRES = 100% stroke (dec)

300 • 200 = 60.000 (dec) → EA60 (hex)
50% di 60.000 = 30.000 (dec) → 7530 (hex)

Example of calculation of position control for ANA sensor with 100% stroke = 300 mm. With analog sensors SSIRES value is preset and unchangeable.

Position setpoint = 150 mm (= 50% stroke)

STROKE • SSIRES = 100% stroke (dec)

300 • 1000 = 300.000 (dec) → 493E0 (hex)
50% di 300.000 = 150.000 (dec) → 249F0 (hex)

Position setpoint to be sent
with decimal value 150,000 :

hex **00 02 49 F0**

Byte 5
Byte 2
Byte 4
Byte 3

10.1.4 - Speed setpoint description

Command velocity: 0x3fff corresponds to 100 %.

Byte 6 and 7 - command velocity 1		
bit	**Function** max value 0x3FFF	
from 0 to 7	velocity Lo byte	Byte 7
from 8 to 15	velocity Hi byte	Byte 6

Byte 12 and 13 - command velocity 2		
bit	**Function** max value 0x3FFF	
from 0 to 7	velocity Lo byte	Byte 13
from 8 to 15	velocity Hi byte	Byte 12

5.2 - Updating data

The card send back to the bus-card a totally of 24 bytes of data.

Byte	Function		Comment
0	status word	Hi	
1	status word	Lo	not used
2	actual position	Hi	
3	actual position		
4	actual position		
5	actual position	Lo	
6	internal command position	Hi	
7	internal command position		
8	internal command position		
9	internal command position	Hi	
10	Control deviation	Hi	in resolution of the positioning sensor
11	Control deviation		
12	Control deviation		
13	Control deviation	Lo	
14			
15			

5.2.1 - Status word description

The status words are:

READY: System is ready.

INPOS: Depending on the mode set, can transmit a target reached information or, in NC mode, the following error control information.

Byte 1 - status word Hi		
bit	**Function**	
0		
1		
2		
3		
4		
5		
6	INPOS	1 = actual value in position window
7	READY	1 = ready to operate

5.2.2 - Positioning description

Bytes 2 to 5 - Actual position		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Actual position Lo-Byte	Byte 5
from 8 to 15	Actual position	Byte 4
from 16 to 23	Actual position	Byte 3
from 24 to 31	Actual position Hi-Byte	Byte 2

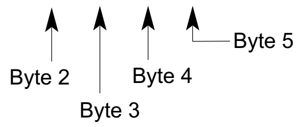
Current command position: is interpreted according to mode differently.

SDD mode : target command position
NC-mode : (VMODE = ON) calculated command position
of the generator.

Actual position: according to the sensor resolution.

The stroke of the cylinder is obtained by applying the following formula:
received data / SSIRES = stroke

hex **00 04 90 F3** = dec **299251**



so, with SSIRES = 1000
299251 / 1000 = 299,251 (millimetres)

Bytes 6 to 9 - Internal command position		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo-Byte	Byte 9
from 8 to 15	Command position	Byte 8
from 16 to 23	Command position	Byte 7
from 24 to 31	Command position Hi-Byte	Byte 6

Bytes 10 to 13 - Control deviation		
byte	**Function** defined by the sensor resolution	
from 0 to 7	Control deviation Lo-Byte	Byte 13
from 8 to 15	Control deviation	Byte 12
from 16 to 23	Control deviation	Byte 11
from 24 to 31	Control deviation Hi-Byte	Byte 10

6 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram. As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory. Also the Profibus cable must be screened.

Every Profibus segment must be provided with an active bus termination at the beginning and at the end. The termination is already integrated in all common Profibus plugs and can be activated by DIL switches.

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

7 - SOFTWARE KIT EWMPC/10 (code 3898401001)

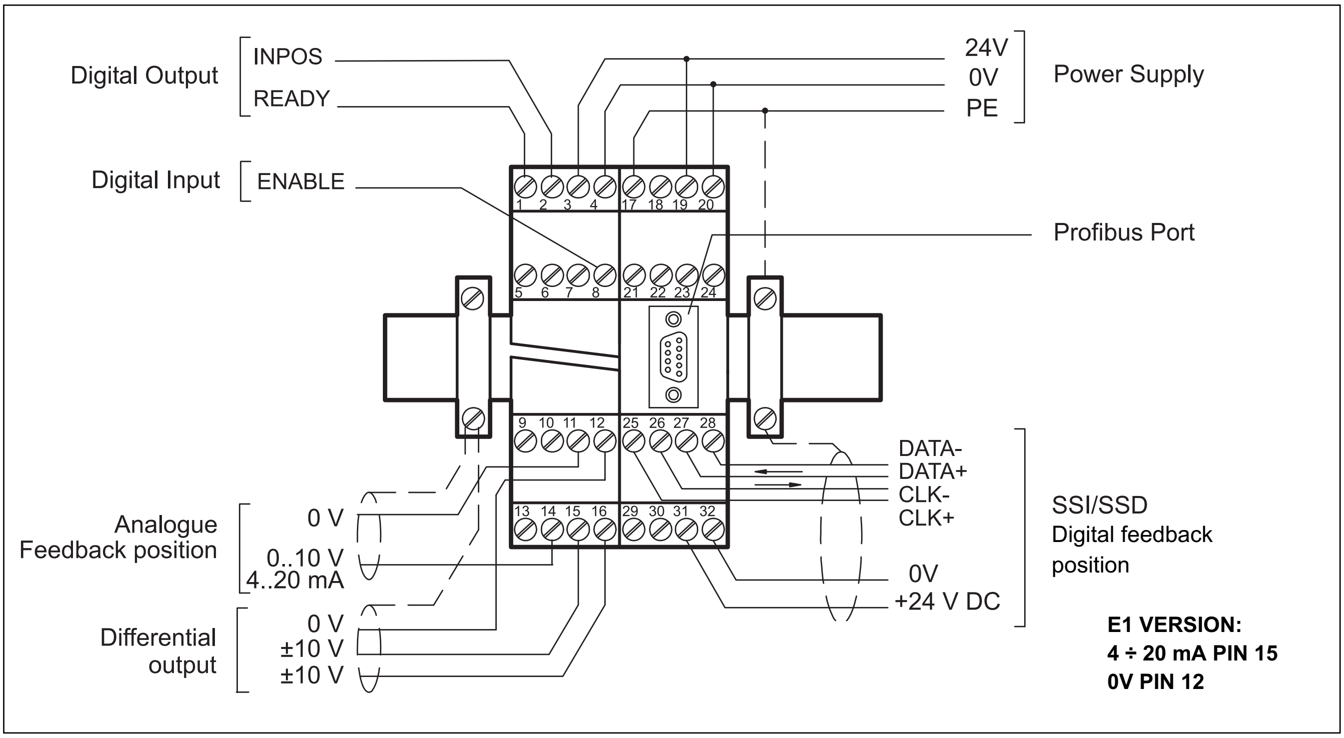
The software kit comprising a USB cable (1.8 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® and Windows7 operating systems.

8 - WIRING DIAGRAM



E1 VERSION:
4 ÷ 20 mA PIN 15
0V PIN 12

DIGITAL INPUT AND OUTPUT

PIN 1 READY output.
General operationality, ENABLE is active and there is no sensor error (by use of 4÷20 mA sensors). This output corresponds with the green LED.

PIN 2 INPOS output.
Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window.
The output is only active if START = ON.

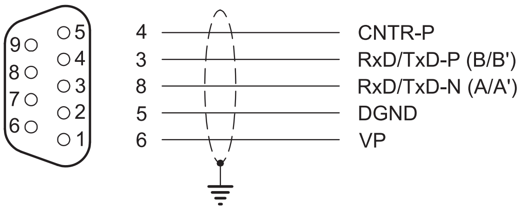
PIN 8 ENABLE input:
This digital input signal initializes the application.
The analogue output is active and the READY signal indicates that all components are working correctly.
Target position is set to actual position and the drive is closed loop controlled.

ANALOGUE INPUT AND OUTPUT

PIN 14 Analogue feedback value (XL),
range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

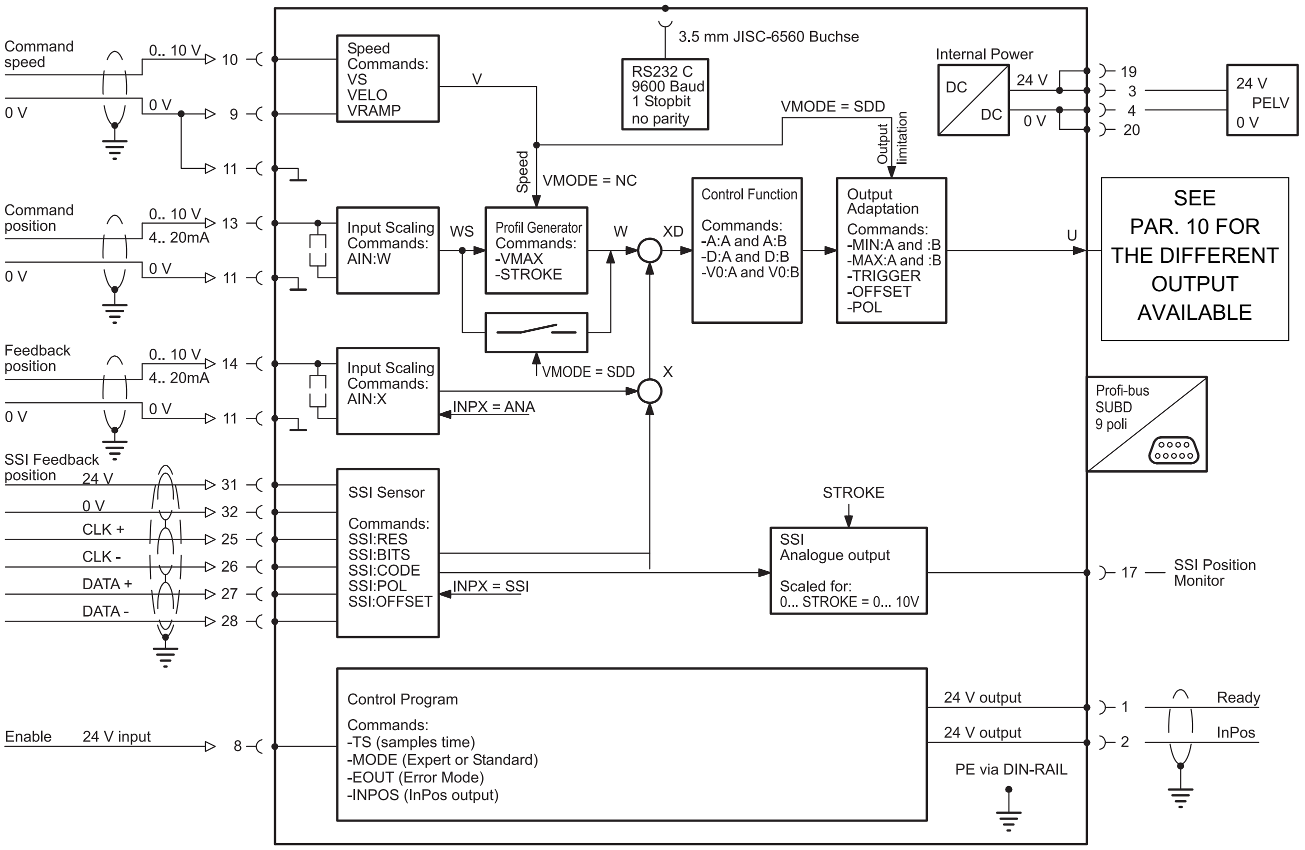
PIN 15/16 Differential output (U)
±100% corresponds to ± 10V differential voltage,
optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

PROFIBUS PORT WIRING AND LINKING CONFIGURATION



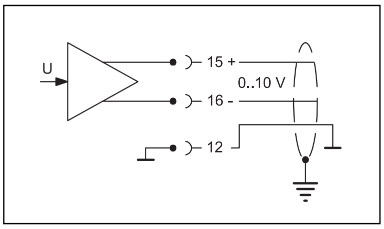
pin	Signal name	Function
1-2-7-9	not used	-
3	RxD/TxD-P (B-Line)	Receive/Send P data
4	CNTR-P/RTS	Request to Send
5	DGND	Data ground
6	VP	+5 V DC for external bus termination
8	RxD/TxD-N (A-Line)	Receive/Send N data

9 - CARD BLOCK DIAGRAM

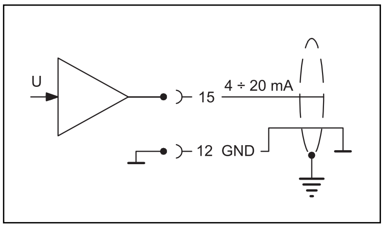


10 - OUTPUT SIGNALS AVAILABLE FOT DIFFERENT VERSIONS

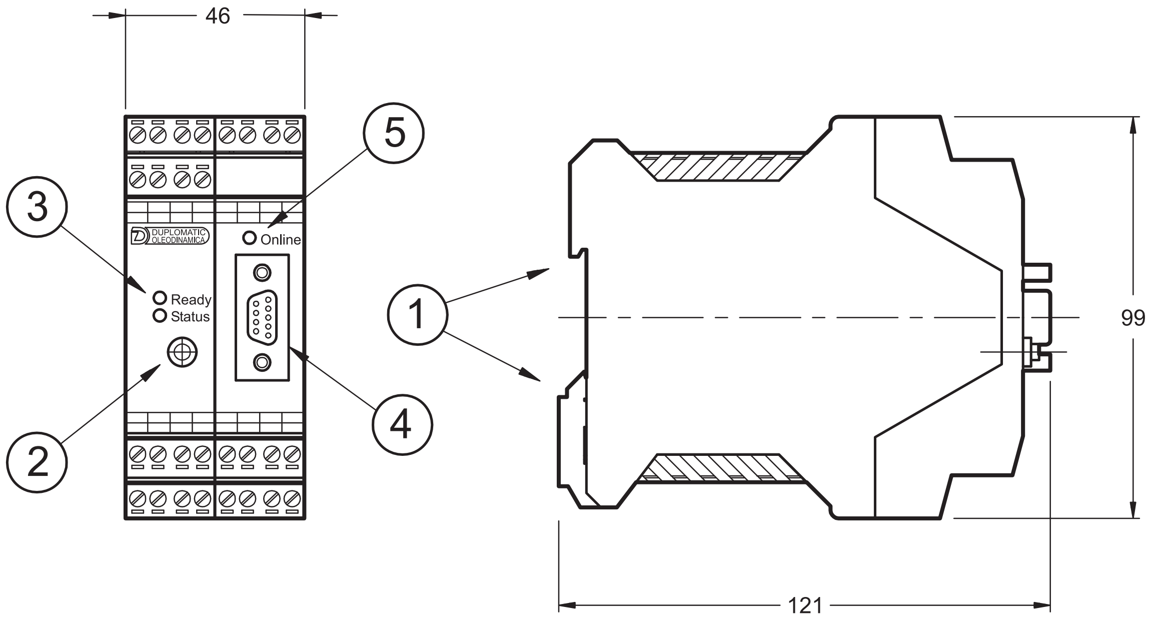
E0 VERSION



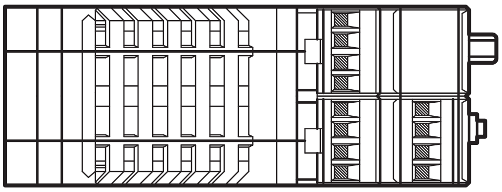
E1 VERSION



10 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for Output signals
4	Profibus Interface port
5	Profibus LED



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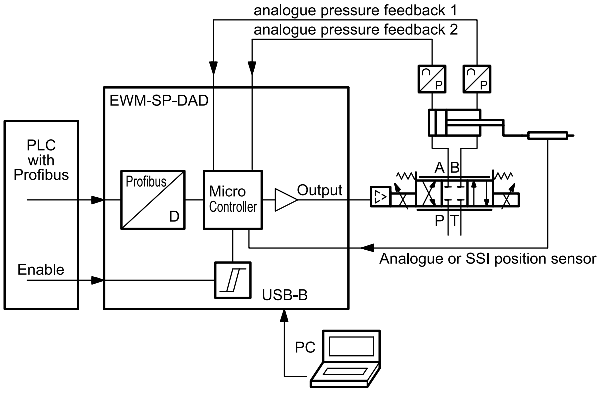
EWM-SP-DAD

CARD FOR AXIS CONTROL WITH PRESSURE LIMITATION IN CLOSED LOOP. PROFIBUS INTERFACE

SERIES 20

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



— This card has been developed for positioning control with integrated closed loop pressure where an high accuracy is needed, using a digital sensor for positioning, and analogue sensors for pressure sensing.

— The card is an axis controller with two positioning control mode, SDD and NC. It communicates with the PLC via the integrated Profibus interface.

— An integrated control for pressure limitation for one or two sensors (differential pressure), completes the card.

— The output value, voltage or current type, has to be configured via software.

— Card setup is via software only, through an USB-B port

TECHNICAL CHARACTERISTICS

Power supply	V DC	24 ÷ 30 ripple included
Fuse, external	A	1A medium time lag
Current consumption	mA	<350 (technical data of the sensors have to be considered)
Command position		via Profibus DP
Profibus DP data rate	kbit/s	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, 12000 - ID number 1810h
Max position accuracy	µm	1
Position feedback values	SSI V mA	digital sensor with any interface SSI - 150 kbit/s 4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Pressure feedback values	V mA	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Output value	V mA	differential, ±10 (max load 10 mA) 4 ÷ 20 (max load 390 Ω)
Interface		USB - B 2.0 / Profibus
Electromagnetic compatibility (EMC) 2004/108/EC		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 46(w)
Connections		USB-B (2.0) - 7x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	SP	-	D	AD	/	20	E

- EWM: Digital card for closed loop systems DIN EN 50022 rail mounting
- SP: Stroke and pressure control
- D: Digital command value
- AD: Analog and digital feedback values
- 20: Series No. (from 20 to 29 sizes and mounting dimensions remain unchanged)
- E: Output value in voltage or current, to be configured via software.

2 - FEATURES OVERVIEW

Controller Functions

- Stroke or stroke + pressure limitation control in closed loop system
- Fine positioning - 1μm resolution
- 2 method for positioning control:
  SDD – Stroke Depending Deceleration - time-optimal positioning structure with very high stability
  NC – Numerically Controlled - To follow the position profile
- Second position and second speed commands available for fast approach / test speed
- Data for lengths and pressures in mm and bar / % respectively
- Gain adjustment made via software
- PT1 filter to stabilize the control behaviour
- Emergency function (EOUT)
- Safe and error-free data transmission
- For digital position sensors
- Internal limitation of velocity for position sensors
- As an alternative, the card can be set via software for operate with analogue position sensors.
- Two analogue feedback for differential pressure measurement
- Two sets of PID and ramp parameters for pressure control
- Simple and intuitive scaling for analogue sensors

Adaptation of the valve characteristic curve

- CTRL function to adapt the braking characteristics to positive and zero overlapped proportional valves
- Advanced deadband compensation: non-linearity compensation by a double-gain characteristics
- Drift compensation

Monitoring functions

- In-position error
- Cable break, in-pressure error and fault of feedback sensors
- 2 Digital output to read the status

Other characteristics

- Output value in voltage or current, to be configured via software.
- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 24 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - Reference signals

The reference signals run via Profibus, ID number 1810h.

3.5 - Position feedback values

The card accepts a digital feedback input from a sensor with any SSI interface with RS422 specifications. Bit, code and resolution are settable via software.

The max sensor resolution is 0,001 mm.

Eventually an analog input could be used as feedback. The card accepts a 0÷10 V (Ri 25 kOhm) or 4 ÷ 20 mA (Ri = 240 Ohm).

The analogue resolution is of 0,003 incl. oversampling for a max res. of 1 μm.

⚠ Using analog sensors, the SSI parameters in the software assume default preset values that the user must not change.

3.6 - Pressure feedback values

Pressure feedback can be analogue only, 0÷10 V (Ri 25 kOhm) or 4 ÷ 20 mA (Ri = 240 Ohm).

3.7 - Analog output values

Output values can be in voltage or current, to be configured via software (parameter SIGNAL:U). The same parameter defines the polarity also.

Voltage: ± 10 V Differential output PIN 15 and 16

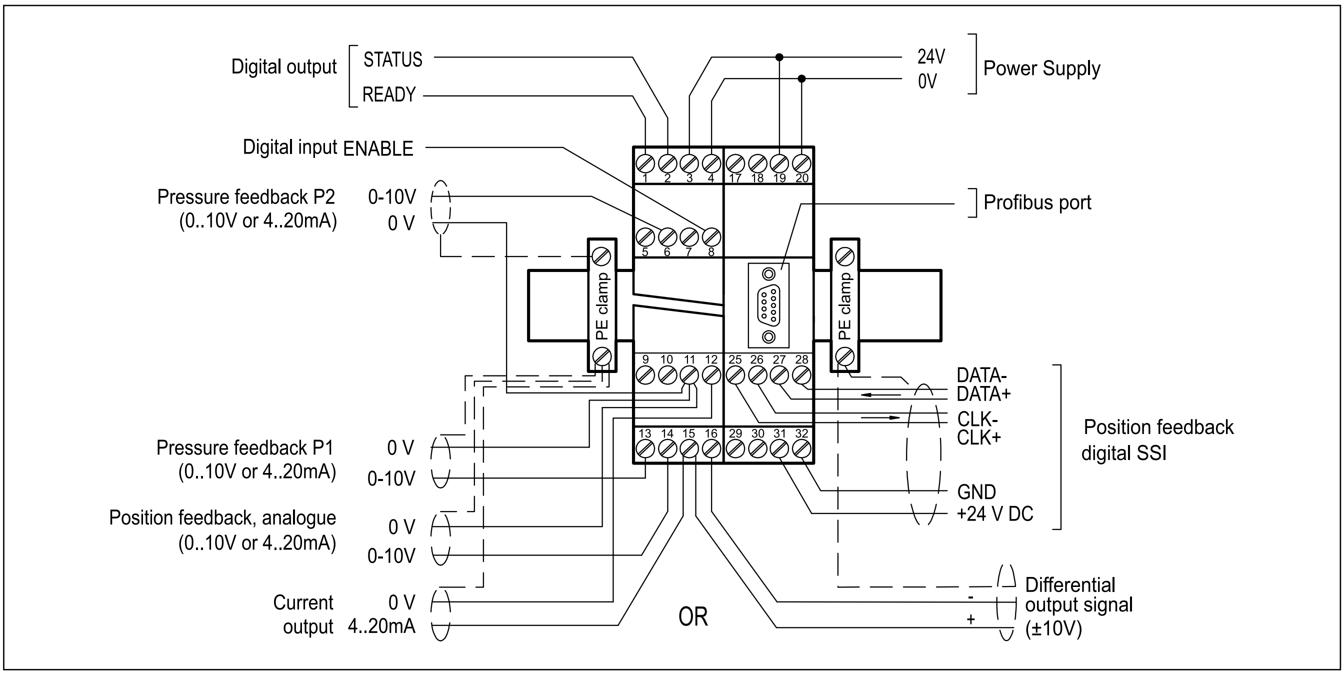
Current: 4 ÷ 20 mA (PIN 15 to PIN 12).

3.8 - Digital Output

Two digital output are available, STATUS and READY, that are displayed by LED on the front panel.

Low level < 2 V High Level > 12 V (50 mA).

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1	READY output. General operationality, ENABLE (PIN 8 and profibus bit) is active and there are no sensor errors. This output corresponds with the green led.
PIN 2	STATUS output. Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater than the adjusted window. The output is only active if START bit (Profibus) = ON.
PIN 8	ENABLE input: This digital input signal initializes the application. The controller and the READY signal are activated. The output signal to the control element is enabled. Target position is set to actual position and the drive stays stationary, in closed loop. The Enable bit via profibus must be active, too.

ANALOGUE INPUT

PIN 6	Analogue pressure feedback value (P2), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 13	Analogue pressure feedback value (P1), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 14	Analogue position feedback value , range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

ANALOGUE OUTPUT
voltage

PIN 16/15	Differential output (U) ± 100% corresponds to ± 10V differential voltage

current

PIN 12/15	±100% corresponds to 4 ÷ 20 mA

SSI SENSOR INTERFACE

PIN 25	CLK+ output
PIN 26	CLK- output
PIN 27	DATA+ input
PIN 28	DATA- input
PIN 31	24V Power supply of the SSI sensor
PIN 32	0V Power supply of the SSI sensor

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system can be controlled in open loop, moving up and down the servo-cylinder with commands HAND:x, via Profibus only, to facilitate the adjustment of the card and its calibration. With these functions the setting-up and the adjustments become easy.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7 and 8.

⚠ **WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.**

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at standard level, easier, or expert, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89440-115 ETM*.

7 - MAIN FEATURES

The EWM-SP-DAD is a card for positioning control loop (POS), that can operate also with a pressure limitation control (POS_PQ).

With only few parameters the controller can be optimized and the movement profile is preset via Profibus (position and velocity).

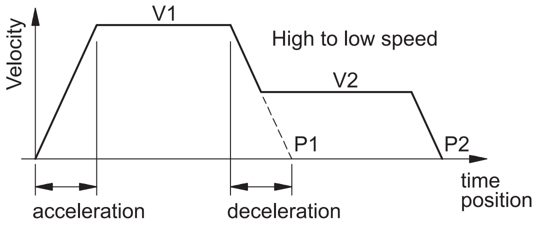
Here below an example of profile with a switch speed:

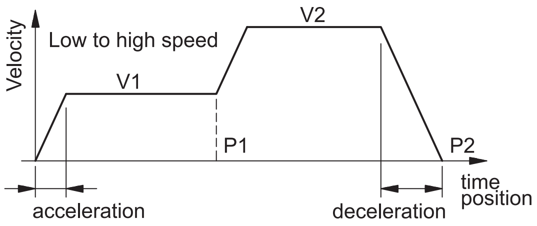
- the target position is command value 2 (P2) combined with velocity 2 (V2).
- the switch over position is command value 1 (P1), combined with velocity 1 (V1).

The switchpoint from high to low velocity is calculated depending on the speed V2 and the braking.

The switchpoint from low to high speed is made in the P1 position with the ramp acceleration, as shown below.

If the command position P2 is between the current position and the position value of P1, the positioning in P2 can only be driven with V1 velocity.





7.1 - Sequence of the positioning

You can switch from the positioning in closed loop to the manual movement in open loop and back via Profibus.

With READY active the system is ready. The open loop control is achieved by using the HAND bits and the speed parameter. When the bit HAND goes low the card assumes the current position as the request and the card is ready to work in closed loop.

With also START bit enabled, the command position parameter (profibus) become active and the new command position will be taken over as a new target.

The axis moves immediately to this new position and indicates on the Inpos Output when it reaches the position. This output is active as long as the axis is within the InPos window or the START bit is active.

Two methods for positioning are available:

SDD - stroke depending deceleration - means the control gain will be adjusted. This is a time-optimal positioning structure with very high stability.

NC mode - the position value is generated from the following error.

The actuator position is measured by a transducer and compared with a specified target position. The target position and speed are set by Profibus.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two clashing requirements (short positioning time and high accuracy) have to be considered in the system design.

7.2 - Pressure limitation control function:

The pressure limitation control requires a dynamic zero-overlapped control valve.

The pressure loop is managed according to the value of pressure measured just in one or in both the two chambers of the cylinder.

The control value for the pressure loop is set via profibus. If the pressure (or force) exceeds, the controller reduces the output signal to the valve (only in a negative scale) until it reaches the preset pressure value.

The switch from 'positioning mode' to 'pressure limitation' is handled automatically.

7.3 - Emergency Output (EOUT)

This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The function can be deactivate.

7.4 - Adaptation of the braking characteristic to the valve type (CTRL).

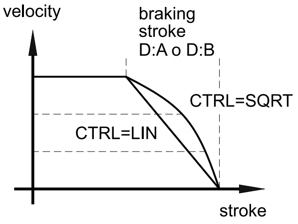
The deceleration characteristic is set with this parameter. In case of positively overlapped proportional valves the SQRT function should be used. The non-linear flow function of these valves is linearized by the SQRT function.

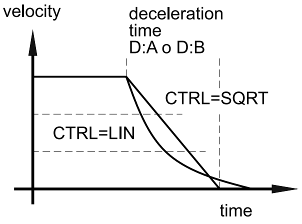
In case of zero lapped valves (control valves and servo valves) the LIN or SQRT1 function should be used regardless of the application. The progressive characteristic of the SQRT1 function has better positioning accuracy but can also lead to longer positioning times in individual cases.

LIN: Linear deceleration characteristic
(gain is increased by a factor of 1).

SQRT1: Root function for braking curve calculation.
The gain is increased by a factor of 3 (in the target position). This is the default setting.

SQRT2: Root function for braking curve calculation.
The gain is increased by a factor of 5 (in the target position). This setting should only be used with a significantly progressive flow through the valve.





characteristic (TRIGGER).

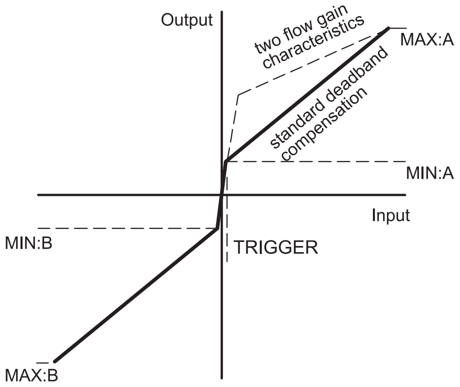
With TRIGGER command, the output signal is adapted to the valve characteristics.

The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

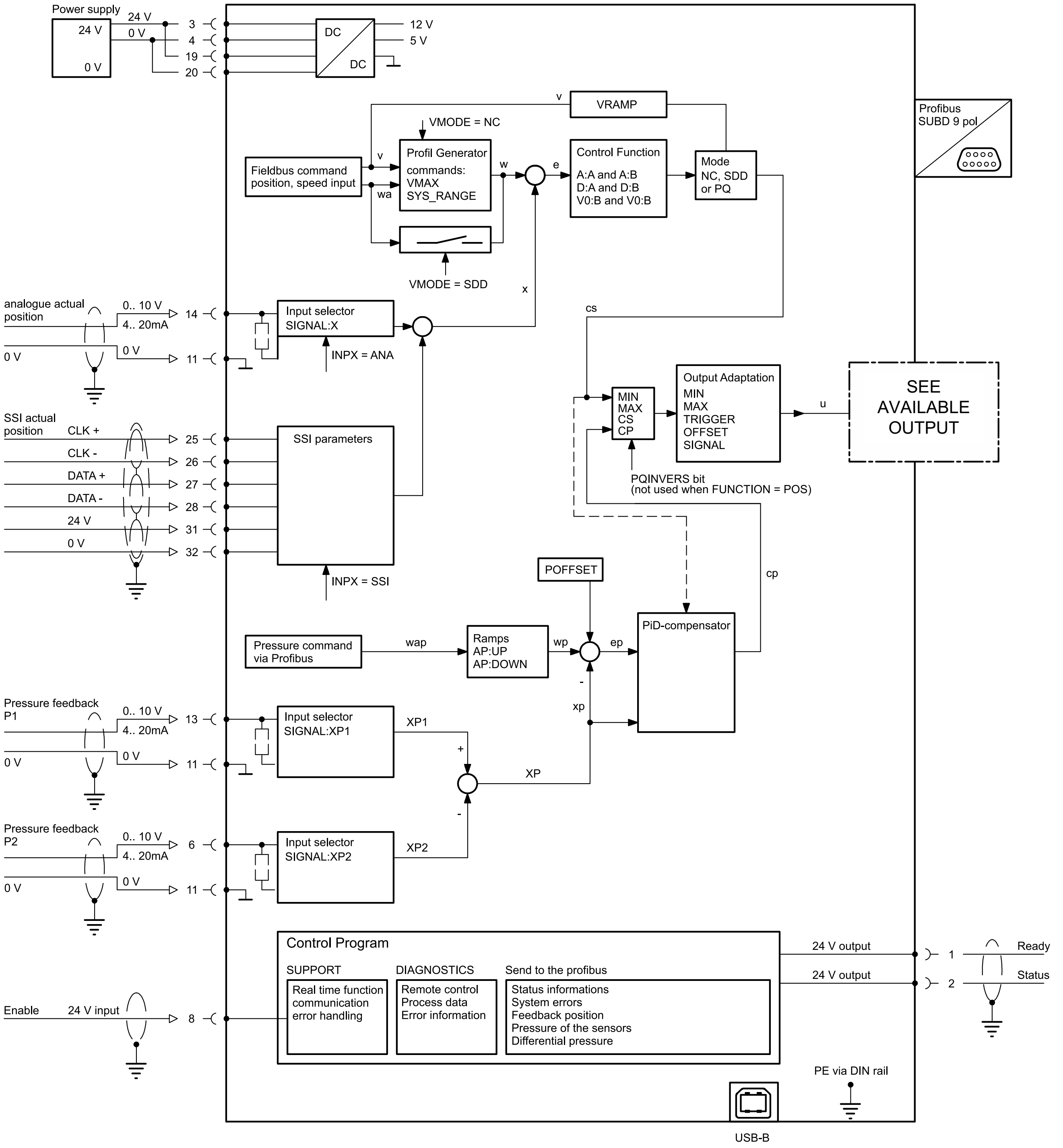
If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out either at the power amplifier or at the positioning module.

If the deadband compensation value (MIN) is set too high, it influences the minimal velocity which cannot be adjusted any longer.

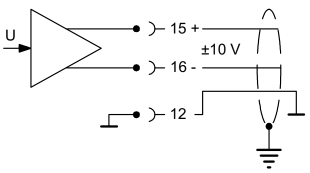
In extreme cases this causes to an oscillating around the closed loop controlled position.



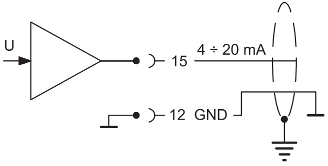
8 - CARD BLOCK DIAGRAM



voltage

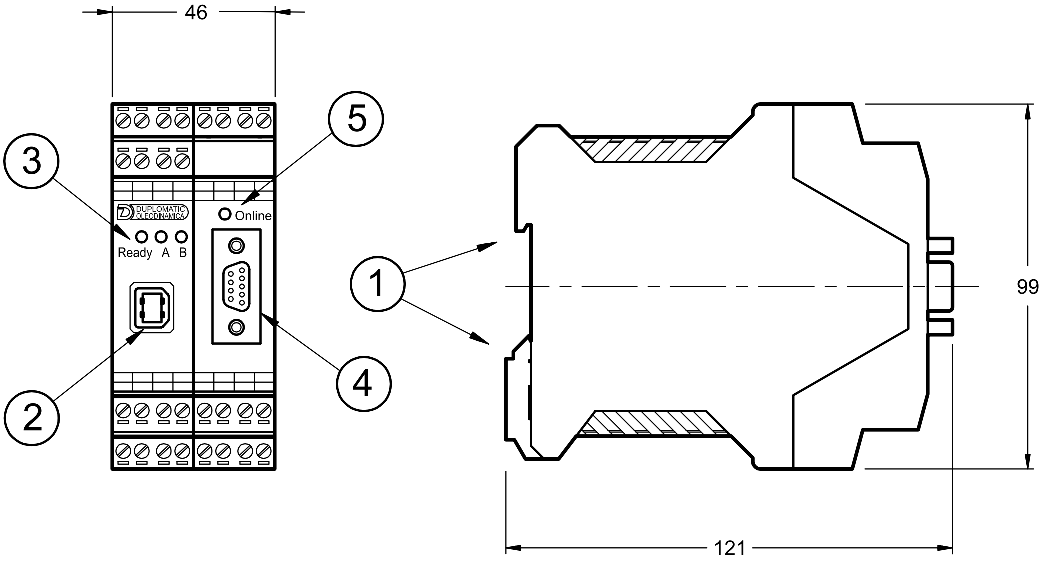


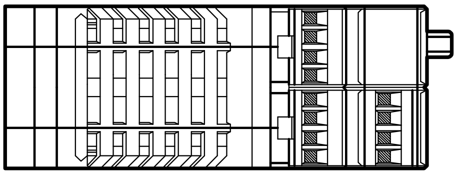
current



NOTE: If the card is configured as simple positioning control without pressure limitation then the output value is calculated just from the output of the position controller (CS) instead of apply MIN and MAX parameters. MIN/MAX are selected by the PQINVERS bit (Profibus).

9 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	USB port
3	LED for output signals
4	Profibus Interface port
5	Profibus LED

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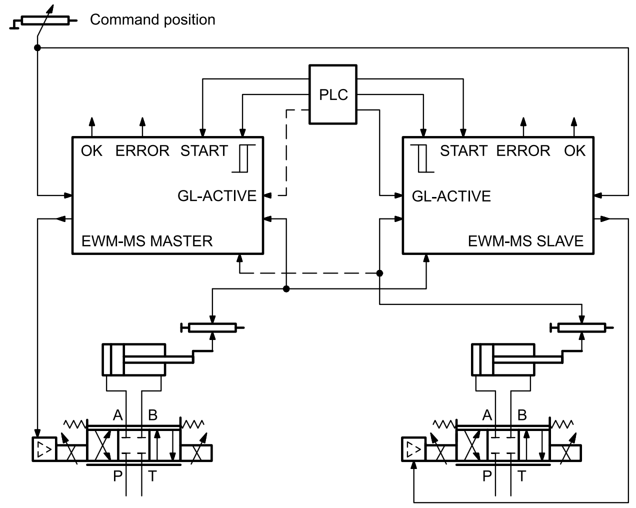
EWM-MS-AA

CARD FOR SYNCHRONIZATION CONTROL WITH ANALOGUE SIGNALS

SERIES 20

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



- — This card has been developed for an easy synchronization of two actuators (up to 6 axes in master-slave mode) with an overriding synchronization controller.
- — The card can drive only an axis; one card per axis is needed.
- — Proportional valves with integrated electronics can be driven by the differential output. A version with amplifier is also available.
- — Analogue feedback sensors (scalable via software)
- — Analogue position input. The axes speed can be limited by an external analogue speed input.
- — 2 control mode: SDD and NC
- — Card setup via software only, through an on-board USB-B port.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 1,0 A (3A for M2 version)
Current consumption: - E versions - M2 version	mA W	<100 60 depending on the solenoid
Command value	V mA	0 ÷ 10 (R_I = 25 kΩ) 4 ÷ 20 (R_I = 240 Ω)
Position input value resolution	%	0,003, 1um max
Speed input value	V mA	0 ÷ 10 (R = 90 kΩ) 4 ÷ 20 (R_I = 240 Ω)
Feedback value	V mA	0 ÷ 10 (R_I = 25 kΩ) 4 ÷ 20 (R_I = 240 Ω)
Output value: - E version, voltage - E version, current - M2 version	V mA A	±10 (max load 10 mA) 4 ÷ 20 (max load 390 Ω) 0,5 - 2,6 stepless
Interface		USB B type 2.0
Electromagnetic compatibility (EMC)		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w) (M2 version: w = 46)
Connector		4x4 (4x7 M2 version) poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	MS	-	A	A	/	20	

Digital card for closed loop systems
DIN EN 50022 rail mounting

Master and slave control

Analog command value

Analog feedback value

Output value:
E = Output value in voltage or current, to be configured via software.
M2 = embedded power amplifier

Series No.
(from 20 to 29 size and mounting dimensions remain unchanged)

NOTE: one card per axis is needed. To synchronize 2 axes, 2 cards are needed.

2 - FEATURES

Controller functions

- stroke control and syncronization of axes
- 2 different working mode for syncronization:
  - master-master (2 axis maximum)
  - master-slave (up to 6 axis)
- 2 method for positioning control:
  SDD – Stroke Depending Deceleration - time-optimal positioning structure with very high stability
  NC – Numerically Controlled - To follow the position profile
- Different gain parameters available via software for SDD and NC control modes
- PT1 filter to stabilize the control behaviour
- Command, feedaback and speed in mm and mm/s respectively
- Analogue feedback scalable via software
- Analogue command position scalable via software
- Speed limit managed by analogue input or internally
- Emergency function (EOUT)

Adaptation of the valve characteristic curve

- CTRL function to adapt the braking characteristics to positive and zero overlapped proportional valves
- Advanced deadband compensation: non-linearity compensation by a double-gain characteristics

Monitoring functions

- In-position error
- Cable break, in-position error and fault of feedback sensors
- Solenoids monitored for M2 version
- 2 Digital output to read the status

Other characteristics

- Output value in voltage or current, to be configured via software.
- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, freewheeling diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: in the M2 version the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoids to be controlled.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - External command position

The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.5 - External command speed

The card accepts an analogue input signal. The command speed can be 0 ÷ 10 V (RI = 90 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.6 - Feedback value

The card accepts analogue feedback input. The feedback value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.7 - Analogue output values

Output values can be in voltage or current, to be configured via software (parameter SIGNAL:U). The same parameter defines the polarity also.

E Voltage: ± 10 V Differential output (PIN 15 to PIN 16).

E Current: 4 ÷ 20 mA (PIN 15 to PIN 12).

M2: embedded power stage configurable via software. Value range 0,5 ÷ 2.6 A stepless.

All analogue output have to be wired with screened cables.

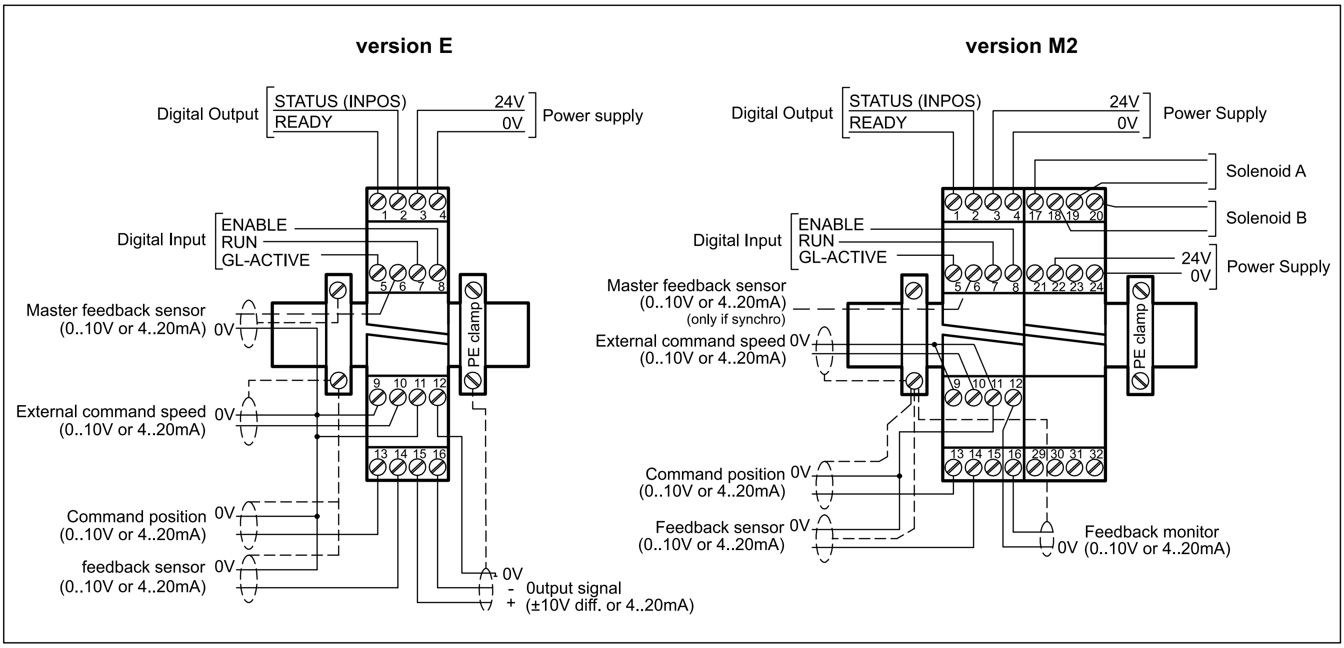
3.8 - Digital output

Two digital output are available, STATUS and READY, that are displayed via LEDs on the front panel.

Low level < 2 V High Level > 12 V (max 50 mA).

4 - WIRING DIAGRAMS

4.1 - Basic wiring



DIGITAL INPUT AND OUTPUT

PIN 1	READY output. General operationality, ENABLE is active and there is no sensor error (by use of 4 ÷ 20 mA sensors). This output corresponds with the green LED.
PIN 2	STATUS output. Monitoring of the control error (INPOS). Depending on the INPOS command, the status output will be deactivated, if the position difference is greater then the adjusted window. If SC-ACTIVE (pin 5) is on, this output is used to monitor the synchronization error. The output is only active if START = ON.
PIN 5	GL-ACTIVE: Synchronisation controller. If this input is not active, the module works as normal positioning controller.
PIN 7	START input: The positioning controller is active; the external analogue command position is taken over as command value. If the input is switched off during movement, the command position is set to the actual position plus a defined emergency deceleration stroke.
PIN 8	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

for M2 version only:

PIN 16	Feedback monitor (scaled) range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

ANALOGUE INPUT

PIN 6	Feedback value (K) of the master axis range 0÷100% corresponds to 0 ÷ 10V or 4 ÷20 mA
PIN 9/10	External command speed (V), range 0 ÷ 100 % corresponds to 0 ÷ 10 V
PIN 13	Command position (W), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 14	Feedback value (X), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

E version - ANALOGUE OUTPUT
voltage

PIN 16/15	Differential output (U) ± 100% corresponds to ± 10V differential voltage

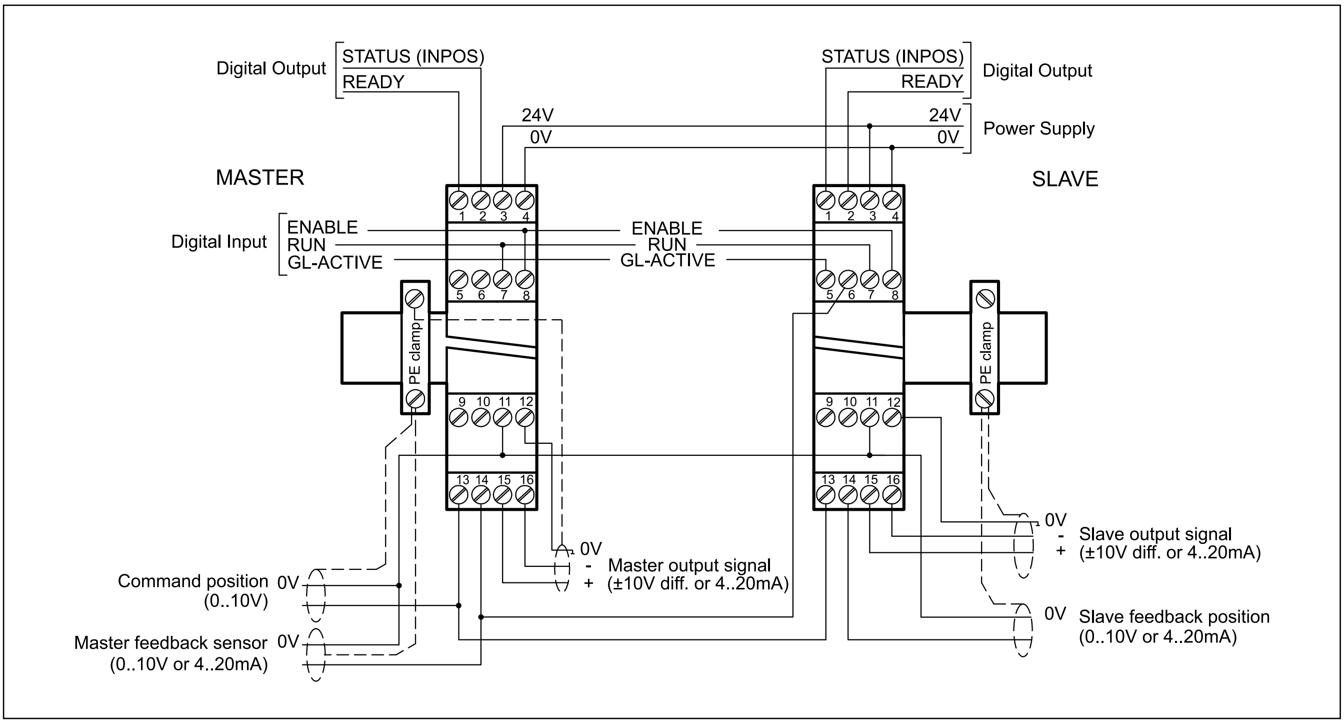
current

PIN 12/15	±100% corresponds to 4 ÷ 20 mA

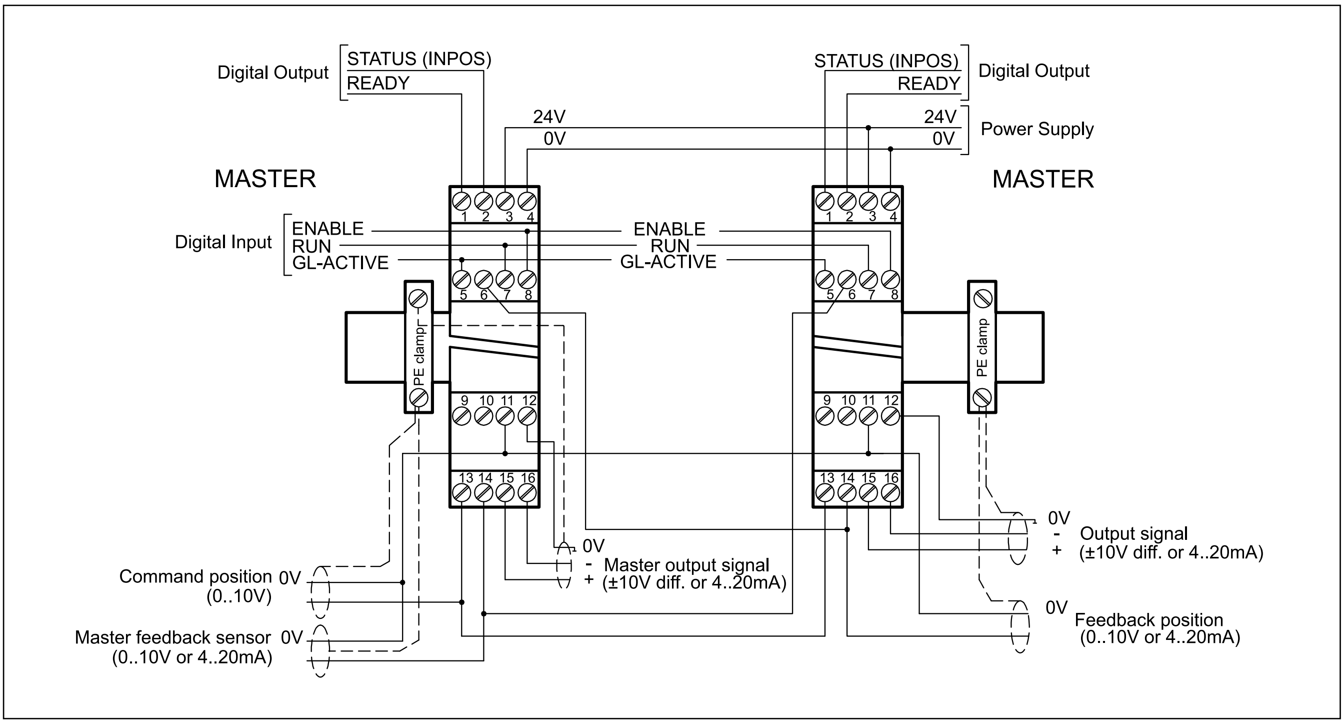
M2 version - ANALOGUE OUTPUT
current

PIN 17+19	Solenoid output A
PIN 18+20	Solenoid output B

4.2 - Wiring example for MASTER / SLAVE configuration, output value type E*, up to 6 axes



4.3 - Wiring example for MASTER / MASTER configuration, output value type E, 2 axes only.



5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

⚠ **WARNING! Plugs with free-wheeling diodes and LED indicators cannot be used with current controlled power outputs.**

They interfere with the current control and can destroy the output stage.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7, 8 and 10.

⚠ **WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.**

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at *standard* level, easier, or *expert*, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89450 ETM*.

7 - MAIN FEATURES

This module can be configured for:

- MASTER/MASTER positioning control for 2 axes (both GL input are active) where the positions information will be linked crosswise.
- MASTER/SLAVE positioning control, for up 6 axes, with selectable master function by deactivating of the GL input.
  If the synchronisation controller is active, it overrides the position control process. When the actual position of the master axis is given to the slave axis all slave axes will follow the master axis.
- INDEPENDENT POSITIONING by deactivation of both GL input and separate command positions at PIN 13.

The function of the STATUS output is - depending on GL input - in position signal or synchronisation error signal

For a reliable function of the synchronisation control the speed of the master axis should be limited to app. 70/80% of maximum speed. The slave axis must be able to increase the speed against the master axis to compensate position failures.

NOTE: If using positioning sensors with current input (4…20 mA) PIN 6 of the slave and with PIN 14 of the master have to be connected parallel. The right current input is set automatically.

If using more modules for synchronous axes, the others analog inputs (command, speed) if supplied in current must be managed with separate current signals for each module.

The card sample time is 1 ms.

7.1 - Sequence of the positioning

After the pre-parameterization and a successfully electrical verification of the control signals the system can switched on.
The positioning process will be controlled by switching the digital inputs.

After enabling (ENABLE input) the drive stays in the current position (i.e. the actual position is accepted as the required position). If the drive moves to an end position, the polarity is probably wrong.

The READY output indicates a general ready to operate.

The speed can be limited by means of the VELO parameter or the external speed demand (SIGNAL:V).

With the RUN signal the demand value of the analogue input is accepted and the axis moves to the predefined target position. STATUS output indicates if the axis is inside the “in position window”.

GL-ACTIVE input has to be activated when a synchronized control is requested.

If each axis can be started-up indiviually this input has to be activated after the optimisation of the axes.

The operating mode can be:

SDD - stroke depending deceleration - means the control gain will be adjusted. This is a time-optimal positioning structure with very high stability.

NC mode - the position value is generated from the following error.

The actuator position is measured by an analogue transducer and compared with a specified target position. The target position is adjusted with an external potentiometer or preset by an analogue input from an external controller (PLC). It’s possible to define the axis speed also by an external command speed.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two clashing requirements (short positioning time and high accuracy) have to be considered in the system design.

7.2 - Gain

The gain is settable and it’s related with the braking distance (parameters available via software). Lower is the braking distance, higher is the gain.

7.3 - Emergency Output (EOUT)

This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The function can be deactivate.

7.4 - Adaptation of the braking characteristic to the valve type (CTRL).

The command CTRL controls the braking characteristic curve of the hydraulic axis. The deceleration can be set with linear or nearly square root characteristic.

With positive overlapped proportional valves one of the SQRT characteristics should be used, because of the linearization of the non-linear flow curve typical of these valves; if zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application.

The progressive gain characteristic of SQRT1 has the better positioning accuracy.

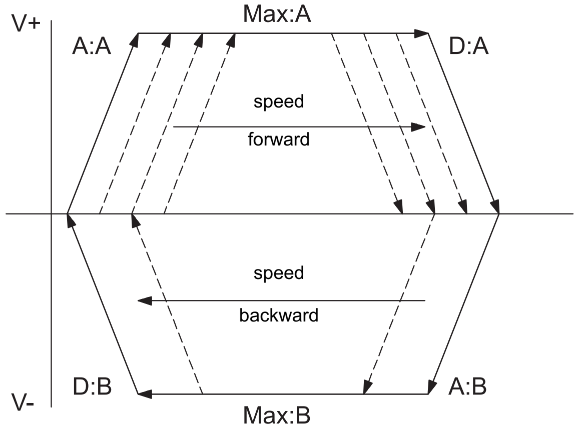
According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

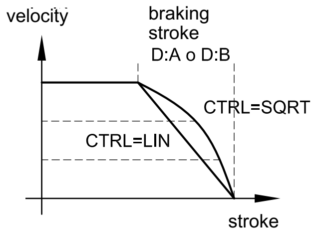
LIN: Linear characteristic (control gain corresponds to: 10000 / d:i).

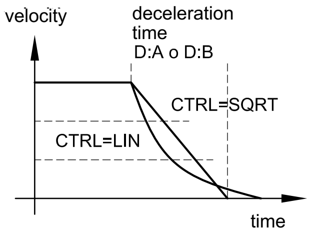
SQRT1: Root function with small control error. (corresponds to 30000 / d:i);

SQRT2: Root function with higher gain corresponds to 50000 / d:i

flow (volume) P→A and B→T







7.5 - Adaptation of the output signal to the valve characteristic (TRIGGER).

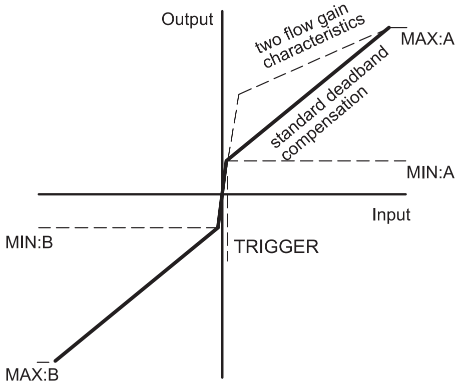
With TRIGGER command, the output signal is adapted to the valve characteristics.

The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out at the power amplifier or at the positioning module.

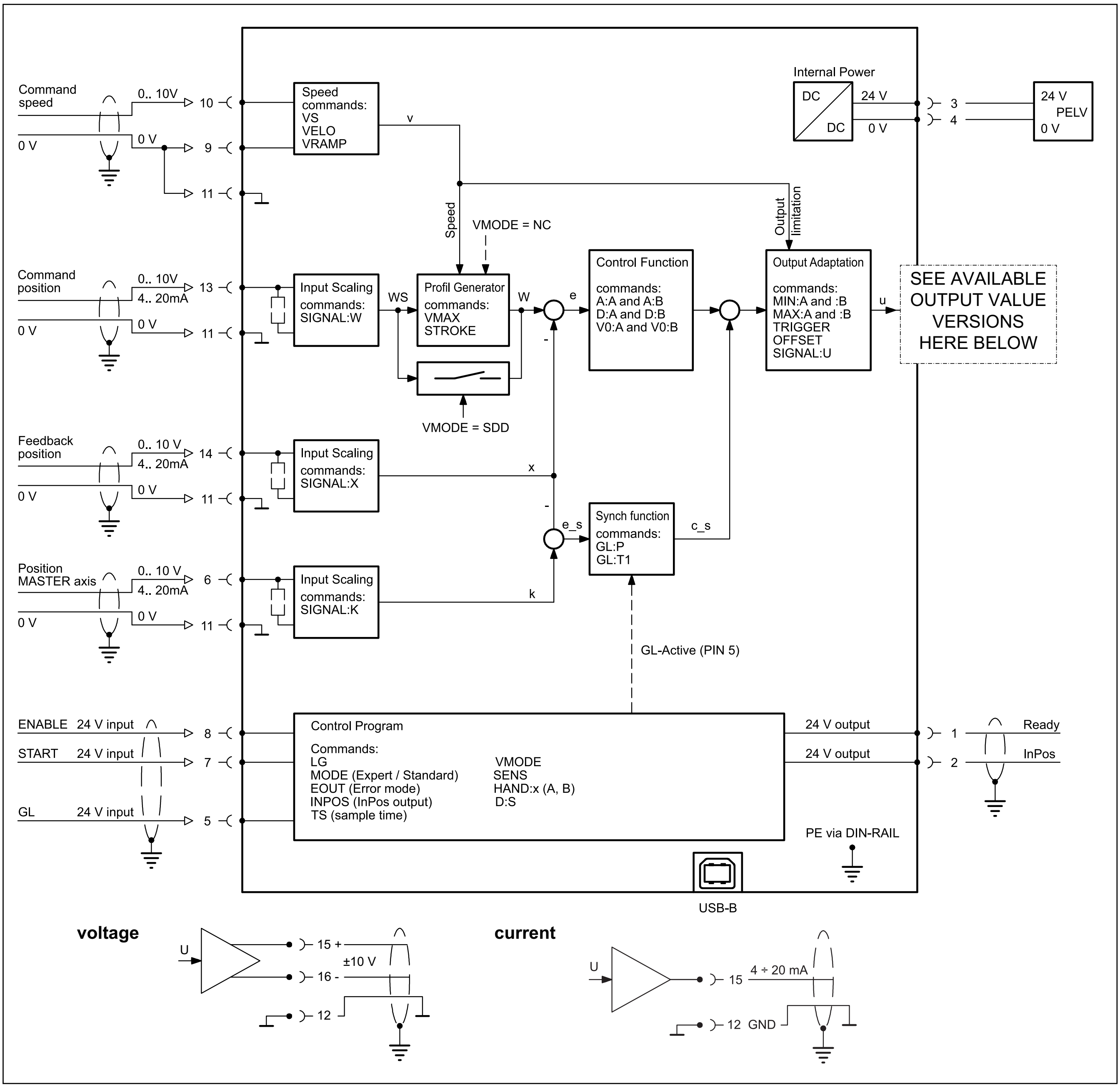
If the deadband compensation value is set too high, it influences the minimal velocity which cannot be adjusted any longer.

In extreme cases this causes to an oscillating around the closed loop controlled position.

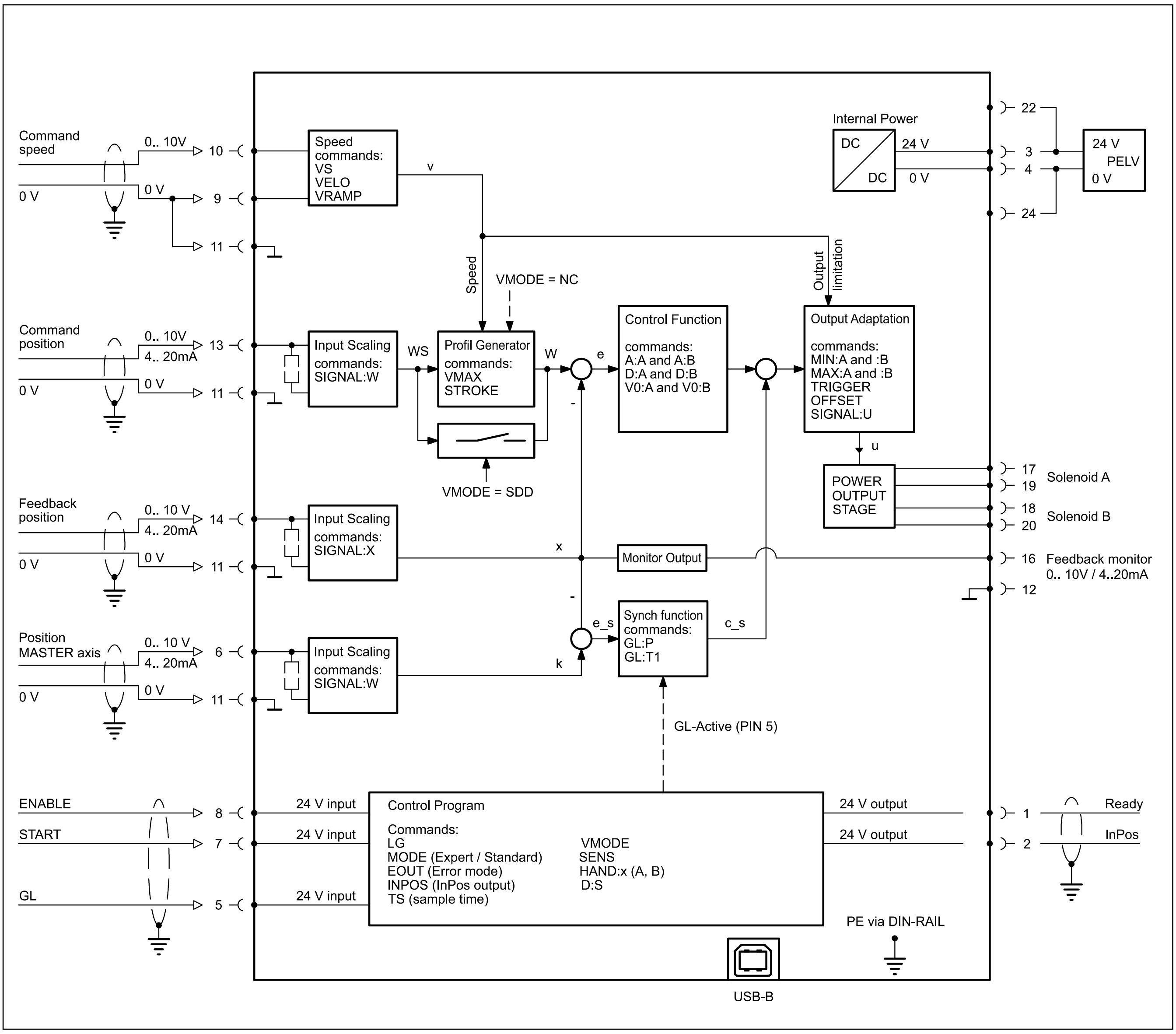


8 - CARD BLOCK DIAGRAMS

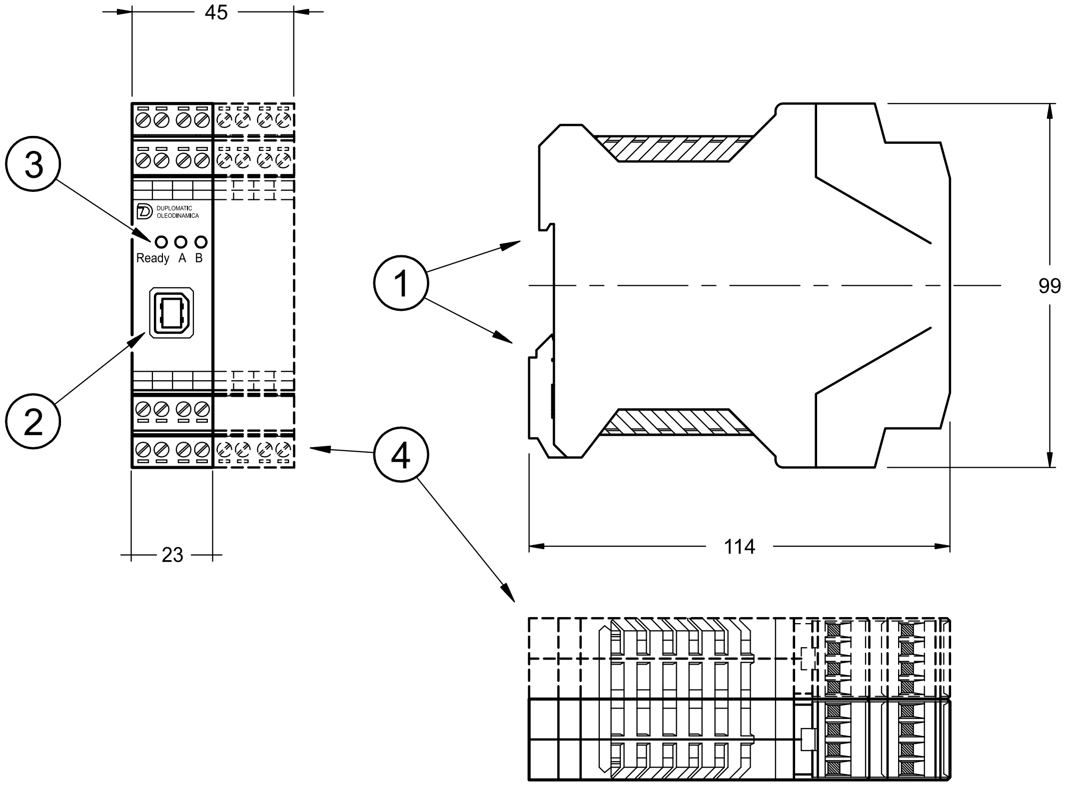
8.1 - 'E' version



8.2 - M2 version - with output stage



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN rail fastening EN 50022
2	USB interface, for setup
3	LED for output signals
4	Power stage module - present on M2 version only .

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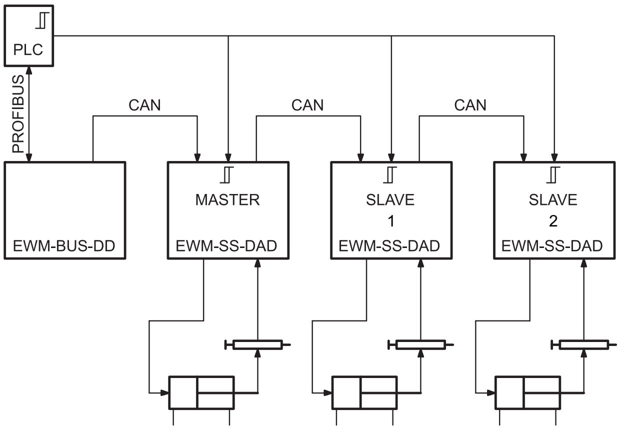
EWM-SS-DAD

AXIS SYNCHRONIZATION CONTROL FOR SYSTEMS FROM 2 TO 9 AXES WITH PROFIBUS/CAN COMMUNICATION INTERFACE

SERIES 11

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



— This system for the axis synchronization control consists of an interface PLC Profibus DP and axis control cards with interconnection via CanBus. The control consists of a bus adapter EWM-BUS-DAD per the system and one EWM-SS-DAD module for each axis to be controlled, to be ordered separately.

— The EWM-SS-DAD synchronizes the axes through a position sensor, digital SSI type (a high accuracy) or analogue type.

— The synchronization controller correct the speed of the slave axis. Positioning failures during the movement will increase or reduce the slave axis velocity, so the synchronization failure will be compensated.

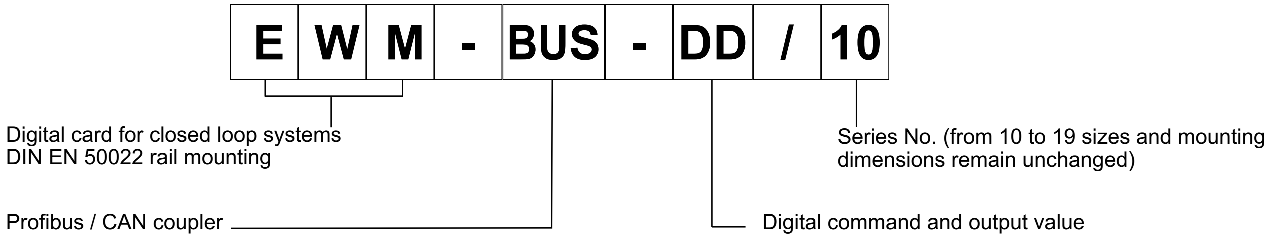
— The cards are, programmable only via software, with EWMPC software kit, and a laptop.

TECHNICAL CHARACTERISTICS

Power supply	V DC	24 ÷ 30 ripple included - external fuse 1,0 A
Current consumption	mA	< 350 + sensor power consumption
Command value		via Profibus DP - ID number 1810h
Speed input value		via Profibus DP - ID number 1810h
Feedback value	SSI V mA	digital sensor with SSI interface 0 ÷ 10 (R_I = 25 kΩ) 4 ÷ 20 (R_I = 250 Ω)
Output value - E0 version - E1 version	V mA	±10 differential (max load 5 mA) 4 ÷ 20 (max load 390 Ω)
Position accuracy		± 2 bits of digital sensor resolution
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-3:2005 Immunity EN 61000-6-2:2002
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions - EWM-SS-DAD - EWM-BUS-DD	mm	114 x 99(h) x 46(w) 120 x 99(h) x 23(w)
Connectors		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

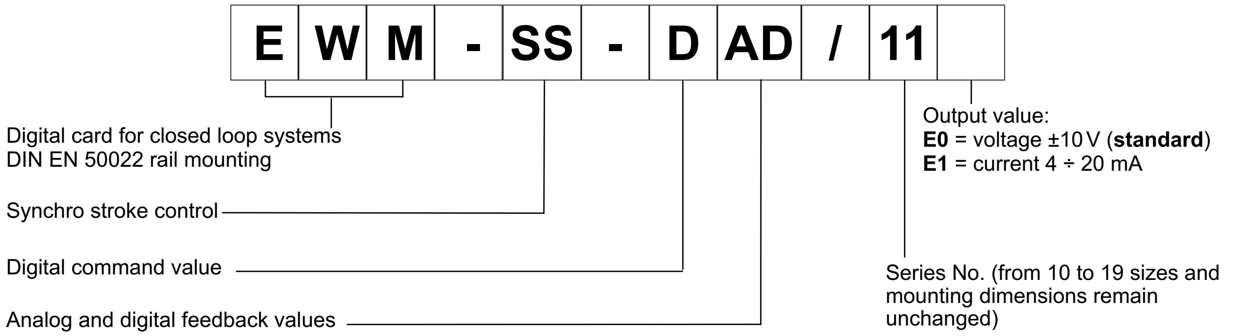
1 - IDENTIFICATION CODES

1.1 - Profibus / CAN coupler code



NOTE: The Bus handles the communication of the whole system. Just one coupler per system is needed.

1.2 - Code of the axis drive card



NOTE: One card per axis is needed.

This electronic module is developed for controlling of hydraulic drives in synchronization. The communication with the PLC is solved by a standard Profibus DP interface.

This system can synchronize up to 9 axes.

A typical repeatable positioning accuracy of > 0,01% with analogue sensors or up to 0,001 mm with digital SSI sensors can be achieved. Proportional valves with integrated electronics (typically with control valves) can be driven by the analogue differential output.

Internal profile generation (acceleration time, max. velocity and stroke depended deceleration) provides fast and excellent positioning. The drive works in open loop mode and is switched over in closed loop during deceleration. This is a time-optimal positioning structure with very high stability.

Even the Numeric Control mode can be used, for a speed controlled internal profile generation (VMODE = ON).

The synchronization control works as a second overriding velocity/position controller. Failure between the axes will be compensated by adjusting the speed of the slave axis.

The card sample time is 2 ms, up to 5 ms with 9 axes to drive.

2 - EWM-SS-DAD FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the existing EMC standards.

All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

2.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

2.3 - Digital Input (ENABLE)

The digital input must have a voltage from 12 to 24 V with current 50 mA; Low level: <2V, high level >10V.

Keep to the block diagram at paragraph 7 for the electric connections. Apply to PIN 8 the 24V to enable hardware.

2.4 - Reference signal

The reference signal is run through the card-bus and addressed to the individual modules via Profibus, ID number 1810h (see par. 7 / 8).

2.5 - Input feedback values

The card works both with digital (SSI) or analog (ANA) sensors.

SSI: parameters are settable via software (see SSI parameters in the table on next page).

ANA: The analogue signal must be voltage 0 ÷ 10V with RI = 25 kΩ or current 4 ÷ 20 mA, with RI = 250 Ω
The analogue resolution is of 0,01% of the sensor stroke.

⚠ Using analog sensors, the SSI parameters in the software assume default preset values that the user must not change.

2.6 - Output values

E0 version: output voltage 0 ±10 V (max load 5 mA).
E1 version: output current 4 ÷ 20 mA. (max load 390 Ω)

2.7 - Digital Output

Two digital output are available, INPOS and READY, that are displayed via LEDs on the front panel.

Low level <4V; High level >10V (I_{max} 50 mA with load of 250 Ω)

3 - LED FUNCTIONS

There are two leds on the EWM-SS-DAD card:

GREEN: Shows if the card is ready.

ON - The card is supplied and ENABLE, hardware, software ON
OFF - No power supply or the ENABLE HW/SW is inactive
FLASHING - Error detected (internal or 4 ÷ 20 mA).
Only if the parameter SENS is ON

YELLOW: Status signal. Axes position.
ON - Axis within position.
OFF - Axis outside position.

4 - ADJUSTMENTS

On the EWM cards the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model and shows a table with all the available commands, with their parameters, the default setting, the measuring unit and an explanation of the commands and its uses.

The parameters changes depending on the hardware and mechanic configuration. The hardware setting must be the same for all the axis. The use of symmetrical structures it is strongly recommended.

PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
inpx	X= SSI|ANA	SSI	-	Selection of the sensor input channel. The standard is a digital sensor with SSI specification at the corresponding connections (clamps 25 to 28 and 31, 32). Alternatively an analogue input which is indicated in the command as parameters "ANA" can be used. The command AIN is used for input scaling of the analogue input.
ain:i a b c x	i= XL a= -10000… 10000 b= -10000… 10000 c= -10000… 10000 x= V|C	 : 1000 : 1000 : 0 : V	 - - 0,01% -	Analogue input scaling for **XL** (actual value) analog input signal. **V** = voltage input and **C** = current input. With the parameters **a**, **b** and **c** the input can be scaled (output = a / b * (input - c)). Because of the programming of the **x**-value (x = **C**) the corresponding input will be switched over to current automatically. (see **NOTE**)
num	X= 0… 24	2	-	Number of axes connected to the Profibus (see **NOTE** at paragraph 9.1.1)
stroke x	X= 2… 5000	200	mm	Full stroke of the sensor (100% of input signal). The stroke of the sensor is needed for the scaling of the analogue input and for the calculation of the braking stroke.
ssioffset x	X= -30000… 30000	0	0,01 mm	Zero point adjustment of the sensor.
ssires x	X= 10… 1000	1000	µm (micron)	Definition of the sensor resolution. The highest resolution (1000) corresponds to 1 µm (0,001 mm). This sensor resolution is always used for the input data via Profibus and is needed for the internal calculations. (see **NOTE**)
ssibits x	X= 8… 32	24	-	Data protocol length in bits
ssicode x	X= GRAY|BIN	GRAY	-	Transmitting code of the sensor.
ssipol x	X= +|-	+	-	Sensor polarity. In order to reverse the working direction of the sensor, the polarity can be changed via this command. In any case also the SSIOFFSET has to be adjusted. Ex: Sensor length = 200 mm opposite working direction. SSIPOL is set on "-" and SSIOFFSET on 20000.
a:i x	i= A|B x= 1… 2000	:A 200 :B 200	ms ms	Acceleration time depending on direction. The ramp time is separately set for driving out (**A**) and for driving in (**B**). Normally **A** = flow P-A, B-T and **B** = flow P-B, A-T.
d:i x	i= A|B|S X= 50… 10000	:A 2500 :B 2500 :S 1000	0,01% 0,01% 0,01%	Deceleration stroke depending on direction. This parameter is set in 0,01% units of the maximum length of the sensor. The braking distance is set dependent from the direction. The controller gain will be calculated by means of the braking distance. The shorter the braking distance the higher the gain (see command CTRL). In case of instabilities a longer braking distance should be set. The parameter **D** indicates the ratio between the maximum sensor length and and a indicated stopping point;will become active after the removal of the 'START' signal only .
ctrl x	x= lin|sqrt1 |sqrt2	sqrt1	-	Deceleration curve (see **NOTE**): **lin** = linear curve **sqrt1** = optimized curve **sqrt2** = curve optimized for high gain in positioning
syncmode x	X= MS|AV	MS		Synchronization mode. **MS** - Master/Slave:all axes follow the master axis (MASTER = 1) **AV** - Averages calculation: the command position will be calculated by the averages of all axes.
glp x **t1 x**	X= -10000… 10000 X= 0… 100	500 10	0,01 ms	Parameters for optimization of the synchronisation controller. (see **NOTE**) The SYNC-controller works as a PT1 compensator for optimized controlling of hydraulic drives. Critical drives can be stabilized with the T1 factor.
vramp x	x= 10… 2000	200	ms	Ramp time for the command speed.

vmode x	x= on|off	off	-	Switching over the control mode. **OFF**: stroke depended deceleration mode (SDD); It's the default mode. The drive comes to a controlled stop at the target position, then switches to control mode and moves accurately to the desired position. The speed varies with the fluctuating pressure as the system runs under open-loop control. **ON:** numeric control (NC). A position profile is generated internally. The system always works under control and uses the following error to follow the position profile. For a properly operating it is necessary not to run at 100 % speed, as otherwise the errors cannot be corrected. 80 % of the maximum speed is typical The stroke time is defined by the parameter VEL.
vel x	X= 1… 20000	50	mm/s	Internal maximum velocity preset when VMODE = ON (numeric control mode).
inpos mode x	X= EPC|TRC	TRC	-	Choosing signal for "inpos" message (LED) in NC mode (VMODE = ON only) On master modules yellow led are activated by the INPOS signal. EPC = positioning error in endposition TRC = monitor the tracing error generated by the positioning profile.
min:i x	i= A|B x= 0… 5000	:A 0 :B 0	0,01% 0,01%	Deadband compensation for positive overlapped proportional valves. Good adjustment will increase positioning accuracy
max:i x	i= A|B X= 5000… 10000	:A 10000 :B 10000	0,01% 0,01%	Limitation / Gain. Maximum output signal. Adapt the control range to maximum flow range.
trigger x	X= 0… 2000	200	0,01%	Response threshold for the MIN parameter. Also useful for reduced sensitivity in position with positive overlapped proportional valves. (see **NOTE**)
inpos x **glerror x**	X= 0… 5000 x= 0… 5000	32 32	0,01mm 0,01mm	Defined windows for creating status signals. INPOS = Definition of the range (window) of the related signal in which the INPOS message will be generated. The positioning process will not be influenced by it. The controller remains active. GLERROR = defines the range of the allowed synchronization error for generating this message. In slave modules this signal is given to the status outputs (PIN 2 and corresponding LED) Working in NC mode GLERROR defines the window synchronization error; INPOS the tracking error.
offset x	x= -2000… 2000	0	0,01%	Zero point adjustment. The corresponding OFFSET will be added to the control error (demand value - actual value + offset). With this parameter the zero point failure can be compensated.
pol x	x= +|-	+	-	Output polarity. All **A** and **B** adjustments depend on the output polarity. The right polarity should be defined first.
sens x	x= on|off	on	-	The sensor monitoring can be activated.
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
help	-	-	-	Listing of all available commands.
copy	-	-	-	Transfer of the parameters into all other modules at the node CAN. The parameters are stored in the EEPROM.
st	-	-	-	Status of the profibus communication, actual sent/received values.
wl **xl** **xw** **kx** **kxw** **v** **u** **x:i**	Command position Actual position Position error Master position Synchro error Speed limitation Control signal Axis position via index	-	mm mm mm mm mm % % mm	The process data can be read out via software. They show the actual and command values
default	-	-	-	Preset values will be set.

NOTE about the AIN command: This command is for analogue sensors only.

With this command each input can be scaled individually. For the scaling function the following linear equation is taken: output signal = *a / b * (input signal - c)*.

At first the offset (c) will be subtracted from the input signal, then the signal will be multiplied with factor **a** / **b**. **a** and **b** should always be positive. With these both factors every floating-point value can be simulated (for example: 1.345 = 1345 / 1000).

With the x parameter value the internal measuring resistance for the current measuring (4… 20 mA) will be activated (V for voltages input and C for current input). ATTENTION: This resistor is never activated at the k input.

	AIN:X	**a**	**b**	**c**	**x**
i with voltage:	AIN:i	1000	1000	0	V
i with current:	AIN:i	2000	1600	2000	C

NOTE about the SSIRES command: the standard of measurement is defined as increment/mm (inkr/mm). The maximum available resolution is equal to 1 μm that corresponds to a value 1000.

Example: A sensor with resolution 5μm has a resolution (0.005 mm) 5 times lower than the maximum set.
The SSIRES value is calculated as follows: *1000* (full scale ink) */ n* (sensor resolution in μm) = *1000 / 5 = 200*

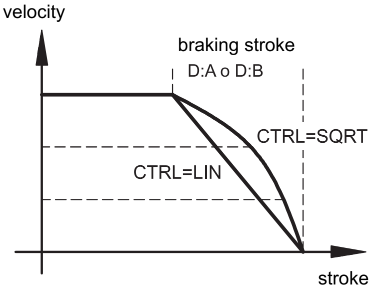
with a 2μm sensor resolution the value will be = *1000 / 2 = 500* :

NOTE about the CTRL command: This command controls the braking characteristic of the hydraulic axis. With positive overlapped proportional valves one of both SQRT braking characteristics should be used because of the linearization of the non-linear flow curve typical of these valves If zero overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

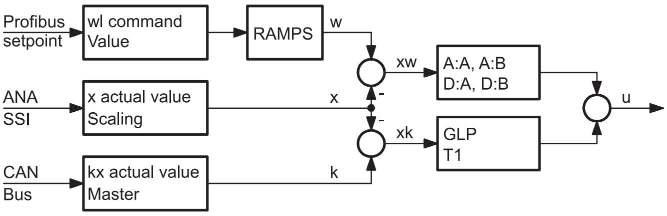
LIN: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

SQRT*: Root function for the calculation for the braking curve.
SQRT1: with small control error. control gain corresponds to 30000 / d:i ;
SQRT2: control gain corresponds to 50000 / d:i



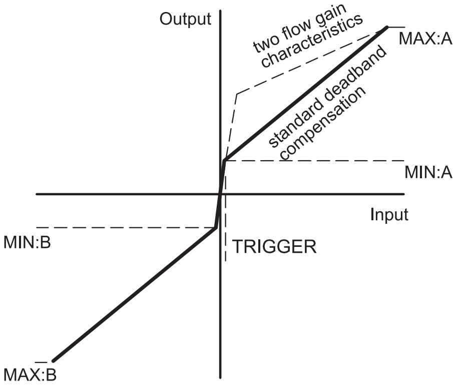
NOTE about the GLP and T1 command: Both controllers (sync and positioning) are working parallel. The higher the sync-gain the lower must be the gain of the positioning controller. A time constant value (T1) can be used to damp the sync-controller for better stability.

Simplified control structure:



NOTE about the TRIGGER command: With this command, the output signal is adjusted to the valve characteristics. The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stabile positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out at the power amplifier or at the positioning module. If the MIN value is set too high, it influences the minimal velocity, which cannot be adjusted any longer. In extreme case this causes to an oscillating around the closed loop controlled position.



5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections. For other connections it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE: To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram. As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical for the electromagnetic interference, a complete protection of the connection wires can be requested.

A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory. Also the Profibus cable must be screened.

Every Profibus segment must be provided with an active bus termination at the beginning and at the end. The termination is already integrated in all common Profibus plugs and can be activated by a DIL switch.

5.1 - EWM-BUS-DD settings and installation

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate. The functionality is defined in IEC 61158. The Profibus address can be programmed by a terminal program, EWMPC/10 or online via the Profibus (default address 3). A display shows the status of the commu-nication between the nodes.

The CAN-side installation of the EWM-BUS-DD is easy and only few steps are necessary.

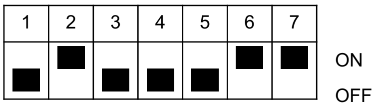
Wire the CAN Bus of the coupler with the CAN Bus line of the EWM-SS-DAD cards, as shown below:

EWM-BUS-DD	EWM-SS-DAD
pin 1	pin 23
pin 3	pin 21
pin 4	pin 22

Connect the power supply: pin 5 and pin 6 = 24 V
pin 7 and pin 8 = 0 V

The reference values are preset over the digital Profibus / CAN-Bus that worked with full internal resolution. The position resolution corresponds to the sensor resolution.

The module EWM-BUS-DD is preconfigured for proper communication with the cards EWM-SS-DAD. The address of the node Canbus (2) and the transmission speed rate (1MBd) must comply with the following configuration:



The DIL switch is inside the module and it gives the possibility to set address and data transmission speed.

The tables below show the meaning of DIL Switches:

DIL-SWITCH						
1	**2**	3	4	5	6	7
CANBUS ADDRESS NODE					**TRANSMISSION SPEED**	

TRANSMISSION SPEED	DIL-SWITCH	
	6	7
125 Kbaud	OFF	OFF
250 Kbaud	ON	OFF
500 Kbaud	OFF	ON
1 Mbaud	**ON**	**ON**

5.1.1 - Display

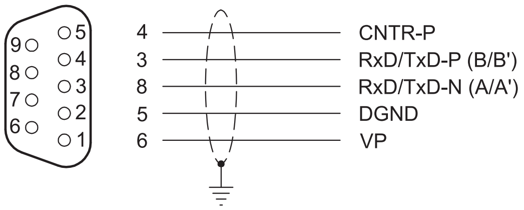
The EWM-BUS-DD has a display that shows the module status:

- everything OK, Profibus and CAN Bus in data exchange
1 Error, CAN Bus no data exchange
2 Error, Profibus no communication
3 Error, Profibus no communication, CAN Bus no data exchange
4 Error, Profibus OK, not connected CAN Bus
5 Error, Profibus no communication, not connected CAN Bus
6 Error, hardware fault

5.1.2- ProfiBUS socket

A shielded typical Profibus connector (9-poles) with internal terminal resistors to be set properly, must be used. The pre addressing of the module can be changed only by Profibus (DEFAULT is 3). The cable is not included.

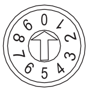
PROFIBUS SOCKET WIRING AND LINKING CONFIGURATION



pin	Signal name	Function
1-2-7-9	not used	-
3	RxD/TxD-P (B-Line)	Receive/Send P data
4	CNTR-P/RTS	Request to Send
5	DGND	Data ground
6	VP	+5 V DC for external bus termination
8	RxD/TxD-N (A-Line)	Receive/Send N data

5.2 - EWM-SS-DAD - CAN interface

The CAN interface is wired on all modules in parallel. The terminating resistors have to be activated in the EWM-SS-DAD at the first and last module. Termination is enabled by a bridge between pin 22 and pin 24.



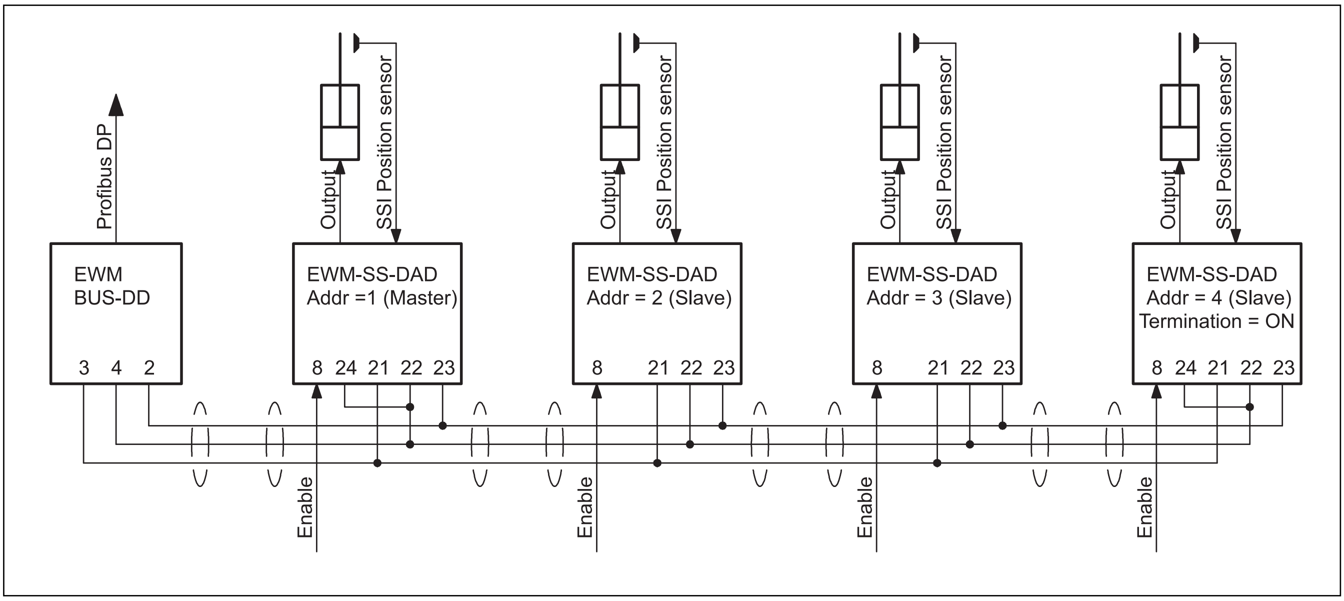
Start the addressing of the EWM-SS-DAD from the number 1, that set the card as MASTER, using the rotary switch on the front panel of the card (use a screwdriver or a small knob of appropriate size).

The MASTER module drives the main axis and takes over the communication with the interface converter EWM-BUS-DD.

The other addresses (2 to 9) set the card as SLAVE.

Upon delivery, the switch is set to zero (no address); you must configure the addressing on each card in the series, depending on the number of axes to be synchronized (see example below).

5.3 - Wiring for 4-axes synchronization



6 - SOFTWARE

6.1 - KIT EWMPC/10 (code 3898401001)

The software kit comprising a USB cable (2 m length) to connect the card to a PC or notebook and the software.

Verify the software version. For correct operating version 3.3 or higher is needed. Lastest version is downloadable from our website.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

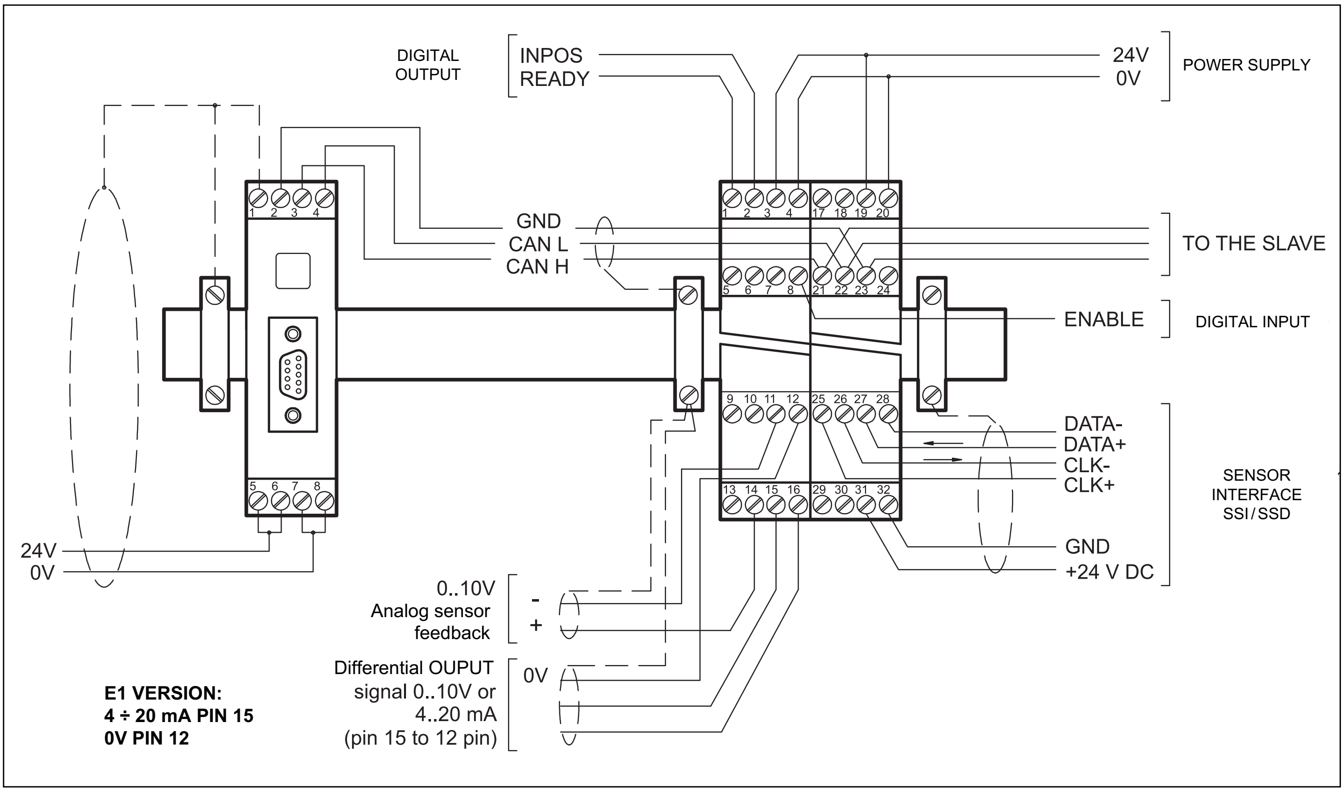
The software is compliant with Microsoft XP® operating systems.

6.2 - .GSD file for ProfiBus module

The file is downloadable from our website .

www.duplomatic.com , download section.

7 - WIRING DIAGRAM FOR EWM-SS-DAD*E0 AND EWM-BUS-DD



DIGITAL INPUT AND OUTPUT

PIN 1	READY output: General operationally, ENABLE is active and there is no sensor error (by use of 4 ÷ 20 mA sensors). This output corresponds with the green LED.
PIN 2	STATUS output: STATUS is active when the axis is within the INPOS window of postioning or synchronisation.
PIN 8	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Target position is set to actual position and the drive is closed loop controlled.

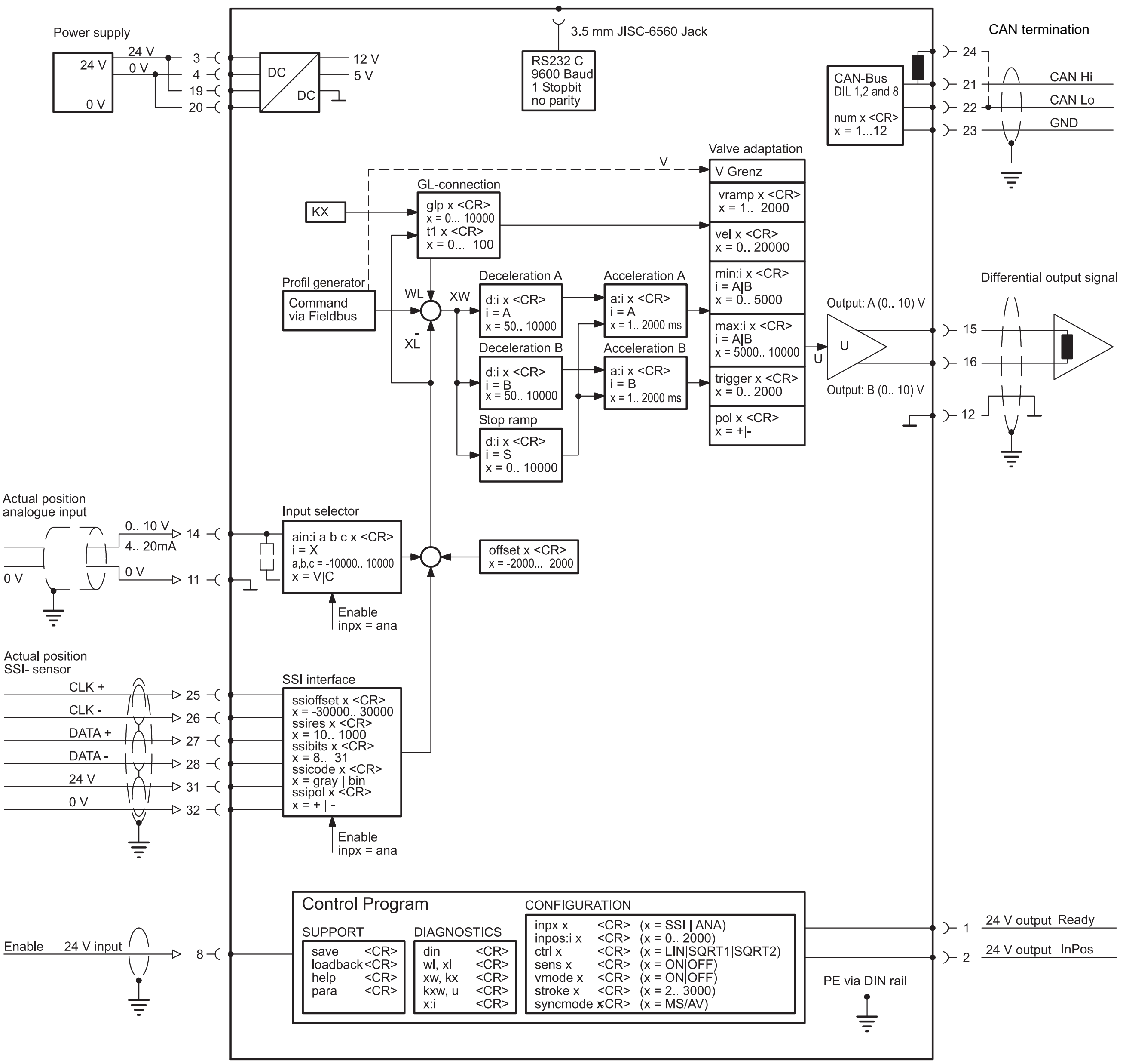
ANALOGUE SIGNALS

PIN 14	Analogue feedback value (X), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 15/16	Differential output (U) ±100% corresponds to ± 10V differential voltage, optionally (E1 version) current output ±100% corresponds to 4 ÷ 20 mA (PIN 15 to PIN 12)

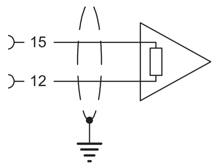
LOCAL CAN-BUS

PIN 21..23	CAN LO, CAN HI, and GND
PIN 24	Termination of the CAN-Bus a bridge to pin 22 at 1st (master) and last module is necessary.

8 - EWM-SS-DAD - CARD BLOCK DIAGRAM E0 version



OUTPUT SIGNAL - E1 VERSION



9 - PROFIBUS COMMUNICATION

The Profibus board controls the modules by sending 8 bytes of data, which contain information on two control words, the command position (position setpoint) and speed control (speed setpoint). The EWM-SS-DAD cards send back to the bus-card two status words, the nominal current position and current actual position, for a total of 24 bytes of data.

Using ST command in EWMPC, those data can be read out. and they appearing in this way:

```
                        (high byte / low byte)
   control word :      1110 1000 / 0000 0000
   control word 2 :    0010 0000 / 0010 0000
   status word :       1101 0000 / 1101 0000
   status word 2 :     0010 0000 / 0010 0000
position setpoint:  22400  (command position in HEX via Profibus)
speed setpoint:     lfff   (command speed in HEX via Profibus)
```

Enable: enabled (module = enabled (Profibus & Hardware-enable))

9.1 - Data sent to the axes

The EWM-BUS-DD card is set as follows:
(Hi = High byte; Lo = low byte)

Byte	Function	Comment
0	control word Hi	unsigned int
1	control word Lo	
2	command position Hi	unsigned long
3	command position..	
4	command position ..	
5	command position Lo	
6	velocity Hi	unsigned int
7	velocity Lo	
8	control word 2 Hi	unsigned int
9	control word 2 Lo	
10 - 23	reserved	no function

9.1.1 - Axes control

Only the first four axes may be activated individually, the further axes must be enabled in groups of four axes at a time, by the x SEL indicator, according to the following:

Address	Controlled axes					
SEL	**1 to 4**	**5 to 8**	**9 to 12**	**13 to 16**	**17 to 20**	**21 to 24**
2	0	0	0	0	1	1
1	0	0	1	1	0	0
0	0	1	0	1	0	1

NOTE: The module EWM-BUS is a module used also in other synchronization systems that manage a greater number of axes.

The system with EWM-SS-DAD cards described in this documentation allows to manage max 9 axes.

9.1.2 - Control words

The control words contain the following informations:

ENABLE: Must be activated in addition to the hardware signal.
START: In case of increasing edge the current command position is taken over, in case of deactivated START the system about a brake ramp is stopped.
GL-ACTIVE: Over this bit the overlapped synchronism controller is activated.
SEL x: Groups of each four modules with the information about status and positions can be read - by the control of the three select-bits -back.

Byte 0 - control word Hi		
bit	**Function**	
0	Axis START 4	start 1 = active
1	Axis START 3	start 1 = active
2	Axis START 2	start 1 = active
3	Axis START 1	start 1 = active
4	SEL 2	selection 1 = active
5	SEL 1	selection 1 = active
6	SEL 0	selection 1 = active
7	Enable (with which enable hardware links)	operation 1 = active

Byte 1 - control word Lo		
bit	**Function**	
0	GL- Active ext 2 (axis 9 to 12)	1 = GL active (group 2)
1	GL- Active ext 1 (axis 5 to 8)	1 = GL active (group 1)
2	START ext 2 (axis 9 to 12)	1 = start (group 2)
3	START ext 1 (axis 5 to 8)	1 = start (group 1)
4	GL- Active axis 4	synch 1 = active
5	GL- Active axis 3	synch 1 = active
6	GL- Active axis 2	synch 1 = active
7	GL- Active axis 1	synch 1 = active

Byte 8 - control word 2 Hi		
bit	**Function**	
0	Reserved	
1	Reserved	
2	Reserved	
3	START ext 5 (start of axis 13 to 16)	1 = start (group 5)
4	START ext 4 (start of axis 17 to 20)	1 = start (group 4)
5	START ext 3 (start of axis 13 to 16)	1 = start (group 3)
6	Reserved	
7	Reserved	

Byte 9 - control word 2 Lo		
bit	**Function**	
0	Reserved	
1	Reserved	
2	Reserved	
3	GL- Active ext 5 (axis 21 to 24)	1 = GL active (group 5)
4	GL- Active ext 4 (axis 17 to 20)	1 = GL active (group 4)
5	GL- Active ext 3 (axis 13 to 16)	1 = GL active (group 3)
6	Reserved	
7	Reserved	

9.1.3 - Position setpoint description

Command position: according to the sensor resolution.

Byte 2 to 5 - command position		
bit	**Function** defined by the sensor resolution	
from 0 to 7	Command position Lo byte	Byte 5
from 8 to 15	Command position	Byte 4
from 16 to 23	Command position	Byte 3
from 24 to 31	Command position Hi byte	Byte 2

Example of calculation of position control for SSI sensor resolution = 5 µm and 100% stroke = 300 mm.

Position setpoint = 150 mm (= 50% stroke)

STROKE • SSIRES = 100% stroke (dec)

300 • 200 = 60.000 (dec) → EA60 (hex)
50% di 60.000 = 30.000 (dec) → 7530 (hex)

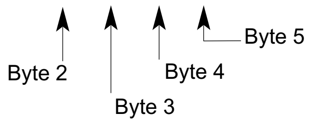
Example of calculation of position control for ANA sensor with 100% stroke = 300 mm. With analog sensors SSIRES value is preset and unchangeable.

Position setpoint = 150 mm (= 50% stroke)

STROKE • SSIRES = 100% stroke (dec)

300 • 1000 = 300.000 (dec) → 493E0 (hex)
50% di 300.000 = 150.000 (dec) → 249F0 (hex)

Position setpoint to be sent
with decimal value 150,000 :
hex **00 02 49 F0**



9.1.4 - Speed setpoint description

Command velocity: 0x3fff corresponds to 100 %.

Byte 6 and 7 - command velocity		
bit	**Function** max value 0x3FFF	
from 0 to 7	velocity Lo byte	Byte 7
from 8 to 15	velocity Hi byte	Byte 6

9.2 - Updating data

The EWM-SS-DAD cards send back to the bus-card two status words, the received setpoint command and the current actual position, totally of 24 bytes of data.

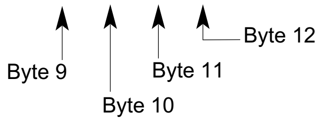
Byte	Function	Comment
0	status word Hi	unsigned int
1	status word Lo	
2	control position* Hi	unsigned long
3	control position*	
4	control position*	
5	control position* Lo	
6	status word 2 Hi	unsigned int
7	status word 2 Lo	
8	actual pos. axes 1,5,9,13,17,21 Hi	unsigned long
9	actual pos. axes 1,5,9,13,17,21	
10	actual pos. axes 1,5,9,13,17,21	
11	actual pos. axes 1,5,9,13,17,21 Lo	
12	actual pos. axes 2,6,10,14,18,22 Hi	unsigned long
13	actual pos. axes 2,6,10,14,18,22	
14	actual pos. axes 2,6,10,14,18,22	
15	actual pos. axes 2,6,10,14,18,22 Lo	
16	actual pos. axes 3,7,11,15,19,23 Hi	unsigned long
17	actual pos. axes 3,7,11,15,19,23	
18	actual pos. axes 3,7,11,15,19,23	
19	actual pos. axes 3,7,11,15,19,23 Lo	
20	actual pos. axes 4,8,12,16,20,24 Hi	unsigned long
21	actual pos. axes 4,8,12,16,20,24	
22	actual pos. axes 4,8,12,16,20,24	
23	actual pos. axes 4,8,12,16,20,24 Lo	

(*) If the average-value control is active (SYNCMODE = AV) the acknowledged value is the calculated position; If the MASTER / SLAVE (SYNCMODE = MS) is active the acknowledged value will be the command position.

Current command position: is interpreted according to mode differently.
Standard mode : target command position
NC-mode : (VMODE = ON) calculated command position of the generator.

Actual position: according to the sensor resolution.

Example: reading the value of stroke 299251:
hex **00 04 90 F3**



9.2.1 - Status word descriptions

READY:	System is ready.
INPOS:	Depending on the mode set, can transmit a position or, in NC mode, the following error control information.
GL-ERROR:	The synchronism error is indicated over this bit by the parameter GLERROR dependently.
SENSOR ERROR:	When the sensor monitoring is activated, the READY signal is deactivated with a sensor error.
COMERROR:	Communication error on the CAN Bus. This message will be sent only from the module No. 1. if general communication problems are found or if a module is faulty

Always the hardware enable signal has to be deactivated at a sensor error (READY Signal) or when a COM error appear.

Byte 0 - status word Hi		
bit	**Function**	
0	INPOS axis 4	1= in position
1	INPOS axis 3	1= in position
2	INPOS axis 2	1= in position
3	INPOS axis 1	1= in position
4	READY axis 4	1= ready
5	READY axis 3	1= ready
6	READY axis 2	1= ready
7	READY axis 1	1= ready

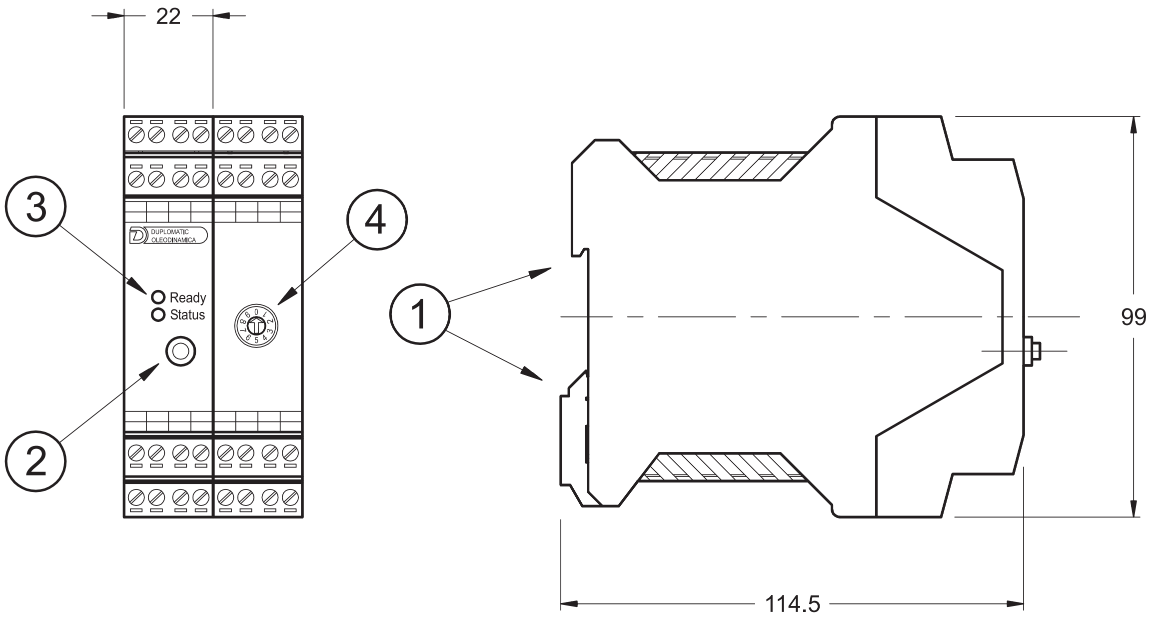
Byte 1 - status word Lo		
bit	**Function**	
0	COMerror	1 = no error
1	reserved	
2	reserved	
3	reserved	
4	axis GL-Error 4	1 = no error
5	axis GL-Error 3	1 = no error
6	axis GL-Error 2	1 = no error
7	axis GL-Error 1	1 = no error

Byte 6 - status word 2 Hi		
bit	**Function**	
0	INPOS axis 4, 8, 12, 16, 20, 24	1= no error Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
1	INPOS axis 3, 7, 11, 15, 19, 23	
2	INPOS axis 2, 6, 10, 14, 18, 22	
3	INPOS axis 1, 5, 9, 13, 17, 21	
4	READY axis 4, 8, 12, 16, 20, 24	1= Ready Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
5	READY axis 3, 7, 11, 15, 19, 23	
6	READY axis 2, 6, 10, 14, 18, 22	
7	READY axis 1, 5, 9, 13, 17, 21	

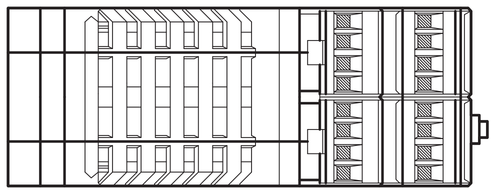
Byte 7 - status word 2 Lo		
bit	**Function**	
0	reserved	
1	reserved	
2	reserved	
3	reserved	
4	GL-Error axis 4, 8, 12, 16, 20, 24	1= no error Corresponding signal indicator through selection bits Sel_0 to Sel_2 in the control word Hi
5	GL-Error axis 3, 7, 11, 15, 19, 23	
6	GL-Error axis 2, 6, 10, 14, 18, 22	
7	GL-Error axis 1, 5, 9, 13, 17, 21	

The status word 2 concerns the messages in the EXTENDED mode.

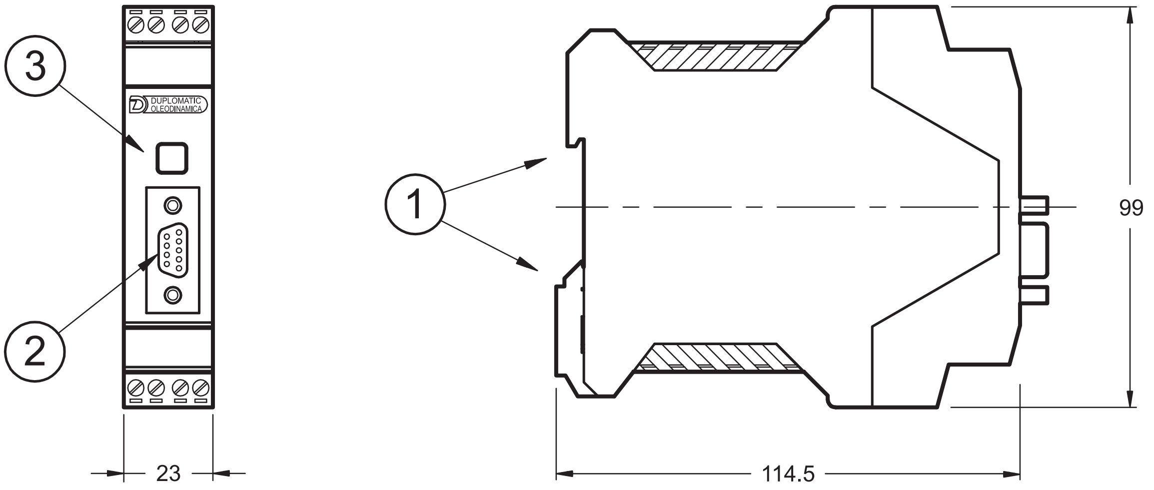
10 - OVERALL AND MOUNTING DIMENSIONS OF EWM-SS-DAD



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals
4	Rotative switch for pre - addressing



11 - OVERALL AND MOUNTING DIMENSIONS OF EWM-BUS-DD



1	DIN EN 50022 rail type fastening
2	Profibus interface port
3	Display

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
www.duplomatic.com • e-mail: sales.exp@duplomatic.com

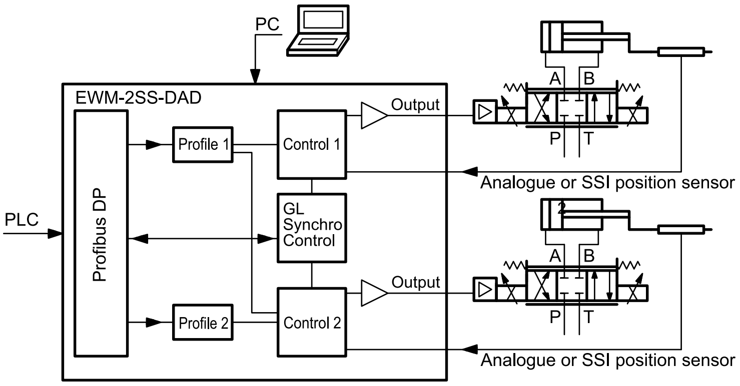
EWM-2SS-DAD

CARD FOR 2 AXES POSITIONING AND SYNCHRONIZATION IN CLOSED LOOP CONTROL. EMBEDDED PROFIBUS INTERFACE

SERIES 20

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE

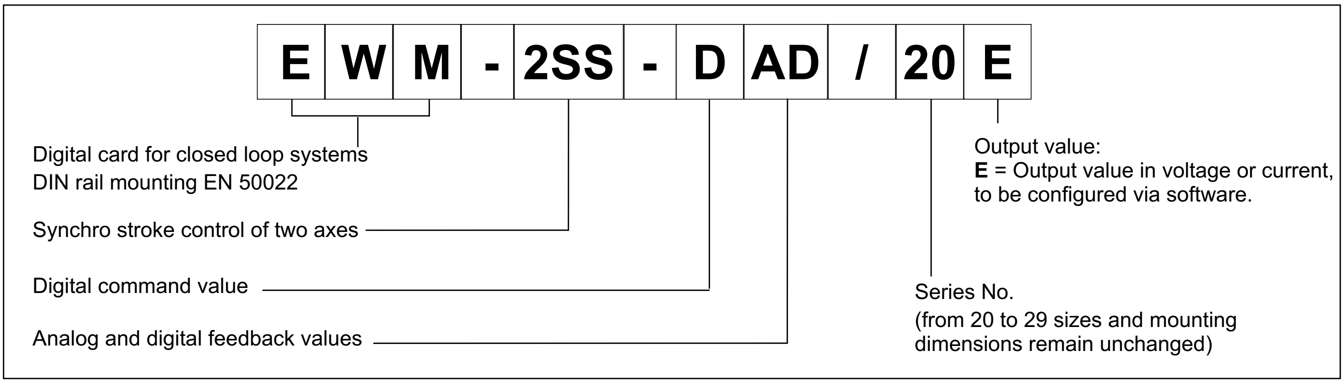


- — The EWM-2SS-DAD card is designed for controlling the stroke position of 2 axes
- — Additionally, the synchronized control of the axes is available
- — Both SSI or analogue sensor input are available
- — The module communicates with the PLC via the embedded Profibus interface
- — Card configuration is made via software, via USB

TECHNICAL CHARACTERISTICS

Power supply	V DC	24 (±10%)
Fuse, external	A	1A medium time lag
Current consumption	mA	< 500
Command position value		via Profibus DP
Profibus DP data rate	kbit/s	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, 12000 - ID number 1810h
Max position accuracy	µm	1
Feedback values	SSI V mA	digital sensor with any interface SSI - 150 kbit/s 4 ÷ 20 (RI = 250 Ω) 0 ÷ 10 (RI = 33 kΩ)
Output value - voltage - current	V mA	±10 differential (max load 5 mA) 4 ÷ 20 (max load 390 Ω)
Resolution of output value	%	0.024
Interface		USB B type 2.0 , Profibus
Electromagnetic compatibility (EMC):		Immunity EN 61000-6-2: 8/2002 - Emissions EN 61000-6-4: 6/2005
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	121(d) x 99(h) x 68(w)
Connectors		11x4 poles screw terminals PE direct via DIN rail USB-B 2.0 - Profibus D-Sub 9 poles
Operating temperature range	°C	-10 / +50
Protection degree		IP 20

1 - IDENTIFICATION CODE



2 - FEATURES OVERVIEW

Controller Functions

- Synchronized or independent positioning control of two axes in closed loop
- Command position, speed parameters and actual value response via Profibus DP
- Fine positioning - 1µm resolution
- 2 methods for positioning control:
  SDD – Stroke Depending Deceleration - time-optimal positioning structure with very high stability
  NC – Numerically Controlled - To follow the position profile
- 2 methods for synchronized control:
  Master-slave
  Average value controller
- Data for lengths in mm
- Digital SSI sensor
- As an alternative, the card can be set via software for operate with analogue position sensors
- Analogue sensors scalable via software
- Gain adjustment made via software with independent parameters for SDD and NC modes
- PT1 compensator for optimized control of hydraulic drives
- Emergency function (EOUT)
- Safe and error-free data transmission
- Manual mode available via Profibus.

Adaptation of the valve characteristic curve

- CTRL function to adapt the braking characteristics to positive and zero overlapped proportional valves
- Advanced deadband compensation: non-linearity compensation by a double-gain characteristics

Monitoring functions

- In-position error
- Cable break, in-pressure error and fault of feedback sensors
- 2 Digital output to read the status

Other characteristics

- Card configuration is made via software, USB-B socket on the module

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 24 VDC of a power supply. This power supply must correspond to the existing EMC standards.

All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, freewheeling diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - Reference signal

The reference signals run via Profibus, ID number 1810h.

3.5 - Position feedback values

The card accepts a digital feedback input from a sensor with any SSI interface with RS422 specifications. Bit, code and resolution are settable via software.

Use SSI sensors with the same resolution (max 1 µm)

Eventually an analogue input could be used as feedback. The card accepts a 0 ÷ 10 V (Ri 33 kOhm) or 4 ÷ 20 mA (Ri = 250 Ohm).

The analogue resolution is of 0,01 % incl. oversampling.

⚠ Using analog sensors, the SSI parameters in the software assume default preset values that the user must do not change.

3.6 - Output values

Output values can be in voltage or current and need to be configured via software (SIGNAL parameter).

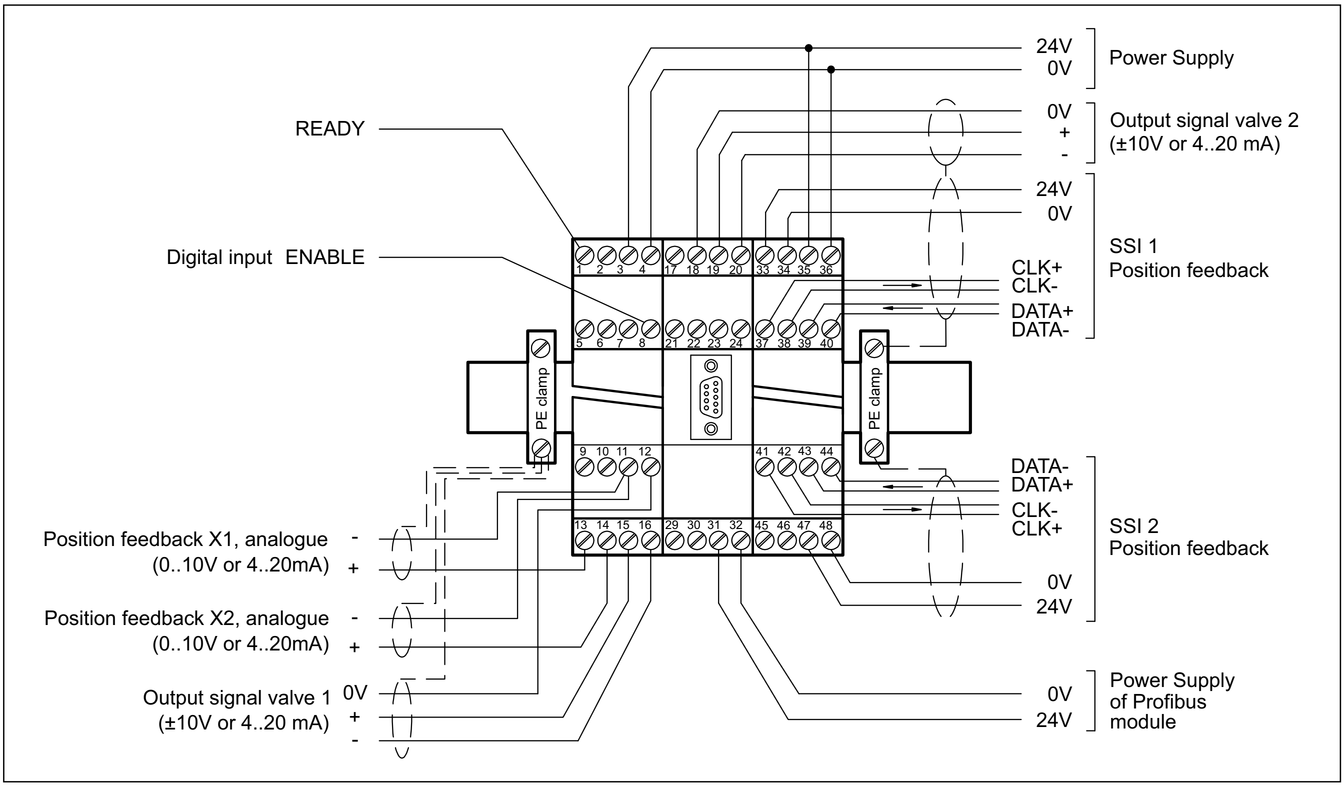
voltage :	± 10 V Differential output	PIN 15 and 16 PIN 19 and 20
current:	4 ÷ 20 mA	PIN 15 to PIN 12 PIN 19 to PIN 18.

3.7 - Digital Output

Two digital output are available, STATUS and READY, that are displayed by LED on the front panel.

Low level < 2 V High Level > = Vsupply (max current 50 mA).

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1	READY output. General operationality, It's on when ENABLE (PIN 8 and profibus bit) is active and there are no sensor errors. This output corresponds with the green led.
PIN 8	ENABLE input: This digital input signal initializes the application. The controller and the READY signal are activated. The output signal to the control element is enabled. Target position is set to actual position and the drive stays stationary, in closed loop. The Enable bit via profibus must be active, too.

ANALOGUE INPUT

PIN 13	Analogue position feedback value (X1), range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 14	Analogue position feedback value (X2) , range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷ 20 mA

ANALOGUE OUTPUT

	voltage
PIN 16/15	Differential output (U1) ± 100% corresponds to ± 10V differential voltage
PIN 29/20	Differential output (U2) ± 100% corresponds to ± 10V differential voltage
	current
PIN 12/15	current output U1: ±100% corresponds to 4 ÷ 20 mA
PIN 18/19	current output U2: ±100% corresponds to 4 ÷ 20 mA

SSI SENSOR INTERFACE

	position 1		position 2
PIN 37	CLK+ output	PIN 41	CLK+ output
PIN 38	CLK- output	PIN 42	CLK- output
PIN 39	DATA+ input	PIN 43	DATA+ output
PIN 40	DATA- input	PIN 44	DATA- output
PIN 33	24V Power supply of the SSI sensor	PIN 47	24V Power supply of the SSI sensor
PIN 34	0V Power supply of the SSI sensor	PIN 48	0V Power supply of the SSI sensor

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

5.2 - Profibus DP interface

Profibus has to be used to control the axis and can also be utilized to set the parameters.

The module supports all baud rates from 9,6 kbit/s up to 12000 kbit/s with auto detection of the baud rate.

The functionality is defined in IEC 61158. The Profibus address can be programmed using the EWMPC/20 or online via the Profibus.

A diagnostic LED indicates the online status.

5.2.1 - Installation and setting

A typical screened Profibus plug (D-Sub 9pol with switchable termination) is mandatory. Every Profibus segment must be provided with an active bus termination at the beginning and at the end. The termination is already integrated in all common Profibus plugs and can be activated by DIL switches.

The Profibus cable must be screened at determined contact clips in the Profibus plug.

The GSD data configuration files are available for download on our website. The communication parameters are 16 bytes (8 words) for IN/OUT variables.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system can be controlled in open loop, moving up and down the servo-cylinder with commands HAND:x, via Profibus only, to facilitate the adjustment of the card and its calibration.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7, 8 and 10.

WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at *standard* level, easier, or *expert*, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89470 ETM*.

7 - MAIN FEATURES

The EWM-2SS-DAD is a card for positioning control loop

With only few parameters the controller can be optimized and the movement profile is preset via Profibus (position and velocity).

7.1 - Sequence of the positioning

The positioning is controlled via Profibus.

You can switch from the positioning in closed loop to the manual movement in open loop and back via Profibus.

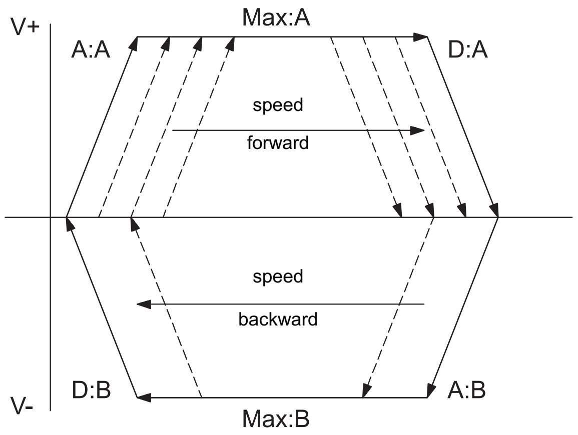
With READY active the system is ready. The open loop control is achieved by using the HAND bits and the speed parameter. When the bit HAND goes low the card assumes the current position as the request and the card is ready to work in closed loop.

With also START bit enabled, the command position parameter (profibus) become active and the new command position will be taken over as a new target.

The axis moves immediately to this new position and indicates on the POSWIN status bit when it reaches the position. This output is active as long as the axis is within the InPos window or the START bit is active.

Setting the synchronous bit (SC) will synchronize both axes and the synchronization controller will work according with the FUNCTION mode selected (Master-slave, Average or Multiplicative Recursive Controller). Axis 2 is now following axis 1 according to the master-slave-principle.

flow (volume) P→A and B→T



Two methods for positioning are available:

SDD - stroke depending deceleration - means the control gain will be adjusted. This is a time-optimal positioning structure with very high stability.

NC mode - the position value is generated from the following error.

The actuator position is measured by a transducer and compared with a specified target position. The target position and speed are set by Profibus.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the right size of the hydraulic valve. Therefore, the correct valve selection is the most important point. Additionally, two clashing requirements (short positioning time and high accuracy) have to be considered in the system design.

7.2 - Emergency Output (EOUT)

This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The function can be deactivate. Different parameters available for each axes.

7.3 - Adaptation of the braking characteristic to the valve type (CTRL).

The deceleration characteristic is set with this parameter. In case of positively overlapped proportional valves the SQRT function should be used. The non-linear flow function of these valves is linearized by the SQRT function.

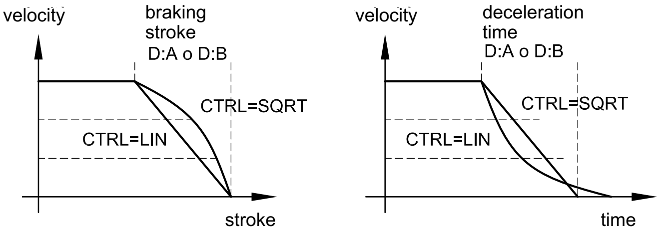
In case of zero lapped valves (control valves and servo valves) the LIN or SQRT1 function should be used regardless of the application. The progressive characteristic of the SQRT1 function has better positioning accuracy but can also lead to longer positioning times in individual cases.

Different parameters available for each axes.

LIN: Linear deceleration characteristic (gain is increased by a factor of 1).

SQRT1: Root function for braking curve calculation. The gain is increased by a factor of 3 (in the target position). This is the default setting.

SQRT2: Root function for braking curve calculation. The gain is increased by a factor of 5 (in the target position). This setting should only be used with a significantly progressive flow through the valve.



7.4 - Adaptation of the output signal to the valve characteristic (TRIGGER).

With TRIGGER command, the output signal is adapted to the valve characteristics.

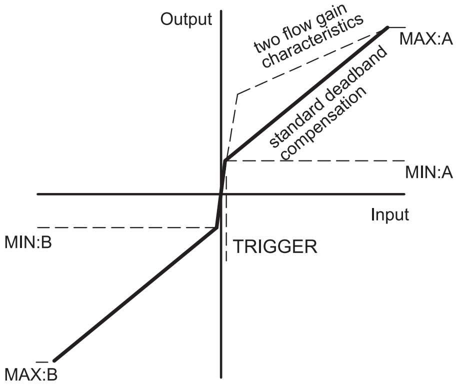
The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out either at the power amplifier or at the positioning module.

If the deadband compensation value (MIN) is set too high, it influences the minimal velocity which cannot be adjusted any longer.

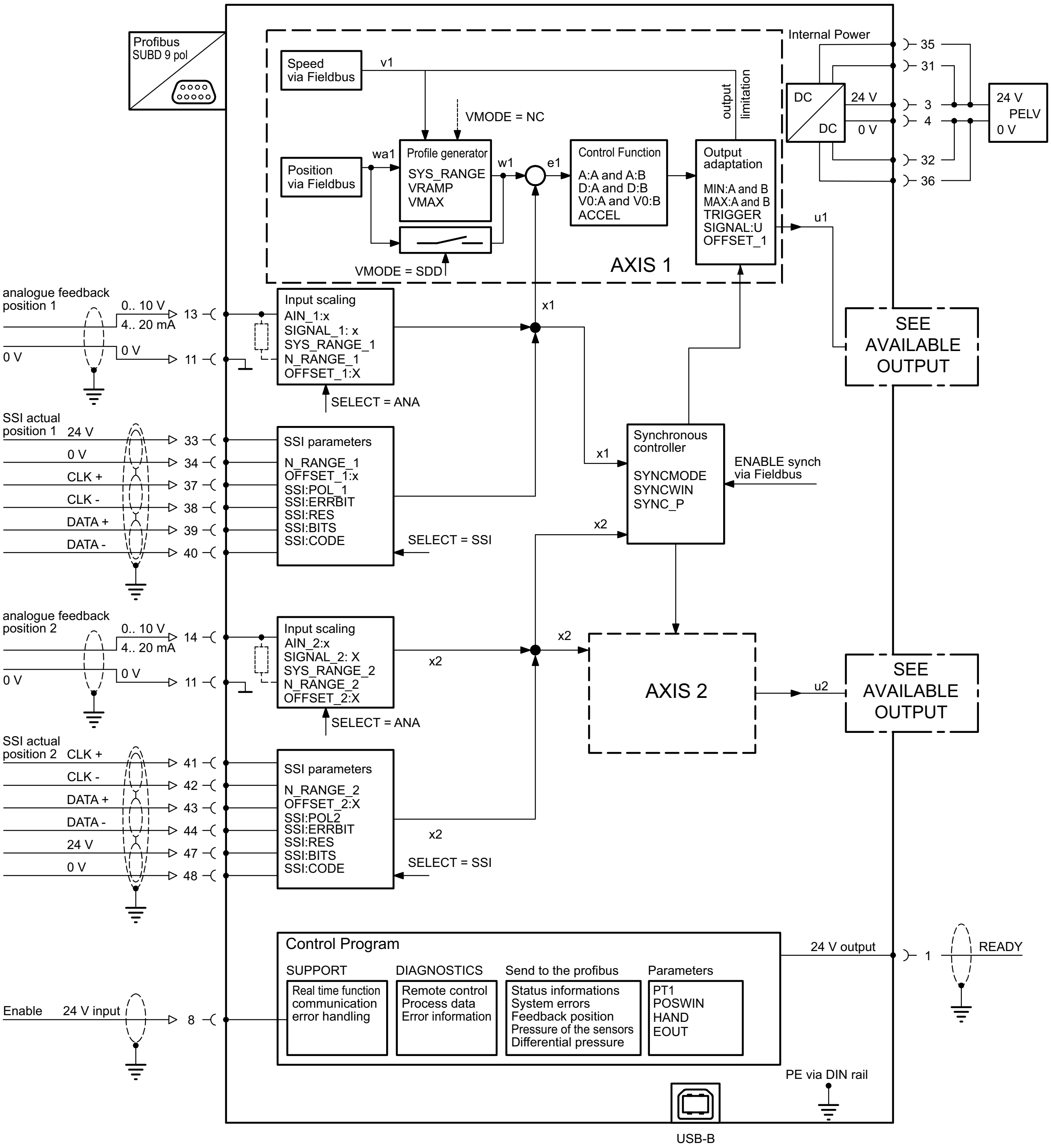
In extreme cases this causes to an oscillating around the closed loop controlled position.

Different parameters available for each axes.

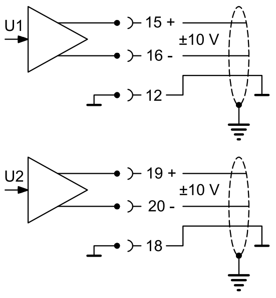


8 - CARD BLOCK DIAGRAM

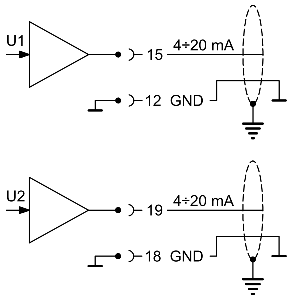
Caution!, PIN 4 is connected internally to PIN 11 (and also possibly to PIN 12 depending on the model). These connections serve as a reference potential for the analogue sensor or demand value signals.



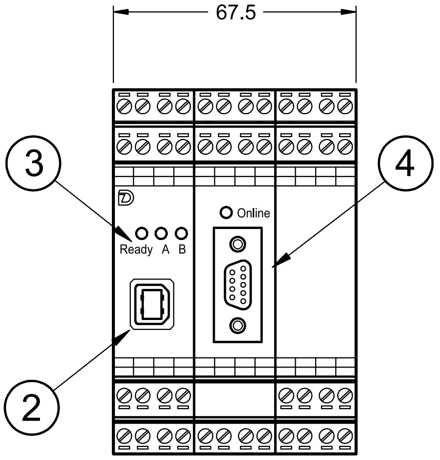
voltage

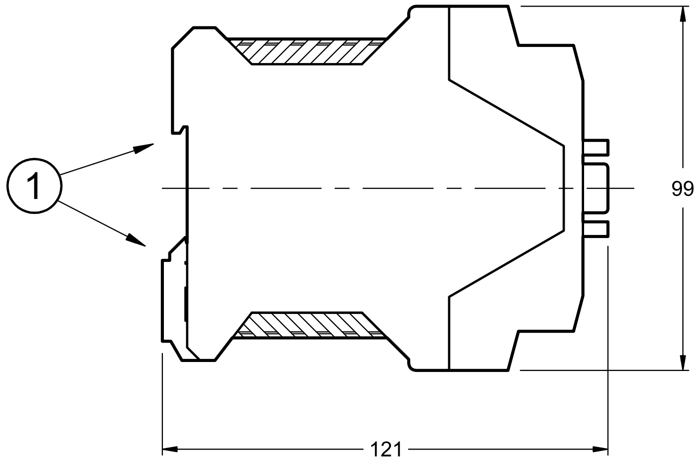


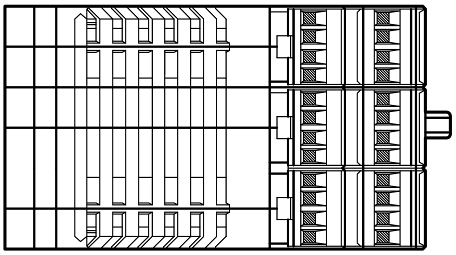
current



9 - OVERALL AND MOUNTING DIMENSIONS







1	DIN rail fastening type EN 50022
2	USB port for PC cable connection
3	LED for output signals
4	Profibus interface port

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www.duplomatic.com • e-mail: sales.exp@duplomatic.com

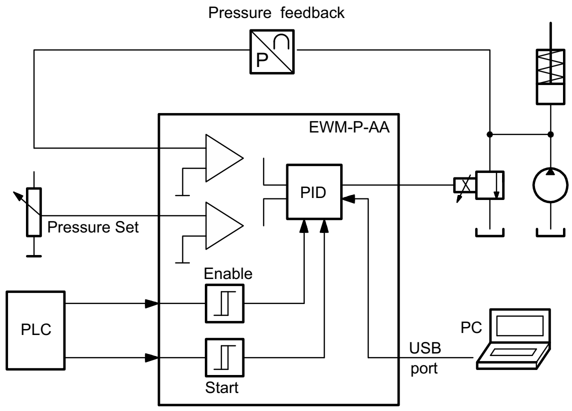
EWM-P-AA

DIGITAL CARD FOR PRESSURE (FORCE) CONTROL IN CLOSED LOOP SYSTEMS

SERIES 20

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE

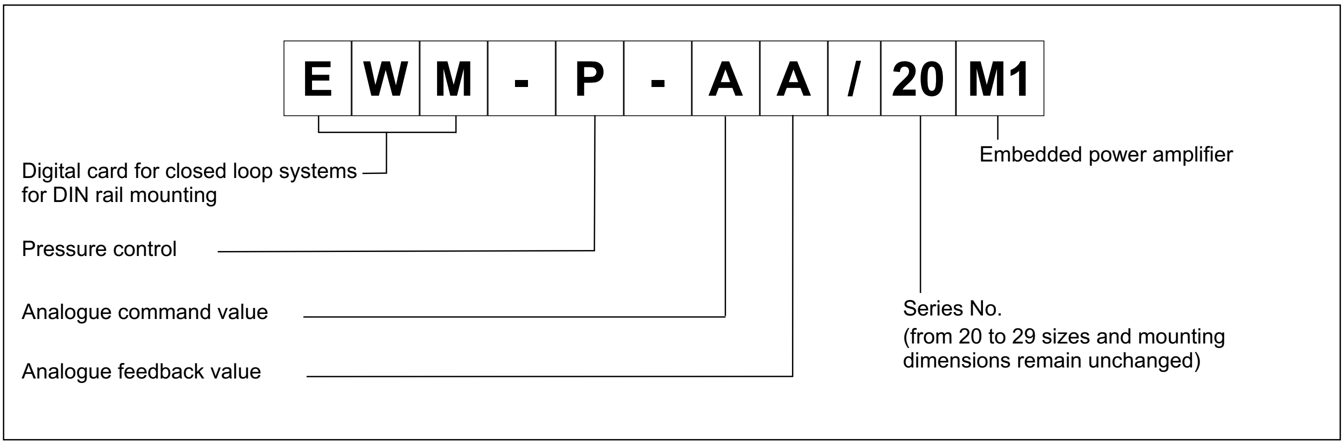


- This card is designed for pressure controlled servo pumps. It manages closed loop control of pressure reducing and pressure relief valves.
- The card works as a bypass control module. The command value is directly transferred to the control output (pressure valve) and the closed loop compensates only the linearity failures. In most of cases the optimization is possible without any measuring instruments (a pressure sensor is necessary only).
- It has an integral power amplifier for direct control of proportional valves.
- Card setup via software only, through an on-board USB-B port. Customizable parameters are: ramp up, ramp down, PID parameters, dither, frequency and amplitude, PWM, maximum and minimum pressure.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
External fuse	A	3,0 (medium time lag)
Current consumption	A	60 + current for solenoid
Command (pressure) value	V mA	0 ÷ 10 (R_I = 150 kΩ) 4 ÷ 20 (R_I = 390 Ω)
Pressure signals accuracy	%	0,006 oversampling included
Feedback value	V mA	0 ÷ 10 (R_I = 90 k Ω) 4 ÷ 20 (R_I = 390 Ω)
Output current	A	0.5 ÷ 2.6 stepless
Sample time (pressure)	ms	1
Interface		USB-B (2.0)
Electromagnetic compatibility (EMC)		Immunity EN 61000-6-2 Emissions EN 61000-6-4
Housing material		thermoplastic polyamide PA6.6 combustibility class V0 (UL94)
Housing dimensions	mm	120 (d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



2 - FEATURES OVERVIEW

Controller Functions

- Pressure control in closed loop system
- Fine regulation – capable of accuracy not achievable with open loop set-up
- Highly dynamic control loop
- Adjustable PID controller
- Ability to modify command signal ramp times
- Emergency function (EOUT)
- Analog signal command
- Analog feedback input
- Simple and intuitive scaling of the input

Adaptation to the valve characteristics

- Advanced dead-band compensation – able to define output range and position
- Adjustable sampling time, PWM, dither
- Adjustable command signal response time

Power amplifier

- Embedded power amplifier
- Fine control of output signal
- PWM current output of up to 2.6A

Other characteristics

- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, freewheeling diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - Command input (pressure)

The card accepts analogue command input, with voltage 0÷10V (R_I= 150 Ω) and current 4 ÷ 20 mA (R_I= 390 Ω).

3.5 - Feedback value

The card accepts analogue feedback input. The feedback value must be 0 ÷ 10V (R_I = 90 kΩ) or 4 ÷ 20 mA (R_I = 390 Ω).

The parameters are settable via software (see the parameter table)

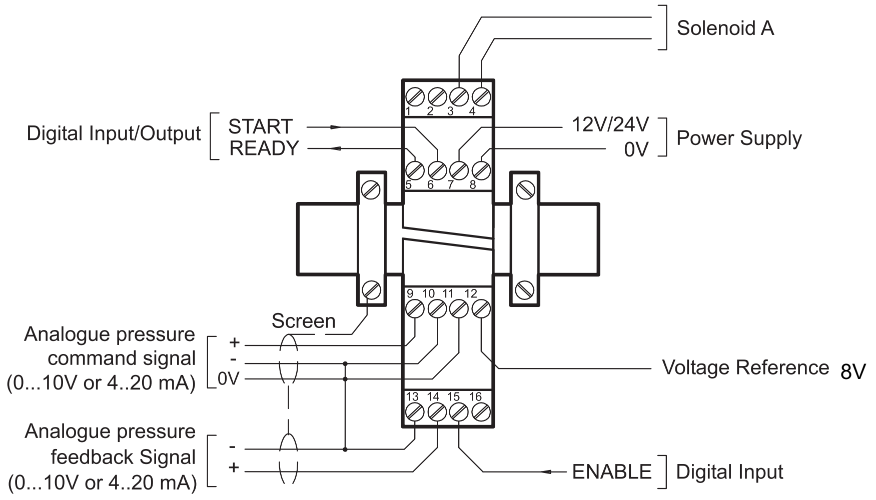
3.6 - Output values

The output current value for this card is settable via software. The value range is 0.5 ÷ 2.6 stepless. Broken wire and short circuit monitored. PWM frequency 61 ÷ 2604 Hz.

3.7 - Digital Output

A digital output is available (READY) and its signal is displayed from the green led. Low level: <2V, high level >10V (50 mA)

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 5	READY output: If the ENABLE is active and there are no discernable errors then the output is on. Otherwise it is off. This output corresponds with the ‘Ready’ LED. If the 4÷ 20 mA sensor is open an error is generated.
PIN 6	START Input: The controller is active; the external analogue command value is taken over.
PIN 15	ENABLE Input: If the signal is applied (>10V) then the module is active and the power stage is active in closed loop.

ANALOGUE INPUT

PIN 9/10	Pressure command (W) range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷20 mA
PIN 13/14	Pressure feedback (X) range 0 ÷ 100% corresponds to 0 ÷ 10V or 4 ÷20 mA

ANALOGUE OUTPUT

PIN 12	8V reference output (max. 25mA)
PIN 3/4	PWM output for valve control.

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

⚠ **WARNING! Plugs with freewheeling diodes and LED cannot be used with current controlled power outputs.**

They interfere with the current control and they can destroy the output stage.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and the signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN rail should be provided. Transient interference voltages at the terminals are discharged via DIN rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system is controlled in closed loop. The integrated power stage makes it easy to set up the system quickly as it can be connected directly to a pressure valve.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7, 8 and 10.

⚠ **WARNING! In card series 20, the default baud rate to be selected in the software has changed from 9600 baud to 57600 baud.**
This can be set in OPTION / SETTINGS / INTERFACE.

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameters setting can be done at *standard* level, easier, or *expert*, where a greater number of parameters is displayed and can be customized.

For a complete list of parameters and their settings please refer to the Technical Manual 89500 ETM.

7 - MAIN FEATURES

7.1 - Applications

This module is useful for a variety of pressure control applications. The control is accomplished by a PID controller carefully optimized for this application. Because of the high stability of this controller, the module is recommended for closed loop applications where an open loop control structure is incapable of achieving the desired accuracy.

The output signal (of up to 2.6A) can control a variety of pressure valves, such as pressure relieve valves and pressure control valves and as such no On-Board Electronics are needed.

Examples of such applications can be pressure control with constant pumps, remote controllable servo pumps and/or force & torque control with cylinders and motor drives.

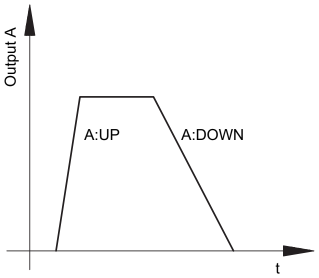
7.2 - Emergency Output (EOUT)

This function is able to set the output at a specific value (degree of valve opening) when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with the programmed ramp. The function can be deactivated.

⚠ The output value defined here is stored permanently (independently of the parameter set). The use of this feature should be carefully evaluated according to safety procedures in the system.

7.3 - Command Signal Ramp time (RA)

The parameters for ramp up and ramp down can be set in milliseconds. These values are the amount of time that the command signal will take to follow a step change in the reference signal.



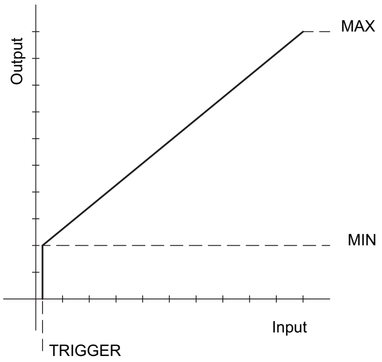
7.4 - PID Controller

The PID controller can be parameterized by modifying the relevant parameters, in order to suppress high-frequency noise and a value is also present in order to control the output by the input signal directly.

7.5 - Adaption of the output signal to the valve characteristics (TRIGGER)

With the MAX value, the maximum output can be easily defined. With the MIN value, the overlap (dead band of the valve) can be compensated. Via the TRIGGER the activation point of the MIN function is set and so a non-sensitive range around the zero-point can be specified.

If the MIN value is set too high, it influences the minimal pressure, which cannot be adjusted any longer. In extreme case this causes to an oscillating at small input values.



7.6 - Sample Time (TS)

The control dynamics can be influenced with the sample time. Changes should only be made by persons who have sufficient knowledge of dynamic systems behavior.

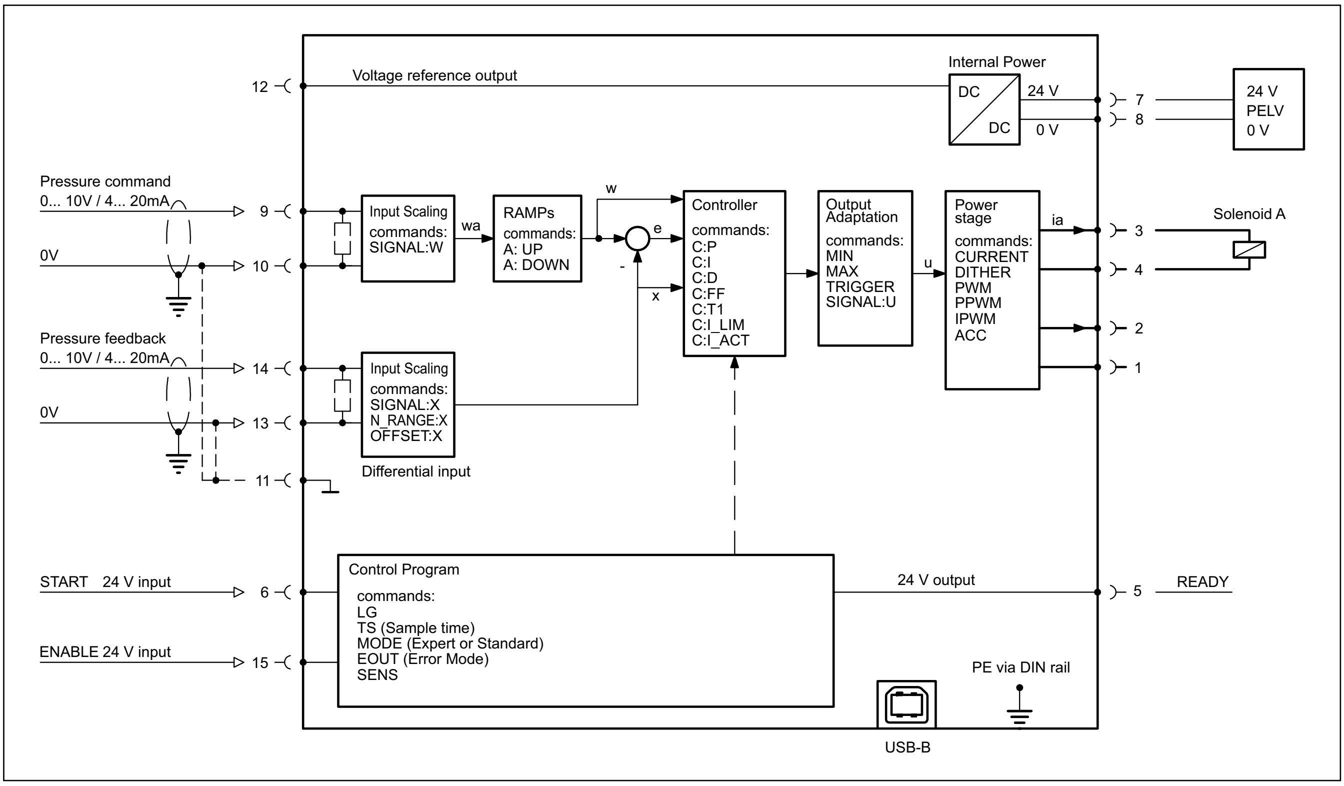
Note that after changing this value all time-dependent parameters must be checked and reset if necessary.

7.7 - Power Amplifier

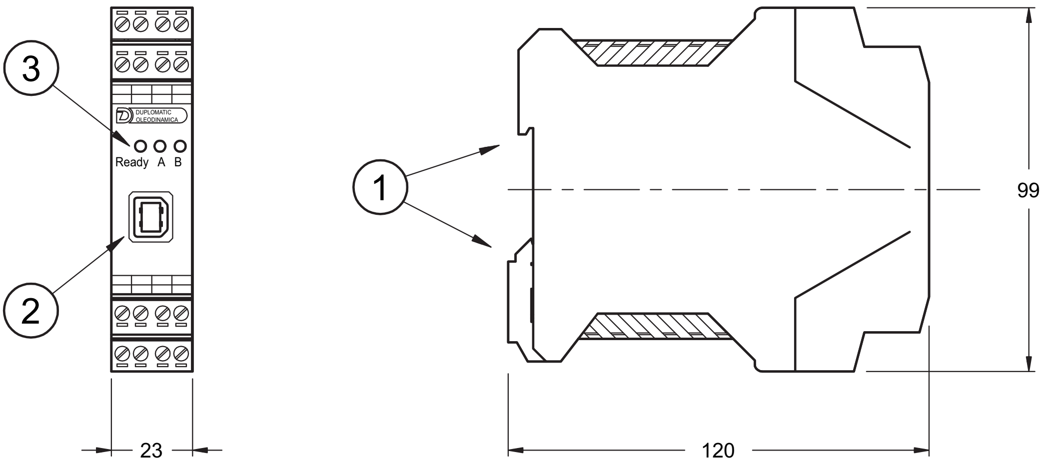
The module comes with an embedded power amplifier that is capable to generate a PWM current signal of up to 2.6A in order to control a pressure valve.

As such the nominal current, dither, frequency and the various parameters of the current loop can be accessed and modified.

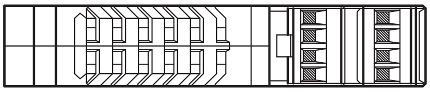
8 - CARD BLOCK DIAGRAM



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN rail fastening EN 50022
2	USB interface, for setup
3	LEDs for output signals



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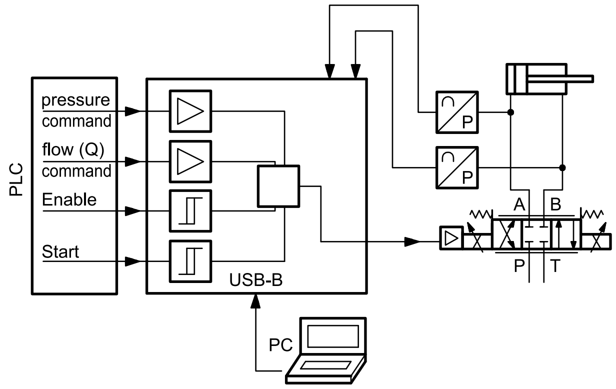
EWM-PQ-AA

DIGITAL CARD
FOR PRESSURE/FLOW CONTROL IN CLOSED LOOP SYSTEMS

SERIES 20

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



— The EWM-PQ-AA has been developed as a classic p/Q controller but it work well also with high response valves (zero overlap) via analogue command inputs for pressure and flow.

— The p/Q controller automatically switches over between Q and p control modes to assure that the set point limits for pressures has not to exceed.

— The pressure feedback are analogue type.

— The output value, voltage or current type, is configurable via software.

— Card setup via software only, through an on-board USB-B port.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external:		1A medium time lag
Current consumption:	mA	<100
Pressure command (p)	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Flow command (Q)	mA V	4 ÷ 20 (RI = 240 Ω) ± 10 (RI = 90 kΩ)
Pressure feedback values	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Sensor resolution	%	0,003 incl. oversampling
Output values	V mA	± 10 (max load 10 mA 2 kΩ) differential 4 ÷ 20 (max load 390 Ω)
Sample time	ms	1
Interface		USB-B 2.0
Electromagnetic compatibility (EMC) 2004/108/EC		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connections		USB-B (2.0) - 4x poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

E	W	M	-	PQ	-	A	A	/	20	E

Digital card for closed loop systems
DIN EN 50022 rail mounting

Pressure and flow control

Analogue command value

Analogue feedback value

Output value in voltage or current, to be configured via software.

Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

2 - FEATURES OVERVIEW

Controller Functions

- Analogue Q– and p-command signals
- Classical p/Q controller with pressure limitation (automatic switch over)
- PID-controller with 2 sets of parameters switchable by digital input
- Data for pressure set in bar
- Ramps for pressure up and down optionally activated by a digital input
- Force / pressure controller with one sensor
- Differential pressure control with two pressure sensors
- D - gain filter to stabilize the control behaviour
- Emergency function for output signal (EOUT)
- Analogue feedback input
- Flow value (Q) alternative to the analogue input as parameter to be entered via software
- Simple and intuitive scaling and offset of the sensors.

Monitoring functions

- Monitoring error
- Cable break for feedback sensor and current command signal
- 2 digital outputs to read the status

Other characteristics

- Current or voltage output to be set via software
- Card configuration via software, through on-board USB port

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; Low level: <2V, high level >10V. Input resistance 25 kΩ. See the block diagram at paragraph 4 for the electric connections.

3.4 - Pressure command (p)

The card accepts an analogue input signal. The command value can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.5 - Flow command (Q)

The card accepts an analogue input signal. The command speed can be ±10 V (RI = 90 kΩ) or 4…12…20 mA (RI = 240 Ω).

3.6 - Feedback values

The card accepts up to two analogue feedback inputs, values can be 0 ÷ 10 V (RI = 25 kΩ) or 4 ÷ 20 mA (RI = 240 Ω).

3.7 - Analogue output values

Output values can be in voltage or current, to be configured via software (parameter SIGNAL:U). The same parameter defines the polarity also.

Voltage: ± 10 V Differential output (PIN 15 / PIN 16).

Current: 4 ÷ 20 mA (PIN 15 to PIN 12).

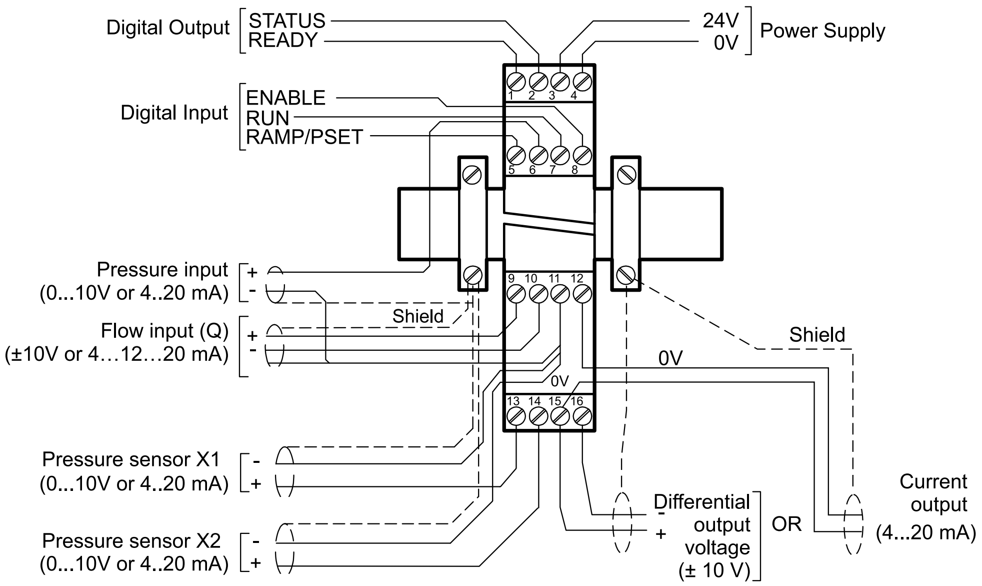
All analogue output have to be wired with screened cables.

3.8 - Digital output

Two digital output are available, STATUS and READY, that are displayed by the READY and A leds on the front panel.

Low level < 2 V High Level > 12 V (max 50 mA).

4 - WIRING DIAGRAM



DIGITAL INPUT AND OUTPUT

PIN 1	READY output: General operationality, ENABLE is active and there are no sensor / command errors (by use of 4… 20 mA sensors). This output corresponds with the LED READY.
PIN 2	STATUS output: Error monitoring. The status output will be deactivated if the error is greater than the acceptability range. This output corresponds with the LED A.
PIN 5	RAMP/PSET input: According to the setup of the parameter PIN:5, it can be configured as: - ramp activation / deactivation - switching between the 2 available sets of parameters
PIN 7	RUN input: Controller activation; if the input is OFF and ENABLE is active, the flow command (PIN 9 / 10) is taken over as valve command value.
PIN 8	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. The Q command signal is controlling the output.

ANALOGUE INPUT

PIN 6	Pressure / force command value (p) range 0 ÷100% of system nominal pressure corresponds to 0 ÷ 10V or 4 ÷ 20 mA
PIN 9/10	Flow command value (Q) range ±100 % corresponds to ±10V or 4…12…20 mA
PIN 13	Pressure sensor (feedback) value (X1) range 0 ÷ 100% of nominal pressure of sensor corresponds to 0 ÷ 10V or 4 ÷20 mA
PIN 14	Pressure sensor (feedback) value (X2) range 0 ÷ 100% of nominal pressure of sensor corresponds to 0 ÷ 10V or 4 ÷20 mA

ANALOGUE OUTPUT

voltage

PIN 16/15	Differential output (U) ± 100% corresponds to ± 10V differential voltage

current

PIN 12/15	±100% corresponds to 4 ÷ 20 mA

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

The system can be controlled in open loop with the control signal Q, moving the servo cylinder forward and backward, for easy programming of the card and of the system calibration.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up. Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7 and 8.

WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at *standard* level, easier, or *expert*, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the Technical Manual *89550 ETM*.

7 - MAIN FEATURES

This module serves to control pressures and forces on hydraulic actuators.

7.1 - Sequence of the positioning

The ENABLE signal initializes the application and error messages are deleted. The READY signal gets activated. The output signal to the control element is enabled. The drive can be controlled by the Q value or input. Setting RUN will start the PID controller.

A dynamic zero-overlap control valve is necessary for p/Q control. If the B-side of the cylinder can not be relieved, pressure in both cylinder sides has to be measured.

The cylinder can be driven in both directions (flow control in open loop) with the analogue Q command input value and limits the max velocity.

The pressure limitation control function is only active with a positive Q signal with a closed loop function.

The p command value pre-sets the max differential pressure. If this pressure (or force) exceeds the controller reduces the output signal to the valve (also in the negative range), so that the preset pressure will be kept. To go backwards for keeping the force is possible.

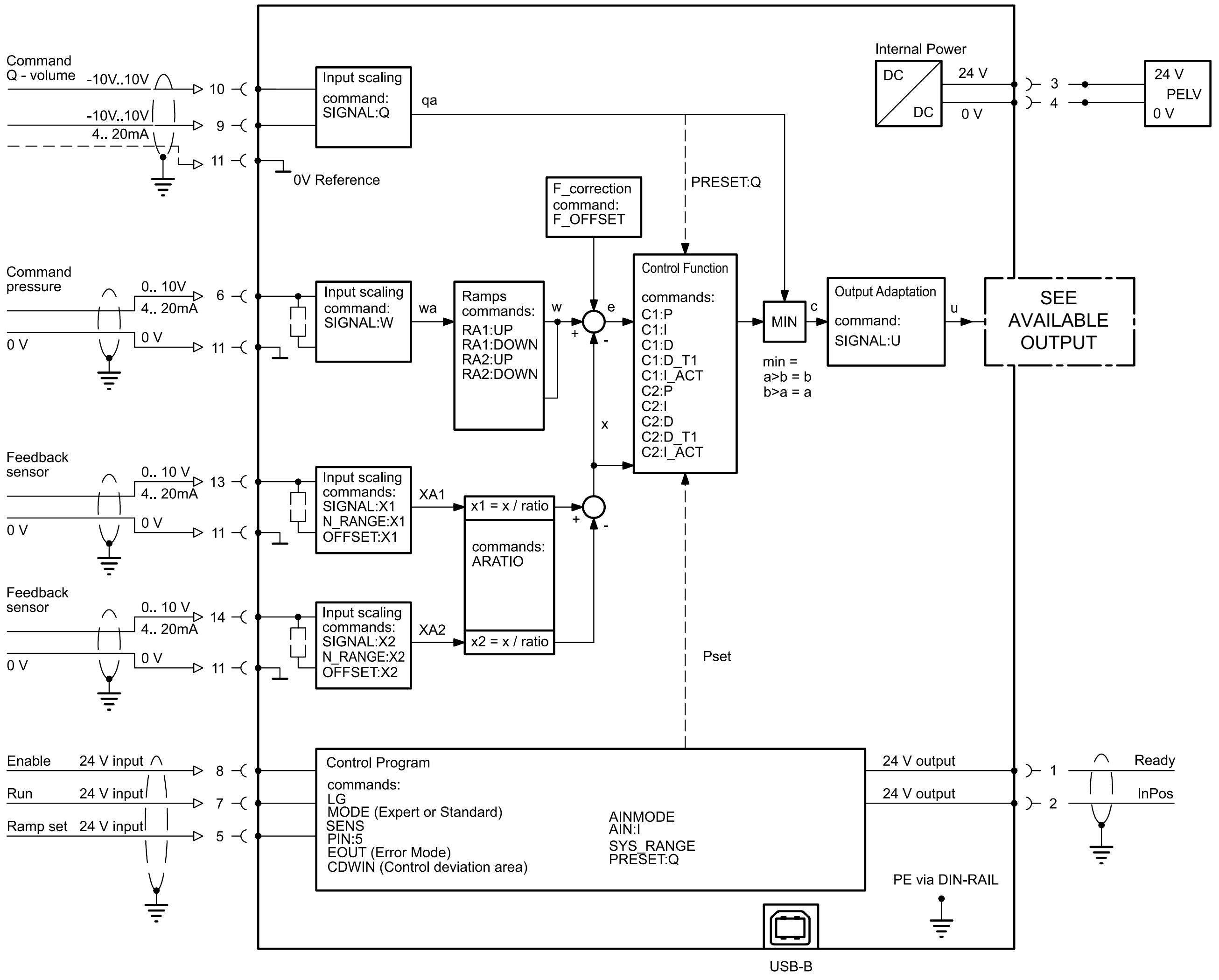
The pressure/force control is determined via the analogue inputs X1 and X2. For differential pressure control the actual value is calculated as X1 – X2.

The output signal is available as a differential output for connection of control valves with integrated electronics.

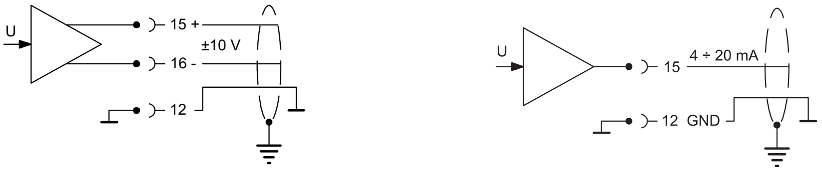
7.2 - Emergency Output (EOUT)

This function is able to set the output at a specific value when a failure occurs (e.g. sensor error or ENABLE disabled). It can be used to move the axis to one of the two end positions with a programmed velocity. The function can be deactivate.

8 - CARD BLOCK DIAGRAM



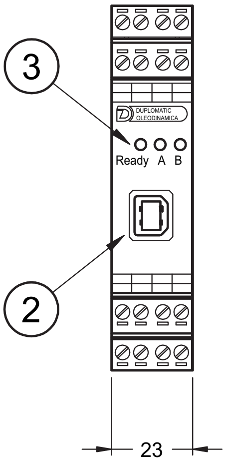
Output signals

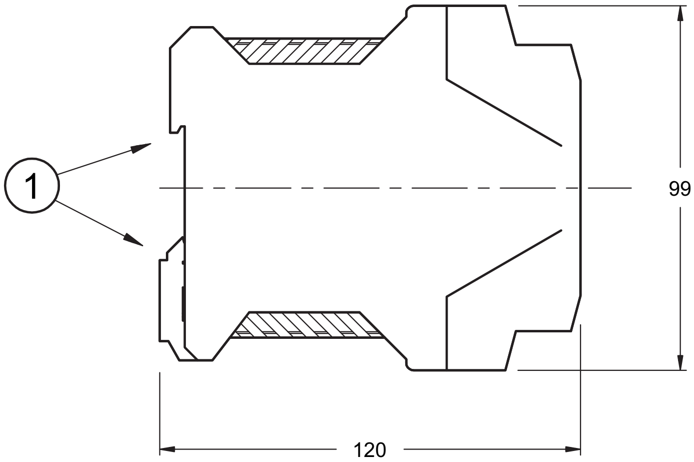


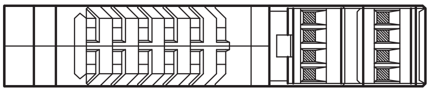
voltage

current

9 - OVERALL AND MOUNTING DIMENSIONS







1	DIN EN 50022 rail type fastening
2	USB interface, for setup
3	LEDs for output signals

DUPLOMATIC OLEODINAMICA S.p.A.
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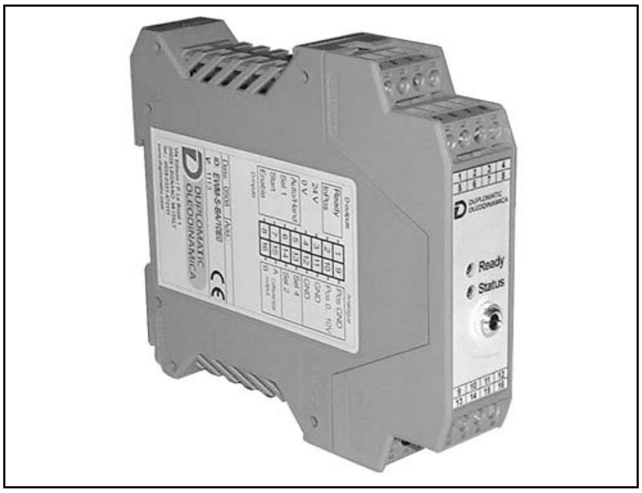


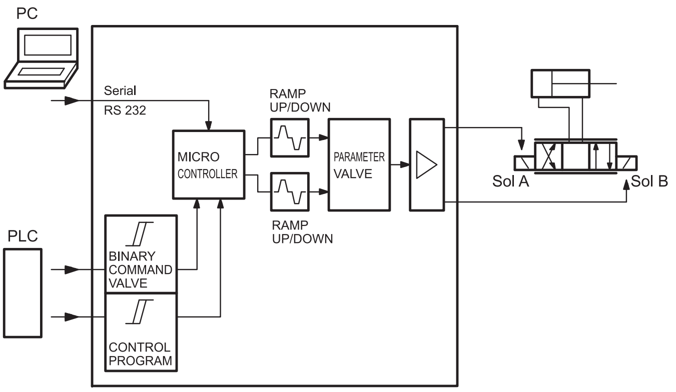
EWM-A-RL

DIGITAL CARD FOR FAST/SLOW SPEED CONTROL IN OPEN LOOP SYSTEMS

SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE



— This card is designed to control proportional valves with one or two solenoids, with the current output controlled in open loop.

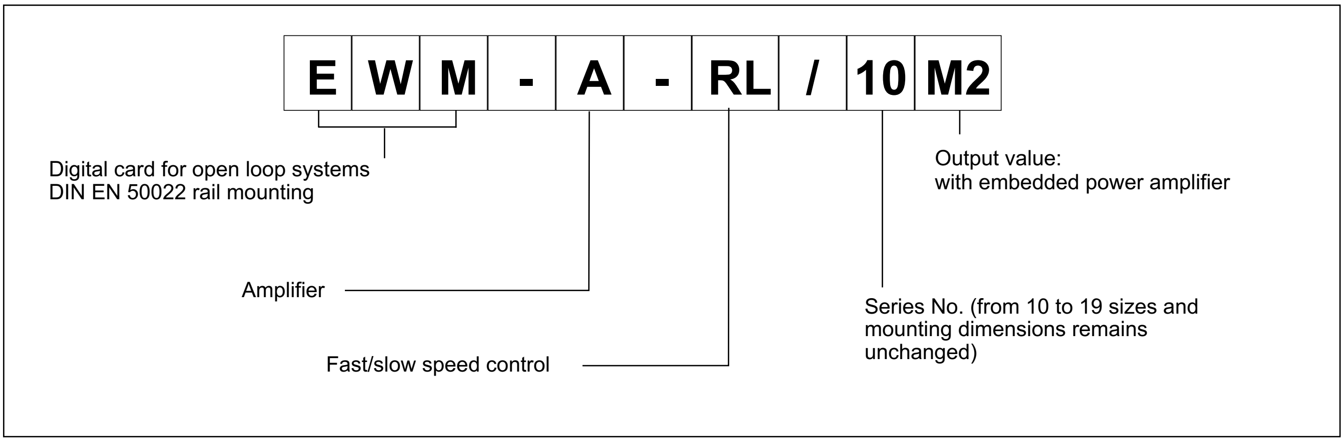
— The card moves the proportional valve via preset value input. Eight demand value input can be activated in binary mode, so it is possible to control speed, directional and ramp values without any analog card into the PLC.

— The card use the RS232C interface, and is settable via notebook, using the kit (EWMPC).

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included external fuse 5 A
Current consumption	mA	100 + solenoid current consumption
Command value		binary command with 8 bit
Output current	A	max 2,6
Interface		RS 232 C
Electromagnetic compatibility (EMC): according to 2004/108/CE standards		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

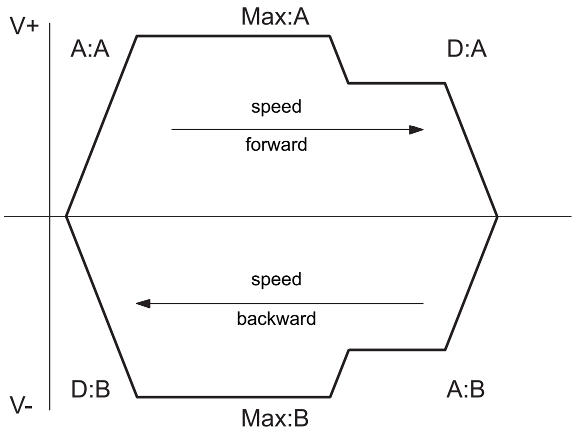
1 - IDENTIFICATION CODE



The power amplifier is controlled by an enable input and three switch signals. Therefore 8 demand values can be activated binary.

In case of direct control (non binary) it is par example possible to preset the directions with two inputs and to switch over between rapid and slow speed with the third input.

The output current is closed loop controlled and therefore independent from the supply voltage and the solenoid resistance.



2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.
All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).
It is recommended to use a regulated power supply (linear or switching mode) for the card supply and the sensors.

NOTE: in the type M2 the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Reference signal

The card accepts digital input. The digital input must have a voltage from 12 to 24 V with current <0,1A. See the block diagram at paragraph 8 for the electric connections.

2.4 - Output values

The card has output values in current, settable via software between 1, 1,6 and 2,6 A.

2.5 - Digital Output

The digital output is READY signal, displayed from the green led.

3 - LED FUNCTIONS

There are two leds on the card: GREEN and YELLOW.

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply
FLASHING - Failure detected
Only if SENS = ON

YELLOW: Indicates the intensity of the output current.

4 - ADJUSTMENTS

On the EWM card family, the adjustment setting is possible only via software. Connecting the card to the PC, the software automatically recognises the card model, and shows a table (see example on next page) with all the available parameters, with their commands, the default setting, the measuring unit and an explanation of the command and its uses.

The parameters changes depending on the card model, and they are fully described in the *Overhaul manual*.

EXAMPLE OF PARAMETERS TABLE

Commands	Parameter	Defaults	Units	Description
s:i x	i= 0..7 x= 0..10000	- :0	- 0,01%	Definition of the target positions. The value **i** is related to the input selection (SEL1, SEL2 and SEL4; binary coded).
rmode x	x= SD|4Q	SD	-	Ramp function: **SD** = ramp time related to the setpoint value **4Q** = Four quadrants ramp, ramp-variable RA:1 to RA:4 is used
ra:i x	i= 0… 7 x= 0..600000	100	ms	**4Q** Ramp **RA:1** up (solenoid A), **RA:2** down (solenoid A) **RA:3** up (solenoid B), **RA:4** down (solenoid B) **SD** Ramp **RA:0** to **RA:7**
mode x	x= on|off	off	-	Activation or deactivation of the linearization defined by the CC command.
cc:i x y	i= -10… 10 x -10000… 10000 y -10000… 10000	5000	0,01% 0,01%	Characteristic linearization.
rcurr x	i= A|B x= -10000… 10000	off	-	Real current input. **MIN** and **MAX** will be typed in, in mA. If *rcurr* = on; the command "current" should not be used.
min:i x	i= A x= 0… 5000	0	0,01% / mA	Deadband compensation of positive overlapped proportional valves.
max:i x	i= A x= 300..10000	10000	0,01% / mA	Maximum output range for adapting control range to maximum flow range.
trigger x	x= 0… 2000	200	0,01%	Point to activate the deadband compensation (min). Also useful for reduced sensitivity in position with control valves.
sens x	x= ON|OFF	ON	-	Activation of the sensor and internal failure monitoring.
solenoids x	x= 1|2	2	-	Number of used solenoids. Two for directional valves, one for pressure or throttle valves.
current:i x	i= A x= 0, 1, 2	0		Output current range. **0** = 1,0 A range **1** = 1,6 A range **2** = 2,6 A range DO NOT USE THIS COMMAND IF *rcurr* = ON.
dampl:i x	i= A x= 0..2000	400	0,01%	Parametering of the dither amplitude in 0,01 % units of the nominal current range. Typical values between 500 and 1200 (with 700 we always had good experience).
dfreq:i x	i= A x= 60… 400	120	Hz	Preset of the dither frequency
pwm:i x	i= A x= 100..7700	2600	Hz	Preset of the PWM frequency
ppwm:i x **ipwm:i x**	x= 1… 20 x= 5… 100	7 40	-	P-gain for control dynamics of the current control loop. Changing of these parameters should only be done by expert know how. A higher P-gain increases the control dynamics of the current control and also the effect of the dither adjustment. I-gain for control dynamics of the current control loop. Changing of these parameters should only be done by expert know how.
cmode x	X= ON|OFF	ON	-	Function of the output stage: OFF: function for closed loop positioning drives, ON: standard and for only one return line by two solenoids
save	-	-	-	Storing the programmed parameter in E²PROM.
loadback	-	-	-	Reloading the parameter from E²PROM in working RAM
help	-	-	-	Help to the commands, for terminal programs only
para	-	-	-	Parameter list with programmed data, for terminal programs only
din	-	-	-	Status of the digital inputs.
id	-	-	-	Display the module type, version and revision.
w, c, u, ia, ib	-	-	0,01%	Actual signals: command value, actual value, process data…
default	-	-	-	Preset values will be set.

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on versions it is recommended to use cables with a screened sheath connected to earth only on the card side.

NOTE 1

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

6 - SOFTWARE KIT EWMPC/10 (code 3898401001)

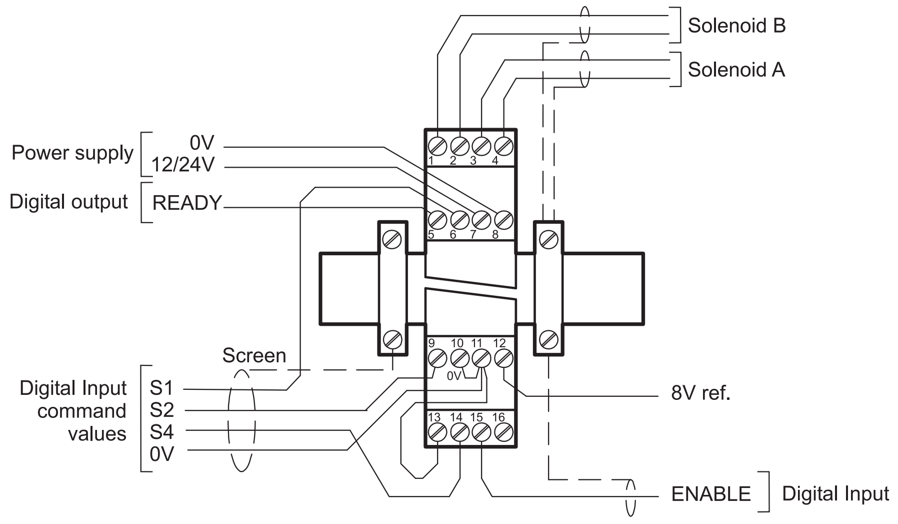
The software kit includes a USB cable (2.70 mt length) to connect the card to a PC or notebook and the software.

During the identification all information are read out of the module and the table input will be automatically generated.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft XP® operating systems.

7 - WIRING DIAGRAM

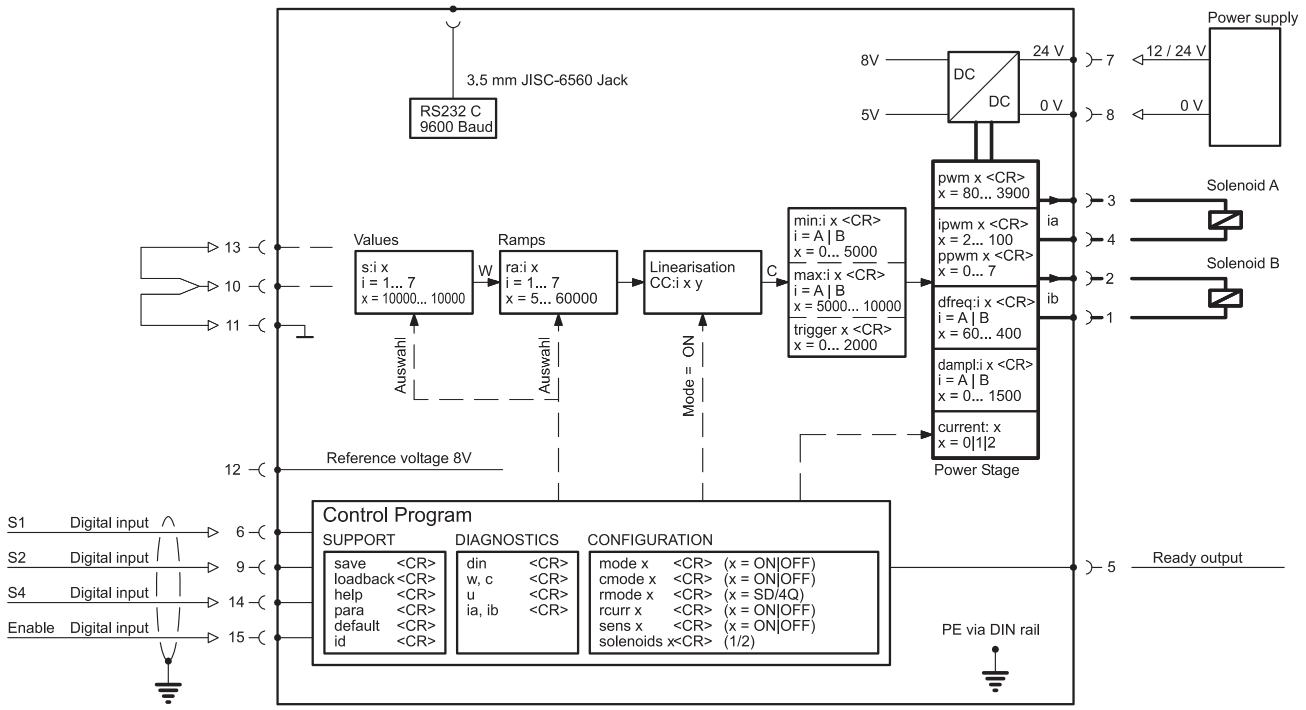


DIGITAL INPUT AND OUTPUT

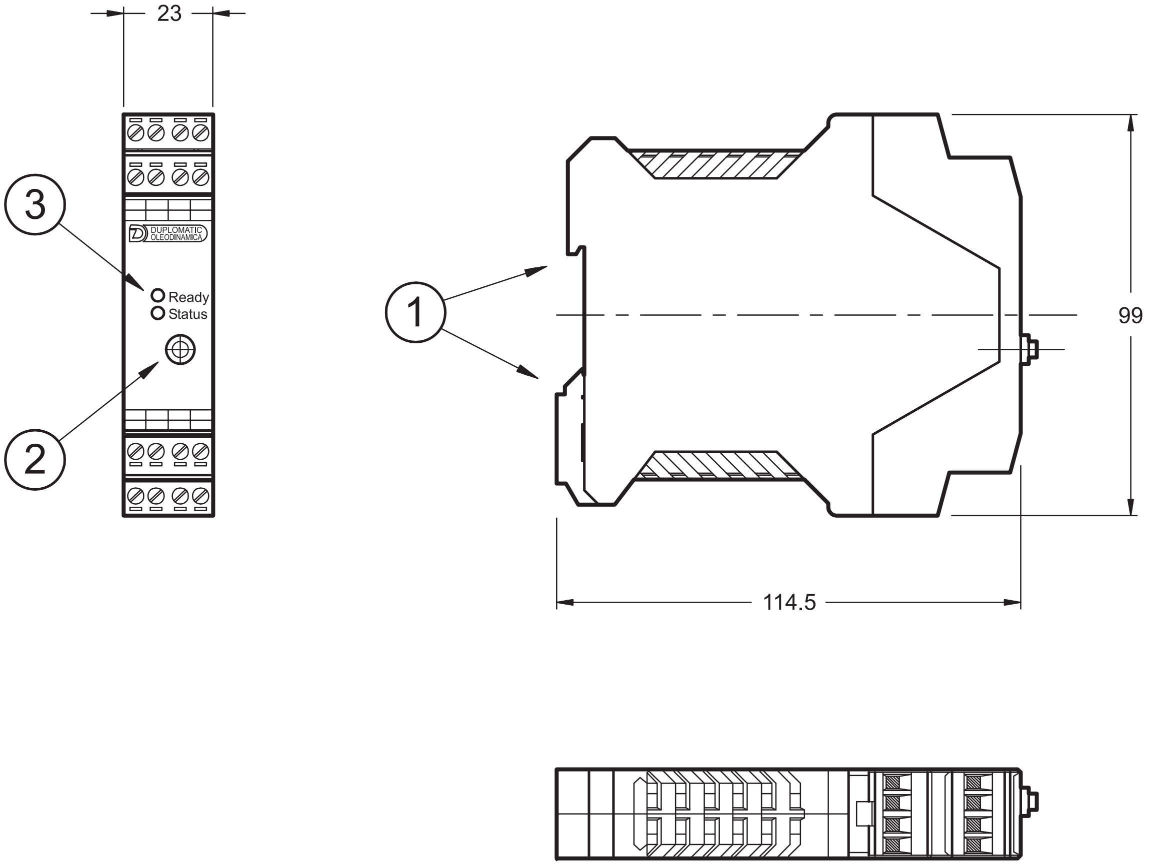
PIN 1/2	PWM outputs for solenoid control. Solenoid B
PIN 3/4	PWM outputs for solenoid control. Solenoid A STATUS output.
PIN 5	READY output. This output is high when ENABLE is active and there is no sensor error. This output corresponds with the green LED.
PIN 15	ENABLE input: This digital input signal initializes the application. The analogue output is active and the READY signal indicates that all components are working correctly. Error conditions are disabling by the ENABLE command.
PIN 6 9 14	Digital control inputs to retrieve the appropriate setpoints. All setpoints, in a storage area be deposited, can be linked binary. S1: Pin 6, S2: Pin 9, S4: Pin 14. see the table below.

Address	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
SEL 1	0	1	0	1	0	1	0	1
SEL 2	0	0	1	1	0	0	1	1
SEL 4	0	0	0	0	1	1	1	1

8 - CARD BLOCK DIAGRAM



9 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	Plug for PC cable connection
3	LED for output signals

DUPLOMATIC OLEODINAMICA S.p.A.
20015 PARABIAGO (MI) • Via M. Re Depaolini 24
Tel. +39 0331.895.111
Fax +39 0331.895.339
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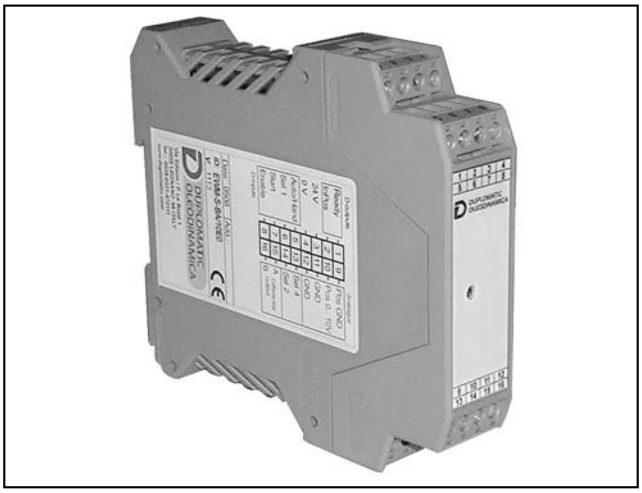
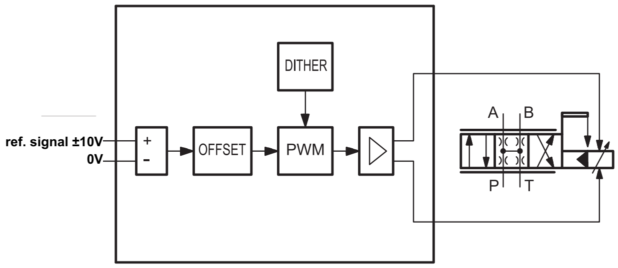


EWM-A-SV

ANALOG AMPLIFIER CARD
SERVOVALVE CONTROL
SERIES 10

RAIL MOUNTING TYPE:
DIN EN 50022

OPERATING PRINCIPLE

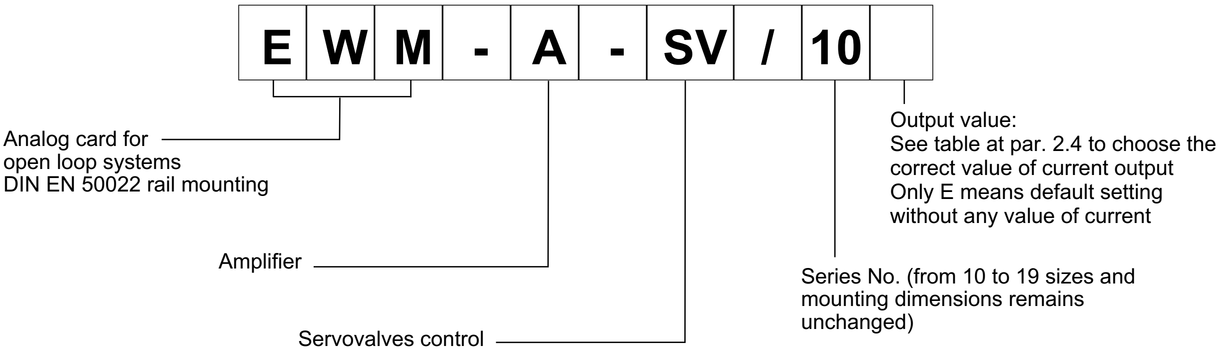


- This card is designed for a dynamic control of servovalves with the current output controlled in closed loop.
- This card is an analog amplifier that receive an analog input ±10V to move the servovalves via different values of current adjustable by DIL switches on board with steps of 10mA.
- This card has embedded an auxiliary supply positive and negative to power an external potentiometer.

TECHNICAL CHARACTERISTICS

Power supply	V DC	18 ÷ 30 ripple included
Current consumption	mA	100 + solenoid current consumption (max 300 mA)
Command position value	V	± 10 (R_I = 100 kΩ)
Output current	mA	10 to 200 (DIL switches internal selection) (R_I = 33 Ω for max I)
Dither Amplitude	Hz %	250 / 100 (DIL switch internal selection S6) 0...15 (5% pre-adjusted) of current
Offset	%	± 10
Auxiliary supply	V mA	± 10 10
Electromagnetic compatibility (EMC): according to 2004/108/EU standards		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 -combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	0 / 50
Protection degree		IP 20

1 - IDENTIFICATION CODE



Analog card for
open loop systems
DIN EN 50022 rail mounting

Amplifier

Servovalves control

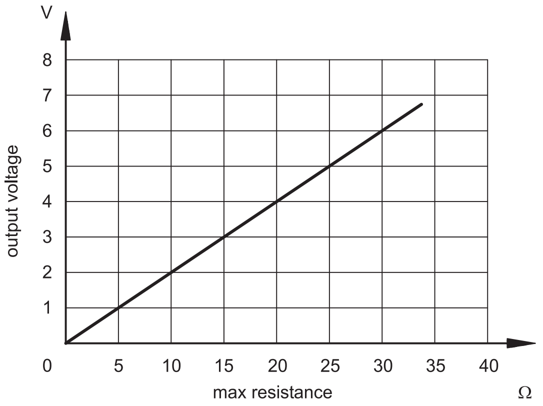
Output value:
See table at par. 2.4 to choose the
correct value of current output
Only E means default setting
without any value of current

Series No. (from 10 to 19 sizes and
mounting dimensions remains
unchanged)

The power amplifier is controlled by an analog input ± 10 Volt.

The output current is closed loop controlled and therefore independent from the supply voltage and the solenoid resistance.

The diagram below shows as resistence changes in function of output to keep constant current (I = 200mA)



2 - FUNCTIONAL SPECIFICATIONS

2.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards.

All inductivity at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode).

2.2 - Electrical protections

All inputs and outputs are protected against overvoltage and have filters.

2.3 - Reference signal

The card accepts an analogue input signal. The command value can be ± 10 V (R_I = 100kΩ).

2.4 - Output values

The card has different output values in current between 10mA to 200mA. It is necessary to open the case and inside the card there are internal DIL switches (S1…S5) for the adjustements:

	Current	S1	S2	S3	S4	S5
E	0 mA	OFF	OFF	OFF	OFF	OFF
E10	10 mA	ON	OFF	OFF	OFF	OFF
E20	20 mA	OFF	ON	OFF	OFF	OFF
E30	30 mA	ON	ON	OFF	OFF	OFF
E40	40 mA	OFF	OFF	ON	OFF	OFF
E50	50 mA	ON	OFF	ON	OFF	OFF
E60	60 mA	OFF	ON	ON	OFF	OFF
E70	70 mA	ON	ON	ON	OFF	OFF
E80	80 mA	OFF	OFF	OFF	ON	OFF
E90	90 mA	ON	OFF	OFF	ON	OFF
E100	100 mA	OFF	ON	OFF	ON	OFF
E110	110 mA	ON	ON	OFF	ON	OFF
E120	120 mA	OFF	OFF	ON	ON	OFF
E130	130 mA	ON	OFF	ON	ON	OFF
E140	140 mA	OFF	ON	ON	ON	OFF
E150	150 mA	ON	ON	ON	ON	OFF
E160	160 mA	OFF	OFF	OFF	OFF	ON
E170	170 mA	ON	OFF	OFF	OFF	ON
E180	180 mA	OFF	ON	OFF	OFF	ON
E190	190 mA	ON	ON	OFF	OFF	ON
E200	200 mA	OFF	OFF	ON	OFF	ON

2.5 - Digital Output

The digital output is the POWER ON signal, displayed from the green led.

3 - LED FUNCTIONS

There is only one green led.

GREEN: Shows if the card is ready.

ON - The card is supplied
OFF - No power supply

4 - ADJUSTMENTS

For these cards it is possible the regulation of offset and dither amplitude. It is necessary to open the case and inside the card there are offset and dither potentiometers for the adjustements.

4.1 - Offset

With this potentiometer it is possible to adjust the zero point. This module is pre-adjusted, often no further adjustment is necessary.

4.2 - Dither

With this potentiometer it is possible to adjust the dither amplitude. The dither amplitude have to be optimised to get best valve or drive performance. Dither adjustment will reduce hysteresis. The frequency range has to be selected by internal DIL switch S6:

S6	Dither
ON	250 Hz
OFF	100 Hz

5 - INSTALLATION

The card is designed for rail mounting type DIN EN 50022.

The wiring connections are on the terminal strip located on the bottom of the electronic control unit. It is recommended to use cable sections of 0.75 mm^2, up to 20 m length and of 1.00 mm^2 up to 40m length, for power supply and solenoid connections on versions it is recommended to use cables with a screened sheath connected to earth only on the card side.

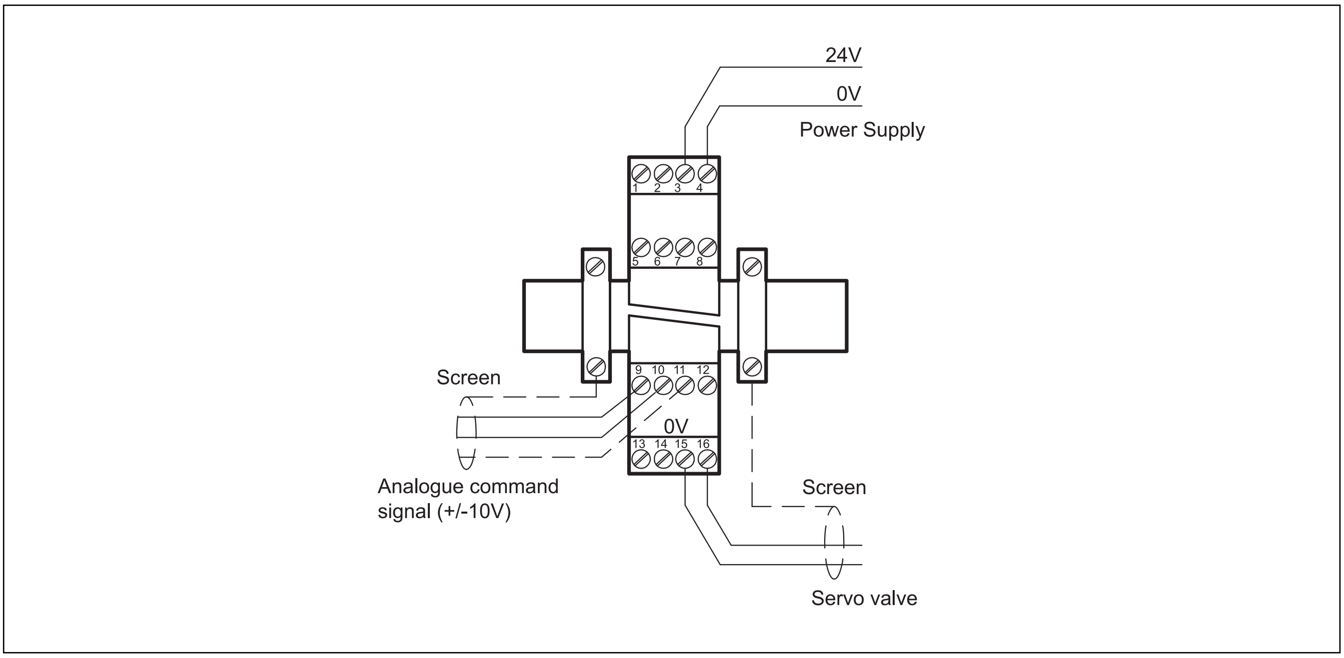
NOTE

To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

In environments that are critical from the electromagnetic interference point of view, a complete protection of the connection wires can be requested.

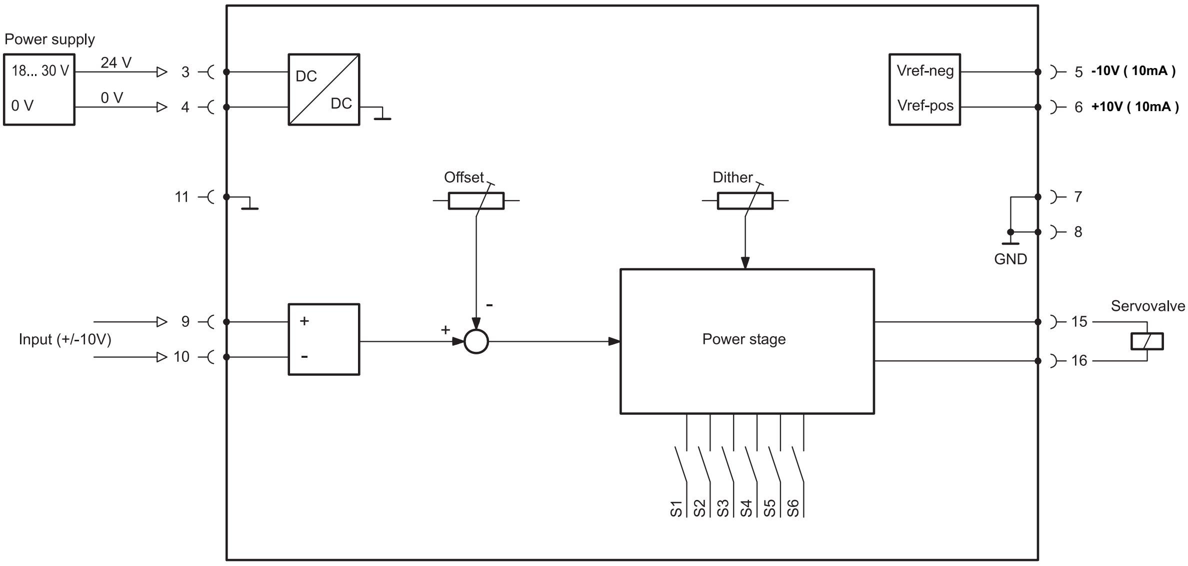
6 - WIRING DIAGRAM



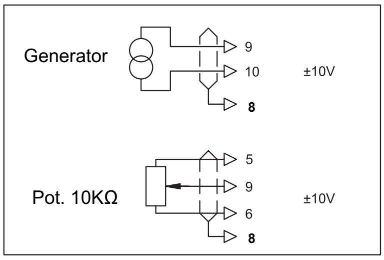
ANALOG INPUT AND OUTPUT

PIN 15/16	PWM outputs for coils control.
PIN 5/6	Auxiliary supply +10V (PIN 6) and -10V (PIN 5) to power external potentiometer.
PIN 9/10	Reference signal ±10V

7 - CARD BLOCK DIAGRAM

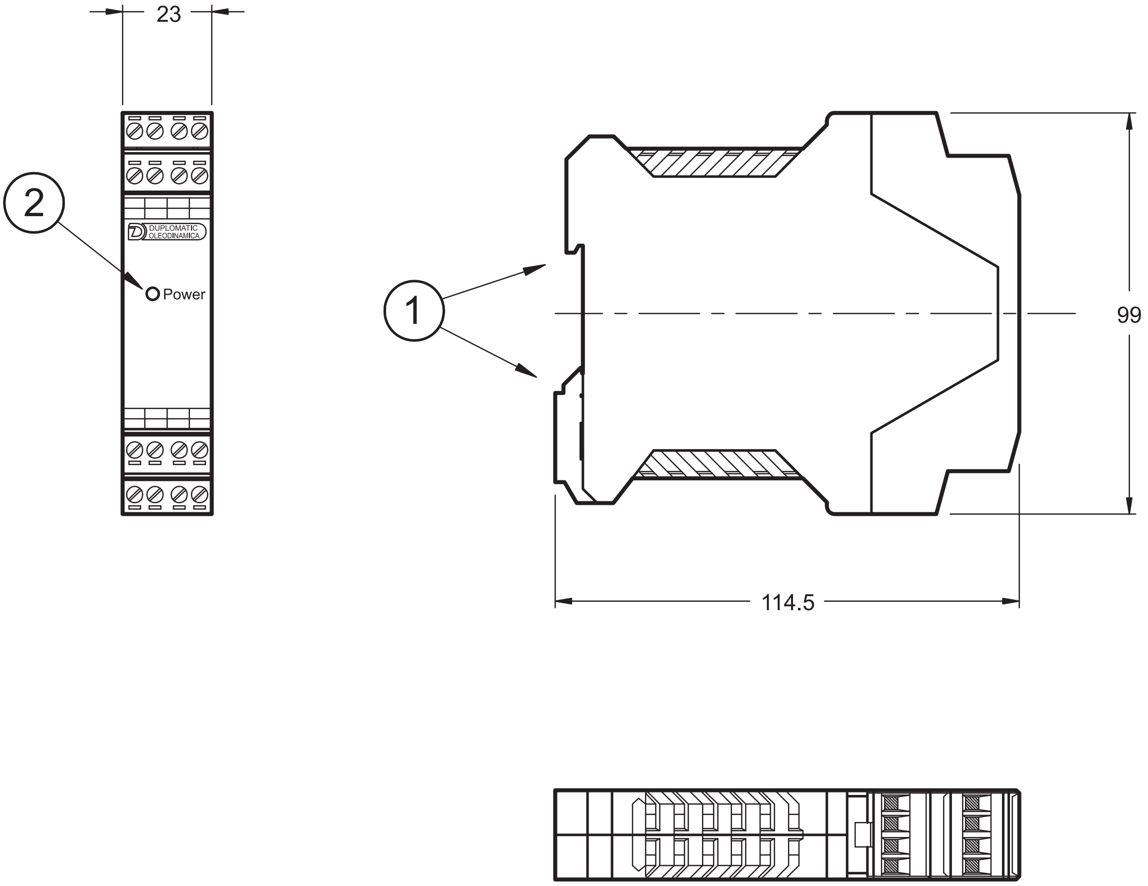


AVAILABLE COMMAND SIGNALS



NOTE: with the potentiometer as reference signal it is necessary to connect PIN 10 with PIN 11.

8 - OVERALL AND MOUNTING DIMENSIONS



1	DIN EN 50022 rail type fastening
2	LED for power on signal

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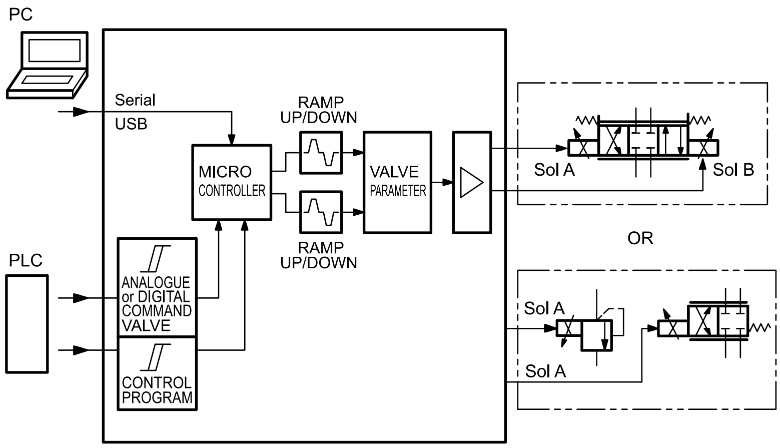
EWM-A-PV

UNIVERSAL AMPLIFIER FOR PROPORTIONAL VALVES

SERIES 20

RAIL MOUNTING TYPE: DIN EN 50022

OPERATING PRINCIPLE



— This card is designed for proportional valves control: directional, pressure or throttle valves. Current output controlled in closed loop.

— Function control mode as parameter to be configured:

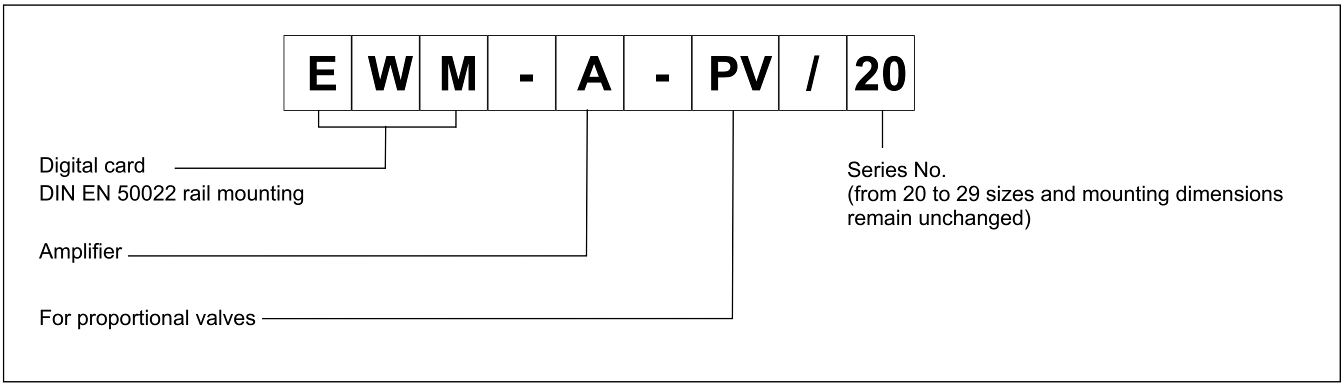
- for dual solenoids proportional valves,with analogue command signal ± 10V or 4 ÷ 20 mA.
- for one or two single solenoid proportional valves (throttle, pressure, directional..), with analogue input signal 0 ÷ 10V or 4 ÷ 20 mA.
- for proportional valves, single or dual solenoids either, with pre-programmed values, selectable by 3 digital inputs.

— Card setup via software only, through an on-board USB-B port.

TECHNICAL CHARACTERISTICS

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external	A	3 medium time lag
Current consumption	W	60 depending on type of solenoid, number of operating solenoids
Analogue command values	V mA	±10, 0 ÷ 10 (R_I = min 90 kΩ) 4 ÷ 20 (R_I = 390 Ω)
Analogue inputs value resolution	%	< 0,01
Digital command values	V	OFF: <2V, ON >10V (R_I = 25 kΩ)
Sample time of solenoid current control	ms	0.125
Sample time	ms	1
Output current	mA	500 ÷ 2600
PWM frequency	Hz	61 ÷ 2604 adjustable in prearranged steps
Interface		USB B type 2.0
Electromagnetic compatibility (EMC) 2004/108/EC		Immunity EN 61000-6-2: 8/2005 Emissions EN 61000-6-4: 6/2007; A1:2011
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Housing dimensions	mm	120(d) x 99(h) x 23(w)
Connector		4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE



2 - FEATURES

Controller functions

General power amplifier for 3 different applications:

- control of one proportional directional valve (2 solenoids) with current controlled by analog input signal
- control of one or two single solenoid proportional valves (throttle, pressure, directional..) with output current controlled by analog input signal
- control of proportional valves (with single or double solenoids either) by three digital input signals to select up to eight pre-programmed command and ramp values
- The output current is closed loop controlled: the current to solenoid is closed loop controlled, so is independent from supply and solenoid resistance.
- Parameters programmable via software: Ramps, Dither frequency and amplitude, PWM frequency and PWM gains
- Free scaling of analogue inputs
- Nominal current selectable stepless via software
- The power stage is controlled by an enable input (ENABLE)

Adaptation of the valve characteristic curve

- Characteristics linearization of current output via 10 XY-points per direction
- Deadband compensation

Monitoring functions

- The output stage is monitored for cable breakdown, is short circuit proof and disables the power stage in case of an error
- Failure monitoring for current analog inputs
- Range monitoring of the input signals (e. g. detecting failures of joystick)

Other characteristics

- GL-certification
- Output value in voltage or current, to be configured via software
- Card configuration is made via software, through on-board USB

3 - FUNCTIONAL SPECIFICATIONS

3.1 - Power supply

This card is designed for 12 to 30 VDC (typical 24 V) of a power supply. This power supply must correspond to the actual EMC standards. All inductivities at the same power supply (relays, valves) must be provided with an over voltage protection (varistors, free-wheel diodes).

It is recommended to use a regulated power supply (linear or switching mode) for the card supply and for the sensors.

NOTE: The value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoids to be controlled.

3.2 - Electrical protections

All inputs and outputs are protected with suppressor diodes and RC-filters against transient overshoots.

3.3 - Digital Input

The card accepts digital input. The digital input must have a voltage from 12 to 24 V; OFF: <2V, ON >10V. Input resistance 25 kΩ. See the block diagrams for the electric connections.

3.4 - Reference signals

This card is broadly customizable and the command value depends on the function mode selected. (FUNCTION parameter). Once the function has been set and the data saved, the input will be configured automatically

3.4.1 - A-PV function, analogue:

± 10V or 4 ÷ 20 mA (one channel, 2 solenoids)

3.4.2 - 2A-PV function, analogue:

0 ÷ 10V or 4 ÷ 20 mA (two indipendent channels)

3.4.3 -D-RL digital, to be pre-parameterized by parameter

8 pre-programmed values (units %), selectable by 3 digital inputs (8 binary targets).

For both single or dual solenoids proportional valve either.

3.5 - Output value

Output value is in current, value range 500 ÷ 2600 mA.

All cables which lead outside must be screened.

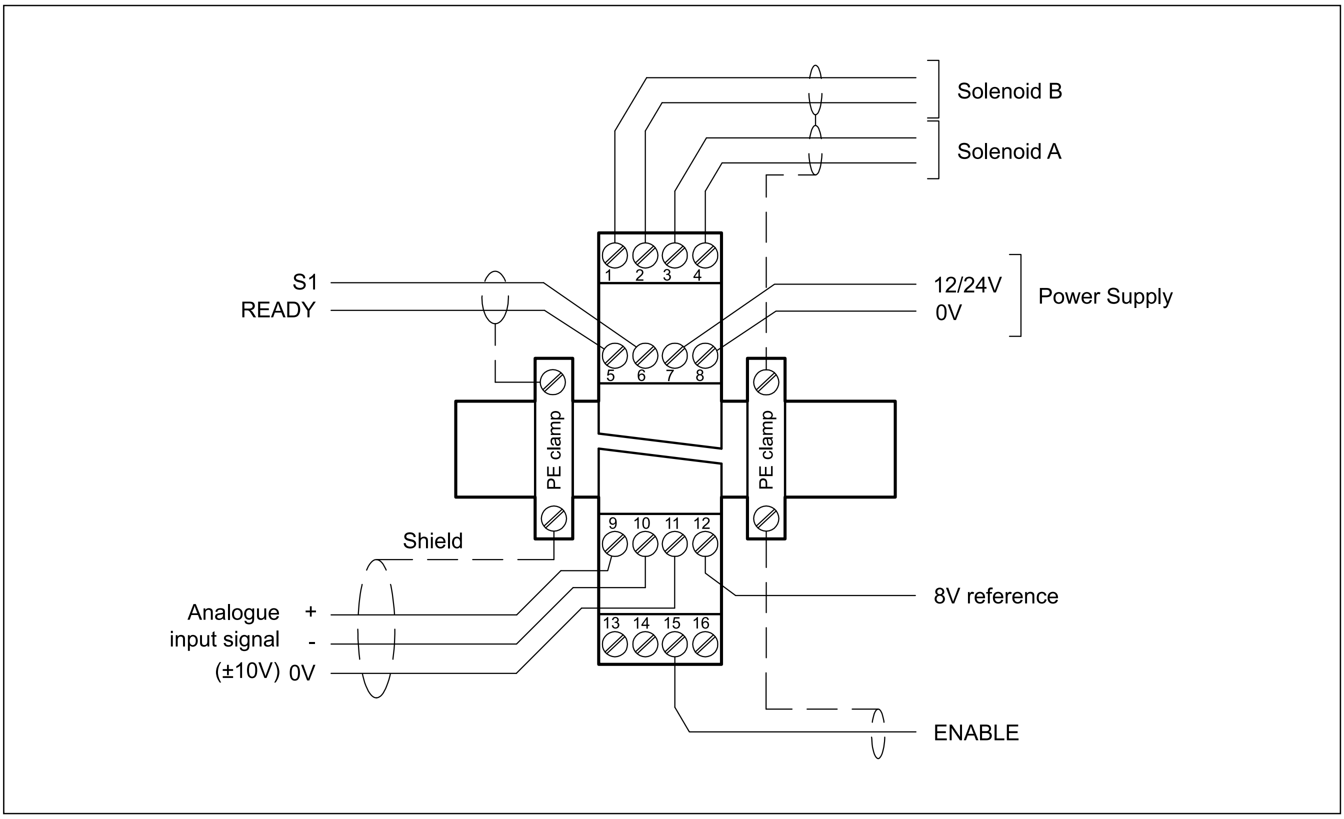
3.6 - Digital outputs

The digital output is READY signal, displayed by the green LED on the front panel.

Low level < 2 V High Level > max V+, where V+ = power supply (max 50 V).

4 - WIRING DIAGRAMS

4.1 - FUNCT A-PV: analogue signal for dual solenoids directional valve



DIGITAL INPUT AND OUTPUT

PIN 5 READY output.
ON: No internal or external errors are detected
OFF: ENABLE (PIN 15) is deactivated or an error is detected

PIN 6 S1 input:
Function dependent on parameter PIN:6 (USCALE/RAMP).
OFF: Output current depends on parameter USCALE / ramp function is deactivated.
ON: Output current is not scaled by USCALE / ramp function is activated.

PIN 15 ENABLE input
This digital input signal initializes the application.
The analogue output is active and the READY signal indicates that all components are working correctly.
By deactivating this input the errors signals are reset.

ANALOGUE INPUT

PIN 11 0V reference for the signal inputs.
Warning! PIN 11 and PIN 8 are connected internally

PIN 10/9 Command input signal (w)
range -100...+100%
corresponds to ±10V or 4 ÷20 mA

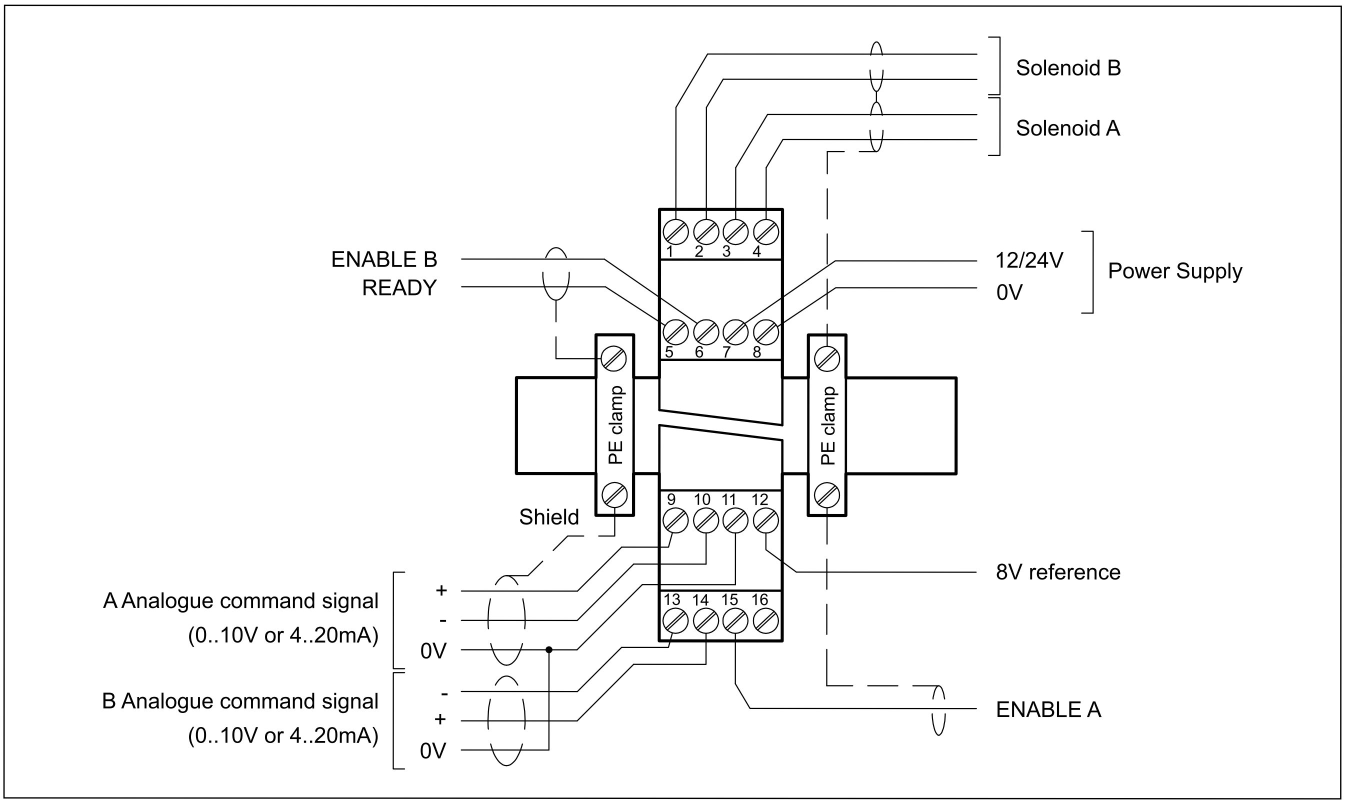
POWER OUTPUT

PIN 1/2 PWM outputs for solenoid control. Solenoid B

PIN 3/4 PWM output for valve control.

PIN 12 8V reference output (max. 25mA)

4.2 - FUNCTION 2A-PV: analogue signal, two independent channels, for up to two single solenoid valves



DIGITAL INPUT AND OUTPUT

PIN 5 READY output.
ON: No internal or external errors are detected.
OFF: Both power stages are deactivated or an error is detected.
This output is visible on the green LED

PIN 6 ENABLE Input Channel B
(dependent on ENABLE_B parameter):
This digital input signal initializes the application.
The output and the READY signal will be activated.
By deactivating error signals are reset.

PIN 15 ENABLE Input channels A/B or channel A either
(dependent on ENABLE_B parameter: if set to OFF, digital input PIN 15 enables both output channels. if ON, the two enable are independent)
This digital input signal initializes the application.
The output and the READY signal will be activated.
By deactivating this input the errors signals are reset.

ANALOGUE INPUT

PIN 11 0V reference for the signal inputs.
Warning! PIN 11 and PIN 8 are connected internally

PIN 10/9 Command input signal A (wa)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷ 20 mA

PIN 13/14 Command input signal B (wb)
range 0 ÷ 100%
corresponds to 0 ÷ 10V or 4 ÷ 20 mA

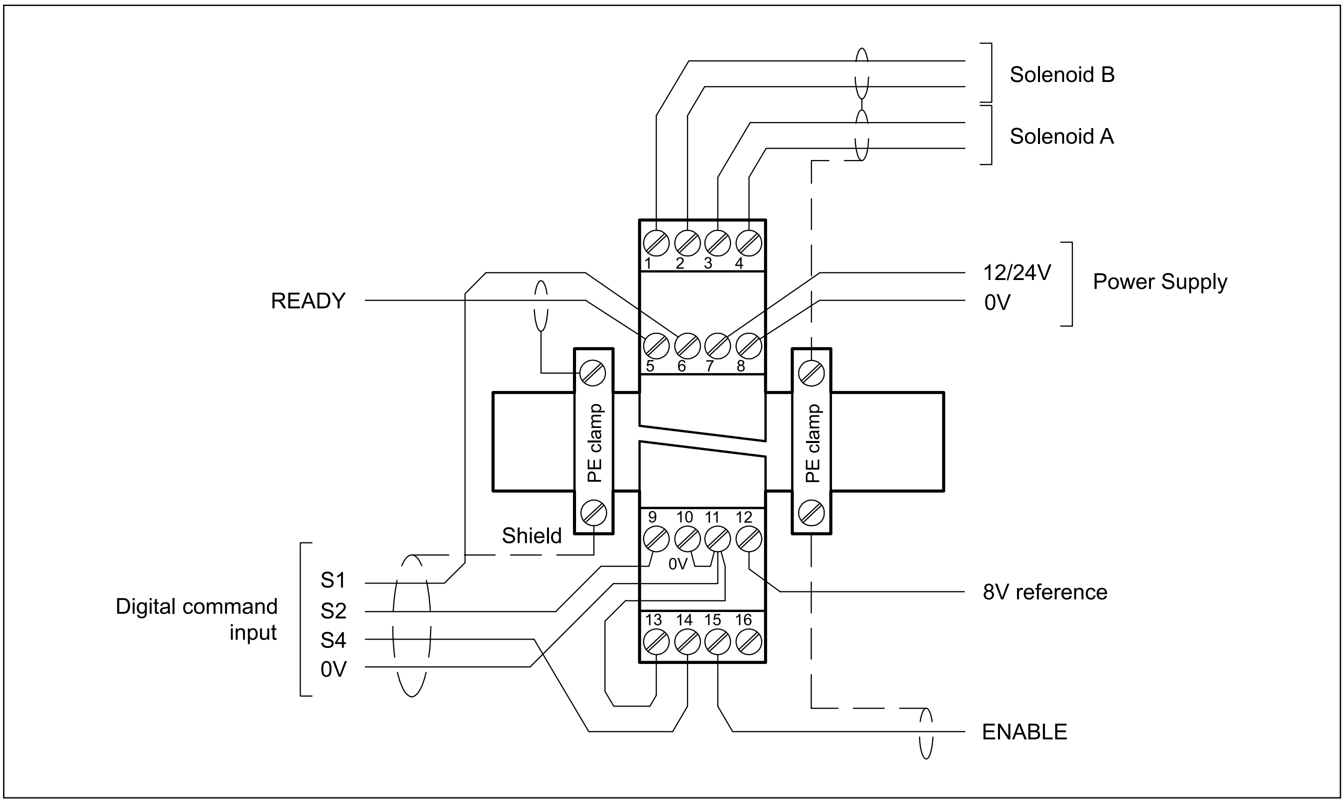
POWER OUTPUT

PIN 1/2 PWM outputs for solenoid control. Solenoid B

PIN 3/4 PWM outputs for solenoid control. Solenoid A

PIN 12 8V reference output (max. 25 mA)

4.3 - FUNCT D-RL: preset digital inputs



DIGITAL INPUT AND OUTPUT

PIN 5 READY output.
ON: No internal or external errors are detected
OFF: ENABLE (PIN 15) is deactivated or an error is detected

PIN 6 9 14 Digital gate inputs for selecting the command value:
PIN 6: S1 PIN 9: S2 PIN 14: S4
The whole range of set points can be chosen by binary coding of these inputs.
see the table below.

Address	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
S1	0	1	0	1	0	1	0	1
S2	0	0	1	1	0	0	1	1
S4	0	0	0	0	1	1	1	1

PIN 15 ENABLE input
This digital input signal initializes the application.
The output and the READY signal will be activated.
By deactivating this input the errors signals are reset.

POWER OUTPUT

PIN 1/2 PWM outputs for solenoid control. Solenoid B

PIN 3/4 PWM output for valve control.

PIN 12 8V reference output (max. 25mA)

5 - INSTALLATION

For power supply and solenoid connections are recommended cable sections of 0.75 mm^2 up to 20 m length, and of 1.00 mm^2 up to 40m length.

For other connections use cables with a shielded jacket, connected to GND only on the card side.

NOTE : To observe EMC requirements it is important that the control unit electrical connection is in strict compliance with the wiring diagram.

As a general rule, the valve and the electronic unit connection wires must be kept as far as possible from interference sources (e.g. power wires, electric motors, inverters and electrical switches).

Complete protection of the connection wires can be requested in environments with critical electromagnetic interferences.

5.1 Start-up

The module must be mounted and wired with attentions to EMC requirements. A star orientated ground connection should be used when other power consumers are sharing the same power supply. Following points have to be taken in account for wiring:

- Signal cable and power cable have to be wired separately.
- Analogue signal cables must be shielded.
- Other cables should be shielded in case of strong electrical disturbance (power relays, frequency controlled power driver) or at cable lengths > 3m.

⚠ **WARNING! Plugs with free-wheeling diodes and LED indicators cannot be used with current controlled power outputs. They interfere with the current control and can destroy the output stage.**

With high frequency EMI inexpensive ferrite elements can be used.

Take in account a separation between the power part (and power cables) and signal part when arrange the areas inside the electrical cabinet. Experience shows us that the area next to the PLC (24 V area) is suitable.

Low impedance between PE “protected earth” and DIN-Rail should be used. Transient interference voltages at the terminals are discharged via DIN-Rail to the local PE. The screens have to be connected directly next to the module via PE terminals.

The power supply should be carried out voltage regulated (i. e. PWM controlled). The low impedance of controlled power supplies facilitates improved interference damping, therefore the signal resolution will be increased.

Switched inductance (relays and solenoids) operating from the same power supply has to be damped by surge protection elements directly by the inductance.

6 - DEVICE SETUP

Card set-up is possible via software only.

6.1 - Software EWMPC/20

The software EWMPC/20 can be easily downloaded from the Duplomatic Oleodinamica website in the section SOFTWARE DOWNLOAD.

To connect the card to a PC or notebook is necessary a standard USB 2.0 cable A – B (standard USB printer cable).

Once connected, the software automatically recognises the card model and shows a table with all the available commands, their parameters, the default setting, the measuring unit and a brief explanation for correct set-up.

Some functions like baud rate setting, remote control mode, saving of process data for later evaluation are used to speed up the installation procedure.

The software is compliant with Microsoft OS Windows 7 and 8.

⚠ **WARNING! For card series 20, the default baud rate to select in the software has changed from 9600 baud to 57600 baud. This is adaptable in OPTION / SETTINGS / INTERFACE.**

6.2 - Parameters table

The parameters table is available in English or German. The language is set in the parameters.

The parameter setting can be done at standard level, easier, or expert, where a greater number of parameters is displayed and can be customized.

For a complete list of the parameters and their settings please refer to the ***Technical Manual 89620 ETM***.

7 - MAIN FEATURES

7.1 - Applications

The power amplifier (D-RL function) is controlled by an enable input and three switch signals. Therefore 8 demand values can be activated binary.

In the event of analogue control (A-PV function) it’s possible to preset the directions with two inputs and switch over between rapid and slow speed with the third input.

The output current is closed loop controlled and therefore independent from the supply voltage and the solenoid resistance.

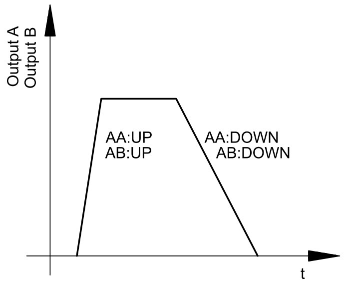
The output signal (of up to 2.6A) can control a variety of valves which need a flexible adaptation of the solenoid control, such as pressure relieve valves and pressure control valves, directional and throttle valves as such no on-board electronics are needed.

7.2 - Ramp function /acceleration time

The parameters for ramp up and ramp down can be set in milliseconds. These values are the amount of time that the command signal will take to follow a step change in the reference signal.

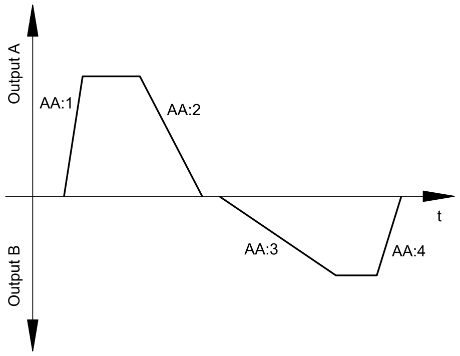
for 2A-PV

Two quadrant ramp function.



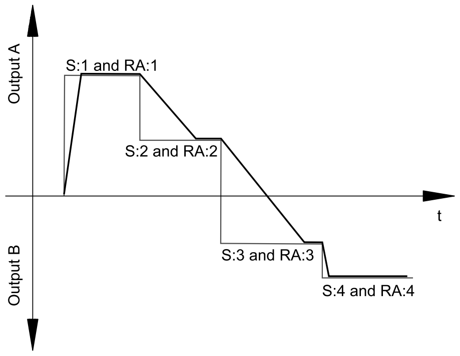
for A-PV

Four quadrants ramp function.



for D-RL

This configuration can take advantage either of the same four quadrant ramp function of A-PV or assign a ramp time for every command value (parameter RMODE)

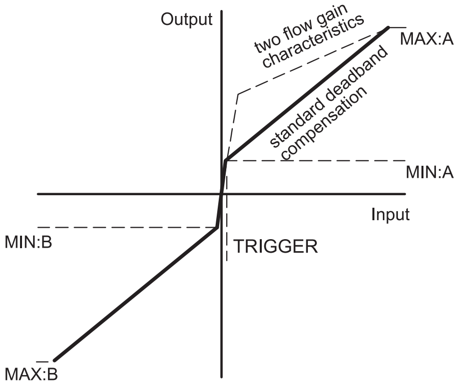


7.3 - Adaption of the output signal to the valve characteristics (TRIGGER)

With the MAX value, the maximum output can be easily defined. With the MIN value, the overlap (dead band of the valve) can be compensated. Via the TRIGGER the activation point of the MIN function is set and so a non-sensitive range around the zero-point can be specified.

If the MIN value is set too high, it influences the minimal pressure, which cannot be adjusted any longer. In extreme case this causes to an oscillating at small input values.

The diagram below is valid for A-PV and D-RL configuration. For 2A -PV please consider just the 1st quadrant.



7.4 - Linearization (CCA, CCB, CC)

A user defined signal characteristic can be set by switching on the CCMODE parameter.

The influence of the user defined linearization can be estimated via the process data on the monitor or on the oscilloscope on EWMPC/20 software.

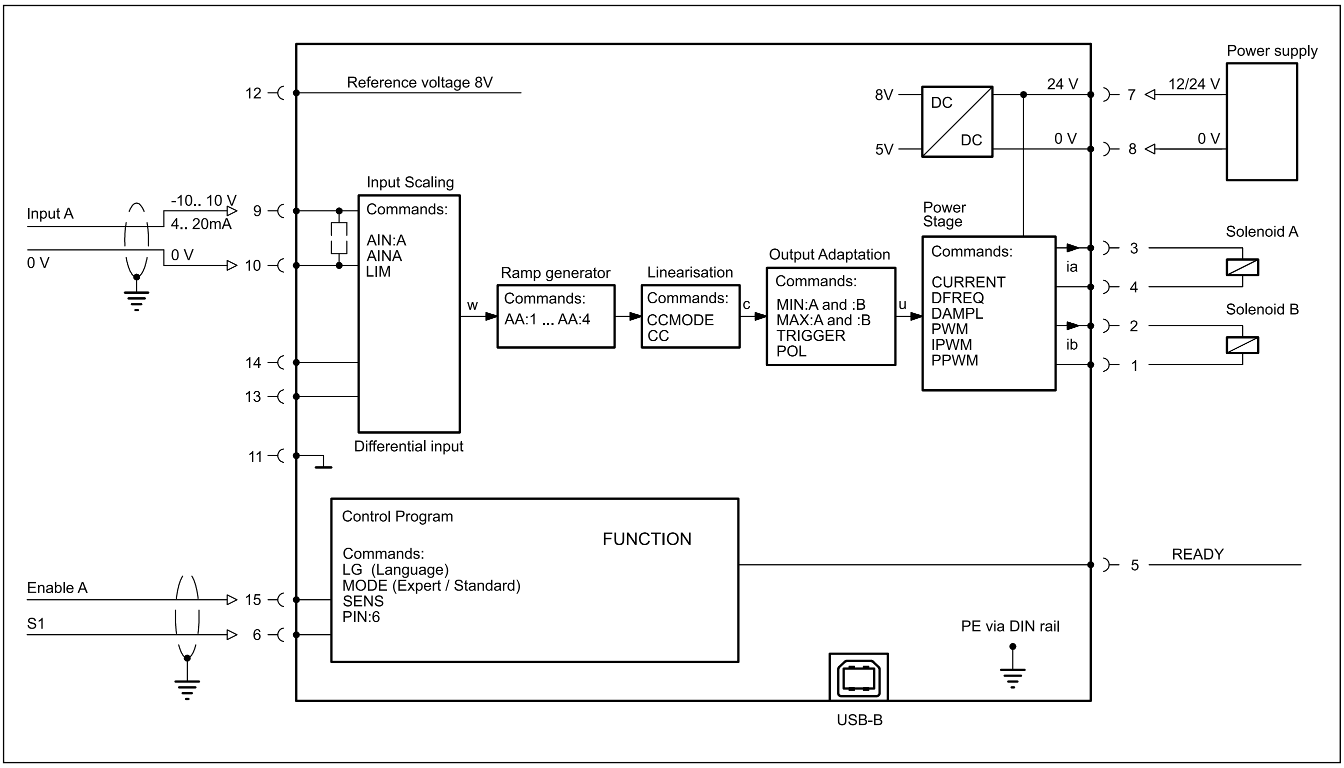
By deactivating CCMODE a simple and quick estimation of the linearization is possible

7.5 - Power Amplifier

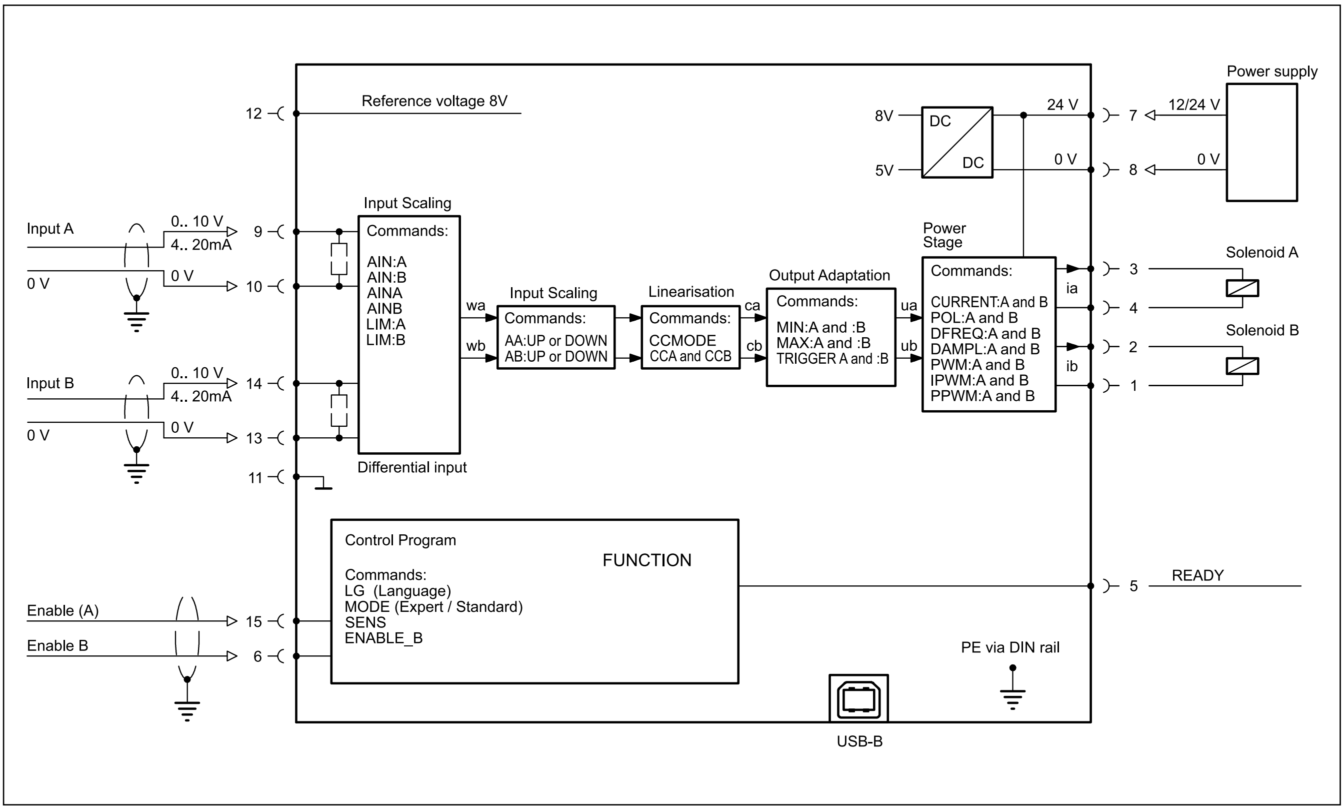
The module comes with an embedded power amplifier that is capable to generating a PWM current signal of up to 2.6A. As such the nominal current, dither, frequency and the various parameters of the current loop can be accessed and modified.

8 - CARD BLOCK DIAGRAMS

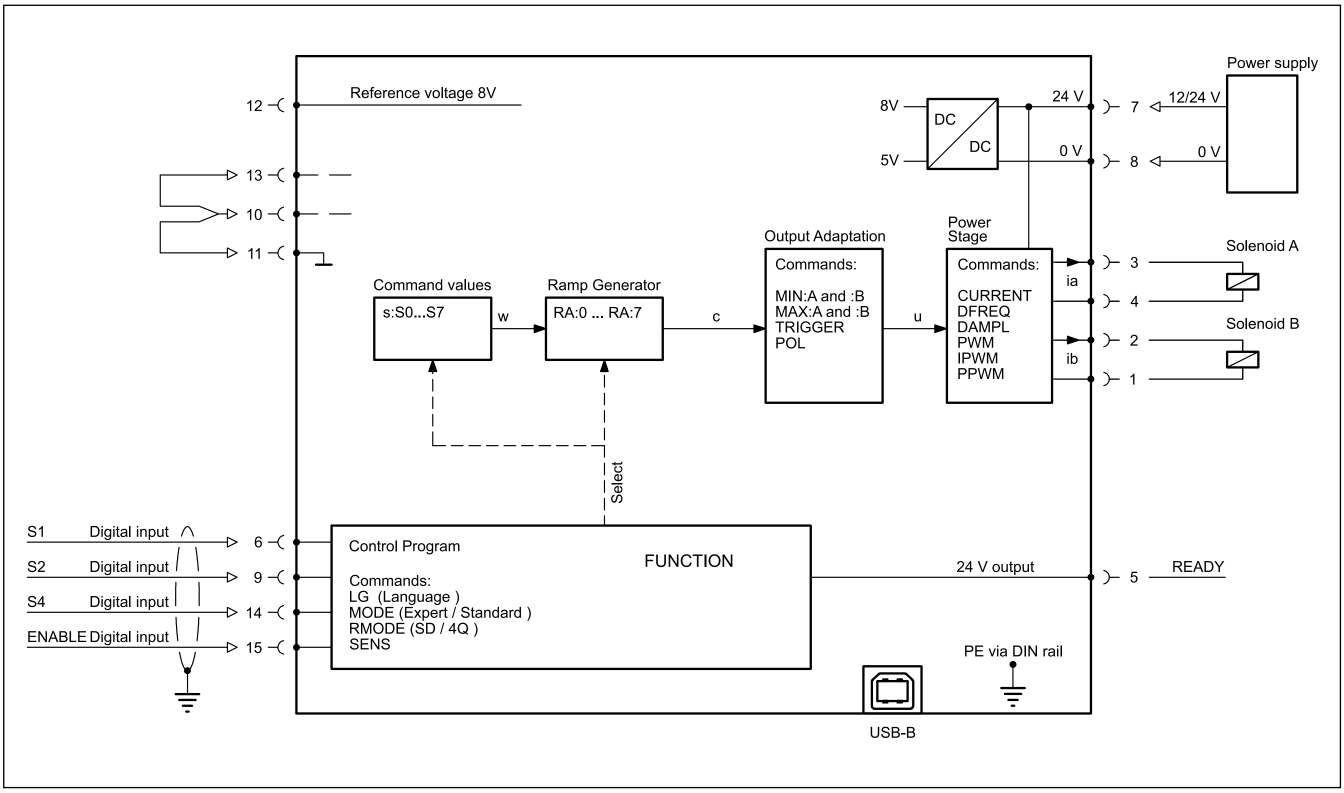
8.1 - function A-PV



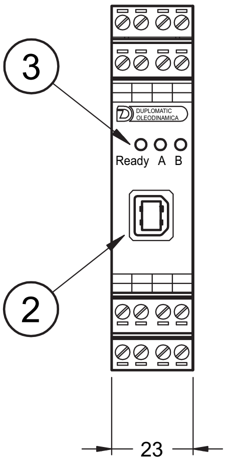
8.2 - function 2A-PV

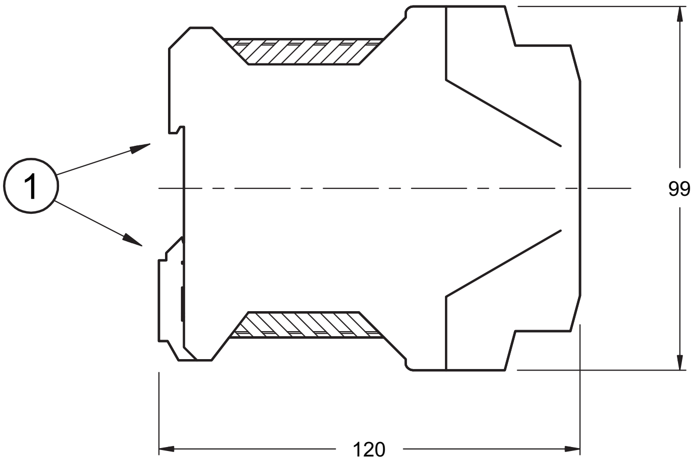


8.3 - function D-RL

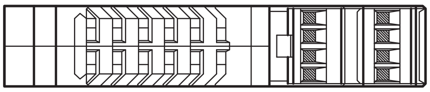


9 - OVERALL AND MOUNTING DIMENSIONS





1	DIN EN 50022 rail type fastening
2	USB interface, for setup
3	LEDs for output signals



DUPLOMATIC OLEODINAMICA

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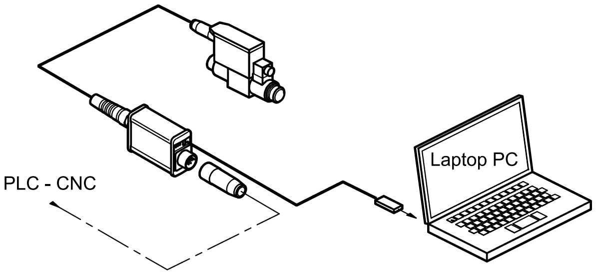
LINPC-USB

TEST DEVICE FOR PROPORTIONAL VALVES WITH INTEGRATED ELECTRONICS

SERIES 30

OPERATING PRINCIPLE



- The kit contains a test device with embedded connection cable 7 pin and a USB cable for connection to the PC. The dedicated software are available for download from our web site.
- The device is suitable for troubleshooting and functional testing of Duplomatic proportional valves with LIN-bus interface, for open loop (type G) and closed loop (type J), series 20, 30 and 31.
- The software allow the check of settings, display the diagnostic and permit to make changes on the standard parameter setting made in factory, adapting it to your system.
- No additional power supply is required: the device uses the supply source from the 7 pin system cable.

TECHNICAL CHARACTERISTICS

Power supply	V CC	24 (19 ÷ 30)
Current consumption	mA	50
Connector to the valve		7 - pin MIL-C-5015-G (DIN 43563)
Connection cable		USB 2.0
Electromagnetic compatibility (EMC) :		according to 2004/108/EC EN 61000-6-4 (emissions) EN 61000-6-2 (immunity)
Housing dimensions	mm	104x63x38 + 2000 outgoing cable
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

1 - IDENTIFICATION CODE

LIN PC - USB / 30

Serial communication protocol type LIN-bus

Interface

Series number

Computer interface type

2 - DESCRIPTION

The device acts as interface between the PC and the valve on-board electronics. It allows the customization of the parameters via software and diagnostics and troubleshooting, by means of the internal monitors available in the software (EBC for series 30, EWMPC for series 20).

The kit contains:

- test device with integrated 7-pin cable to be connected to the valve
- USB Cable 2.0 A - Male to Micro B (3 m).

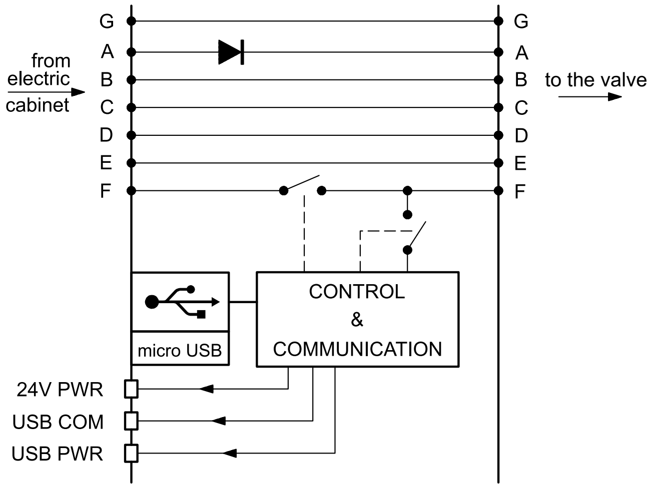
⚠ **The USB cable cannot be longer than 3 m, in order to maintain the communication quality.**

Software and customization Guide are available for download at www.duplomatic.com , 'Documents & downloads'.

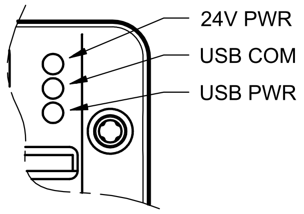
The EBC software is compliant with Windows OS 7, 8 and 10.

More details on device operation are available in the Software Guide.

3 - BLOCK DIAGRAM



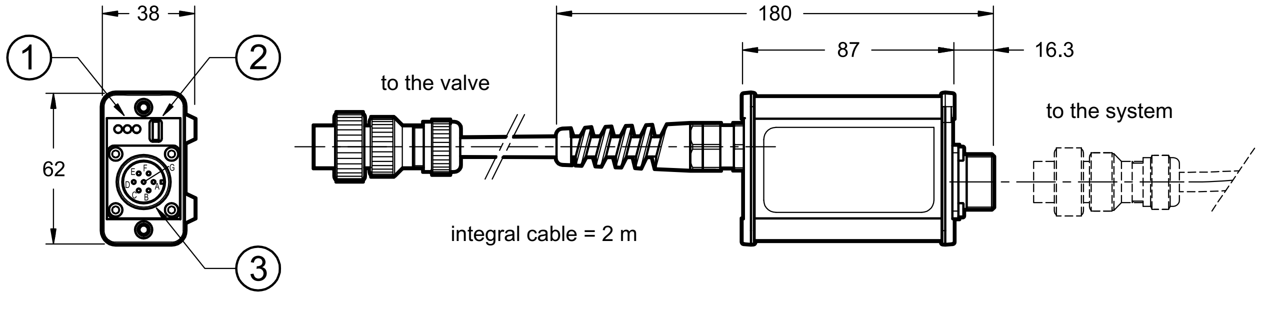
4 - LED



function	description
24V PWR (24V powered)	Main power supply via 24V (pin A) green LED indicates the device is powered by 24 V source on pin A of the 7-pin connector.
USB COM	USB communication red = [TX] transmission green = [RX] receiving
USB PWR (USB powered)	USB supply yellow indicates that the USB section is powered.

⚠ **WARNING! Connecting the device will cut off the pin F monitor signal from the valve, in order to allow the LINbus communication. This behaviour can be managed via software.**

5 - OVERALL DIMENSIONS



1	LED
2	USB micro B socket (cable included - length = 3 m)
3	Main connection 7 pin

PSC

CARD HOLDERS FOR ELECTRONIC CONTROL UNITS IN EUROCARD FORMAT

SERIES 20

IEC 60603-2 (DIN 41612)

TECHNICAL CHARACTERISTICS

CARD HOLDER TYPE		32D	48F
Connector type		IEC 603 / DIN 41612 female	
Number of poles		32	48
Connector shape		D	F
Nominal voltage	V	250	
Nominal current	A	4	
Flexible conductors max section	mm^2	2,5	
Stiff conductors max section	mm^2	4	
Conductors wiring		terminal block with fastening bolts	

DESCRIPTION

— The card holders type PSC are accessories suitable to be installed on electronic control units type UEIK.

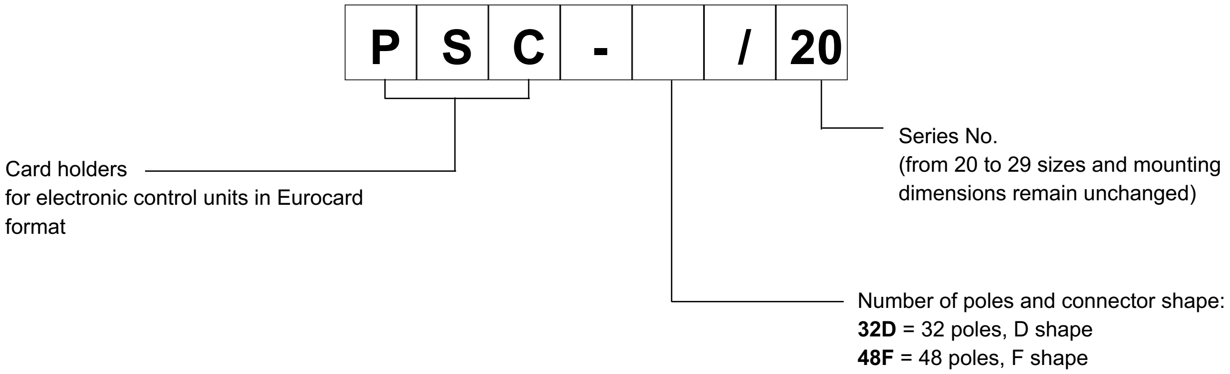
— They are available with a IEC 603 / DIN 41612 connector, with a female fitting, either D shape 32 poles, or F shape 48 poles.

— They are supplied with a special safety locking, which blocks the electronic control unit and prevents any accidental contact loss between the two used connectors.

— The conductor wiring is carried out via a terminal block with fastening bolts.

— They can be installed inside a switchboard and be fixed directly on a plate.

1 - IDENTIFICATION CODE



Card holders
for electronic control units in Eurocard format

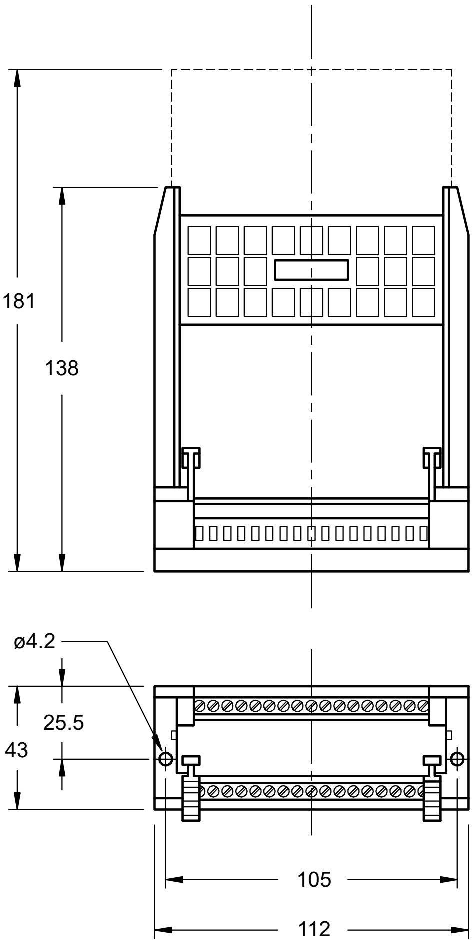
Series No.
(from 20 to 29 sizes and mounting dimensions remain unchanged)

Number of poles and connector shape:
32D = 32 poles, D shape
48F = 48 poles, F shape

2 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

PSC-32D/20



PSC-48F/20