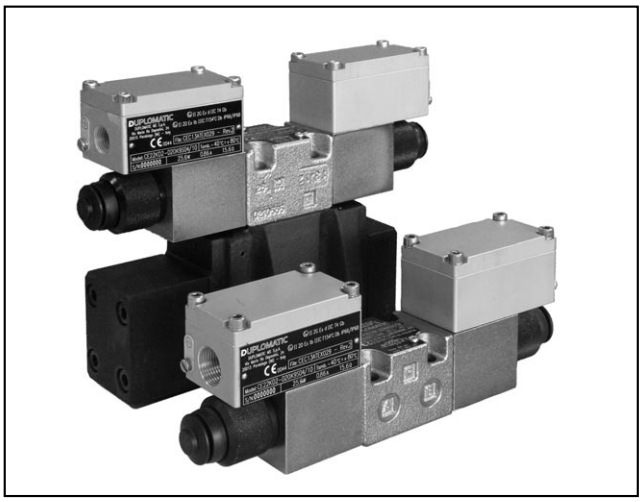
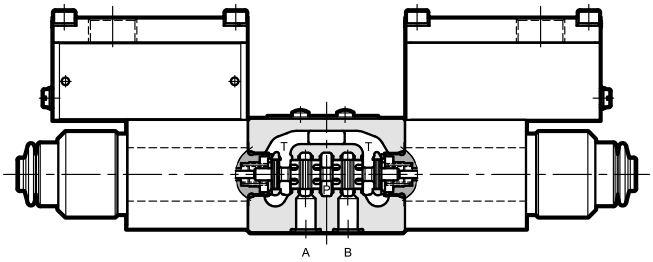


# DS(P)E*K*

## EXPLOSION-PROOF PROPORTIONAL DIRECTIONAL VALVES ATEX, IECEx, INMETRO, PESO

| | |
|---|---|
| **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, INMETRO or PESO 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. 20).

— 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.

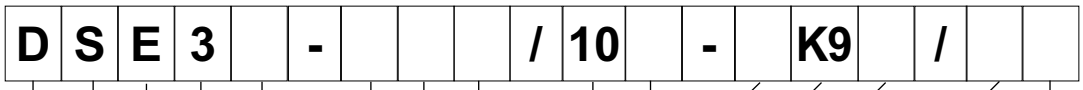
— **Details for classification, operating temperatures and electrical characteristics are in the technical data sheet 02 500 'Explosion proof classification'.**

## PERFORMANCES

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

| | | DSE3K* | DSPE5K* DSPE5RK* | DSPE7K* | DSPE8K* | DSPE10K* |
|---|---|---|---|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T ports | bar | 350<br>210 | 350<br>see paragraph 8 | | | |
| Max flow rate | l/min | 20 | 180 | 450 | 800 | 1600 |
| Step response | | see paragraph 7 | | | | |
| Hysteresis | % of Q max | <6% (PWM 200Hz) | < 4% (PWM 100 Hz) | | | |
| Repeatability | % of Q max | < ±1,5% | < ± 2% | | | |
| Electrical characteristics | | see paragraph 3 | | | | |
| 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<br>double solenoid valve | kg | 1,9<br>2,8 | 7,5<br>8,3 | 9,9<br>10,7 | 16,1<br>16,9 | 38,5<br>39,5 |

## 1 - IDENTIFICATION OF DIRECT OPERATED VALVES




Direct operated solenoid valve

Electric proportional control

Size: ISO 4401-03

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

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: junction box

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
**CH** = lever manual override.
Dimensions for CB and CH at par. 18

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

**NOTE**: Valves are supplied with zinc-nickel surface treatment, that is 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).

**Version with monobloc steel coil**

Standard coils are made of zinc-nickel steel, with anodized aluminium junction box on it.

Monobloc coils **MD24K9S01** completely made of steel are available upon request. They have zinc-nickel treatment, power supply voltage D24 and cable gland connection type S01. Other variants for voltage and cable gland connection are available, always on request.

### 1.1 - Names of valves per certification

| | ATEX | | IECEx | | INMETRO | | PESO | |
|---|---|---|---|---|---|---|---|---|
| for gases<br>for dusts | **KD2** | II 2GD | **KXD2** | IECEx Gb<br>IECEx Db | **KBD2** | INMETRO Gb<br>INMETRO Db | **KPD2** | PESO Gb<br>not applicable for dust |
| for mines | **KDM2** | I M2 | **KXDM2** | IECEx Mb | **KBDM2** | INMETRO Mb | not applicable for mines | |

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

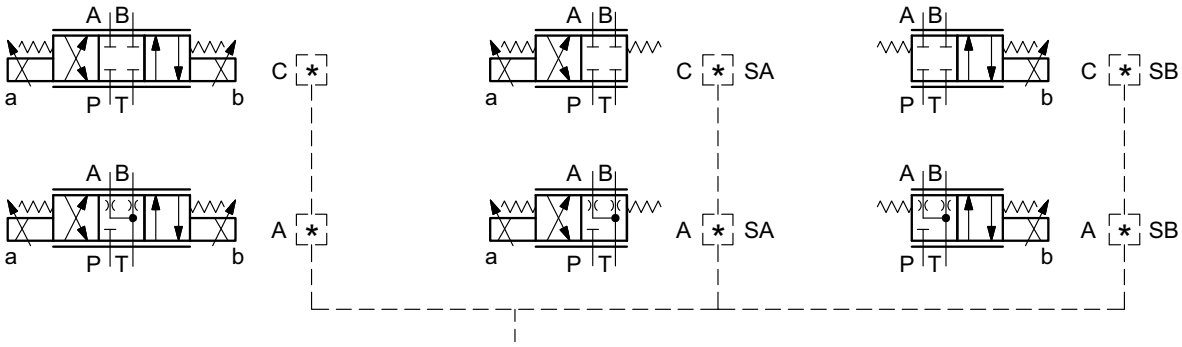
**1.2 - Available configurations**

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



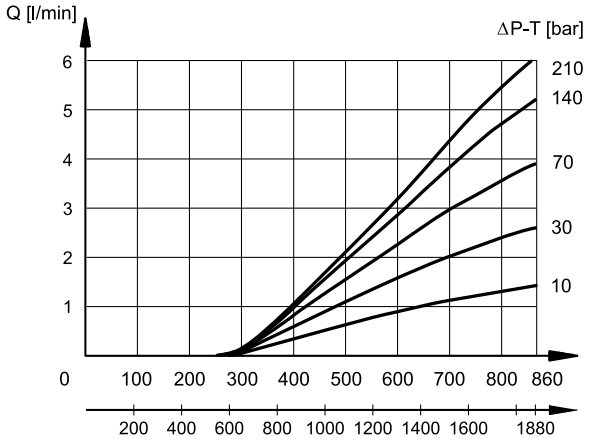

| * | Nominal flow with Δp10 bar P→T |
|---|---|
| **01** | 1 l/min |
| **04** | 4 l/min |
| **08** | 8 l/min |
| **16** | 16 l/min |
| **16/08** | 16 (P→A) / 08 (B→T) l/min |
| **26** | 26 l/min |
| **26/13** | 26 (P→A) / 13 (B→T) l/min |

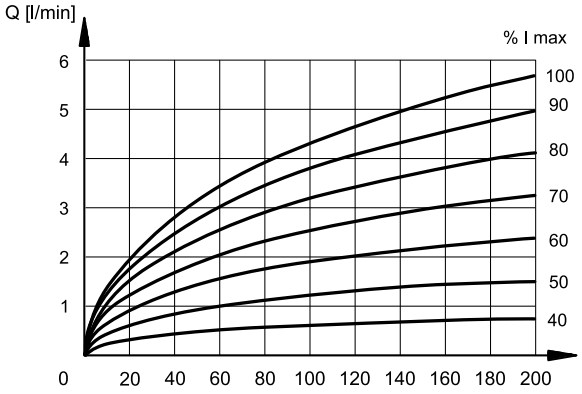
## 2 - CHARACTERISTIC CURVES OF DIRECT OPERATED VALVES

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

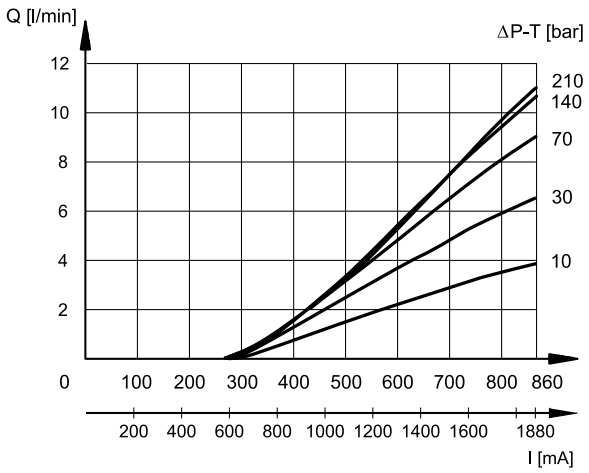
Typical flow control characteristics, according to current supply to the solenoid.
The reference Δp values are measured between ports P and T on the valve.

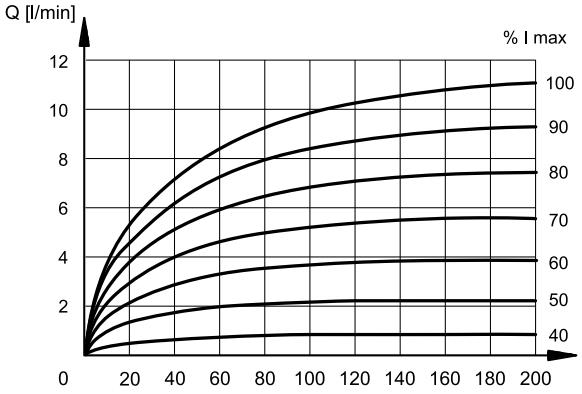
**C01 / A01**



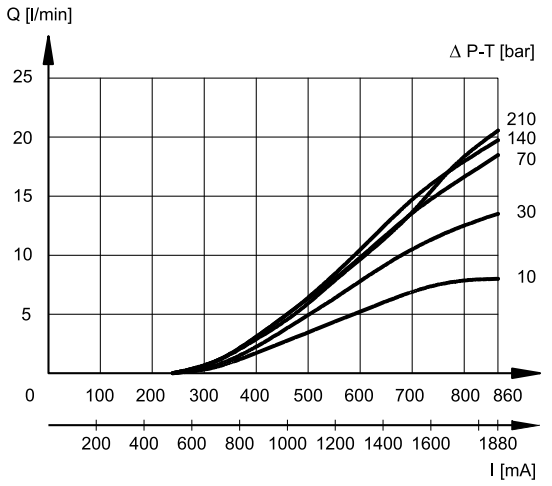



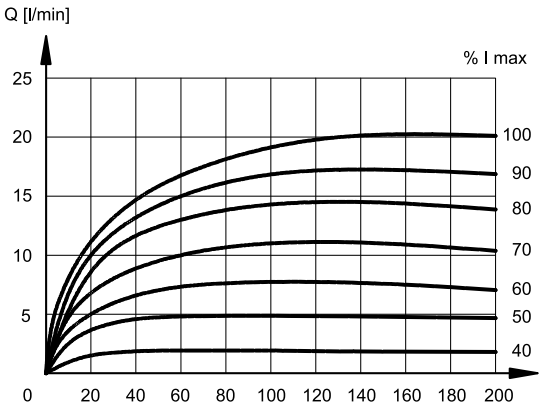

**C04 / A04**



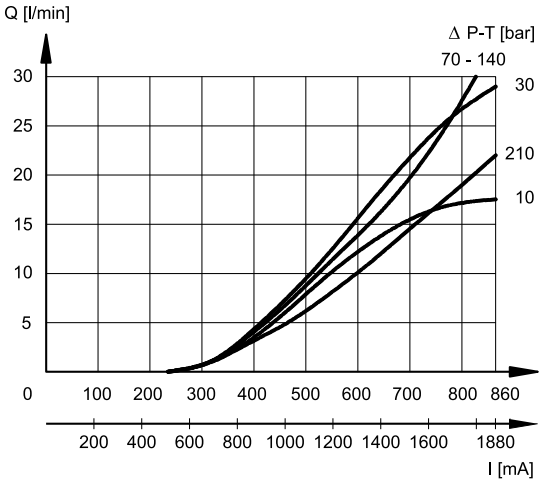



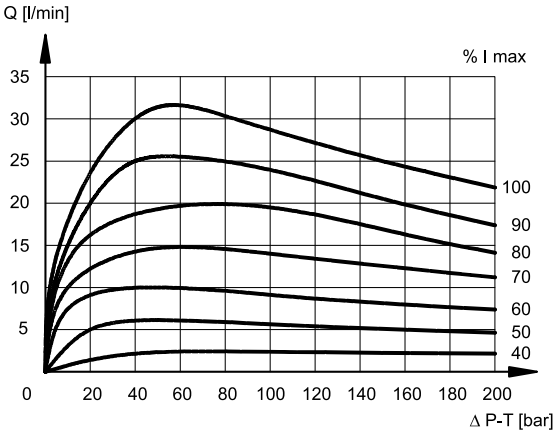

**C08 / A08**



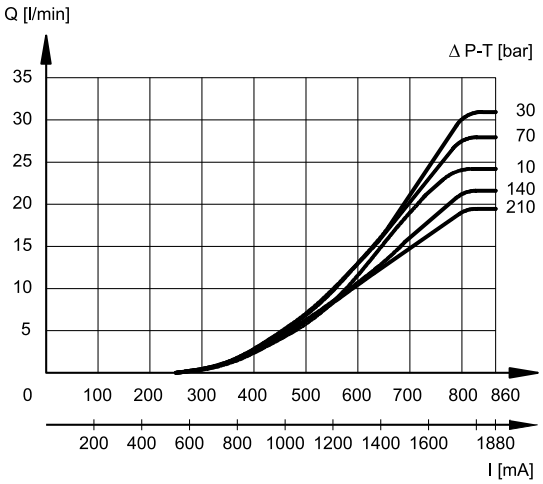



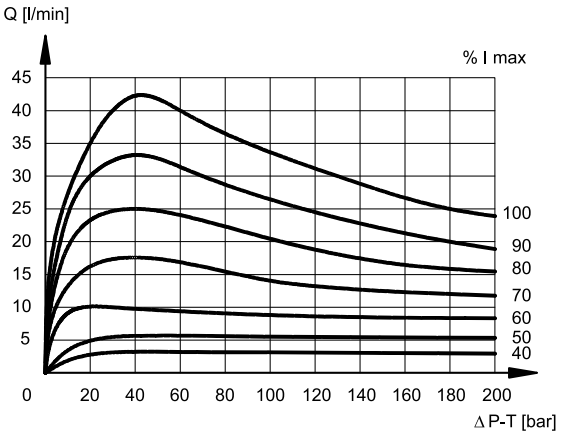
**C16 / A16**




**C26 / A26**



## 3 - ELECTRICAL CHARACTERISTICS

**(values ± 5%)**

| NOMINAL VOLTAGE | V DC | 12 | 24 |
|---|---|---|---|
| RESISTANCE (AT 20°C) | Ω | 3,8 | 15,6 |
| NOMINAL CURRENT | A | 1,88 | 0,86 |

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

### 3.1 - 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.

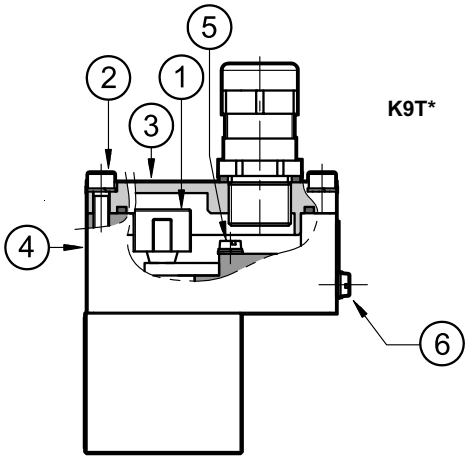
**The electrical connection is polarity-independent.**

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.

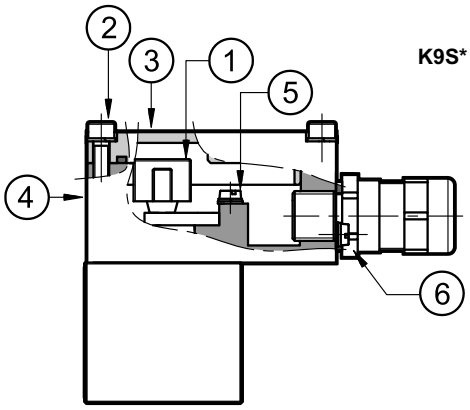
On the external body of the coil there is a grounding point (6) (M4 screw) that allow to ensure equipotentiality between the valve and the general grounding line of the system; connecting this point the regulation of the EN 13463-1 standard, that impose to verify the equipotentiality of the elements 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***

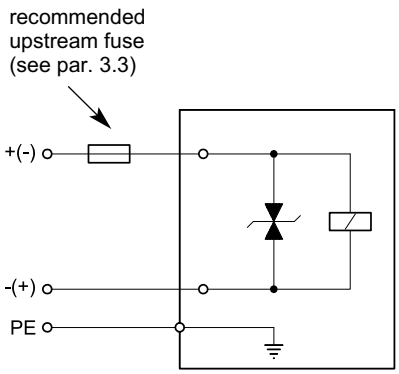
Characteristics of the cables connectable for wiring are indicated in the table below:

| 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 19) allow to use cables with external diameter between 8 and 10 mm.

### 3.2 - Electrical diagrams




### 3.3 - 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.

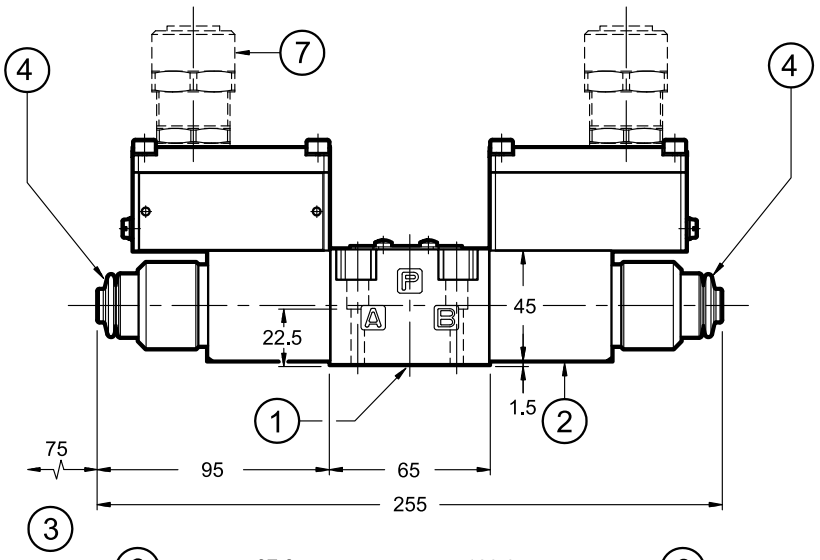
The table shows the type of fuse recommended according to the nominal voltage of the valve and to the value of the voltage peaks reduction.

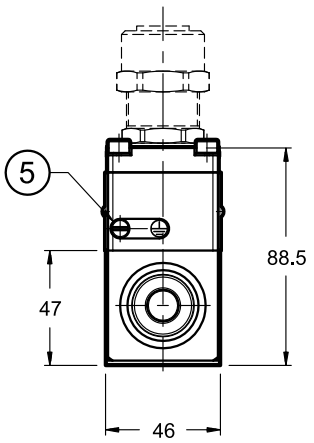
| Coil type | Nominal voltage [V] | Rated current [A] | **Recommended pre-fuse characteristics medium time-lag according to DIN 41571 [A]** | Maximum voltage value upon switch off [V] | Suppressor circuit |
|---|---|---|---|---|---|
| **D12** | 12 | 1,88 | 2,5 | - 49 | Transient voltage suppressor bidirectional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

## 4 - DSE3K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

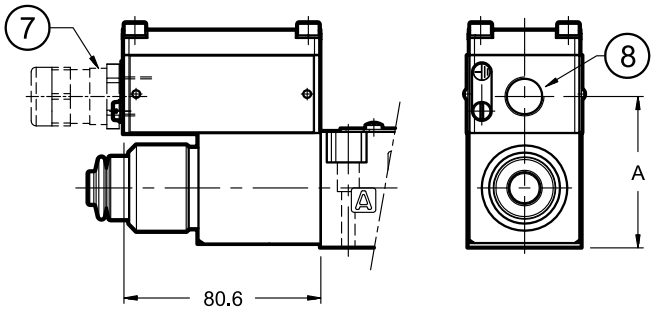
**DSE3K*-A*/10*-*K9T*/CM**
**DSE3K*-C*/10*-*K9T*/CM**

dimensions in mm

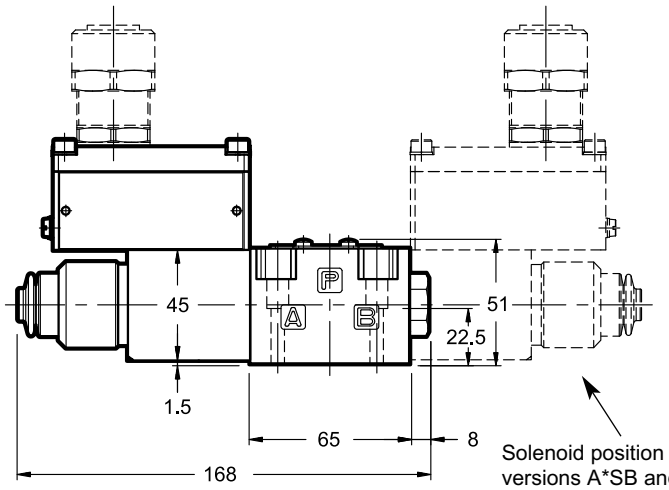



**DSE3K*-*/10*-*K9S*/CM**




**DSE3K*-A*SA/10*-*K9T*/CM**
**DSE3K*-C*SA/10*-*K9T*/CM**




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

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>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.<br>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 |

## 5 - IDENTIFICATION OF PILOT OPERATED SOLENOID VALVES


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 1.1**

Spool type:
**C** = closed center
**A** = open center
**RC** = regenerative closed center
**RA** = regenerative open center

Spool nominal flow rate (see table par. 5.1)

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)
**11** = for DSPE10K*
**10** = for all the other valves

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)

Pilot oil supply:
**I** = internal
**E** = external
**Z** = internal pilot oil supply with 30 bar fixed adjustment pressure reducing valve

Drain:
**I** = internal
**E** = external

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

Coil electrical connection: junction box

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**: Valves are supplied with standard surface treatment of phosphating black for the main body and zinc-nickel for the pilot body.

The full zinc-nickel surface treatment is available upon request. It is 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 the suffix **/W7** at the end of the identification code.

A version with monobloc coils made of steel is available. Please refer to details in page 2.

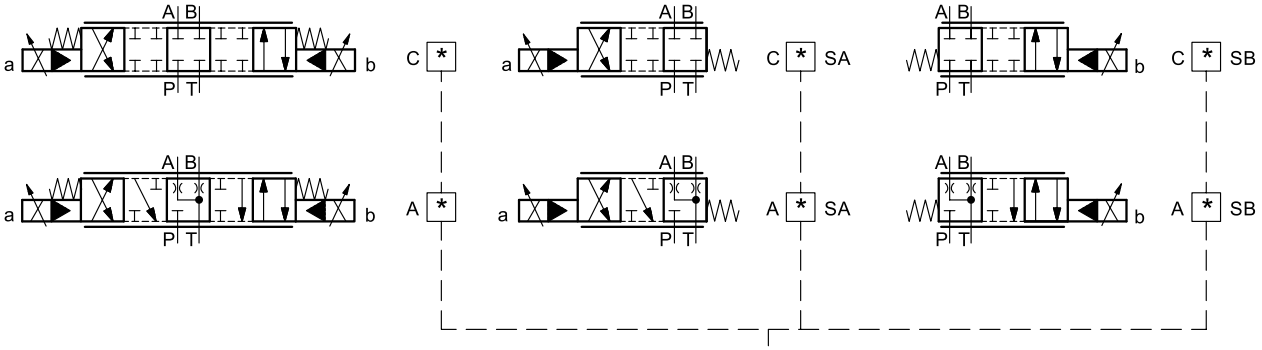
### 5.1 - Configurations

The valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

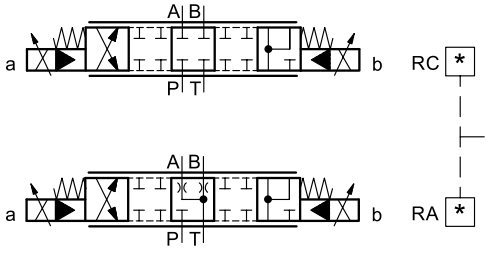
Configuration 2 solenoids:
3 positions with spring centering

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*<br>DSPE5RK* | **80** | 80 l/min |
| | **80/40** | 80 (PA) / 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 |



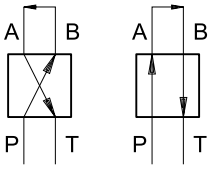

| valve type | * | nominal flow rate with Δp 10 bar P-T |
|---|---|---|
| DSPE7K* | **150/75** | 150 (P-A, A-T) / 75 (P-B, B-P) l/min |
| DSPE8K* | **300/150** | 300 (P-A, A-T) / 150 (P-B, B-P) l/min |
| DSPE10K* | **500/250** | 500 (P-A, A-T) / 250 (P-B, B-P) l/min |

## 6 - CHARACTERISTIC CURVES OF PILOT OPERATED SOLENOID VALVES

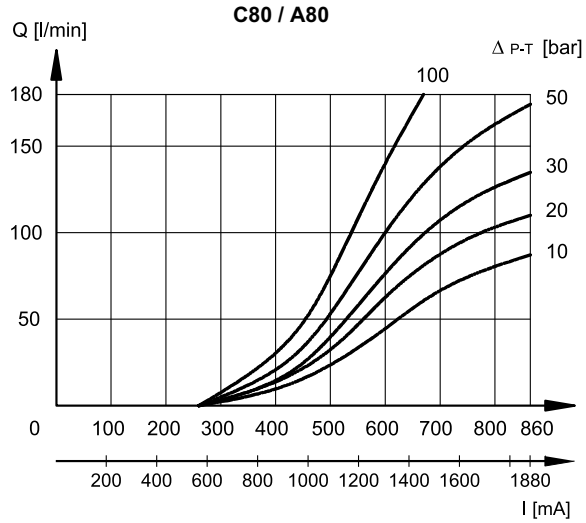
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves at constant Δp according to current supply to the solenoid, measured for the available spool types.

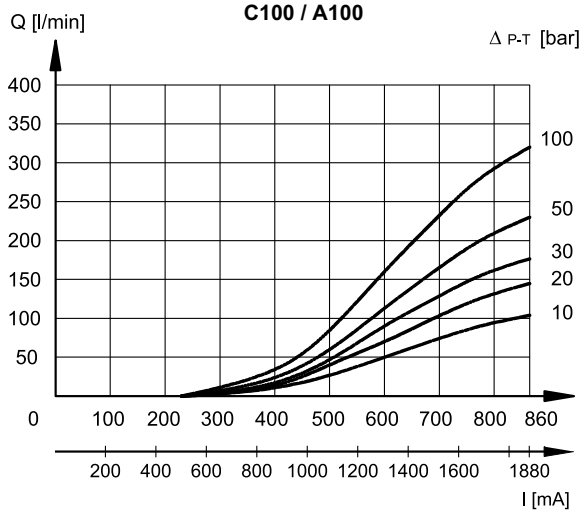
The reference Δp values are measured between valve ports P and T.

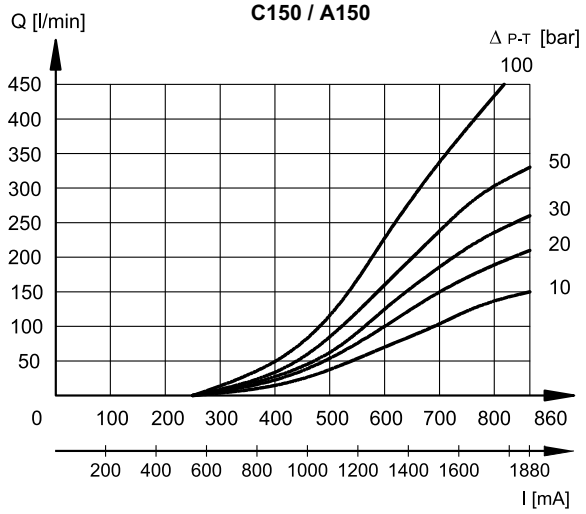



### 6.1 - Characteristic curves DSPE5K* and DSPE5RK

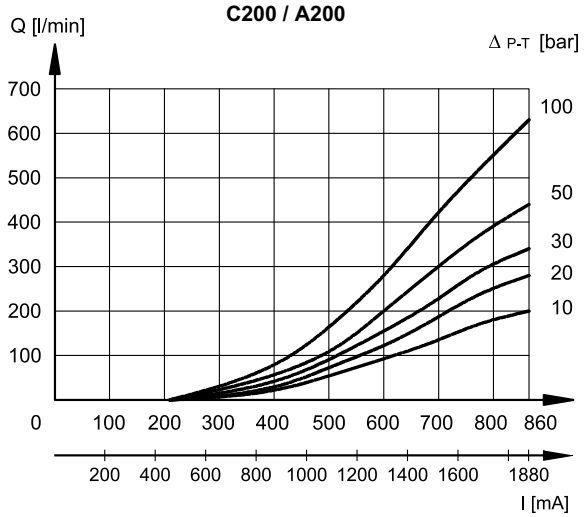


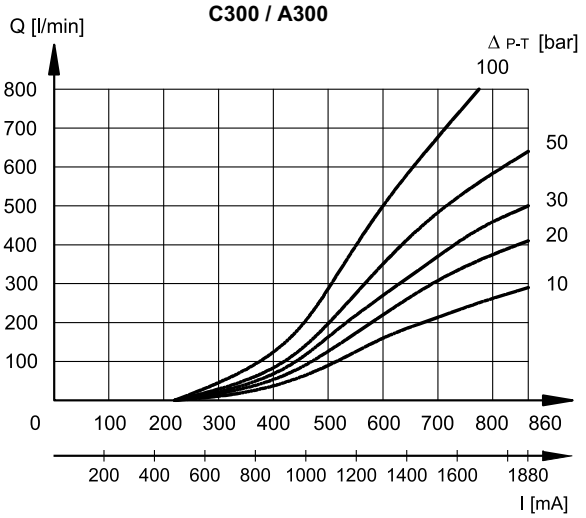

### 6.2 - Characteristic curves DSPE7K*



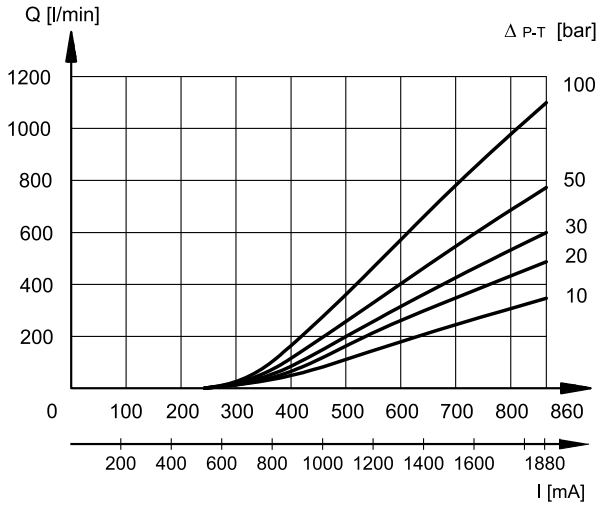

### 6.3 - Characteristic curves DSPE8K*



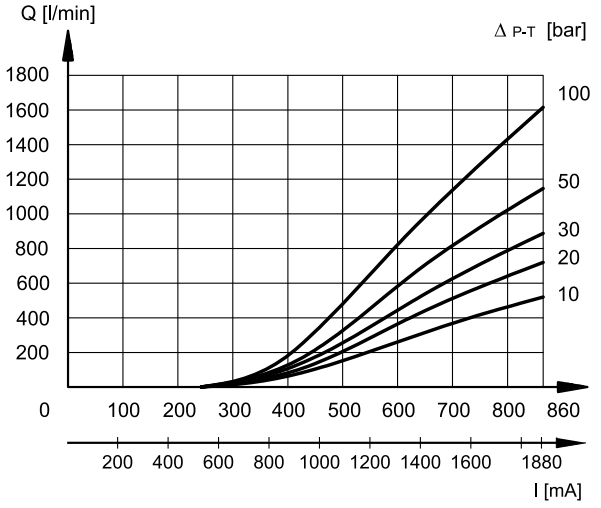



### 6.4 - Characteristic curves DSPE10K*

**C350 / A350**




**C500 / A500**




## 7 - 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 |

## 8 - 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. 5). Consider that, by adding the pressure reducing valve, the overall dimensions increase 40 mm in height.

## 9 - PILOTING AND DRAINAGE

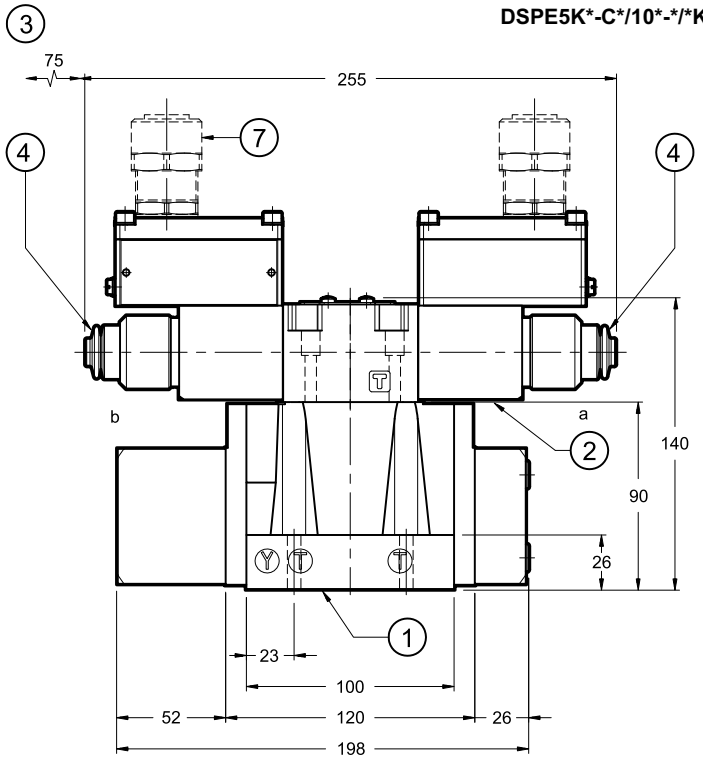
DSPE*K* valves are available with piloting and drainage, both internal and external. The version with external drainage allows for a higher back pressure on the outlet.

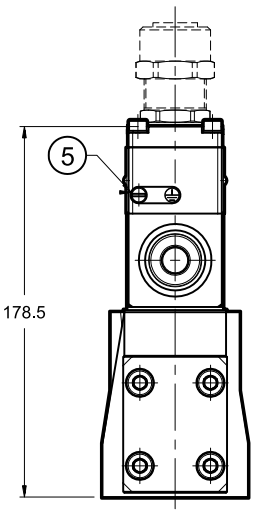
| | TYPE OF VALVE | Plug assembly X | Plug assembly Y |
|---|---|---|---|
| **IE** | INTERNAL PILOT AND EXTERNAL DRAIN | NO | YES |
| **II** | INTERNAL PILOT AND INTERNAL DRAIN | NO | NO |
| **EE** | EXTERNAL PILOT AND EXTERNAL DRAIN | YES | YES |
| **EI** | EXTERNAL PILOT AND INTERNAL DRAIN | YES | NO |

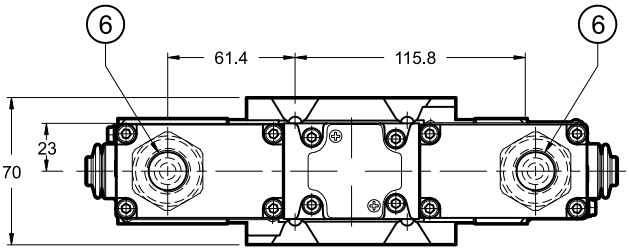
## 10 - DSPE5K* AND DSPE5RK* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

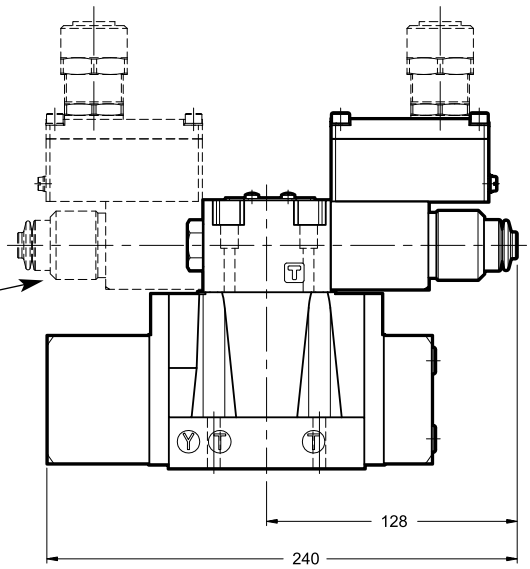
**DSPE5K*-A*/10*-*/*K9T*/CM**
**DSPE5K*-C*/10*-*/*K9T*/CM**




**DSPE5K*-A*SA/10*-*/*K9T*/CM**
**DSPE5K*-C*SA/10*-*/*K9T*/CM**




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) - 90 Shore<br>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.<br>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.

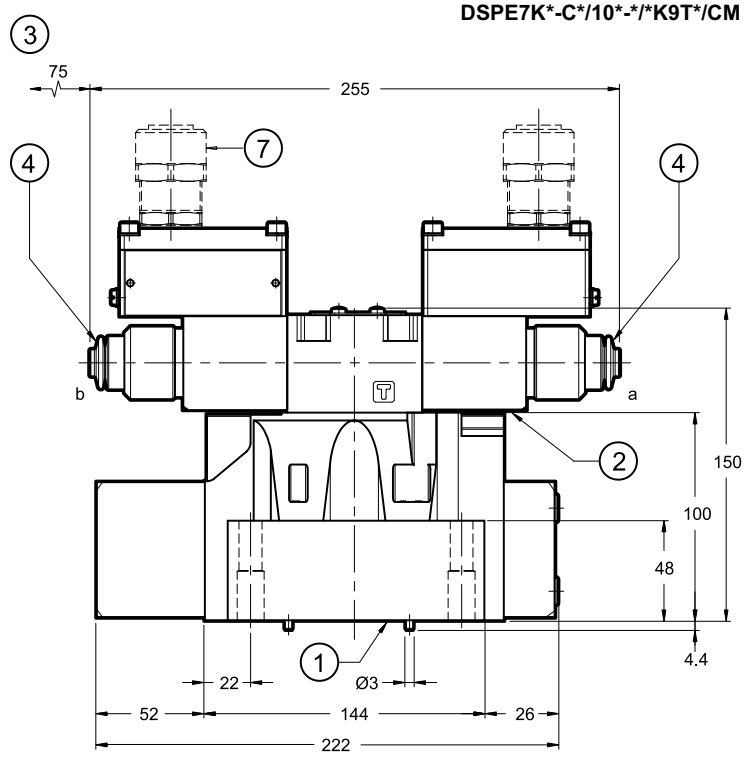
**NOTE 2**: for side port cable gland see paragraph 14.

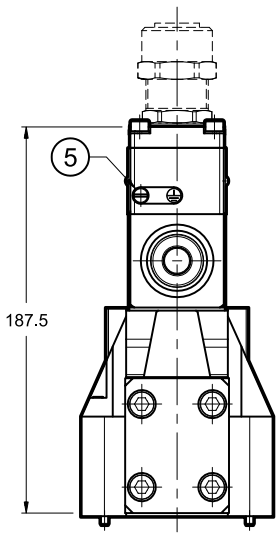
| |
|---|
| Valve fastening: 4 SHC ISO 4762 screws M6x35 |
| Tightening torque: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x10 |

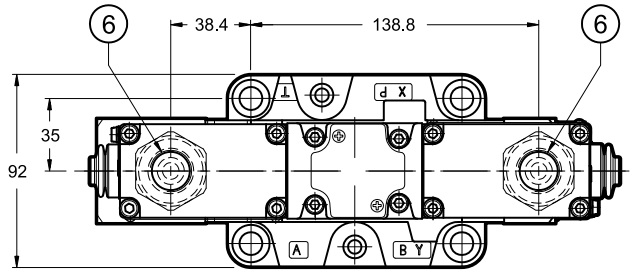
## 11 - DSPE7K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

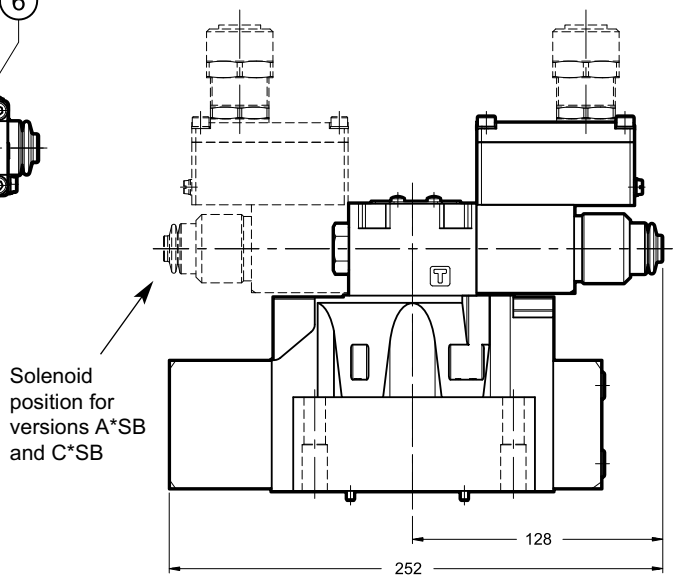
**DSPE7K*-A*/10*-*/*K9T*/CM**
**DSPE7K*-C*/10*-*/*K9T*/CM**




**DSPE7K*-A*SA/10*-*/*K9T*/CM**
**DSPE7K*-C*SA/10*-*/*K9T*/CM**




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 130 (22.22X2.62) - 90 Shore<br>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 |

**NOTE 1**: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

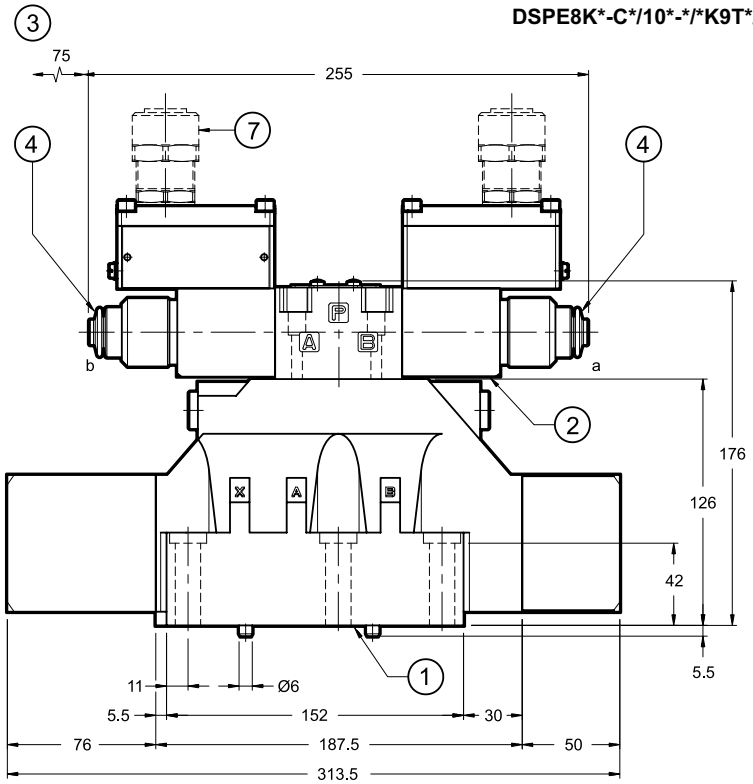
**NOTE 2**: for side port cable gland see paragraph 14.

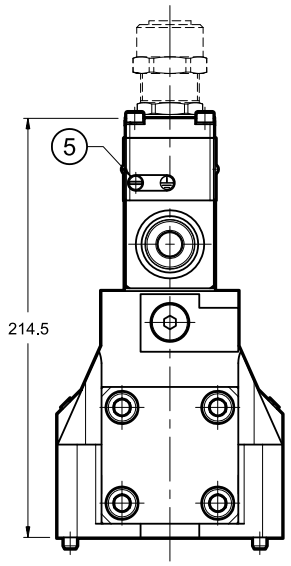
| |
|---|
| Valve fastening: 4 SHC screws ISO 4762 M10x60<br>2 SHC screws ISO 4762 M6x60 |
| Tightening torque: M10x60: 40 Nm (A8.8 screws)<br>M6x60: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x18; M10x18 |

## 12 - DSPE8K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

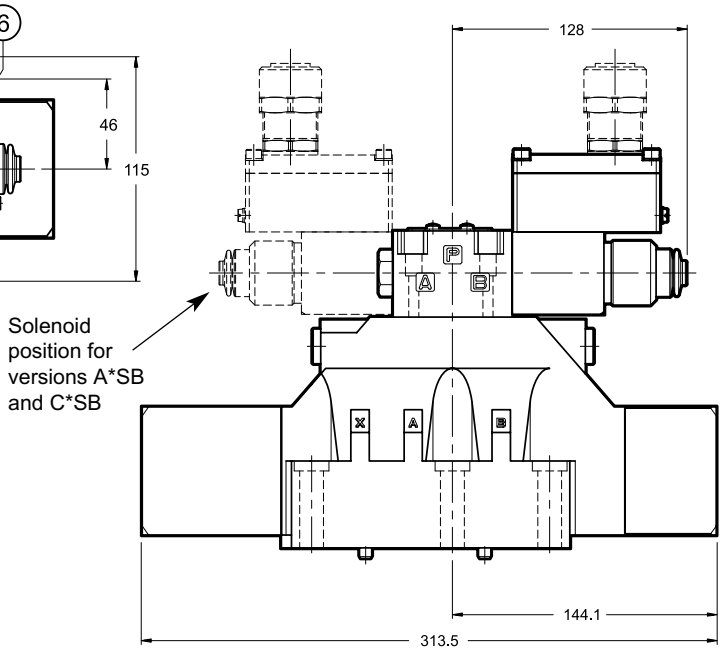
dimensions in mm

**DSPE8K*-A*/10*-*/*K9T*/CM**
**DSPE8K*-C*/10*-*/*K9T*/CM**




**DSPE8K*-A*SA/10*-*/*K9T*/CM**
**DSPE8K*-C*SA/10*-*/*K9T*/CM**




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 3118 (29.82x2.62) - 90 Shore<br>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.<br>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.

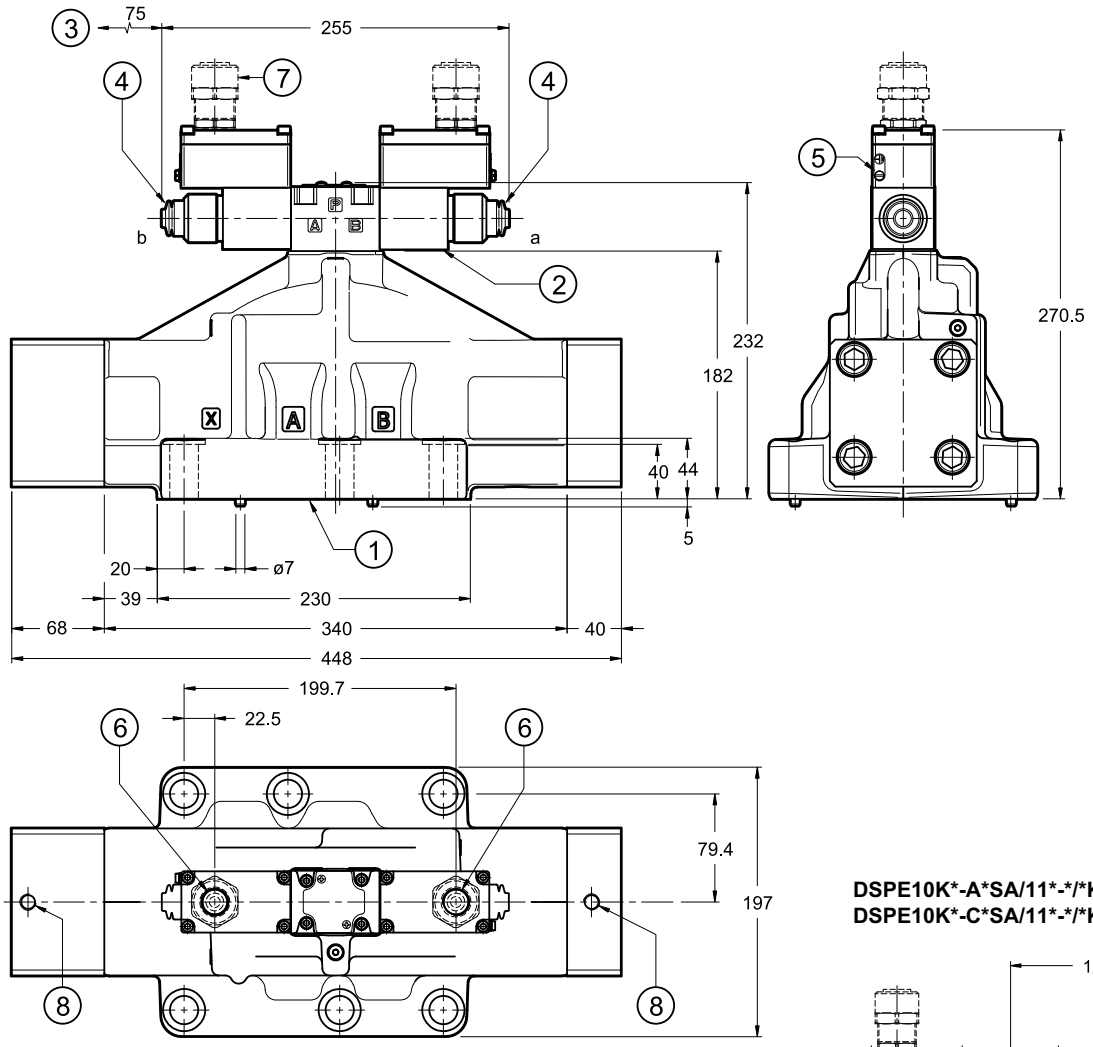
**NOTE 2**: for side port cable gland see paragraph 14.

| |
|---|
| Valve fastening: 6 SHC ISO 4762 screws M12x60 |
| Tightening torque: 69 Nm (A8.8 screws) |
| Threads of mounting holes: M12x20 |

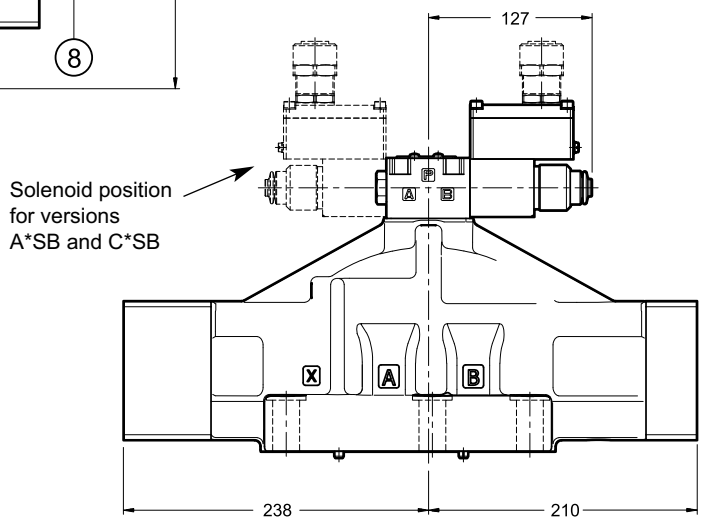
## 13 - DSPE10K* WITH UPPER CONNECTION - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

**DSPE10K*-A*/11*-*/*K9T*/CM**
**DSPE10K*-C*/11*-*/*K9T*/CM**




**DSPE10K*-A*SA/11*-*/*K9T*/CM**
**DSPE10K*-C*SA/11*-*/*K9T*/CM**




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 4162 (40.86x3.53) - 90 shore<br>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.<br>To be ordered separately, see paragraph 19 |
| 8 | M12 eyebolt hole for safe lift |

**NOTE 1**: for overall dimensions with Z option (fixed adjustment pressure reducing valve) consider an increase of 40 mm in height.

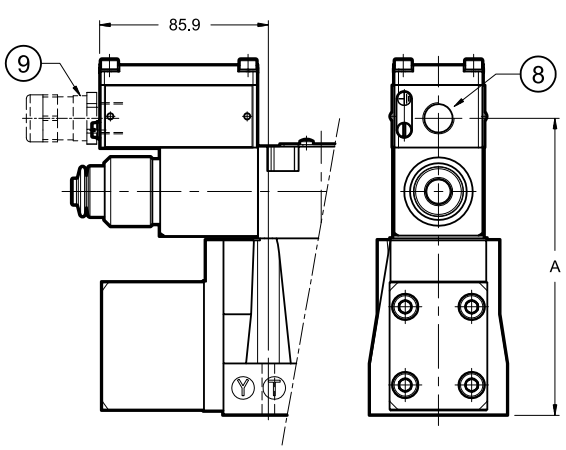
**NOTE 2**: for side port cable gland see paragraph 14.

| |
|---|
| Valve fastening: 6 SHC screws ISO 4762 M20x70 |
| Tightening torque: 330 Nm (A8.8 screws) |
| Threads of mounting holes: M20x40 |

## 14 - DSPE*K*-*K9S* WITH SIDE CONNECTION - OVERALL AND MOUNTING DIMENSIONS

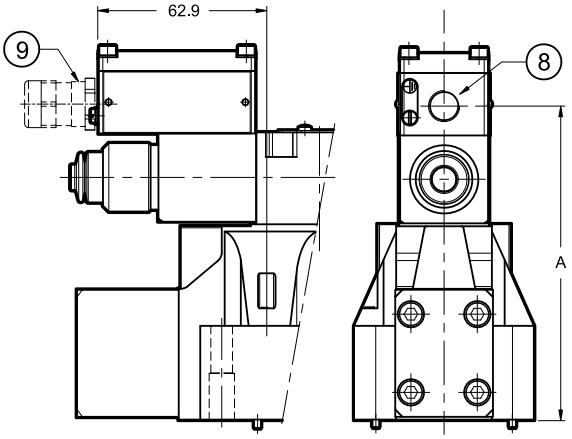
dimensions in mm

**DSPE5K*-*K9S***
**DSPE5RK*-*K9S***



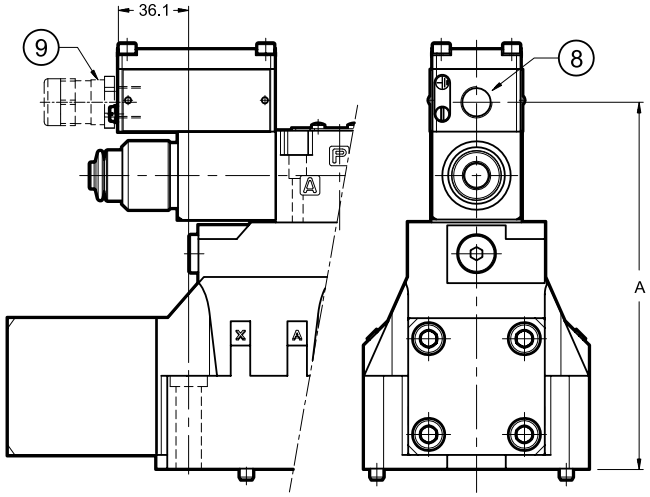

| Side port type | Dimension A |
|---|---|
| **S01, S04** | 150.5 |
| **S02, S03** | 150 |

**DSPE7K*-*K9S***



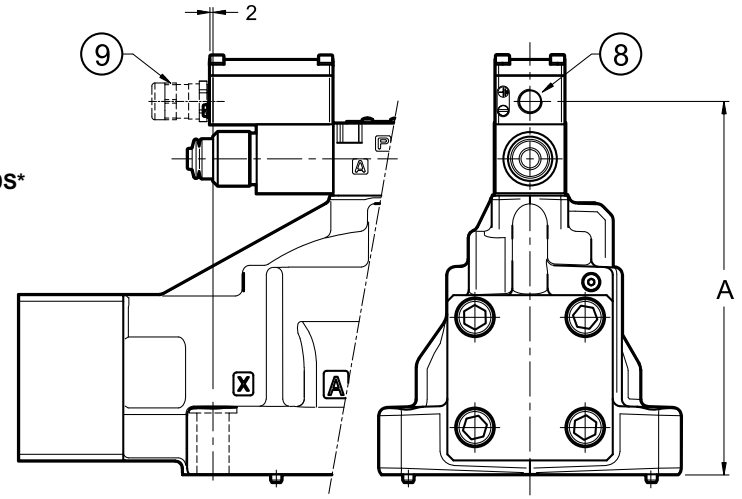

| Side port type | Dimension A |
|---|---|
| **S01, S04** | 157.5 |
| **S02, S03** | 157 |

**DSPE8K*-*K9S***




| Side port type | Dimension A |
|---|---|
| **S01, S04** | 186.5 |
| **S02, S03** | 186 |

**DSPE10K*-*K9S***

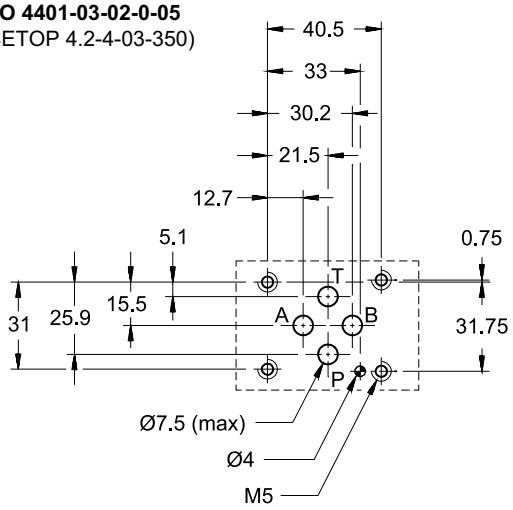



| Side port type | Dimension A |
|---|---|
| **S01, S04** | 242.5 |
| **S02, S03** | 242 |

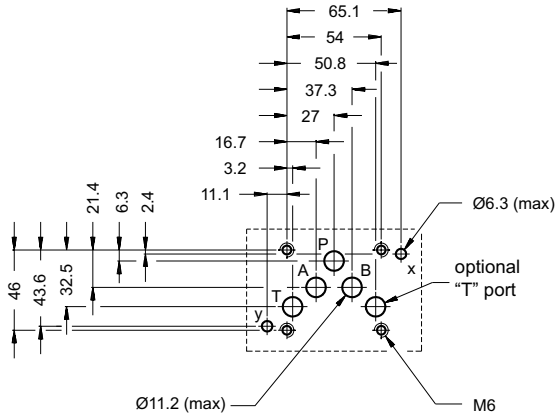
| | |
|---|---|
| 8 | Side port for cable gland |
| 9 | Cable gland.<br>To be ordered separately, see par. 19 |

## 15 - MOUNTING SURFACES

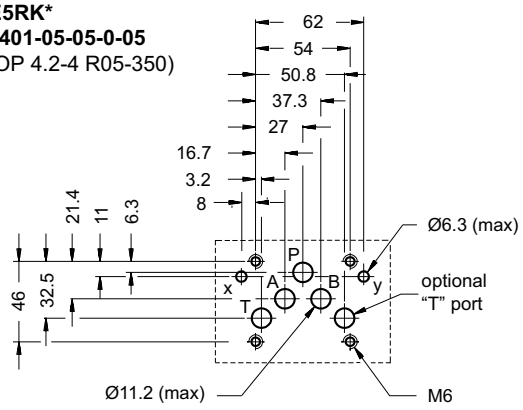
**DSE3K***
**ISO 4401-03-02-0-05**
(CETOP 4.2-4-03-350)



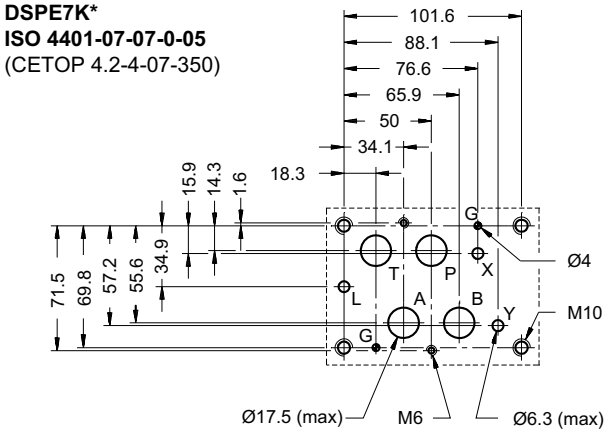

**DSPE5K***
**CETOP 4.2-4 P05-350**



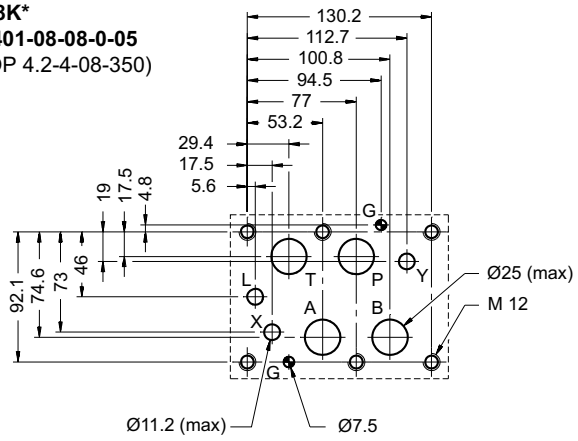

**DSPE5RK***
**ISO 4401-05-05-0-05**
(CETOP 4.2-4 R05-350)



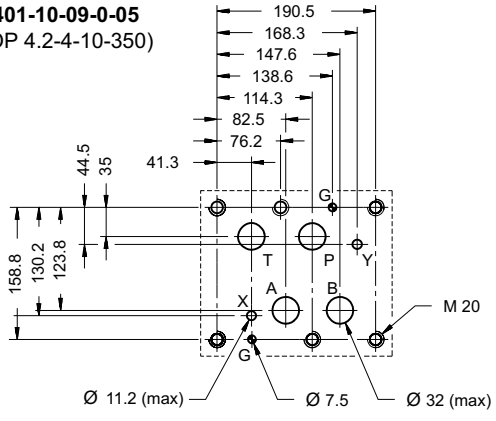

**DSPE7K***
**ISO 4401-07-07-0-05**
(CETOP 4.2-4-07-350)




**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.

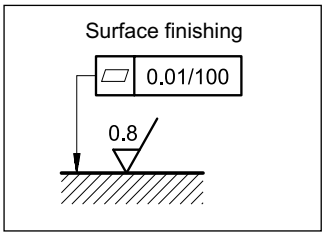
## 17 - INSTALLATION

**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

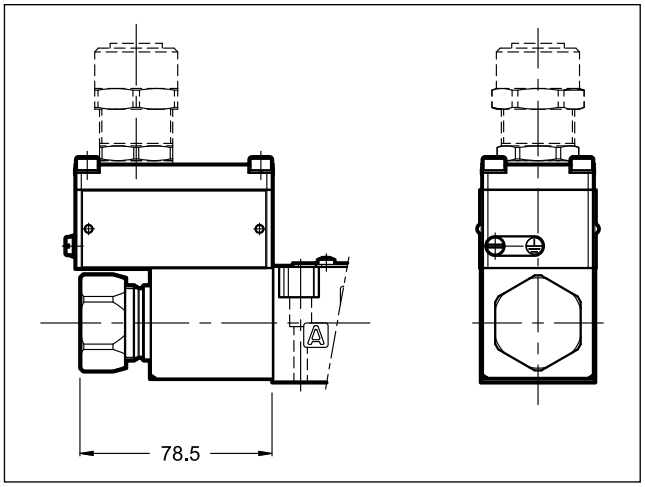
The metal ring nut protects the solenoid tube from atmospheric agents and isolates the manual override from accidental operations. The ring nut is tightened on a threaded fastener that keeps the coil in its position even without the ring nut.

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.

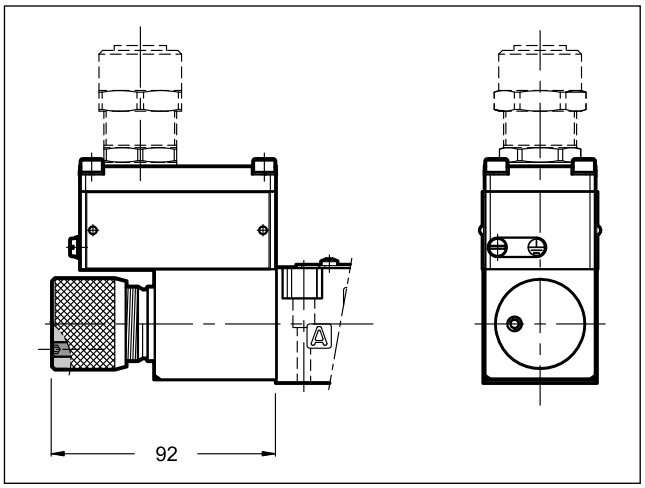
**CAUTION!: The manual override doesn't allow any proportional regulation; indeed using this kind of override, the main stage spool will open completely and the whole inlet pressure will pass through A or B line.**




### 18.2 - CK Knob manual override

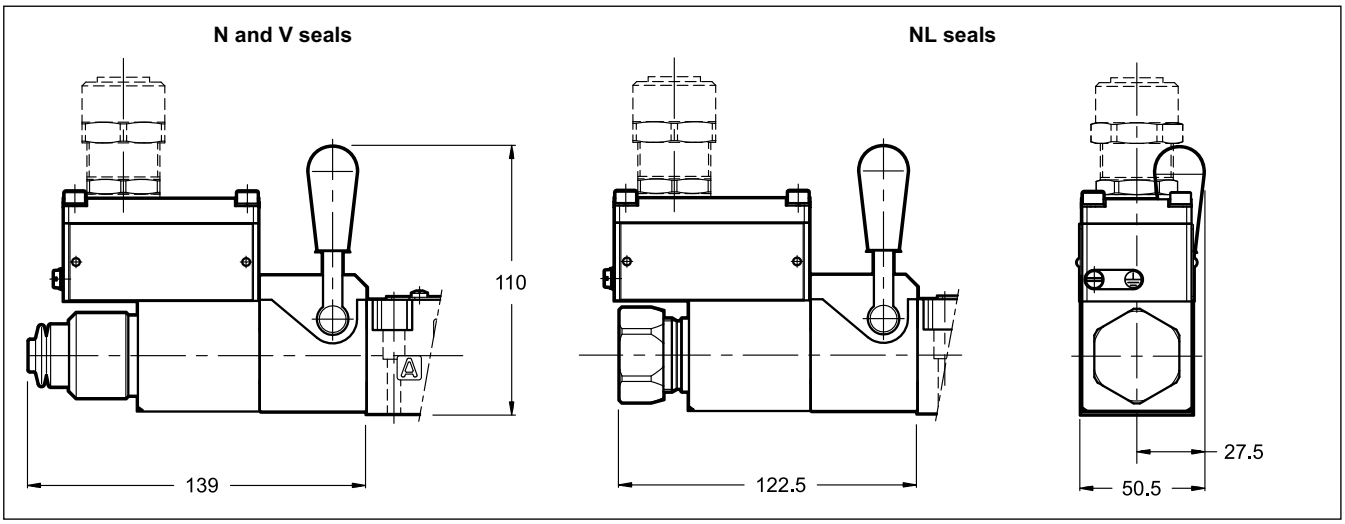
When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing. Available for DC valves only.

Spanner: 3 mm



**18.3 - CH - Lever manual override**

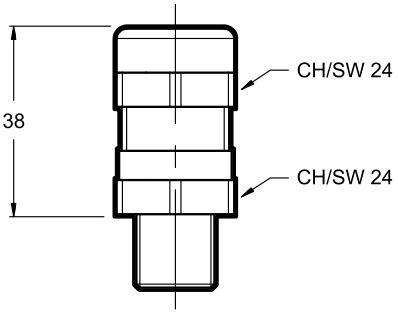
The seals choice leads the type of the standard ring nut to be mounted. The lever device is always placed at valve side A.




## 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 Ø 8÷10 mm cables);
- ATEX II 2GD, I M2; IECEx Gb, Db, Mb;
- cable gland material: nickel brass
- inner rubber tip material: silicone
- ambient temperature range: -65 ºC ÷ +220 ºC
- protection degree: IP66/IP68




To order the desired cable glands, specify description, code and quantity.

**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 copper washer, that must be assembled between the cable gland and the coil, so as to ensure IP66/IP68 protection degree.

Tightening torque: 45 ÷ 50 Nm

**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.

Tightening torque: 20 ÷ 25 Nm

**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.

Tightening torque: 20 ÷ 25 Nm

**Description: CGK2/NB-04/10**

**Code: 3908108004**

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

Tightening torque: 45 ÷ 50 Nm

## 20 - ELECTRONIC CONTROL UNITS

**DSE3K* - ** SA** **DSE3K* - ** SB**

| | | | |
|---|---|---|---|
| **EDM-M112** | for solenoid 24V DC | DIN EN 50022 rail mounting | see cat. 89 251 |
| **EDM-M142** | for solenoid 12V DC | | |

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

**DSE3K* - A*** **DSE3K* - C***

| | | | |
|---|---|---|---|
| **EDM-M212** | for solenoid 24V DC | DIN EN 50022 rail mounting | see cat. 89 251 |
| **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. 89 251 |
| **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. 89 251 |
| **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<br>X, Y ports dimensions | 3/8” BSP<br>- | 3/4” BSP<br>1/4” BSP | 1” BSP<br>1/4” BSP | 1 ½” BSP<br>1/4” BSP |

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

The user will bear to do the complete assessment of the ignition risk that can occur from the relative use in potentially explosive environments.

# EXPLOSION-PROOF CLASSIFICATION for

## SOLENOID AND PROPORTIONAL VALVES

ref. catalogues:

| | |
|---|---|
| **pressure control valves** | |
| **RQM*K*-P** | **21 515** |
| **P*E*K*** | **81 316** |
| **ZDE3K*** | **81 515** |
| **DZCE*K*** | **81 606** |
| **flow control valves** | |
| **QDE3K*** | **82 225** |
| **directional valves** | |
| **D*K*** | **41 515** |
| **DT3K*** | **42 215** |
| **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 MS offers valves with the following certifications:

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

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.

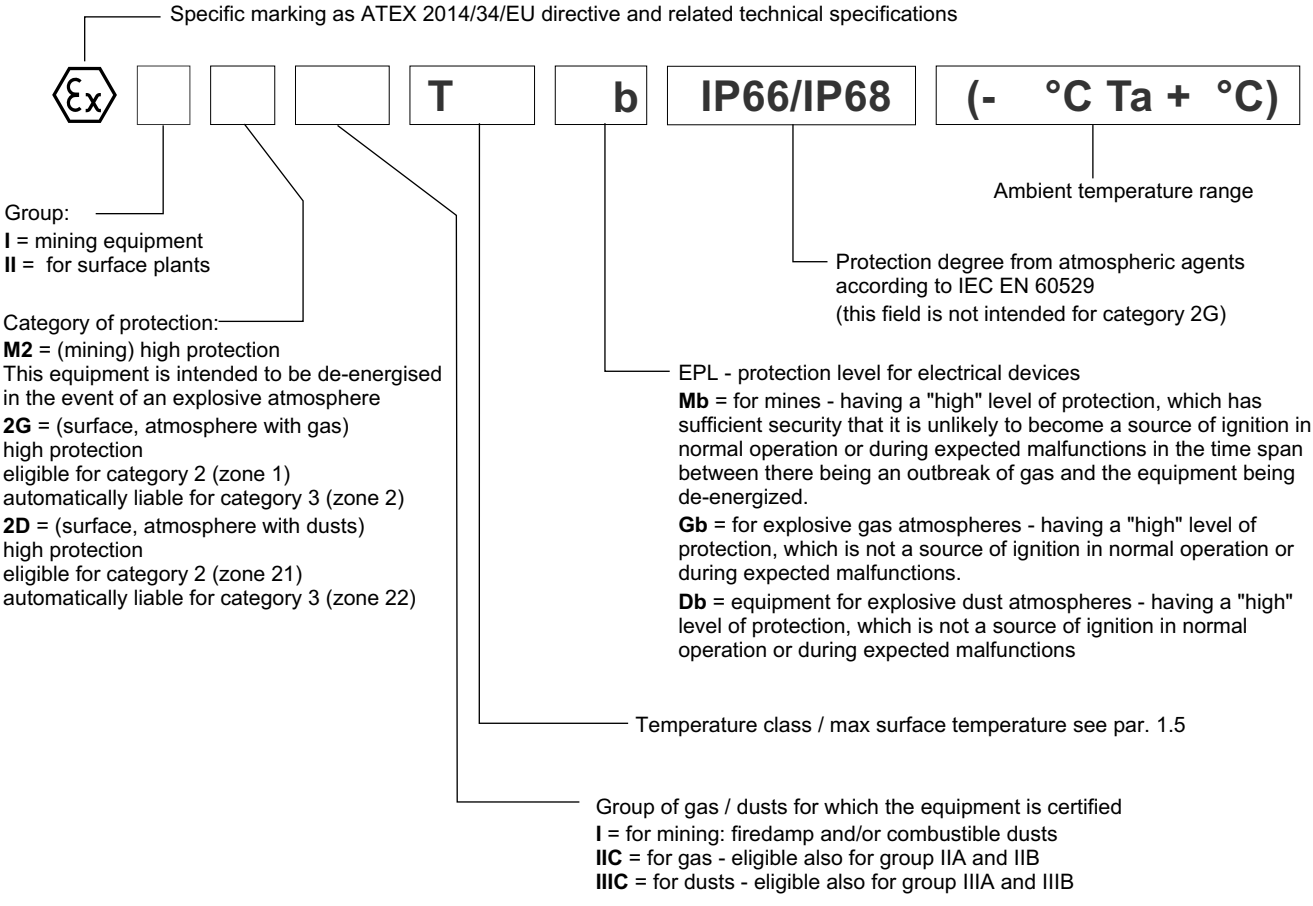
### 1.1 - ATEX classification for valves

Type examination certificate: AR18ATEX055
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

| | | |
|---|---|---|
| ATEX II 2G<br>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.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account. |
| 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.<br>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) |



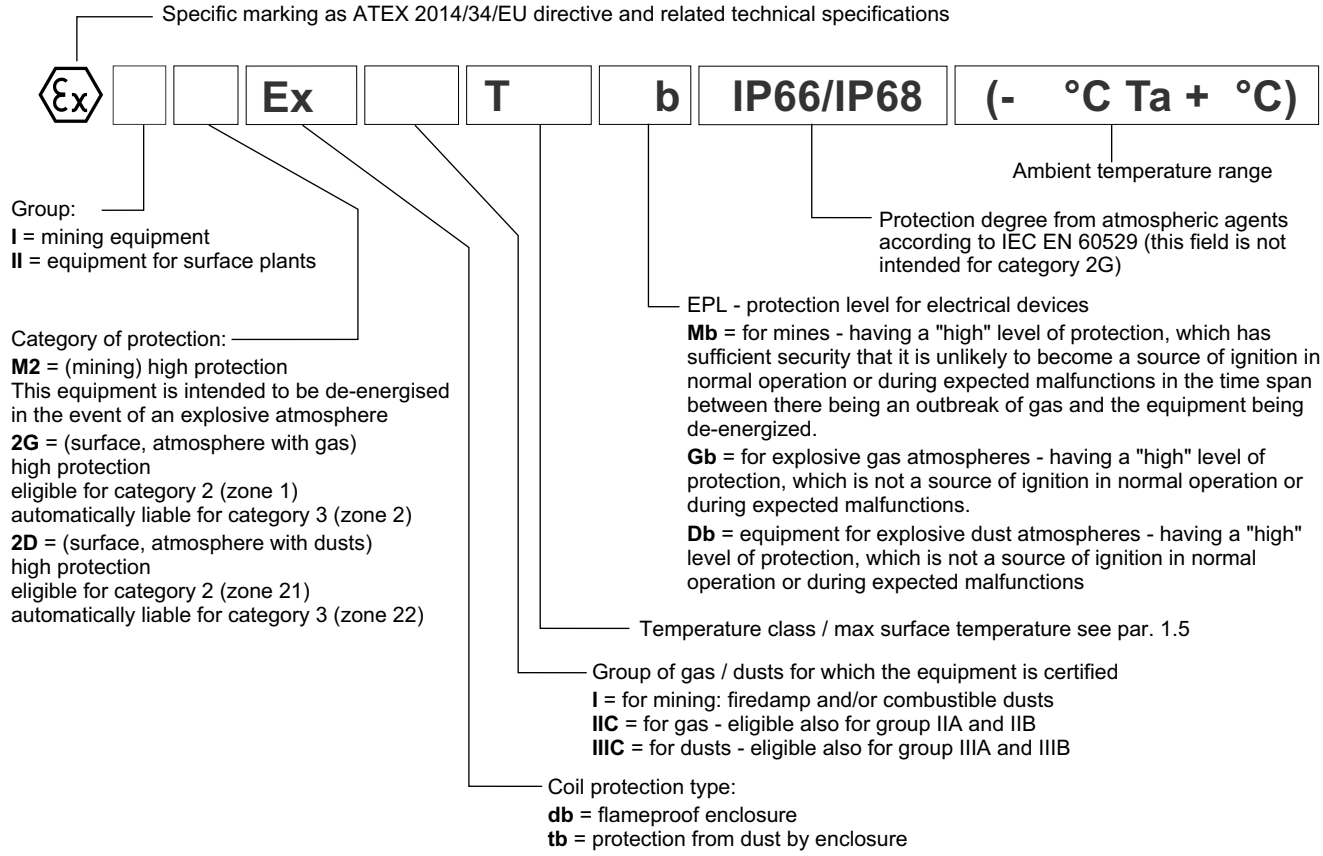
### 1.3 - ATEX classification of the coils

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




### 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<br>ATEX II 2D | ***KD2** | of ambient | -20 / +80 °C | -40 / +80 °C | T4 (gas)<br>T154°C (dusts) | T3, T2, T1<br>T200°C and higher |
| | | of fluid | | | | |
| | ***KD2 /T5** | of ambient | -20 / +55 °C | -40 / +55 °C | T5 (gas)<br>T129°C (dusts) | T4, T3, T2, T1<br>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

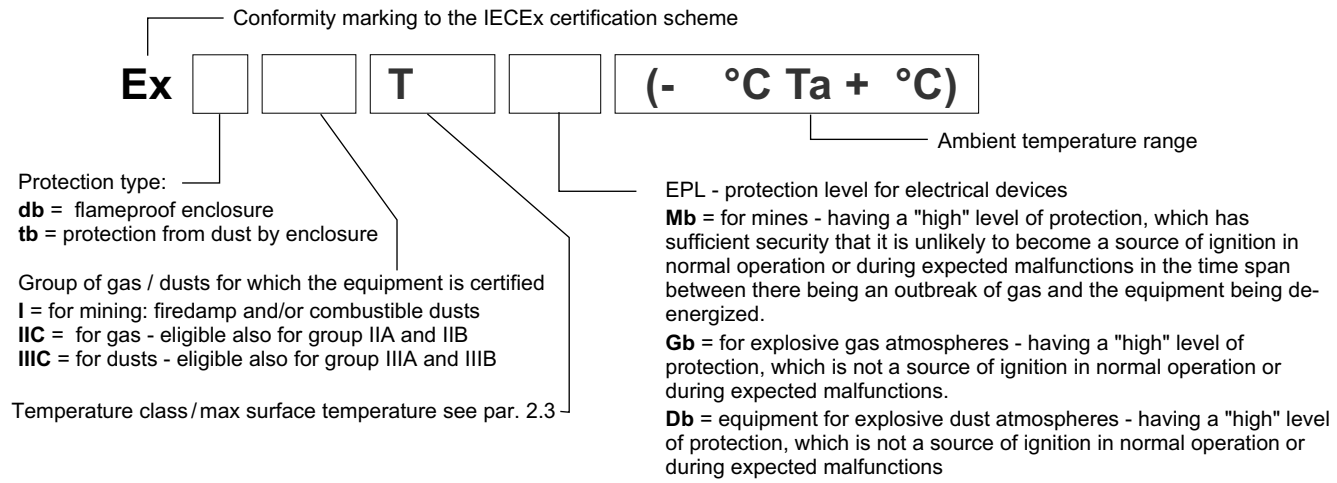
Certificate of conformity (CoC): IECEx TUN 15.0028X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

| | | |
|---|---|---|
| IECEx Gb<br>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.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account. |
| 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.<br>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**<br>valves | for gas<br>for dusts | Ex db IIC T4 Gb (-40°C Ta +80°C)<br>Ex tb IIIC T135°C Db (-40°C Ta +80°C) |
| ***KXD2 /T5**<br>valves | for gas<br>for dusts | Ex db IIC T5 Gb (-40°C Ta +55°C)<br>Ex tb IIIC T100°C Db (-40°C Ta +55°C) |
| ***KDM2**<br>valves | mining | Ex db I Mb (-40°C Ta +80°C) |




### 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<br>IECEx Db | ***KXD2** | of ambient | -20 / +80 °C | -40 / +80 °C | T4 (gas)<br>T135°C (dusts) | T3, T2, T1<br>T200°C and higher |
| | | of fluid | | | | |
| | ***KXD2 /T5** | of ambient | -20 / +55 °C | -40 / +55 °C | T5 (gas)<br>T100°C (dusts) | T4, T3, T2, T1<br>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 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.

### 3.1 - INMETRO classification

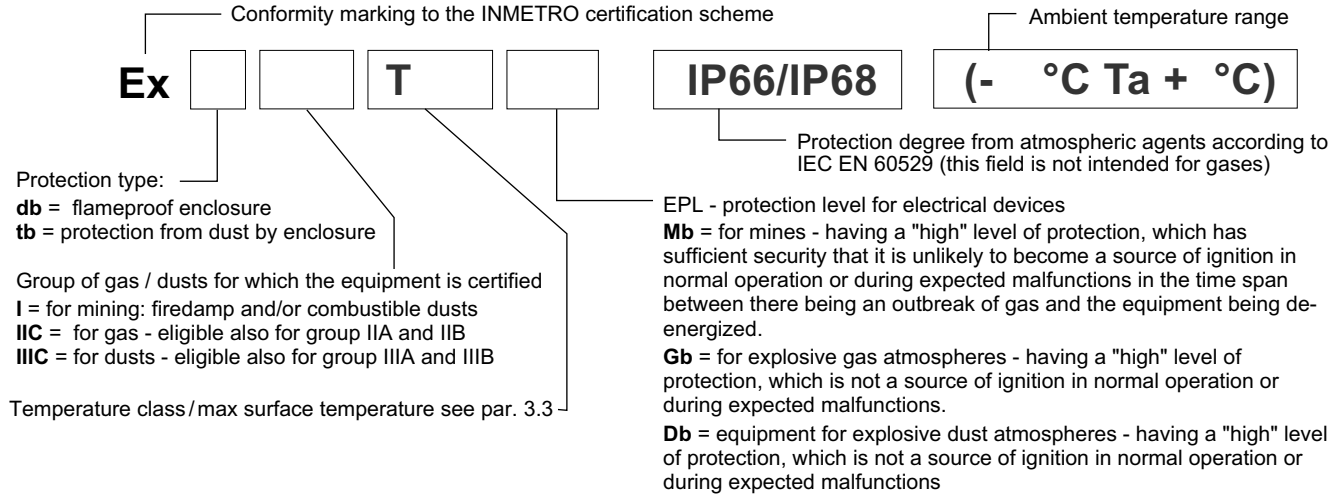
Certificate of conformity: DNV 15.0094 X
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

| | | |
|---|---|---|
| INMETRO Gb<br>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.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account. |
| 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.<br>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**<br>valves | for gas | Ex db 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**<br>valves | for gas | Ex db IIC T5 Gb (-40°C Ta +55°C) |
| | for dusts | Ex tb IIIC T129°C Db IP66/IP68 (-40°C Ta +55°C) |
| ***KBDM2**<br>valves | mining | Ex db I T150° Mb IP66/IP68 (-40°C Ta +75°C) |




### 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<br>INMETRO Db | ***KBD2** | of ambient | -20 / +80 °C | -40 / +80 °C | T4 (gas)<br>T154°C (dusts) | T3, T2, T1<br>T200°C and higher |
| | | of fluid | | | | |
| | ***KBD2 /T5** | of ambient | -20 / +55 °C | -40 / +55 °C | T5 (gas)<br>T129°C (dusts) | T4, T3, T2, T1<br>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 | | | | |

## 4 - PESO CLASSIFICATION AND TEMPERATURES

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

Duplomatic supplies valves with PESO 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.

### 4.1 - PESO classification

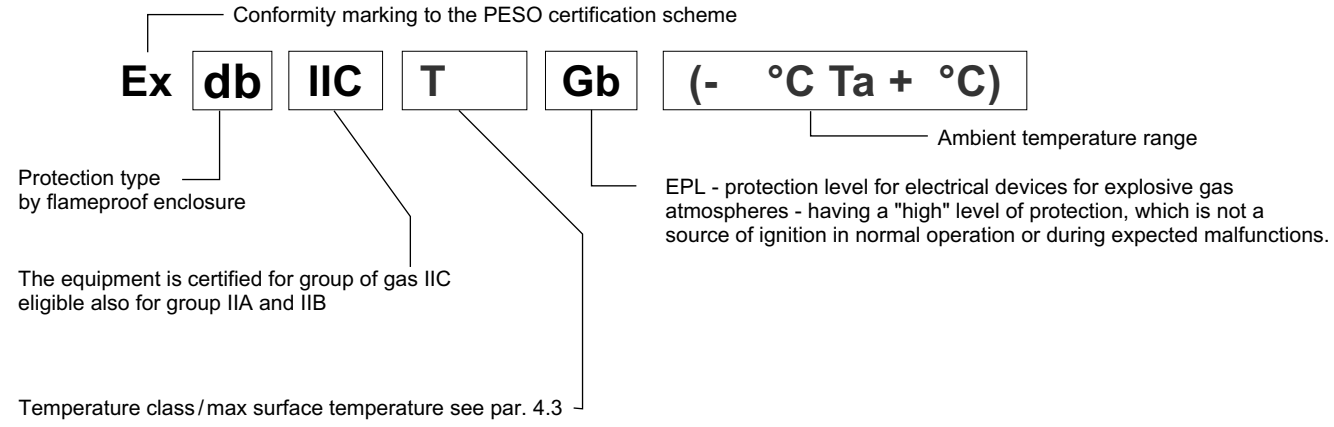
Certificate of conformity: P480801
The valves are suitable for applications and installations in potentially explosive atmospheres that fall within:

| | | |
|---|---|---|
| PESO Gb | ***KPD2** | equipment intended for use in areas in which explosive atmospheres caused by gases, vapours, mists are likely to occur occasionally.The means of protection relating to equipment in this category ensure the requisite level of protection, even in the event of frequently occurring disturbances or equipment faults which normally have to be taken into account. |

### 4.2 - PESO marking

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

| | | |
|---|---|---|
| ***KPD2** valves | for gas | Ex db IIC T4 Gb (-40°C Ta +80°C) |
| ***KPD2 /T5** valves | for gas | Ex db IIC T5 Gb (-40°C Ta +55°C) |

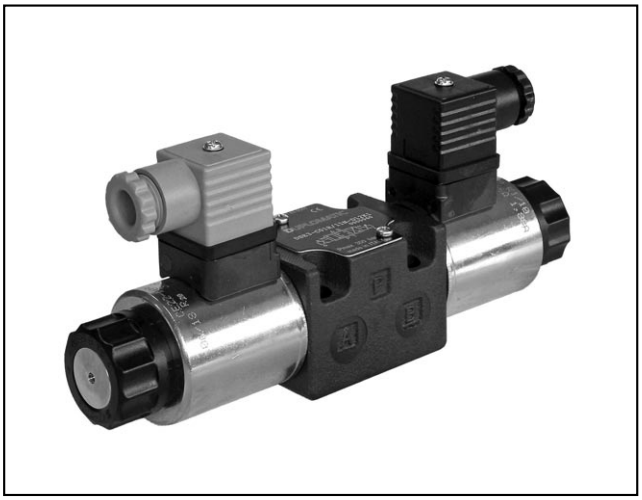



### 4.3 - Operating temperatures

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 |
|---|---|---|---|---|---|---|
| PESO Gb | ***KPD2** | of ambient | -20 / +80 °C | -40 / +80 °C | T4 (gas) | T3, T2, T1 |
| | | of fluid | | | | |
| | ***KPD2 /T5** | of ambient | -20 / +55 °C | -40 / +55 °C | T5 (gas) | T4, T3, T2, T1 |
| | | of fluid | -20 / +60 °C | -40 / +60 °C | | |



# DSE3

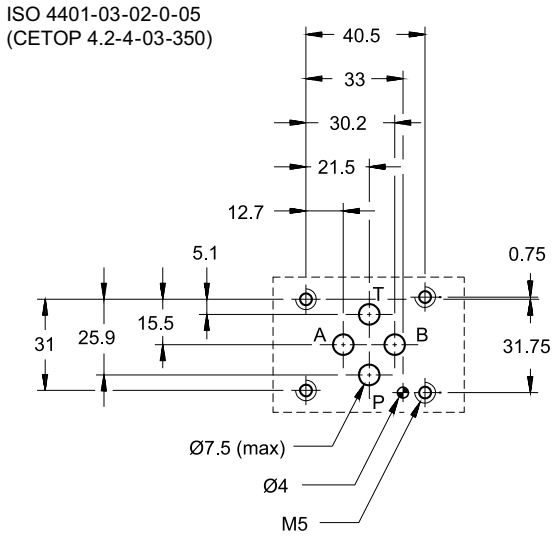
## PROPORTIONAL DIRECTIONAL VALVE

### SERIES 11

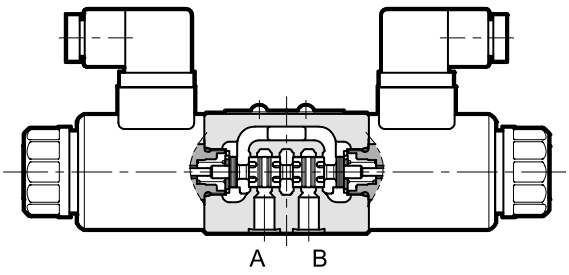
## SUBPLATE MOUNTING ISO 4401-03

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

### MOUNTING SURFACE




### OPERATING PRINCIPLE




— The DSE3 valve is a proportional directional valve, direct operated, with ports in compliance with ISO 4401-03 standards.

— It is suitable 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 maximize the valve performances (see par. 12).

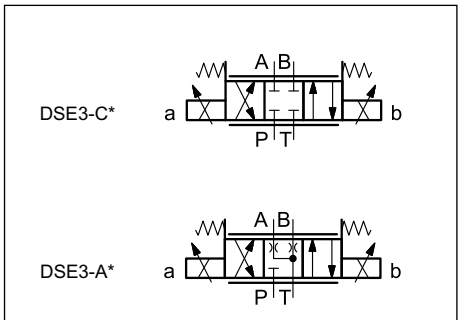
— Several manual overrides are available.

### PERFORMANCES

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

| | | |
|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T port | bar | <br>350<br>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<br>double solenoid valve | kg | 1.4<br>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 centres
**A** = open centres

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 EN 175301-803 (ex 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. For a salt spray resistance up to **600** hours refer to **paragraph 9**.
(test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

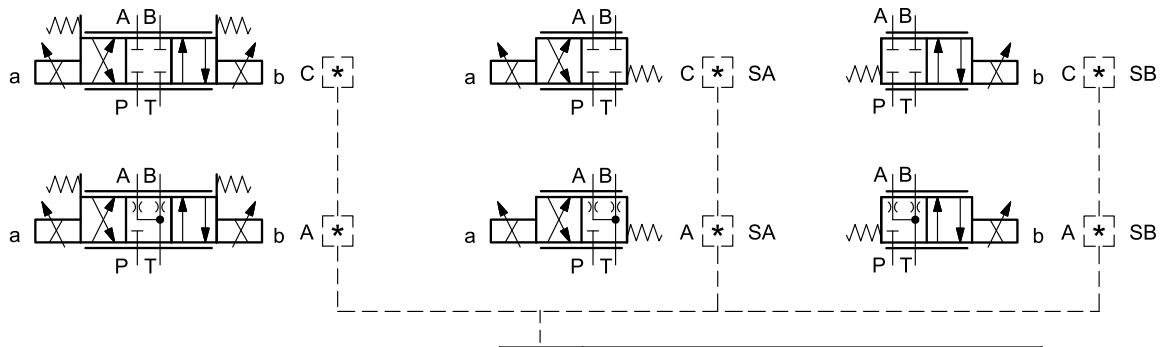
## 2 - CONFIGURATIONS

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 centreing

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with spring centreing

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with spring centreing

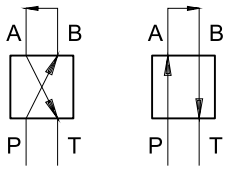



| * | Nominal flow with Δp 10 bar P→T |
|---|---|
| **01** | 1 l/min |
| **04** | 4 l/min |
| **08** | 8 l/min |
| **16** | 16 l/min |
| **16/08** | 16 (P→A) / 08 (B→T) l/min |
| **26** | 26 l/min |
| **26/13** | 26 (P→A) / 13 (B→T) l/min |

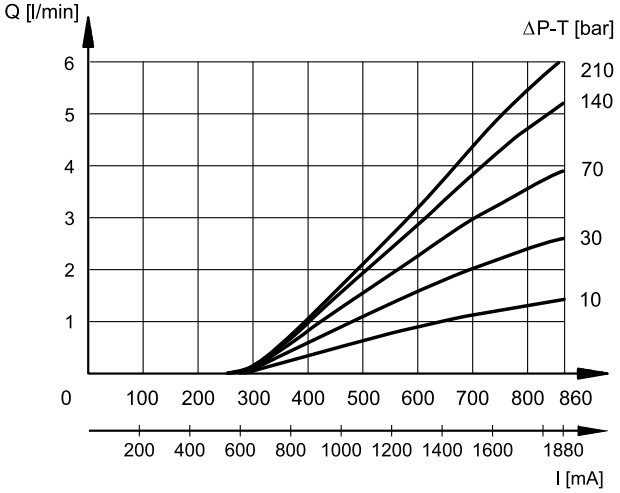
## 3 - CHARACTERISTIC CURVES

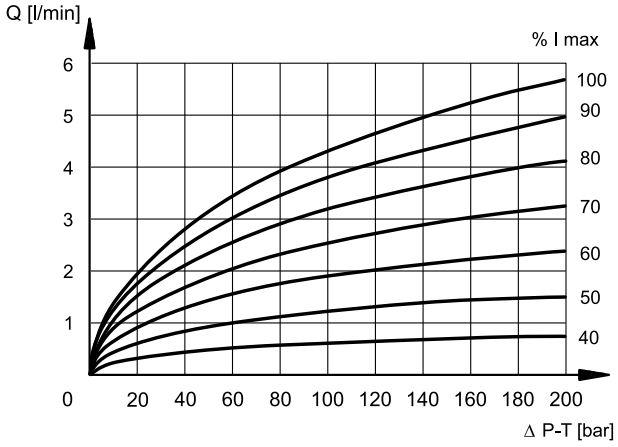
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves according to the current supply to solenoid. The reference Δp values are measured between ports P and T on the valve.

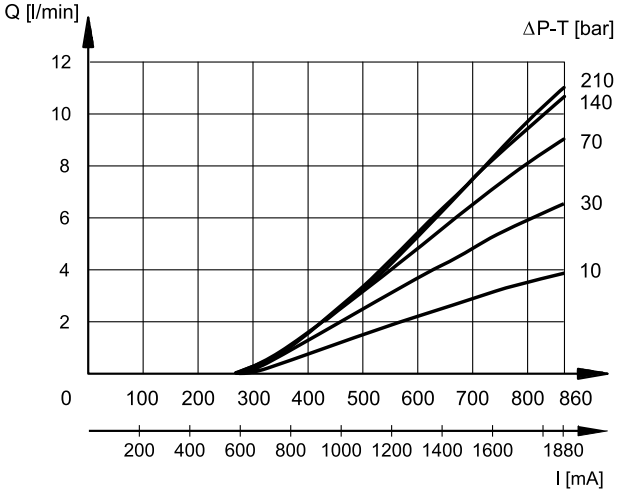


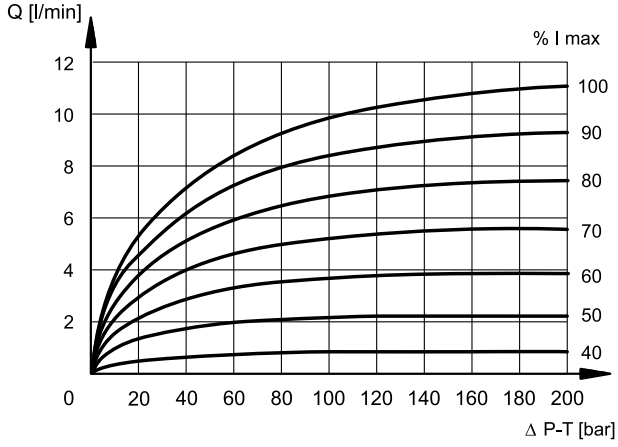

**C01 / A01**



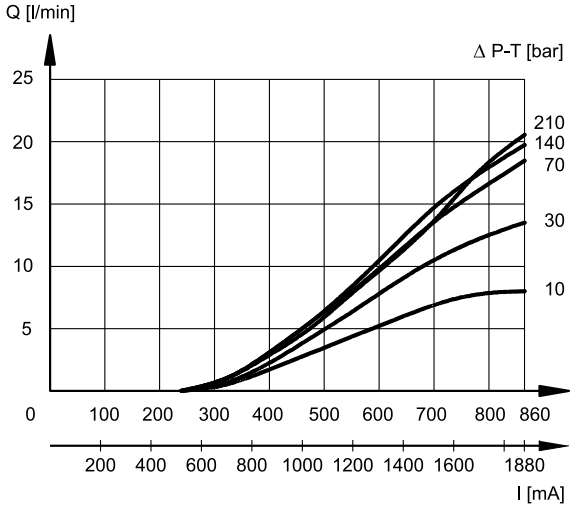



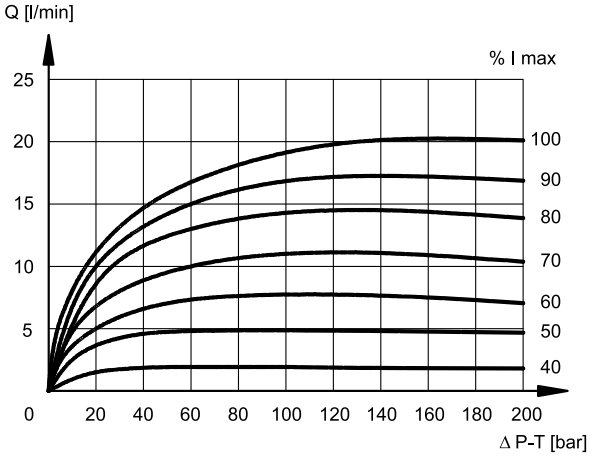

**C04 / A04**



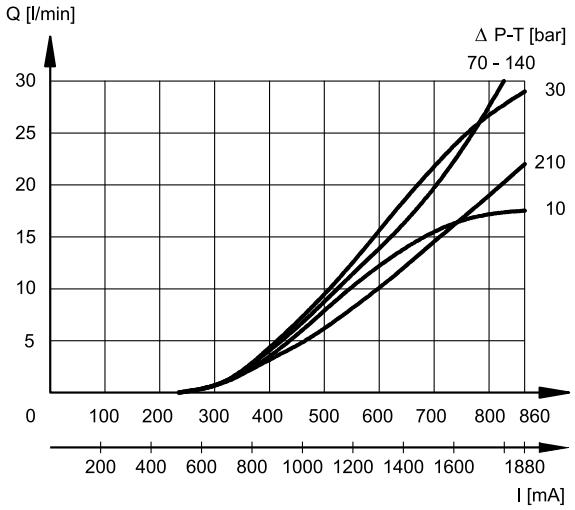



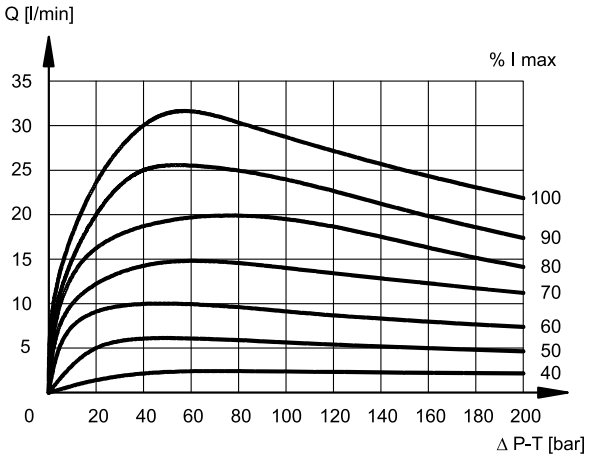

**C08 / A08**



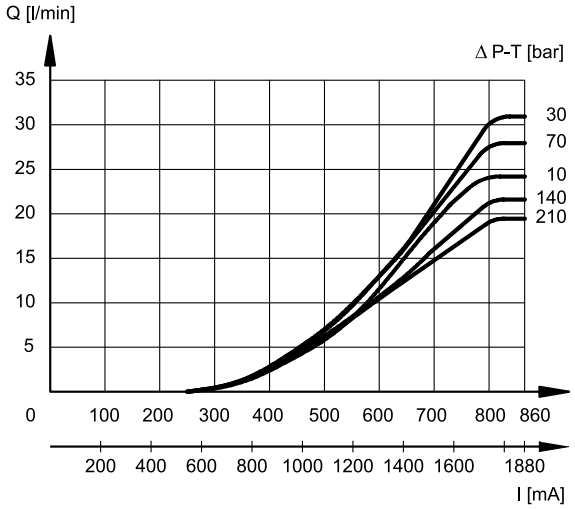



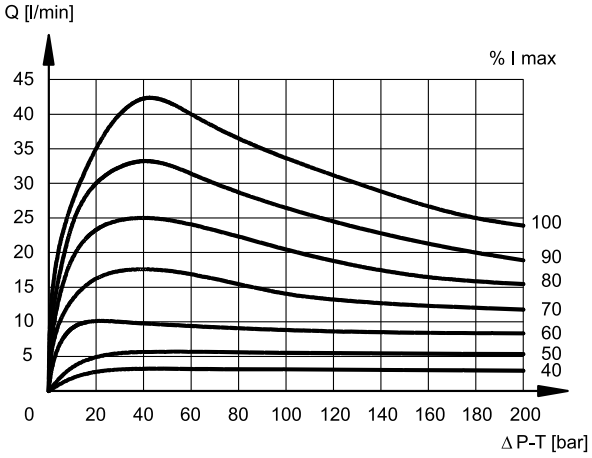
**C16 / A16**




**C26 / 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<br>K7 coil | Ω | 3.66<br>4.4 | 17.6<br>18.6 |
| **NOMINAL CURRENT** | A | 1.88 | 0.86 |
| **DUTY CYCLE** | | 100% | |
| **ELECTROMAGNETIC COMPATIBILITY (EMC)** | | According to 2014/30/EU | |
| **CLASS OF PROTECTION :**<br>Coil insulation (VDE 0580)<br>Impregnation | | class H<br>class F | |

**Protection from atmospheric agents IEC 60529**

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

| electric connection | electric connection protection | whole valve protection |
|---|---|---|
| K1 EN 175301-803 (ex DIN 43650) | IP65 | IP65 |
| K7 DEUTSCH DT04 male | IP65/67 | |

## 5 - STEP RESPONSE

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

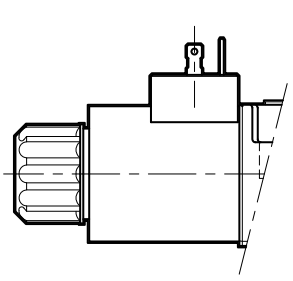
Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal. The table shows typical response times tested with spool type C16 and $\Delta p$ = 30 bar P-T.

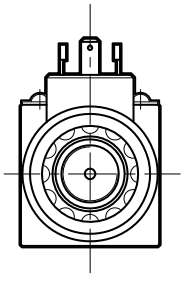
| **REFERENCE SIGNAL STEP** | 0 → 100% | 100 → 0% |
|---|---|---|
| Step response [ms] | 50 | 40 |

## 6 - ELECTRIC CONNECTIONS

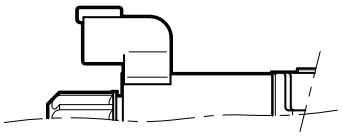
Connectors for K1 connection are always delivered together with the valve.

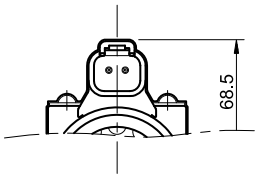
connection for EN 175301-803
(ex DIN 43650) connector
code **K1** (**standard**)
code **WK1** (W7 version only)



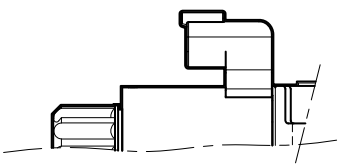


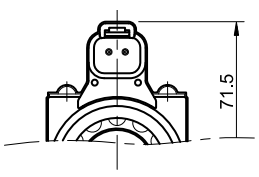
connection for
DEUTSCH DT06-2S male connector
code **K7**






connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)

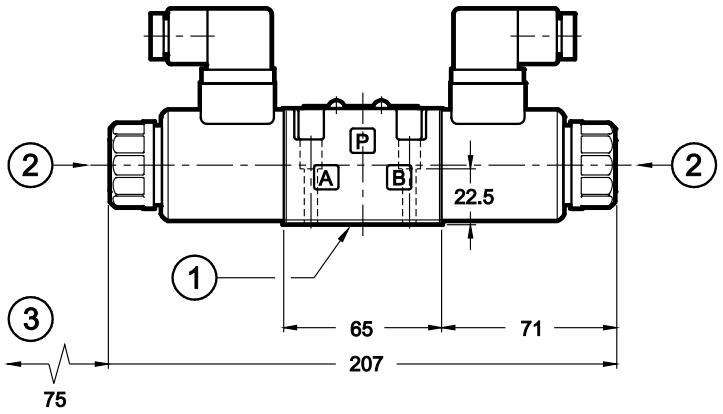


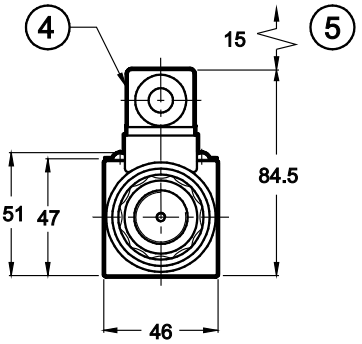


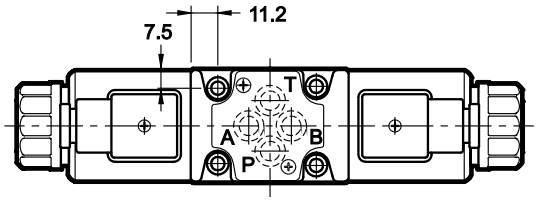
## 7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

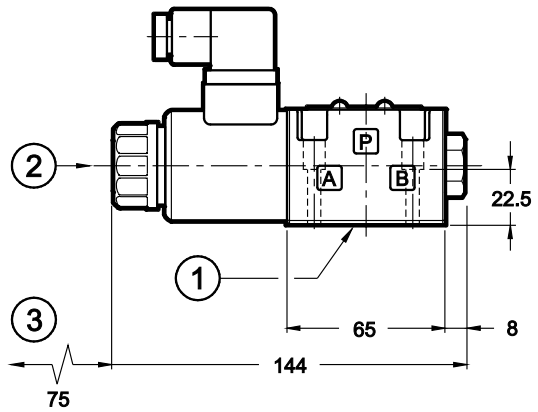
DSE3-**

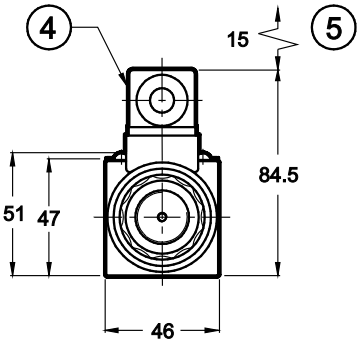


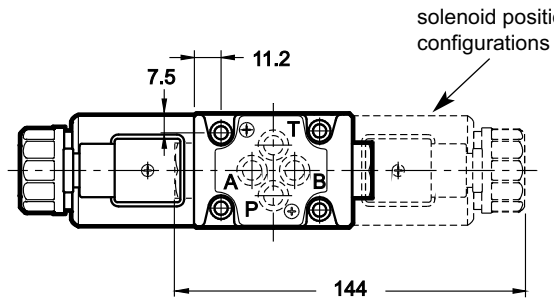




DSE3-*SA




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

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 2037 (9.25 x 1.78) - 90 shore |
| 2 | Standard manual override, integrated in the solenoid tube |
| 3 | Coil removal space |
| 4 | Electric connector type EN 175301-803<br>(ex DIN 43650) |
| 5 | Connector removal space |

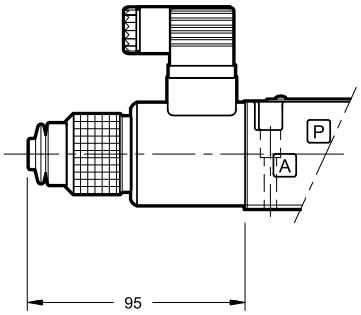
## 8 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Four different manual override versions are available upon request:

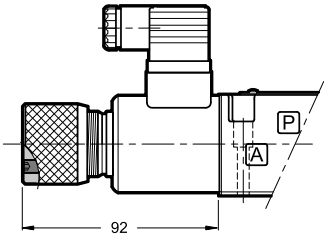
- **CM** version, manual override boot protected.
- **CK** version, knob. When the set screw is screwed and its point is aligned with the edge of the knob, tighten the knob till it touches the spool: in this position the override is not engaged and the valve is de-energized. After adjusting the override, tighten the set screw in order to avoid the knob loosing.
- **CS** version, with metal ring nut provided with a M4 screw and a locknut.
- **CH** version, lever manual override. The lever device is always placed at the A side of the valve.

**CM Version**




Code: 3803210003

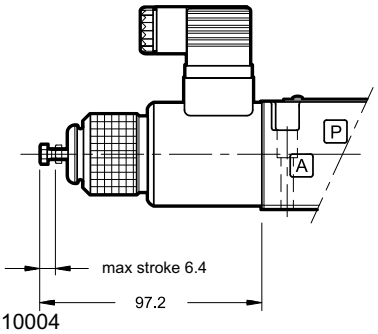
**CK Version**




Allen key for set screw: 3 mm

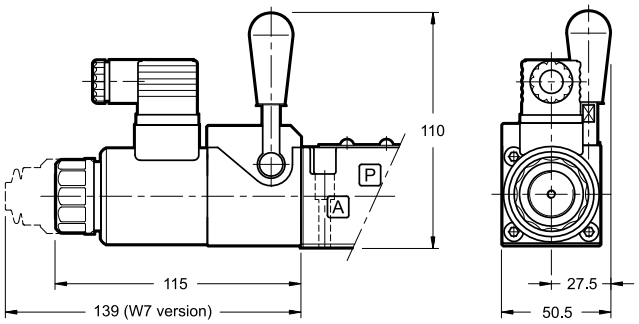
Code: 3803210005

**CS Version**

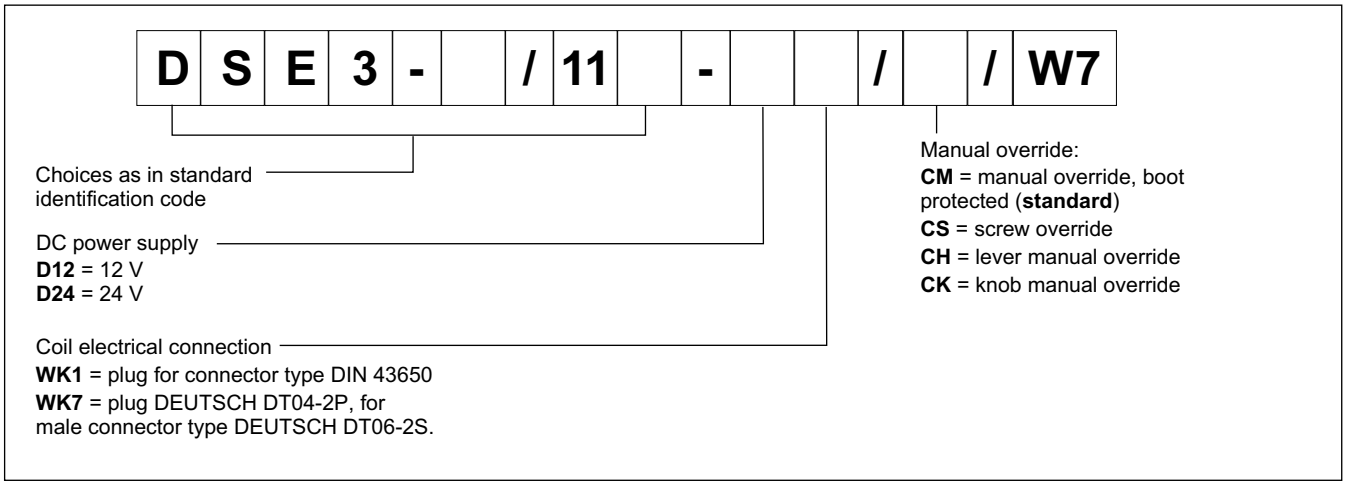



Code: 3803210004

**CH Version**



## 9 - HIGH IP AND CORROSION RESISTANCE VERSION




### 9.1 - Corrosion resistance

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 boot protected manual override is fitted as standard in order to protect the solenoid tube. See the dimensions of the CM manual override in par. 8.

### 9.2 - Coils

The coils feature a zinc-nickel surface treatment. The electrical characteristics do not change compared to the standard version: see table in par. 4

### 9.3 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

| electric connection | electric connection protection | whole valve protection |
|---|---|---|
| WK1 EN 175301-803 (ex DIN 43650) | IP66 | IP66 |
| WK7 DEUTSCH DT04 male | IP66/IP68/IP69 IP69K* | IP66/IP68/IP69 IP69K* |

(*) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

**NOTE**: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

## 10 - 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.

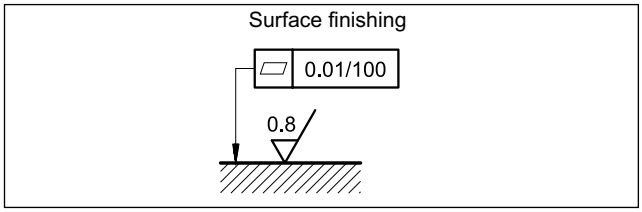
Operation with fluid temperature exceeding 80°C causes premature deterioration of the quality of the fluid and seals. The physical and chemical properties of the fluid must be maintained.

## 11 - 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.




## 12 - 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. 89 251 |
| **EDM-M142** | for solenoid 12V DC | | |

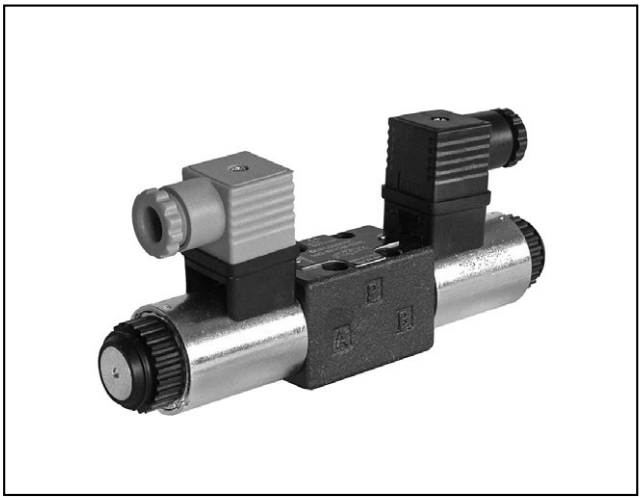
**DSE3 - A*  DSE3 - C***

| | | | |
|---|---|---|---|
| **EDM-M212** | 24V DC solenoids | rail mounting DIN EN 50022 | see cat. 89 251 |
| **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 |



# DSE2

## PROPORTIONAL DIRECTIONAL VALVE

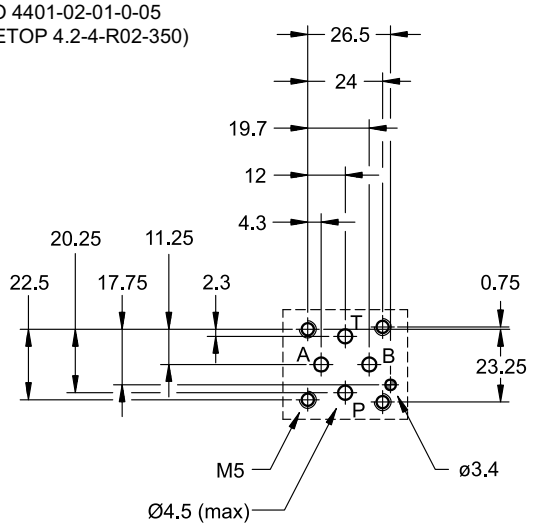
### SERIES 10

## SUBPLATE MOUNTING ISO 4401-02

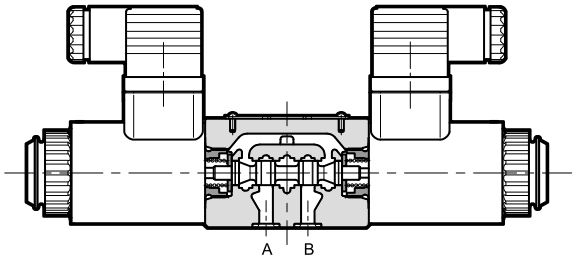
**p** max **350** bar
**Q** max **20** l/min

### MOUNTING SURFACE

ISO 4401-02-01-0-05
(CETOP 4.2-4-R02-350)




### OPERATING PRINCIPLE




— The DSE2 valve is a proportional directional valve, direct operated, with ports in compliance with ISO 4401-02 standards.

— It is suitable 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 maximize the valve performances (see point 11).

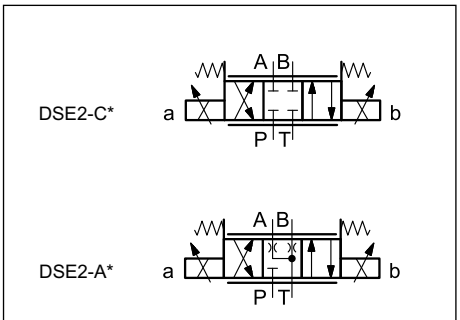
— Boot and knob manual overrides are available.

### PERFORMANCES

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

| | | |
|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T port | bar | <br>350<br>250 |
| Nominal flowrate with Δp 10 bar P-T | l/min | 1 - 3 - 8 |
| Step response | | see point 5 |
| Hysteresis (with PWM 200 Hz) | % $Q_{max}$ | < 6% |
| Repeatability | % $Q_{max}$ | < ± 1,5% |
| Electrical characteristics | | see point 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<br>double solenoid valve | kg | 0.9<br>1.3 |

### HYDRAULIC SYMBOLS (typical)



## 1 - IDENTIFICATION CODE

| D | S | E | 2 | - | | | | / | 10 | | - | | | / | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Direct operated directional control valve

Electric proportional control

Size ISO 4401-02

Spool type:
**C** = closed centres
**A** = open centres

Spool nominal flow. See point 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 EN 175301-803 (ex DIN 43650) (**standard**)
**K2** = plug for connector type AMP JUNIOR
**K7** = plug for connector type DEUTSCH DT04-2P male

Option: manual override (see at point 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 UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

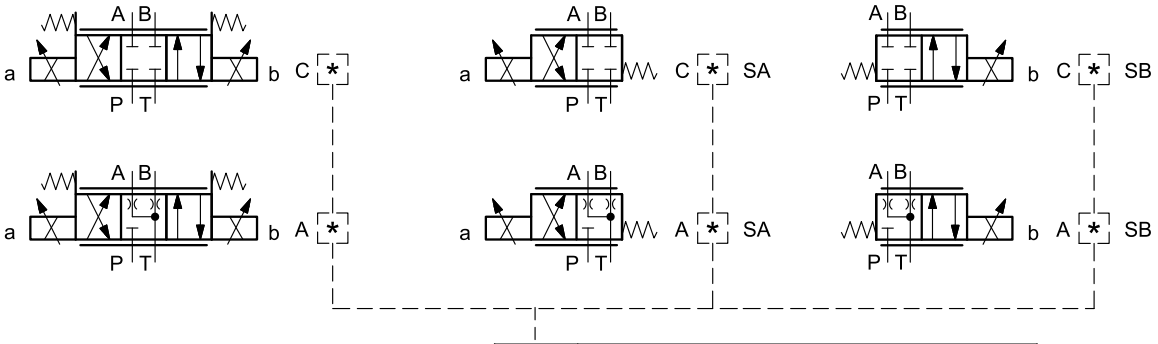
## 2 - CONFIGURATIONS

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 centreing

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external) with spring centreing

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external) with spring centreing

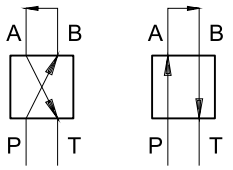



| * | Nominal flow with Δp 10 bar P→T |
|---|---|
| **01** | 1.4 l/min (available for spool type A only) |
| **03** | 3 l/min |
| **08** | 8 l/min |

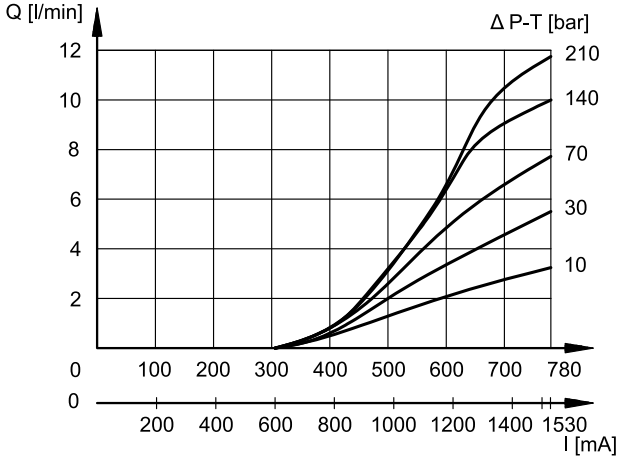
## 3 - CHARACTERISTIC CURVES

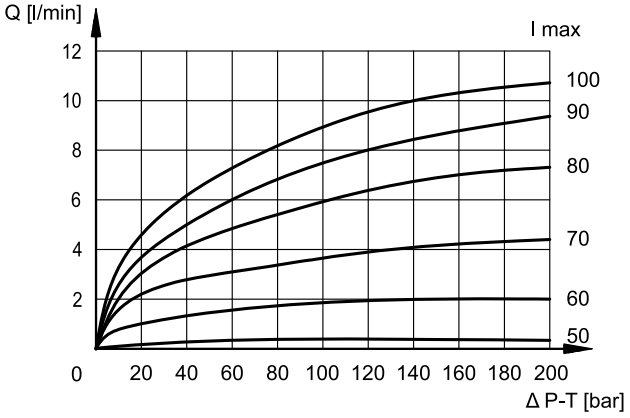
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

Typical flow rate control curves according to the current supply to solenoid. The reference Δp values are measured between ports P and T of the valve.

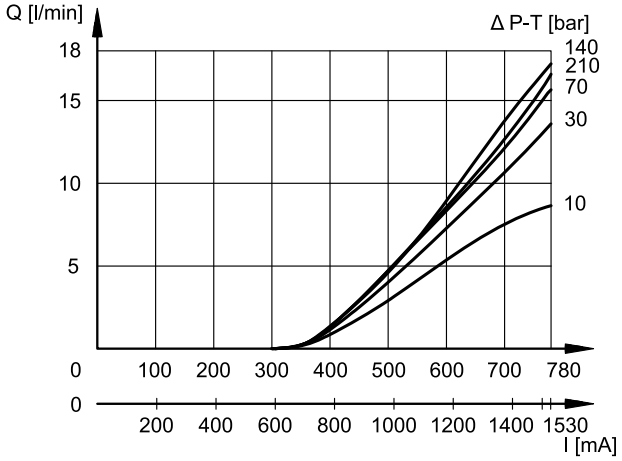


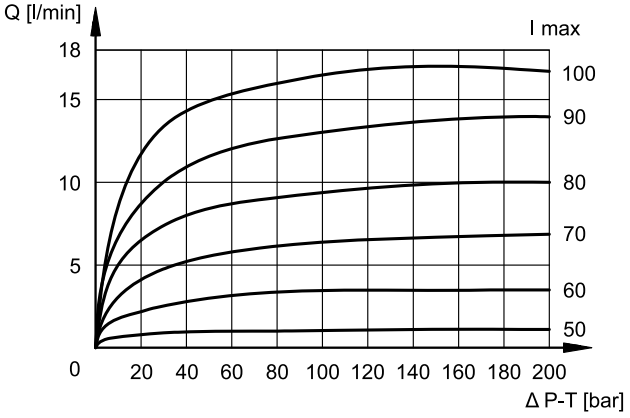

**C03**



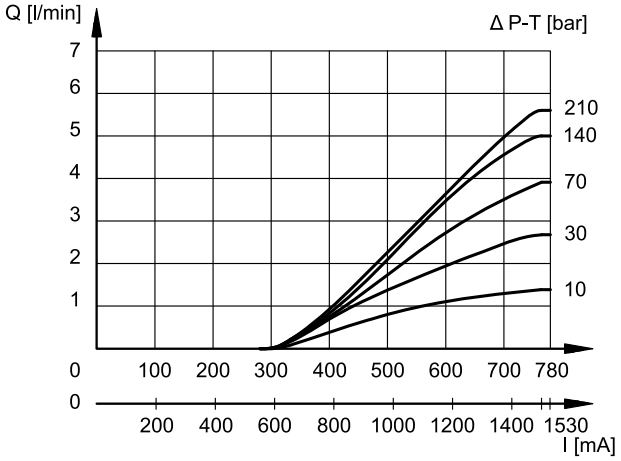



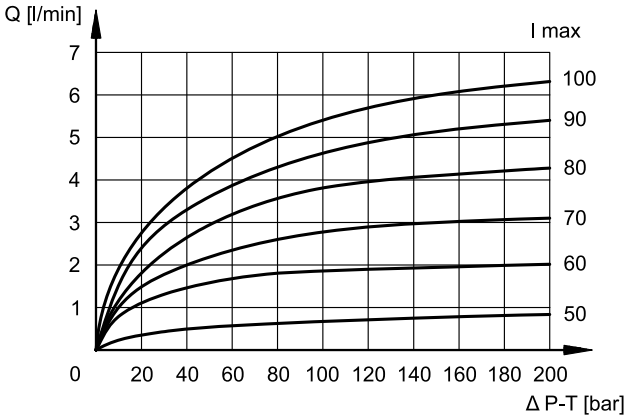

**C08**



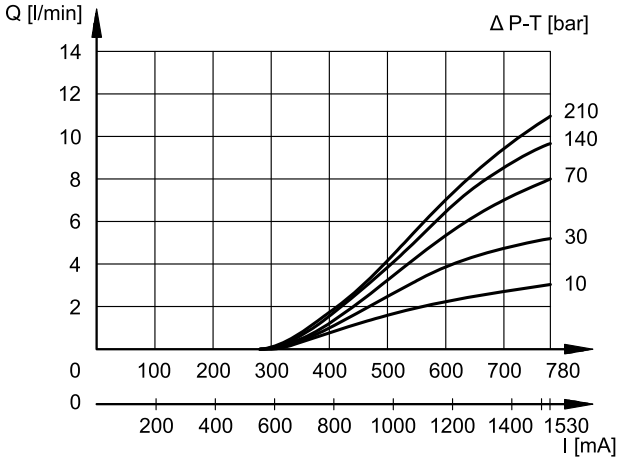



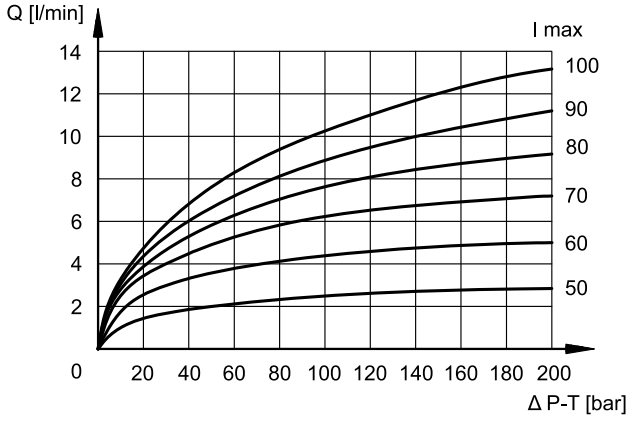
**A01**


Q [l/min]
Δ P-T [bar]
7
6
5
4
3
2
1
0
210
140
70
30
10
0
100 200 300 400 500 600 700 780
200 400 600 800 1000 1200 1400 1530
I [mA]

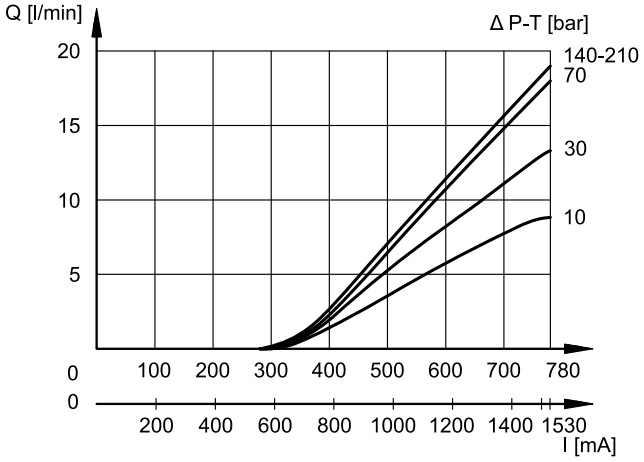

Q [l/min]
I max
7
6
5
4
3
2
1
0
100
90
80
70
60
50
0
20 40 60 80 100 120 140 160 180 200
Δ P-T [bar]

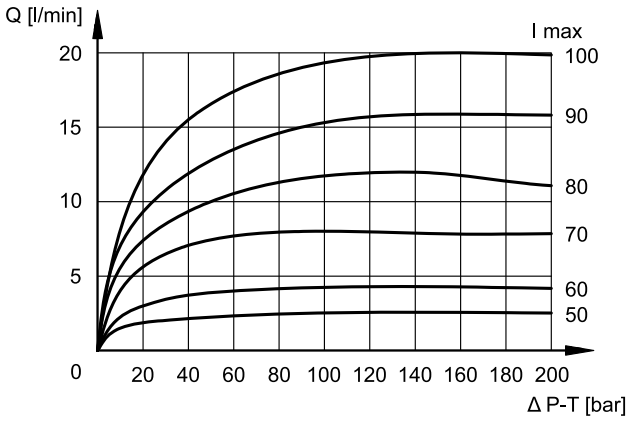
**A03**


Q [l/min]
Δ P-T [bar]
14
12
10
8
6
4
2
0
210
140
70
30
10
0
100 200 300 400 500 600 700 780
200 400 600 800 1000 1200 1400 1530
I [mA]


Q [l/min]
I max
14
12
10
8
6
4
2
0
100
90
80
70
60
50
0
20 40 60 80 100 120 140 160 180 200
Δ P-T [bar]

**A08**


Q [l/min]
Δ P-T [bar]
20
15
10
5
0
140-210
70
30
10
0
100 200 300 400 500 600 700 780
200 400 600 800 1000 1200 1400 1530
I [mA]


Q [l/min]
I max
20
15
10
5
0
100
90
80
70
60
50
0
20 40 60 80 100 120 140 160 180 200
Δ P-T [bar]

## 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 | 4.98 | 21 |
| **NOMINAL CURRENT** | A | 1.53 | 0.78 |
| **DUTY CYCLE** | | 100% | |
| **ELECTROMAGNETIC COMPATIBILITY (EMC)** | According to 2014/30/EU | | |
| **CLASS OF PROTECTION**<br>Coil insulation (VDE 0580)<br>Impregnation | class H<br>class F | | |

**Protection from atmospheric agents IEC 60529**

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

| electric connection | electric connection protection | whole valve protection |
|---|---|---|
| **K1** | IP65 | IP65 |
| **K2** | IP65 | |
| **K7** | IP65/67 | |

## 5 - STEP RESPONSE

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

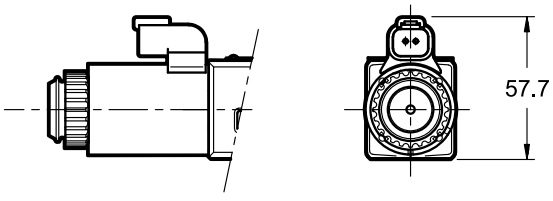
Step response is the time taken for the valve to reach 90% of the setted positioning value, following a step change of reference signal. The table shows typical response times tested with spool type A03 and $\Delta p$ = 30 bar P-T.

| **REFERENCE SIGNAL STEP** | 0 → 100% | 100 → 0% |
|---|---|---|
| Step response [ms] | 60 | 60 |

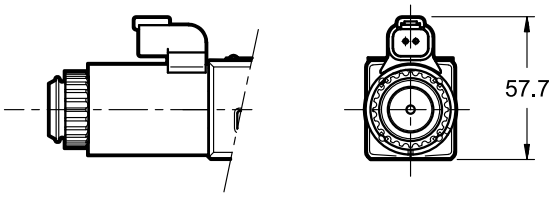
## 6 - ELECTRIC CONNECTIONS

Refer to the overall and mouting dimension for K1 connection. Connectors for K1 connection are always delivered together with the valve.

connection for AMP JUNIOR
connector type
code **K2**



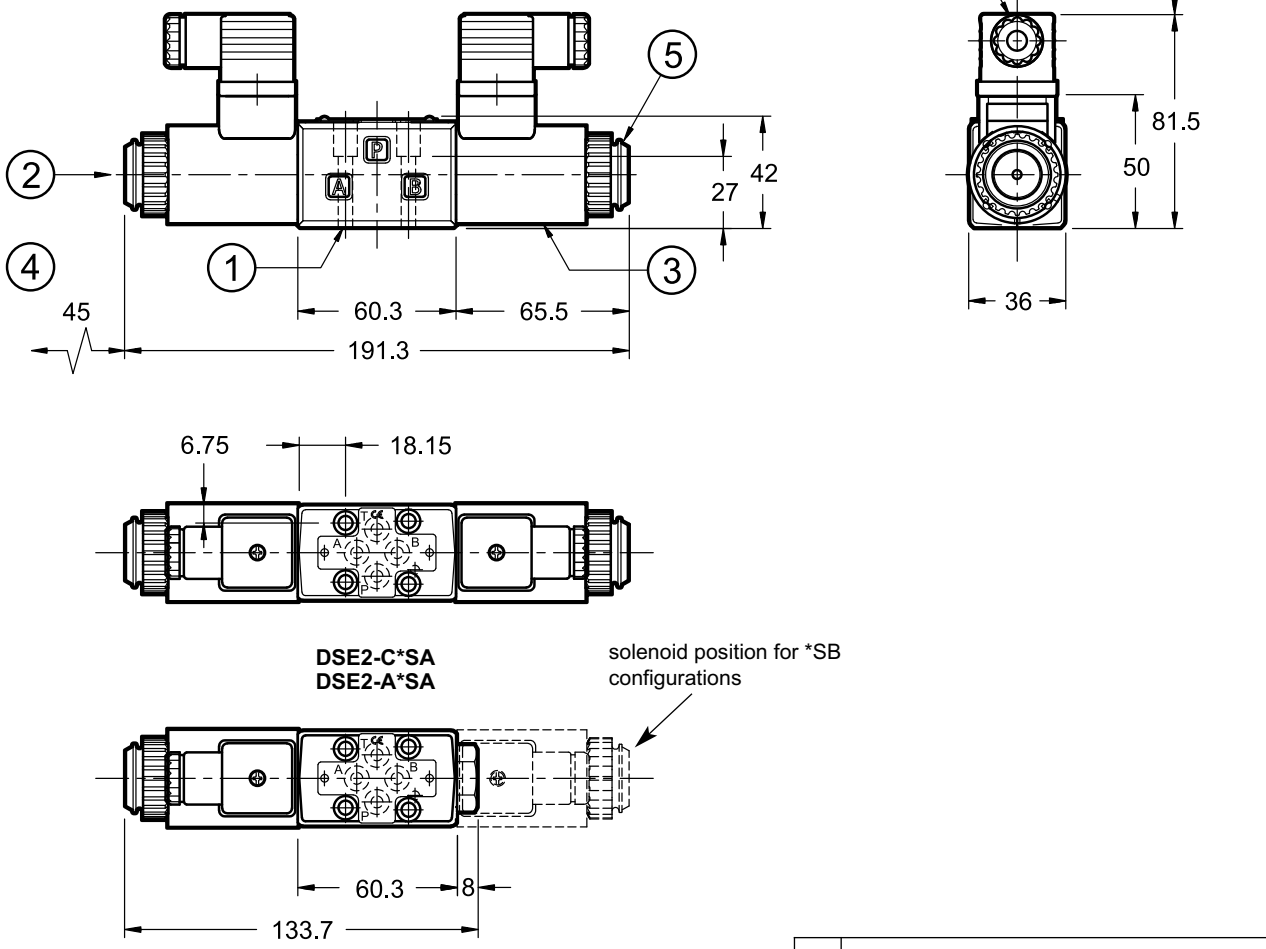

connection for
DEUTSCH DT06-2S male connector
code **K7**



## 7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

**DSE2-C***
**DSE2-A***




**DSE2-C*SA**
**DSE2-A*SA**

solenoid position for *SB configurations




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 106 (6.75x1.78) - 90 shore |
| 2 | Standard manual override, integrated in the solenoid tube |
| 3 | Coil (360° revolving) |
| 4 | Coil removal space |
| 5 | Locking ring:<br>tightening torque: 5 Nm ± 0,5 |
| 6 | Electric connector type EN 175301-803<br>(ex DIN 43650) |
| 7 | Connector removal space |

| |
|---|
| Fastening bolts: 4 bolts M5x35 - ISO 4762 |
| Torque: 5 Nm (A8.8) |
| Threads of mounting holes: M5x10 |

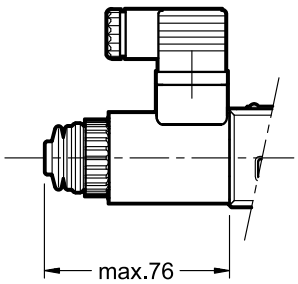
## 8 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

Two different manual override versions are available upon request:

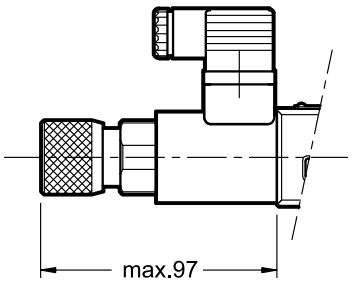
- **CM** version, manual override boot protected.
- **CK1** version, knob to screw

**CM Version**




Code: 3404100043

**CK1 Version**




Code: 3404100041

## 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.

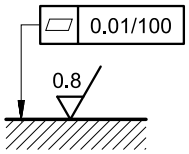
## 10 - INSTALLATION

These 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

**DSE2 - **SA (SB)**

| | | | |
|---|---|---|---|
| **EDM-M101** | 24V DC solenoids | rail mounting DIN EN 50022 | see cat. 89 251 |
| **EDM-M162** | 12V DC solenoids | | |

**DSE2 - A*  DSE2 - C***

| | | | |
|---|---|---|---|
| **EDM-M201** | 24V DC solenoids | rail mounting DIN EN 50022 | see cat. 89 251 |
| **EDM-M262** | 12V DC solenoids | | |

## 12 - SUBPLATES

(see catalogue 51 000)

| |
|---|
| Type PMMD-AI3G rear ports (port thread 3/8” BSP) |
| Type PMMD-AL3G side ports (port thread 3/8” BSP) |

# DSE3B

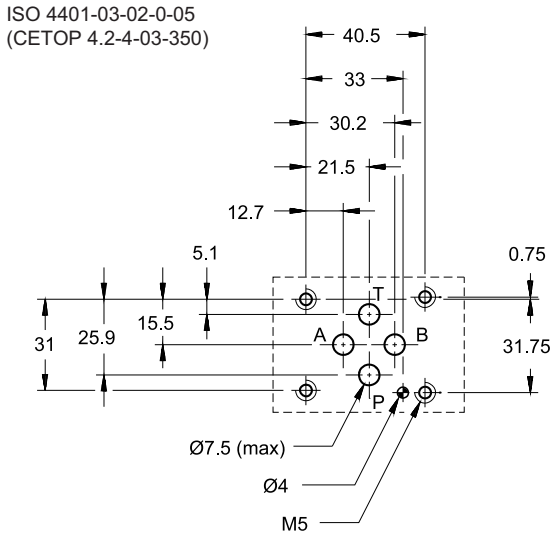
## DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

### SERIES 10

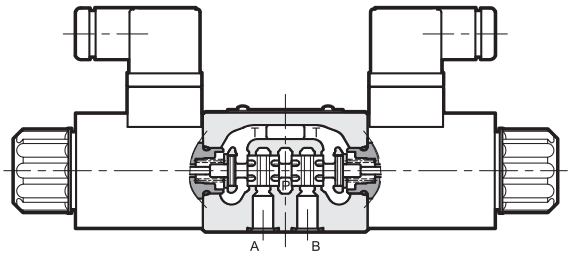
### SUBPLATE MOUNTING ISO 4401-03

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

### MOUNTING INTERFACE




### OPERATING PRINCIPLE




— The DSE3B valve is a direct operated directional valve with electric proportional control, with ports in compliance with ISO 4401-03 standards.

— It is suitable 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.

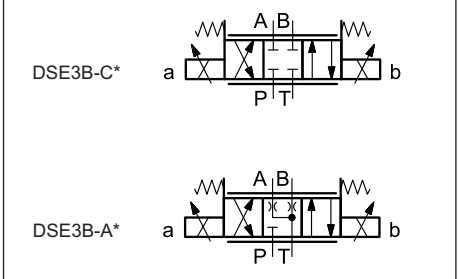
— The valve can be controlled directly by a current control supply unit or combined with an external electronic card to exploit valve performance to the full (see par. 12).

### PERFORMANCES

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

| | | |
|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T port | bar | <br>350<br>160 |
| Nominal flow with Δp 10 bar P-T | l/min | 1 - 4 - 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 / +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<br>double solenoid valve | kg | 1.6<br>2.0 |

### HYDRAULIC SYMBOLS (typical)



## 1 - IDENTIFICATION CODE

| D | S | E | 3 | B | - | | | | / | 10 | | - | | | / | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Direct operated directional valve

Electric proportional control

Size ISO 4401-03

Spool type:
**C** = closed centres
**A** = open centres

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 EN 175301-803 (ex 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. For a salt spray resistance up to **600** hours refer to **paragraph 9**. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

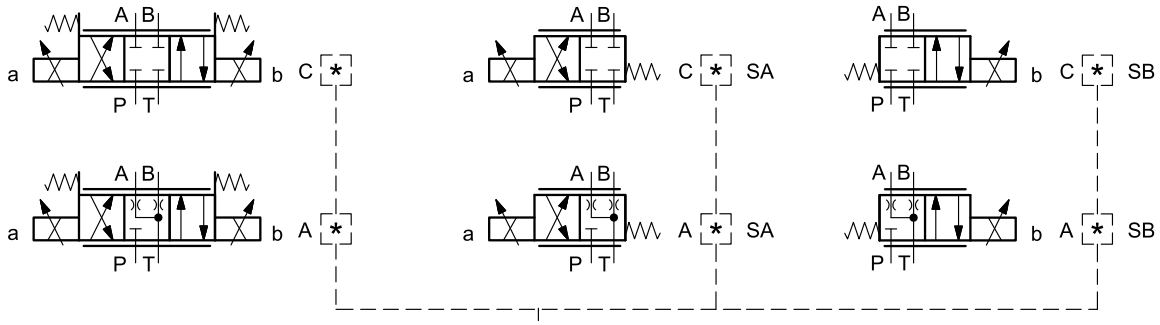
## 2 - CONFIGURATIONS

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 centreing

"**SA**" configuration: 1 solenoid on side A.
2 positions (central + external)
with spring centreing

"**SB**" configuration: 1 solenoid on side B.
2 positions (central + external)
with spring centreing



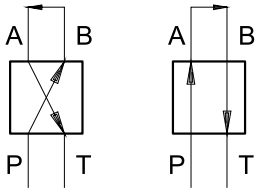

| * | Controlled flow with Δp10 bar P-T |
|---|---|
| **01** | 1 l/min |
| **04** | 4 l/min |
| **08** | 8 l/min |
| **16** | 16 l/min |
| **26** | 26 l/min |

## 3 - CHARACTERISTIC CURVES

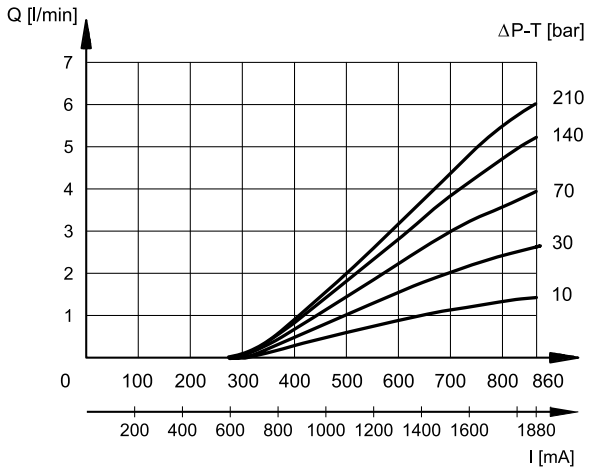
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

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.

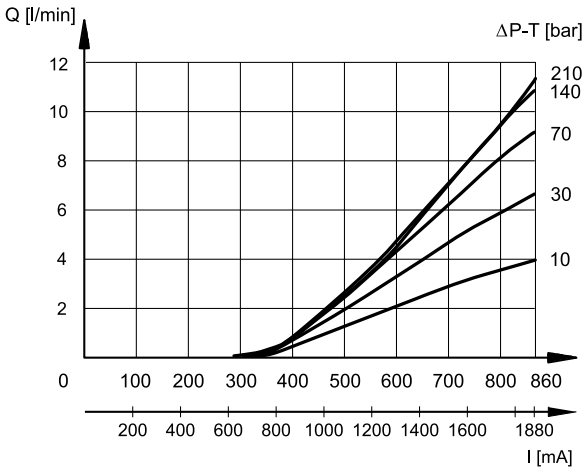
The reference Δp values are measured between ports P and T on the valve.



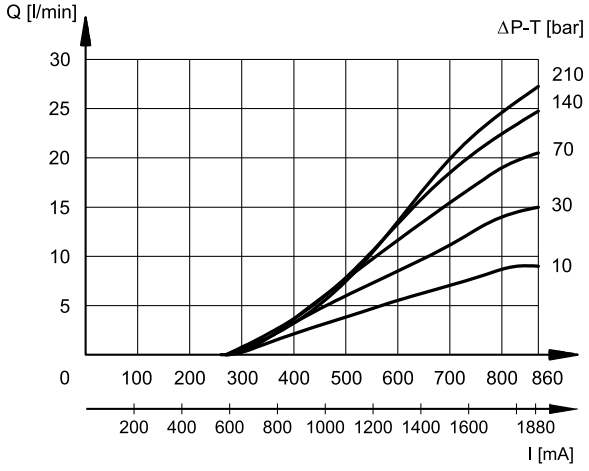

**SPOOL TYPE C01/A01**



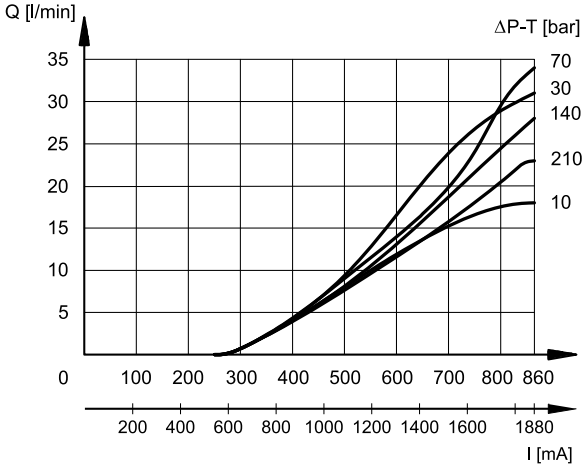

**SPOOL TYPE C04/A04**



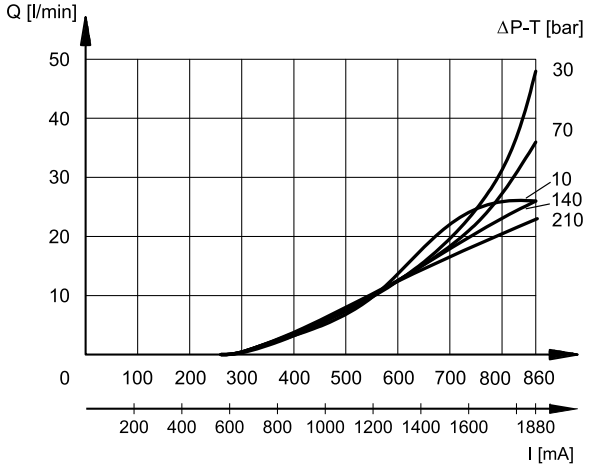

**SPOOL TYPE C08/A08**




**SPOOL TYPE C16/A16**




**SPOOL TYPE C26/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 2014/30/EU | | |
| **CLASS OF PROTECTION**<br>coil insulation ( VDE 0580 )<br>impregnation | class H<br>class F | | |

**Protection from atmospheric agents IEC 60529**

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

| electric connection | electric connection protection | whole valve protection |
|---|---|---|
| K1 EN 175301-803 (ex DIN 43650) | IP65 | IP65 |
| K7 DEUTSCH DT04 male | IP65/67 | |

## 5 - 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 setted positioning value, following a step change of reference signal.

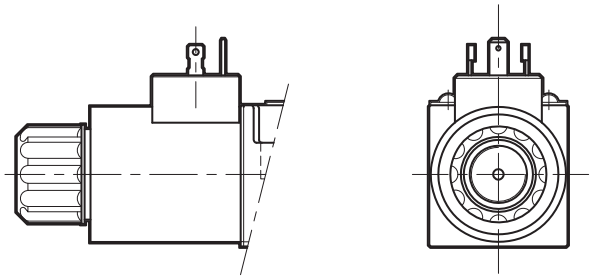
The table shows typical response times tested with spool type C16 and $\Delta p$ = 30 bar P-T.

| **REFERENCE SIGNAL STEP** | 0 → 100% | 100 → 0% |
|---|---|---|
| Step response [ms] | 50 | 40 |

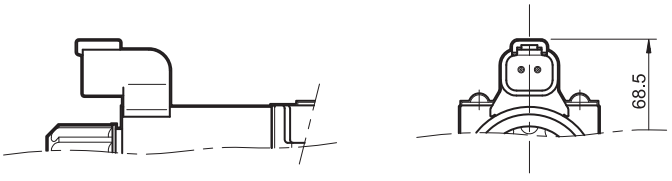
## 6 - ELECTRIC CONNECTIONS

Connectors for K1and WK1 connections are always delivered together with the valve.

connection for EN 175301-803 connector
code **K1** (**standard**)
code **WK1** (W7 version only)



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

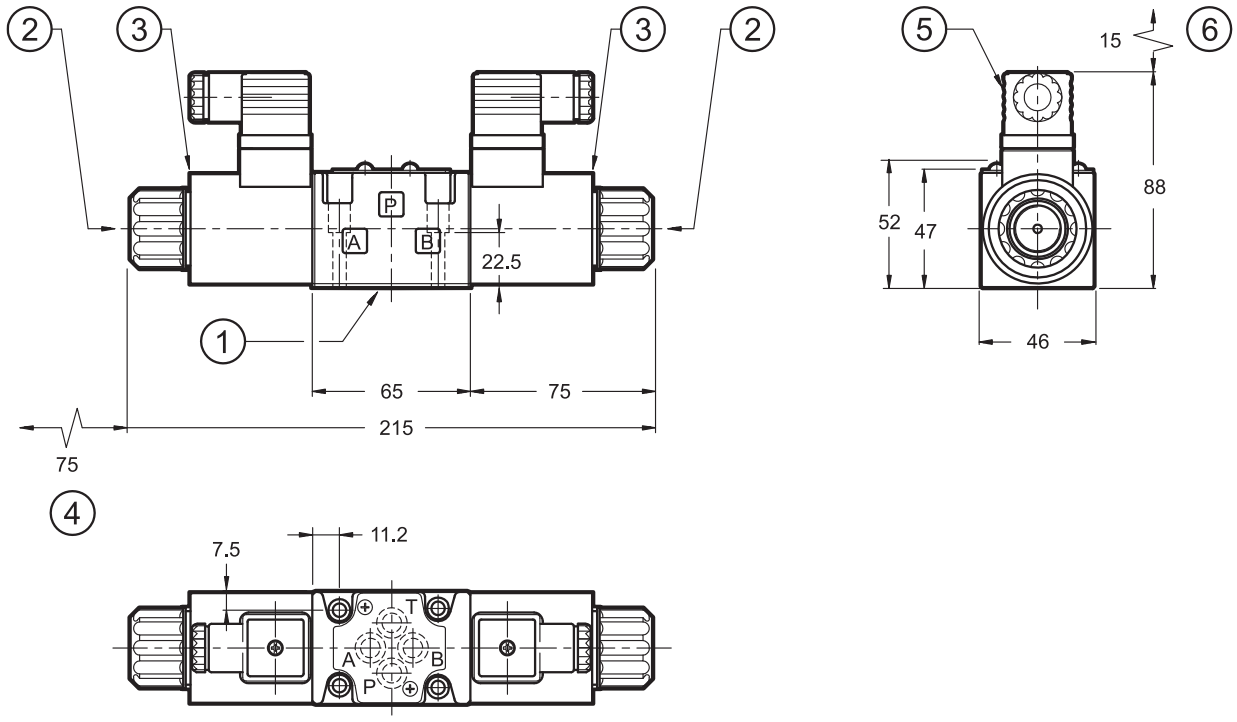



connection for
DEUTSCH DT06-2S male connector
code **WK7** (W7 version only)

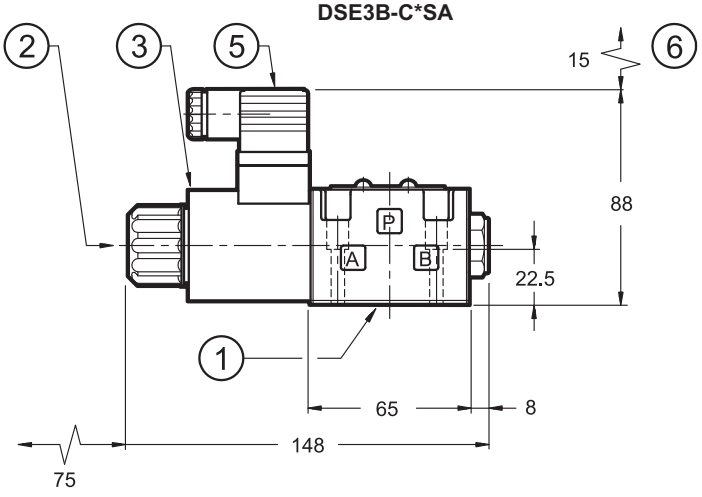
## 7 - OVERALL AND MOUNTING DIMENSIONS

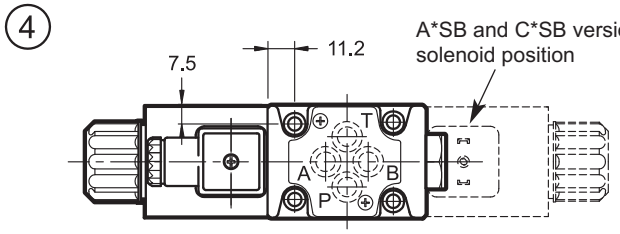
dimensions in mm

**DSE3B-A***
**DSEB3-C***




**DSE3B-A*SA**
**DSE3B-C*SA**




| |
|---|
| Fastening bolts: 4 SHCS M5x30 - ISO 4762 |
| Torque: 5 Nm (A 8.8) |
| Threads of mounting holes : M5x10 |
| Locking ring tightening torque: 5 ± 0.5 Nm |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 2037 (9.25 x 1.78) - 90 shore |
| 2 | Standard manual override integrated in the solenoid tube<br>**NOTE**: The valve version with high IP and high corrosion resistance fits the CM manual override as standard<br>See the CM dimensions in par. 8 |
| 3 | Coil (360° revolving) |
| 4 | Coil removal space |
| 5 | EN 175301-803 (ex DIN 43650) electric coil connector |
| 6 | Connector removal space |

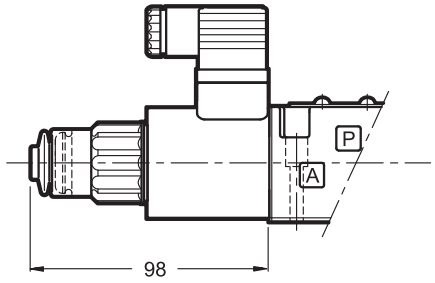
## 8 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

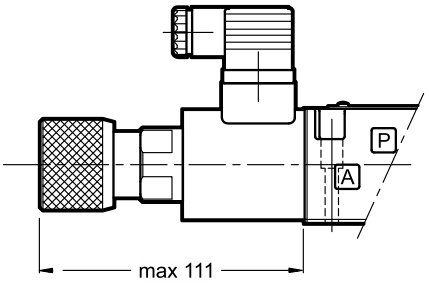
Three different manual override version are available upon request:

- **CM** version, manual override boot protected.
- **CK1** version, turning knob override.
- **CS** version, with metal ring nut provided with a M8 screw and a blocking locknut to allow the continuous mechanical operations.

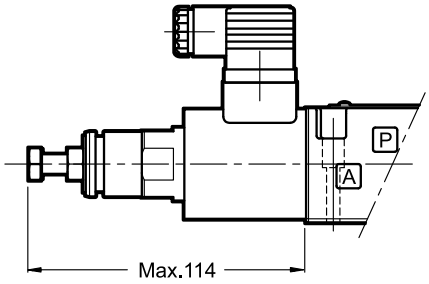
**CM Version -** Code: 3401150006



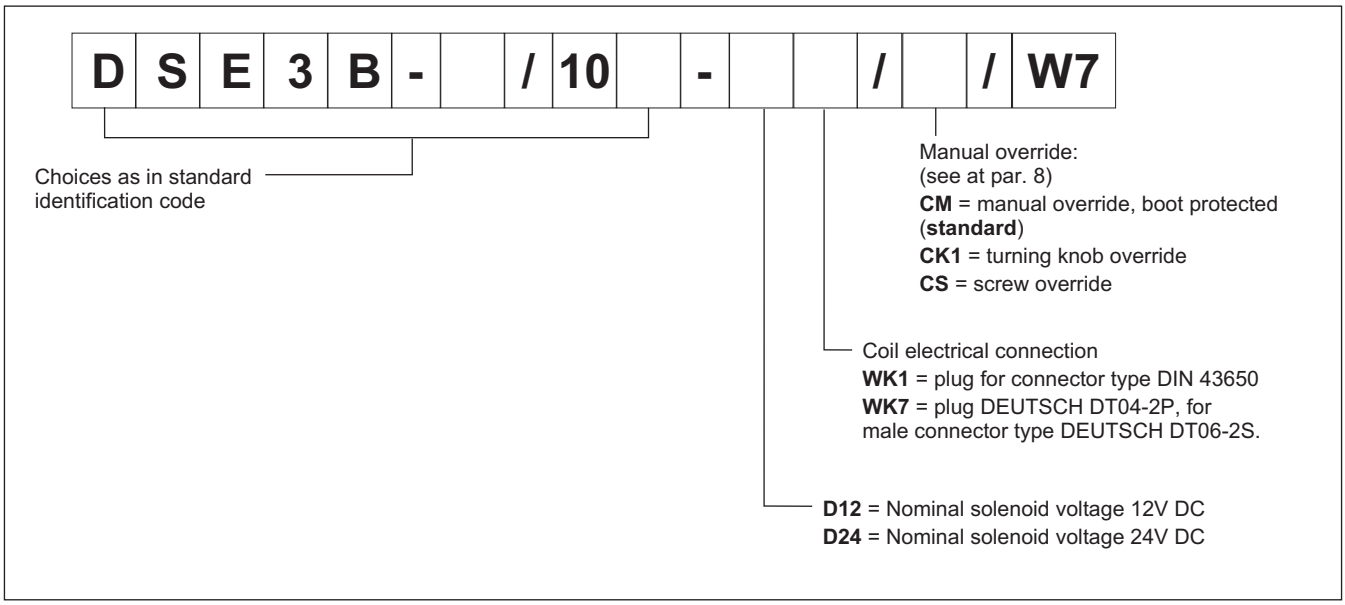

**CK1 Version -** Code: 3401150021




**CS Version -** Code: 3803210006



## 9 - HIGH IP AND CORROSION RESISTANCE VERSION




### 9.1 - Corrosion resistance

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 boot protected manual override is fitted as standard in order to protect the solenoid tube. See the dimensions of the CM manual override in par. 8.

### 9.2 - Coils

The coils feature a zinc-nickel surface treatment. The electrical characteristics do not change compared to the standard version: see table in par. 4

### 9.3 - Protection from atmospheric agents IEC 60529

The IP protection degree is guaranteed only with both valve and connectors of an equivalent IP degree correctly connected and installed.

| electric connection | electric connection protection | whole valve protection |
|---|---|---|
| WK1 EN 175301-803 (ex DIN 43650) | IP66 | IP66 |
| WK7 DEUTSCH DT04 male | IP66/IP68/IP69 IP69K* | IP66/IP68/IP69 IP69K* |

(*) The IP69K protection degree is not taken into account in IEC 60529 but it is included in ISO 20653.

**NOTE**: As regards the liquid ingress protection (second digit), there are three means of protection.

Codes from 1 to 6 are related to water jets.

Rates 7 and 8 are related to immersion.

Rate 9 is reserved for high pressure and temperature water jets.

This means that IPX6 covers all the lower steps, rate IPX8 covers IPX7 but not IPX6 and lower, instead IPX9 does not cover any of them.

Whether a device meets two types of protection requirements it must be indicated by listing both the tests separated by a slash.

(E.g. a marking of an equipment covered both by temporary immersion and water jets is IP66/IP68).

## 10 - 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.

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.

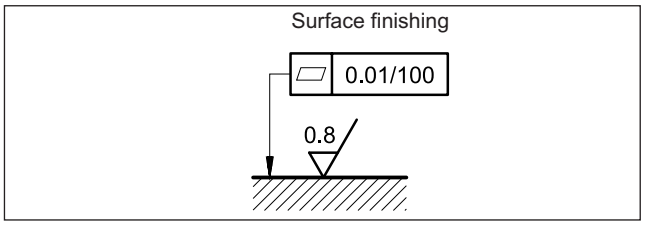
## 11 - INSTALLATION

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 lapped surface with planarity and roughness equal to or better than those indicated in the symbol.

If minimum values of planarity or smoothness are not observed, fluid leakages between valve and mounting surface can easily occur.




## 12 - 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. 89 251 |
| **EDM-M142** | for solenoid 12V DC | | |

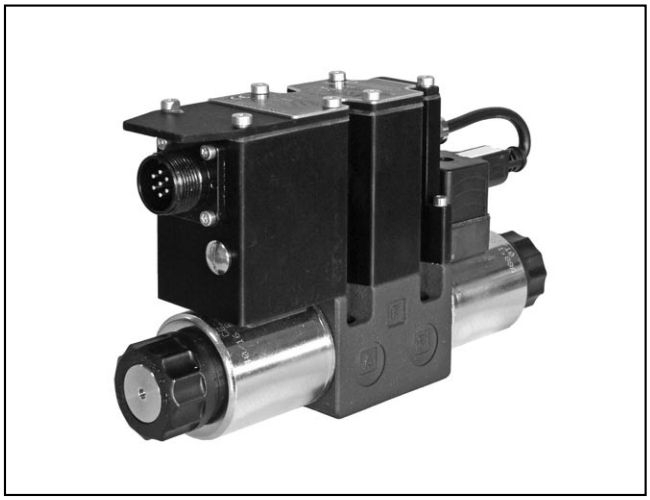
**DSE3B - A*** **DSE3B - C***

| | | | |
|---|---|---|---|
| **EDM-M212** | for solenoids 24V DC | rail mounting DIN EN 50022 | see cat. 89 251 |
| **EDM-M242** | for solenoids 12V DC | | |

## 13 - SUBPLATES

(see catalogue 51 000)

| |
|---|
| Type PMMD-AI3G ports on rear (3/8” BSP threaded) |
| Type PMMD-AL3G side ports (3/8” BSP threaded) |



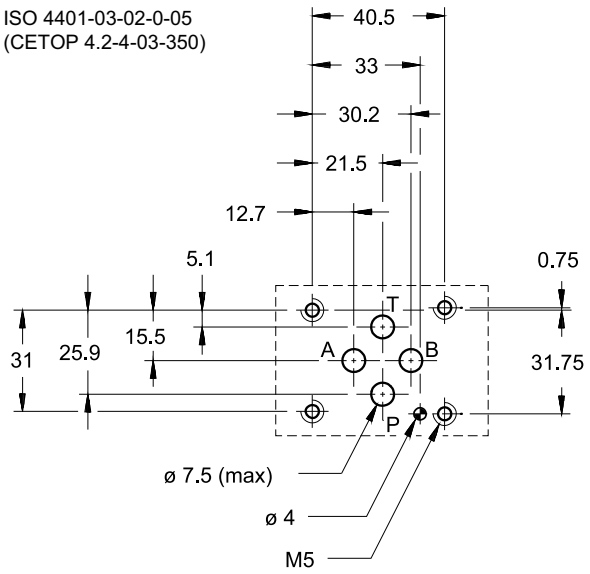
# DSE3G*

## PROPORTIONAL DIRECTIONAL VALVE WITH DIGITAL INTEGRATED ELECTRONICS

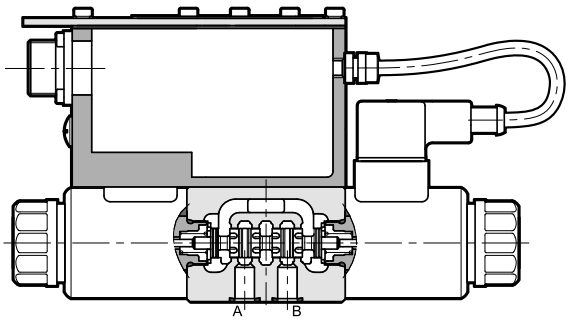
### SUBPLATE MOUNTING ISO 4401-03

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

### MOUNTING INTERFACE




### OPERATING PRINCIPLE




— The DSE3G* are proportional directional valves, direct operated, with digital integrated electronics and with mounting interface according to ISO 4401-03 standards.

— They control the positioning and the speed of hydraulic actuators.

— They are available with different types of electronics, with analogue or fieldbus interfaces.

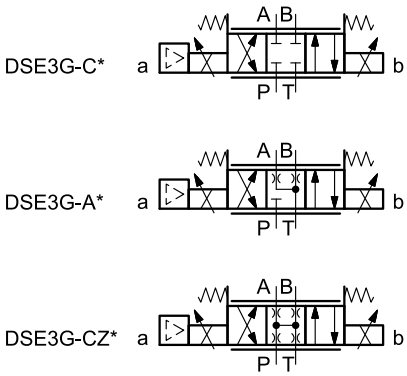
— The valves are easy to install. The driver manages digital settings directly.

### PERFORMANCES

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

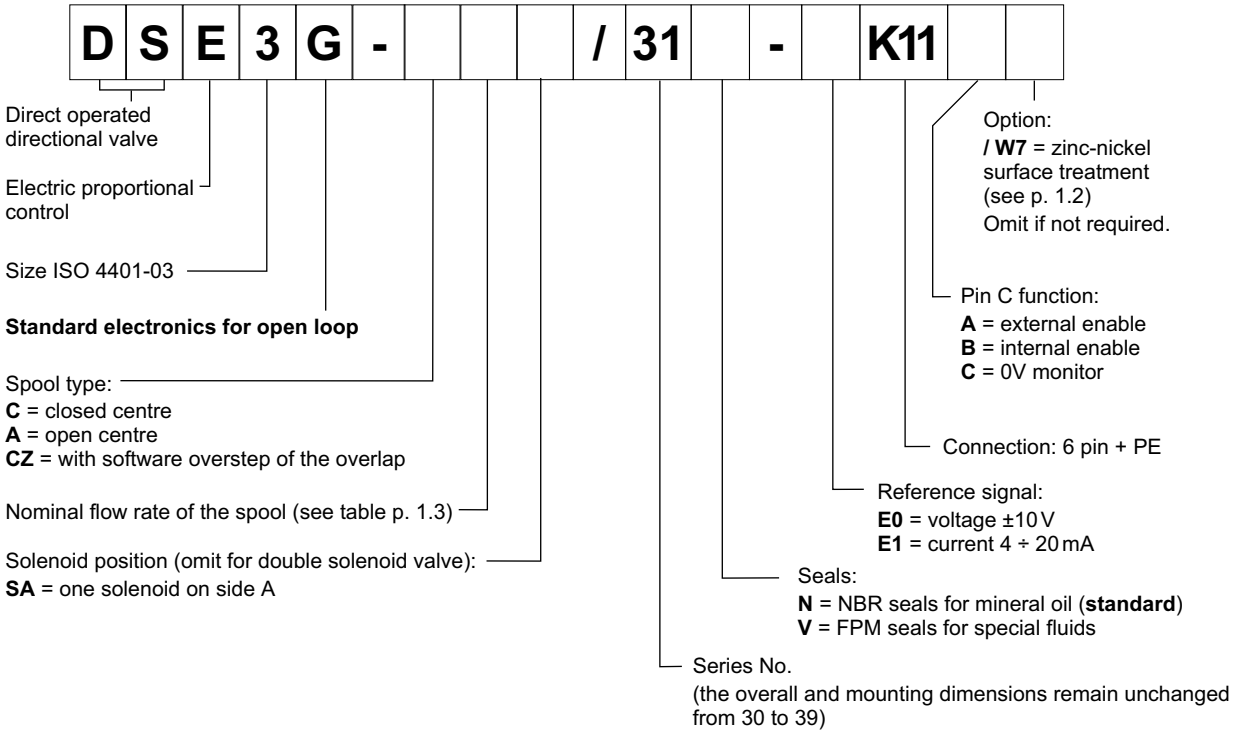
| | | |
|---|---|---|
| Max operating pressure:<br>- P - A - B ports<br>- T port | bar | <br>350<br>210 |
| Nominal flow with Δp 10 bar P-T | l/min | 1 - 4 - 8 - 16 - 26 |
| Response times | see point 6 | |
| Hysteresis | % of Q max | < 3% |
| Repeatability | % of Q max | < ±1% |
| Electrical characteristics | see points 3 and 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<br>class 18/16/13 | |
| Recommended viscosity | cSt | 25 |
| Mass: single solenoid valve<br>double solenoid valve | kg | 1.9<br>2.4 |

### HYDRAULIC SYMBOLS (typical)



## 1 - IDENTIFICATION CODES AND CONFIGURATION

### 1.1 - Standard electronics




### 1.2 - Surface treatments

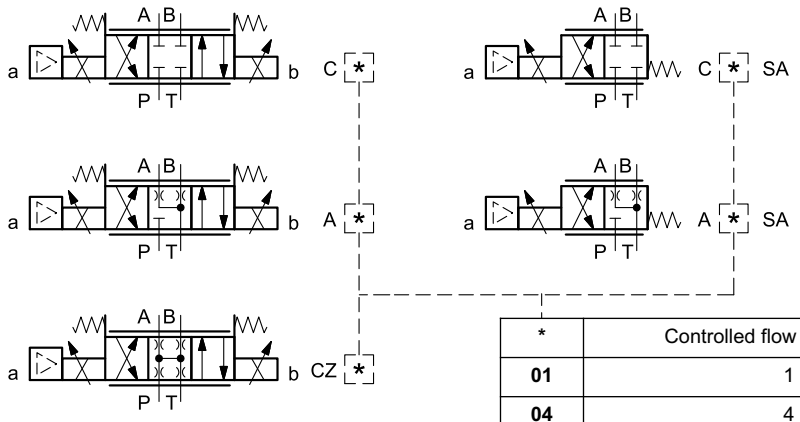
The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

### 1.3 - Configurations

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

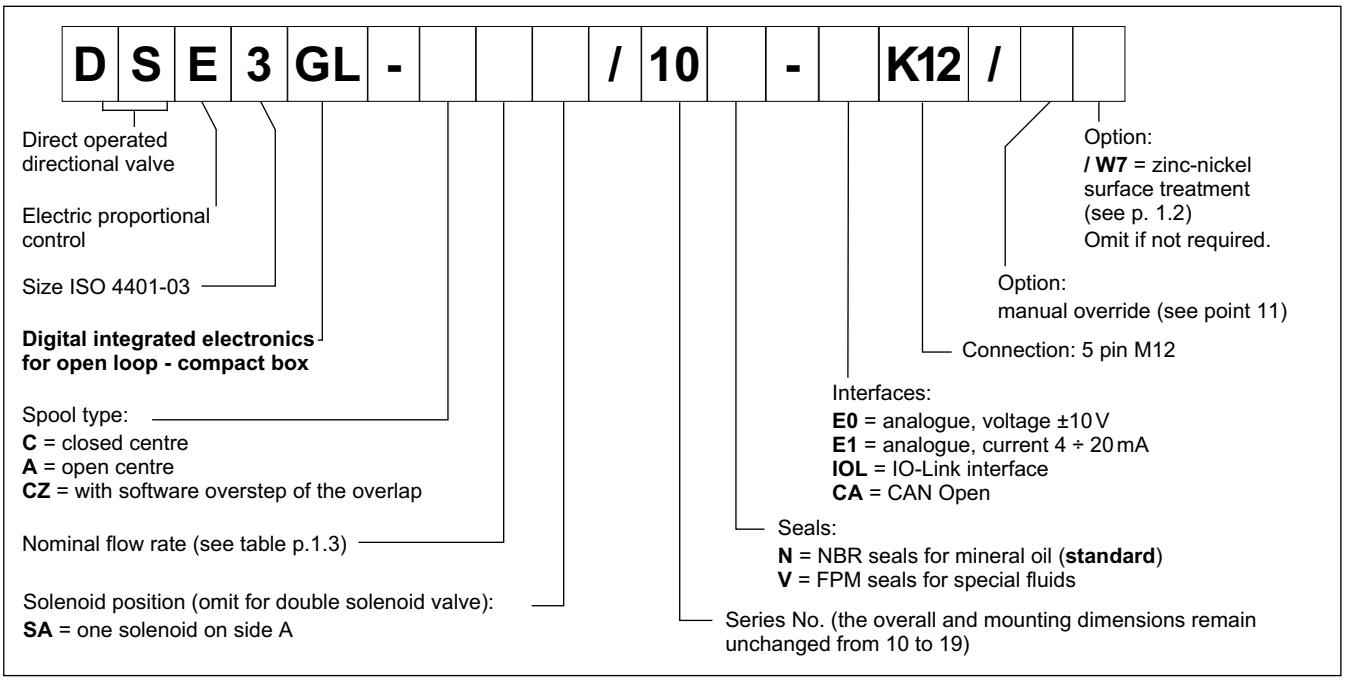
Configuration 2 solenoids :
3 positions with spring centreing

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external) with spring centreing

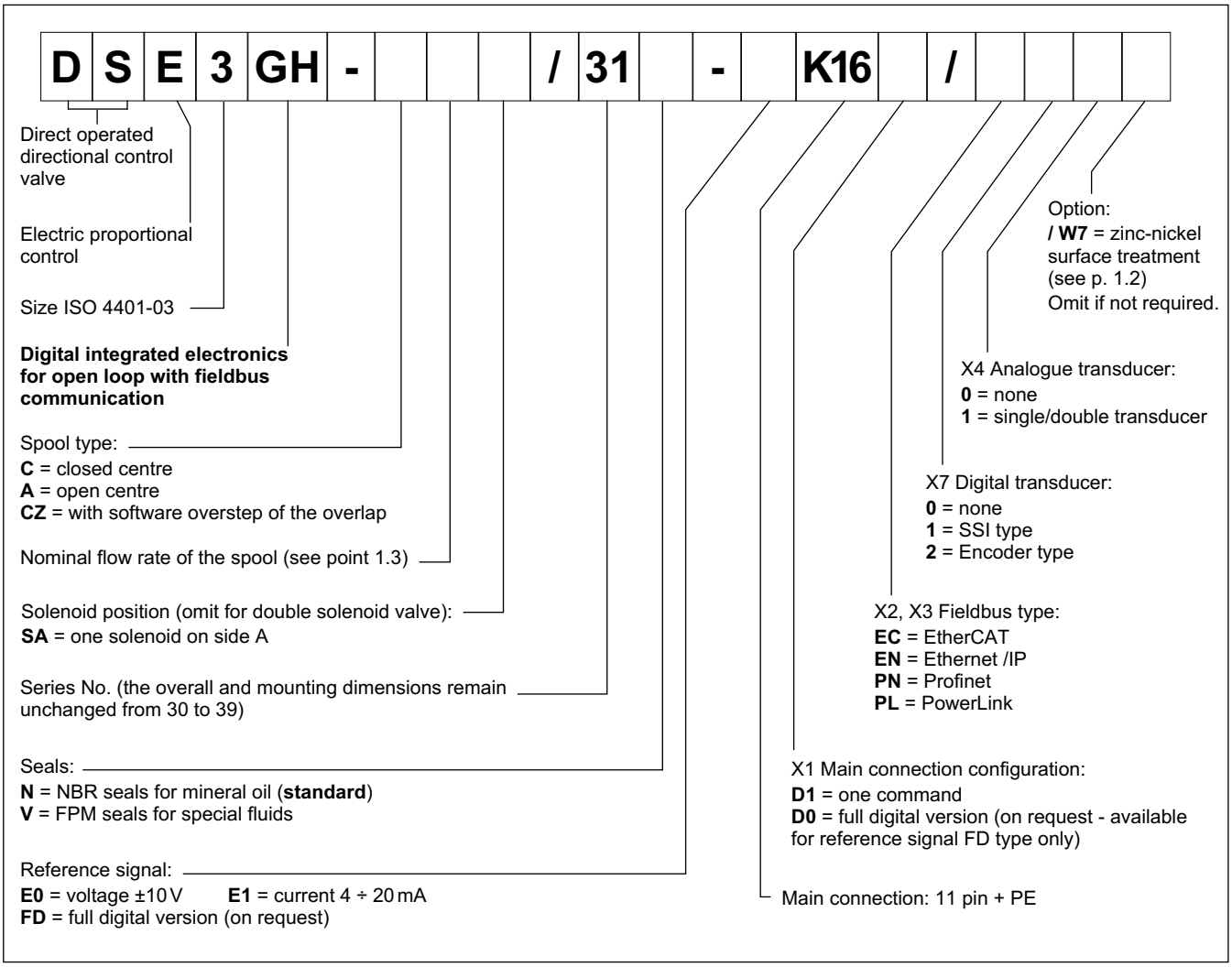



| * | Controlled flow with Δp10 bar P-T |
|---|---|
| **01** | 1 l/min |
| **04** | 4 l/min |
| **08** | 8 l/min |
| **16** | 16 l/min |
| **16/08** | 16 (P-A) / 08 (B-T) l/min |
| **26** | 26 l/min |
| **26/13** | 26 (P-A) / 13 (B-T) l/min |

### 1.4 - Compact electronics




### 1.5 - Electronics with fieldbus communication



## 2 - ELECTRONICS COMMON DATA

| | | |
|---|---|---|
| Duty cycle | | 100% (continuous operation) |
| Protection class according to EN 60529 | | IP65/IP67 (**NOTE**) |
| 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 | A | 3 |
| Managed breakdowns | | Overload and electronics overheating, cable breakdown, supply voltage failures |
| Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2 | | According to 2014/30/EU standards |

**NOTE**: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

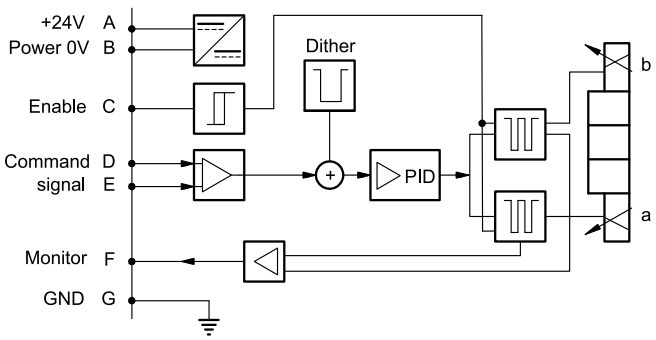
## 3 - DSE3G - STANDARD ELECTRONICS

### 3.1 - Electrical characteristics

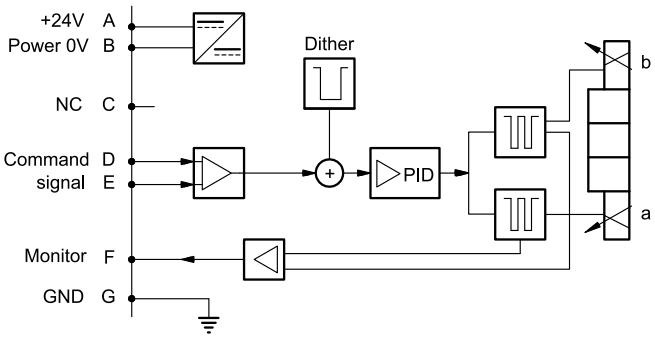
| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication for diagnostic | | LIN-bus Interface (by means of the optional kit) |
| Connection | | 6 pin + PE (MIL-C-5015-G - DIN EN 175201-804) |

### 3.2 - On-board electronics diagrams

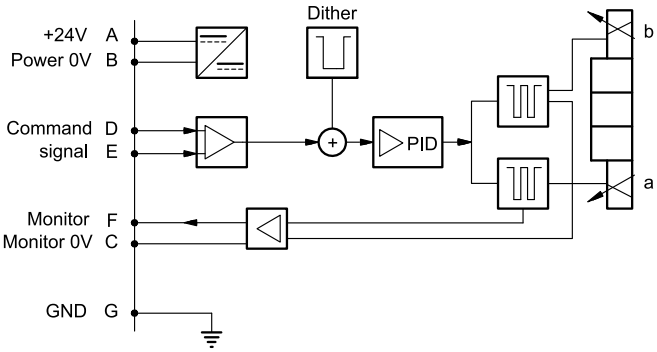
**VERSION A** - External Enable




**VERSION B** - Internal Enable

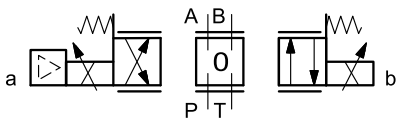


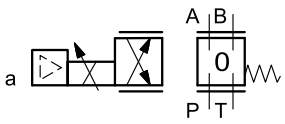

**VERSION C** - 0V Monitor



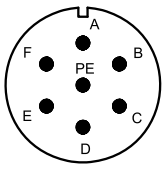
### 3.3 - Versions with voltage command (E0)

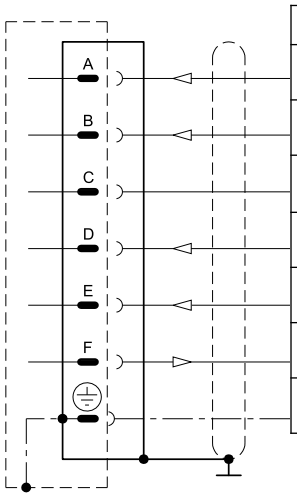
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **COMMAND** | **-10V** | **0V** | **+10V** | **COMMAND** | **+10V** | **0V** |
| **MONITOR** | **-10V** | **0V** | **+10V** | **MONITOR** | **+10V** | **0V** |



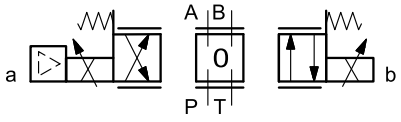



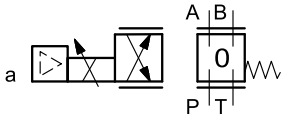

| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable<br>24 V DC | do not connect<br>- | PIN F reference<br>0 V |
| **D** | ± 10 V | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | ± 10 V | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

### 3.4 - Versions with current command (E1)

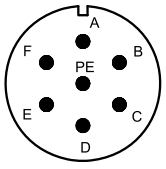
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient restoring the signal.

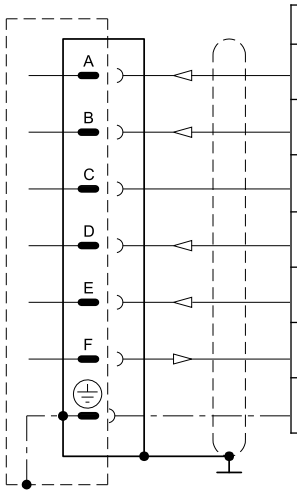
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **COMMAND** | **4 mA** | **12 mA** | **20 mA** | **COMMAND** | **20 mA** | **4 mA** |
| **MONITOR** | **4 mA** | **12 mA** | **20 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<br>24 V DC | do not connect<br>- | PIN F reference<br>0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | 4 ÷ 20 mA | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

## 4 - DSE3GL - COMPACT ELECTRONICS

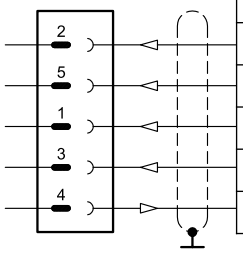
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

### 4.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>0 ÷ 5 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| IO-Link communication (IOL):<br>Data rate | kBaud | IO-Link Port Class B<br>230,4 |
| Can Open communication (CA):<br>Data rate | kbit | 10 ÷ 1000 |
| Connection | | 5-pin M12 code A (IEC 61076-2-101) |

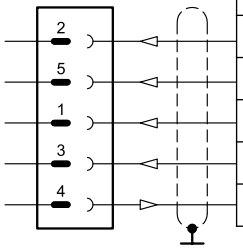
### 4.2 - Pin tables

**'E0' connection**

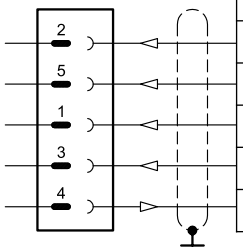

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | ±10 V | Command |
| 3 | 0V | Command reference |
| 4 | 0 ÷ 5 V | Monitor (0V reference: pin 5) |

**'E1' connection**

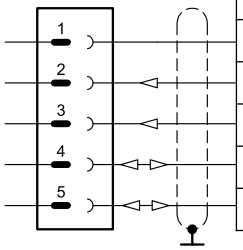

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | 4 ÷ 20 mA | Command |
| 3 | 0V | Command reference |
| 4 | 4 ÷ 20 mA | Monitor (0V reference: pin 5) |

**'IOL' connection**


| Pin | Values | | Function |
|---|---|---|---|
| 2 | 2L+ | 24 V DC | Supply of the power stage |
| 5 | 2L- | 0 V (GND) | Internal galvanic isolation from PIN 3 |
| 1 | 1L+ | +24 V DC | IO-Link supply voltage |
| 3 | 1L- | 0V (GND) | |
| 4 | C/Q | | IO-Link Communication |

**'CA' connection**


| Pin | Values | Function |
|---|---|---|
| 1 | CAN_SH | Shield |
| 2 | 24 V DC | Supply voltage |
| 3 | 0 V (GND) | |
| 4 | CAN H | Bus line (high) |
| 5 | CAN_L | Bus line (low) |

## 5 - DSE3GH - FIELDBUS ELECTRONICS

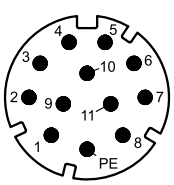
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

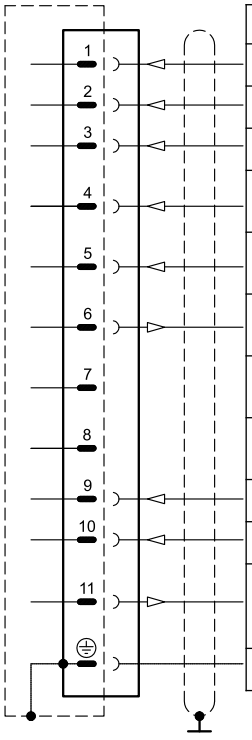
Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

### 5.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal:<br>voltage (E0)<br>current (E1)<br>digital (FD) | <br>V DC<br>mA | <br>±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm)<br>via fieldbus |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication / diagnostic | | via Bus register |
| Communication interface standard | | IEC 61158 |
| Communication physical layer | | fast ethernet, insulated 100 Base TX |
| Power connection | | 11 pin + PE (DIN 43651) |

### 5.2 - X1 Main connection pin table




**D1: one command**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Command |
| **5** | 0 V | Command reference signal |
| **6** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Monitor<br>(0V reference pin 10) |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V reference pin 2) |
| **12** | GND | Ground (Earth) |

**D0: full digital**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | NC | do not connect |
| **5** | NC | do not connect |
| **6** | NC | do not connect |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V ref. pin 2) |
| **12** | GND | Ground (Earth) |

### 5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

**X2 (IN) connection** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

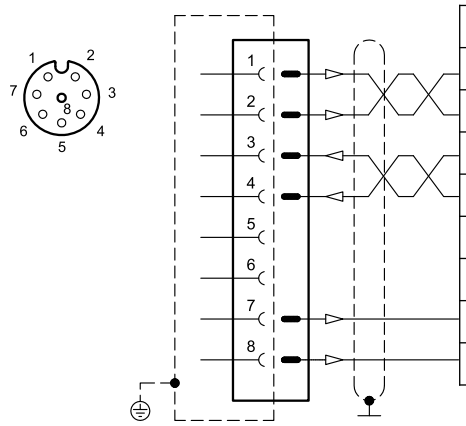
**X3 (OUT) connection:** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**NOTE**: Shield connection on connector housing is recommended.

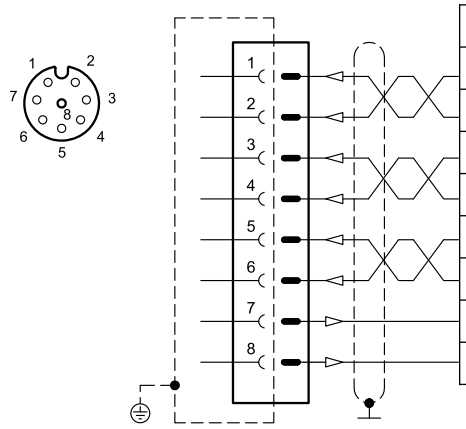
**5.4 - Digital transducer connection**
**X7 connection:** M12 A 8 pin female

**VERSION 1: SSI type**



| Pin | SSI Values | Function | Notes |
|---|---|---|---|
| **1** | CLK+ | Serial synchronous clock (+) | Input - digital signal |
| **2** | CLK- | Serial synchronous clock (-) | |
| **3** | MIS0+ | Serial position data (+) | |
| **4** | MIS0- | Serial position data (-) | |
| **5** | NC | - | do not connect |
| **6** | NC | - | |
| **7** | +24 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

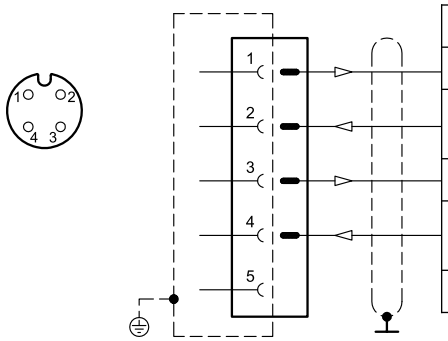
**VERSION 2: ENCODER type**



| Pin | Values | Function | Notes |
|---|---|---|---|
| **1** | ENC_Z+ | input channel Z+ | Input - digital signal |
| **2** | ENC_Z- | input channel Z- | |
| **3** | ENC_A+ | input channel A+ | |
| **4** | ENC_A- | input channel A+ | |
| **5** | ENC_B+ | input channel B+ | |
| **6** | ENC_B- | input channel B+ | |
| **7** | +5 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

**5.5 - Analogue transducer connection**
**X4 connection**: M12 A 4 pin female

**VERSION 1: single / double transducer**
(single or double is a software-selectable option)



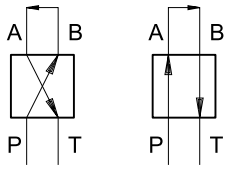
| Pin | Values | Notes |
|---|---|---|
| **1** | +24 V | Remote transducer power supply (out) 100 mA |
| **2** | ±10 V<br>4 ÷20 mA | Input signal of transducer 1 (range software selectable) |
| **3** | 0 V | Common reference signal for transducer power and signals |
| **4** | ±10 V<br>4 ÷20 mA | Input signal of transducer 2 (range software selectable) |
| **5** | - | |

## 6 - CHARACTERISTIC CURVES

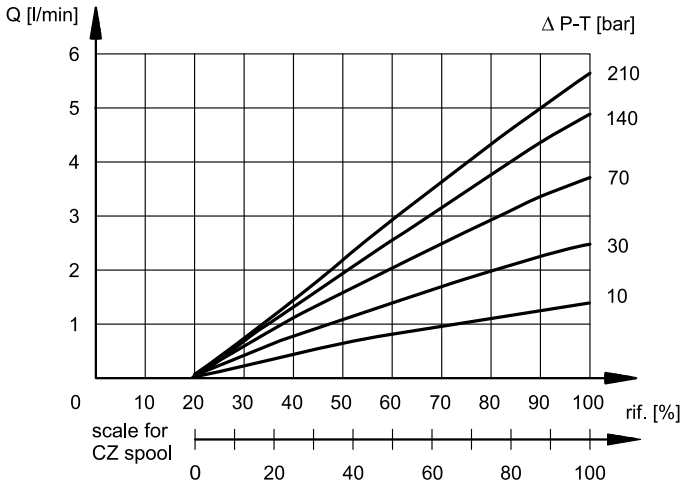
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

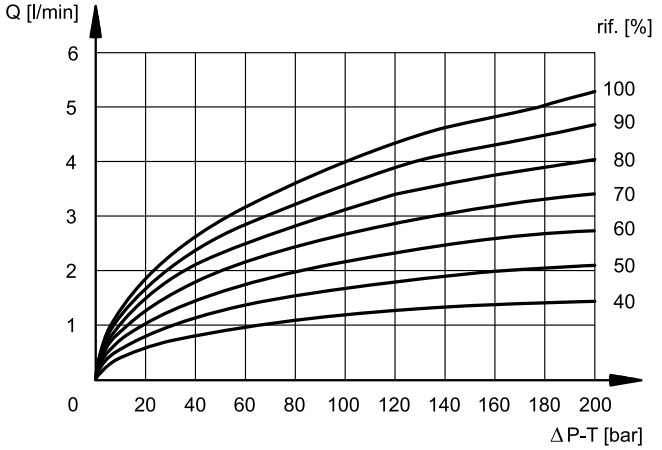
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

Curves obtained after linearization of the characteristic curve in factory, 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.

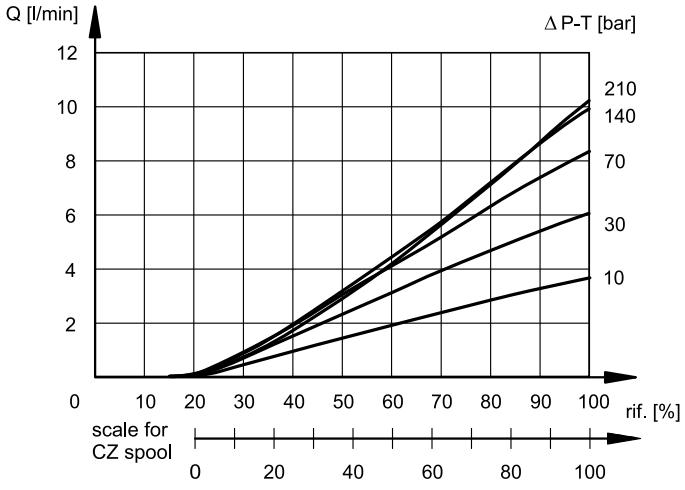


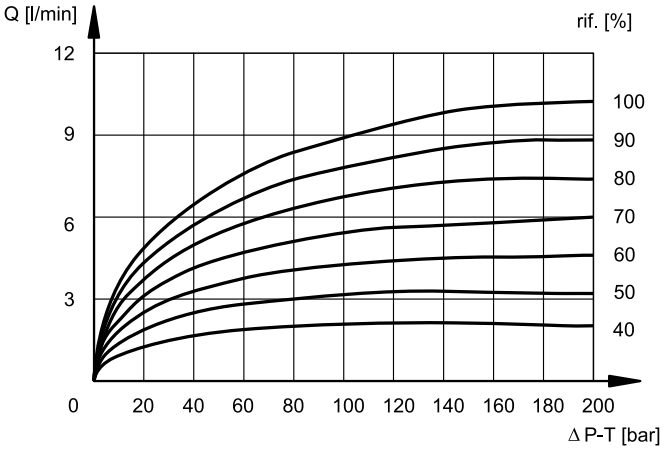

### SPOOL TYPE C01/A01



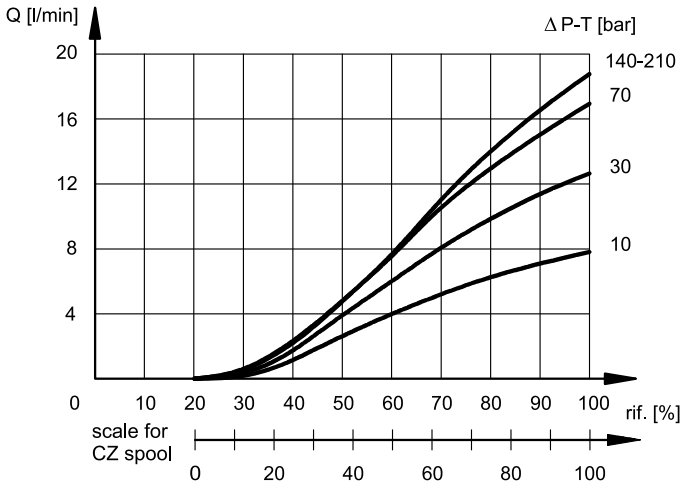



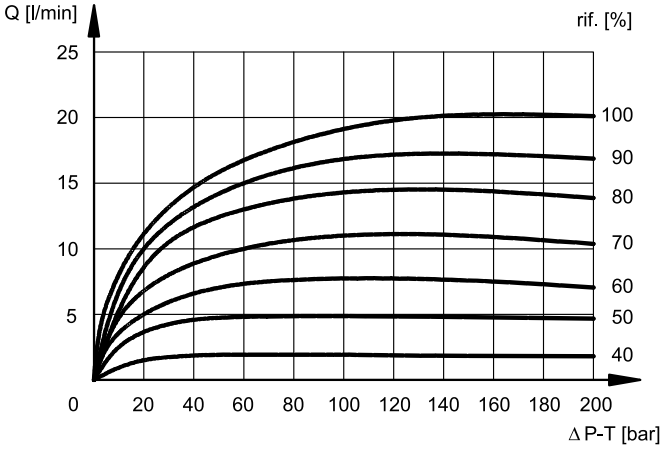

### SPOOL TYPE C04/A04



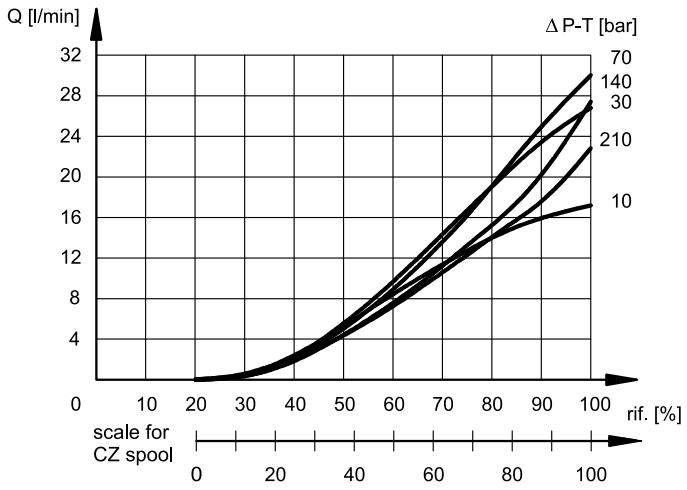



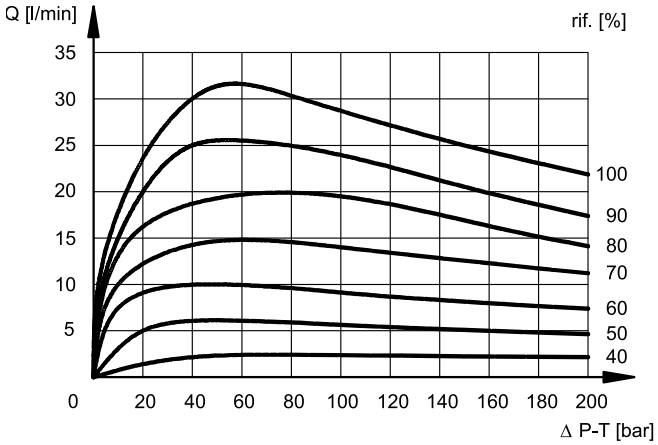

### SPOOL TYPE C08/A08



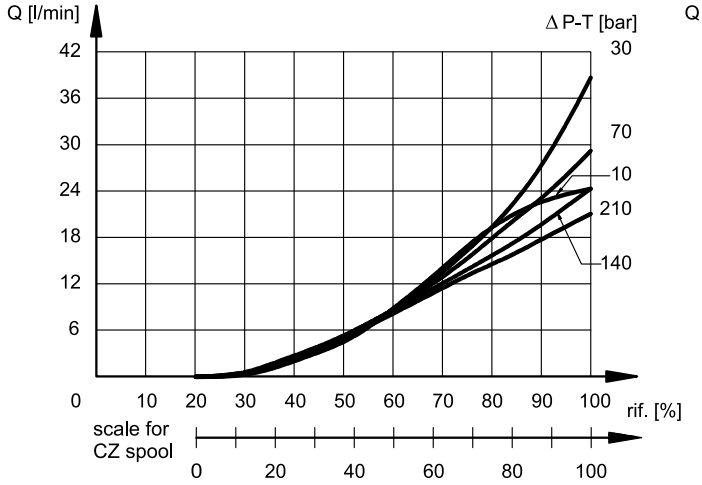



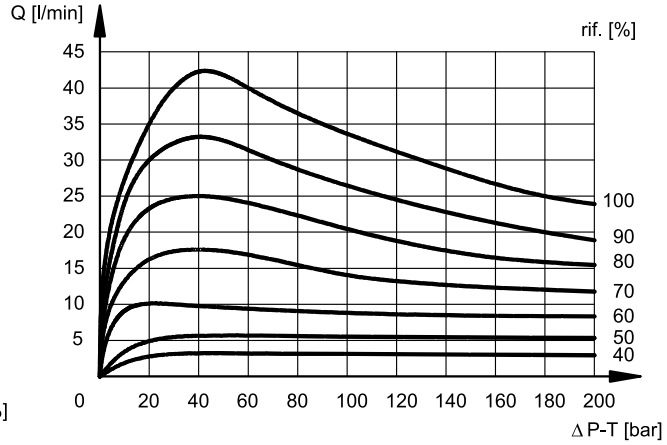
**SPOOL TYPE C16/A16**



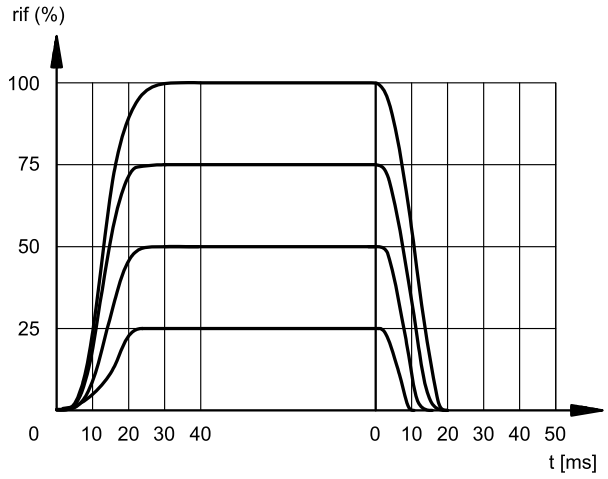

**SPOOL TYPE C26/A26**




## 7 - RESPONSE TIMES

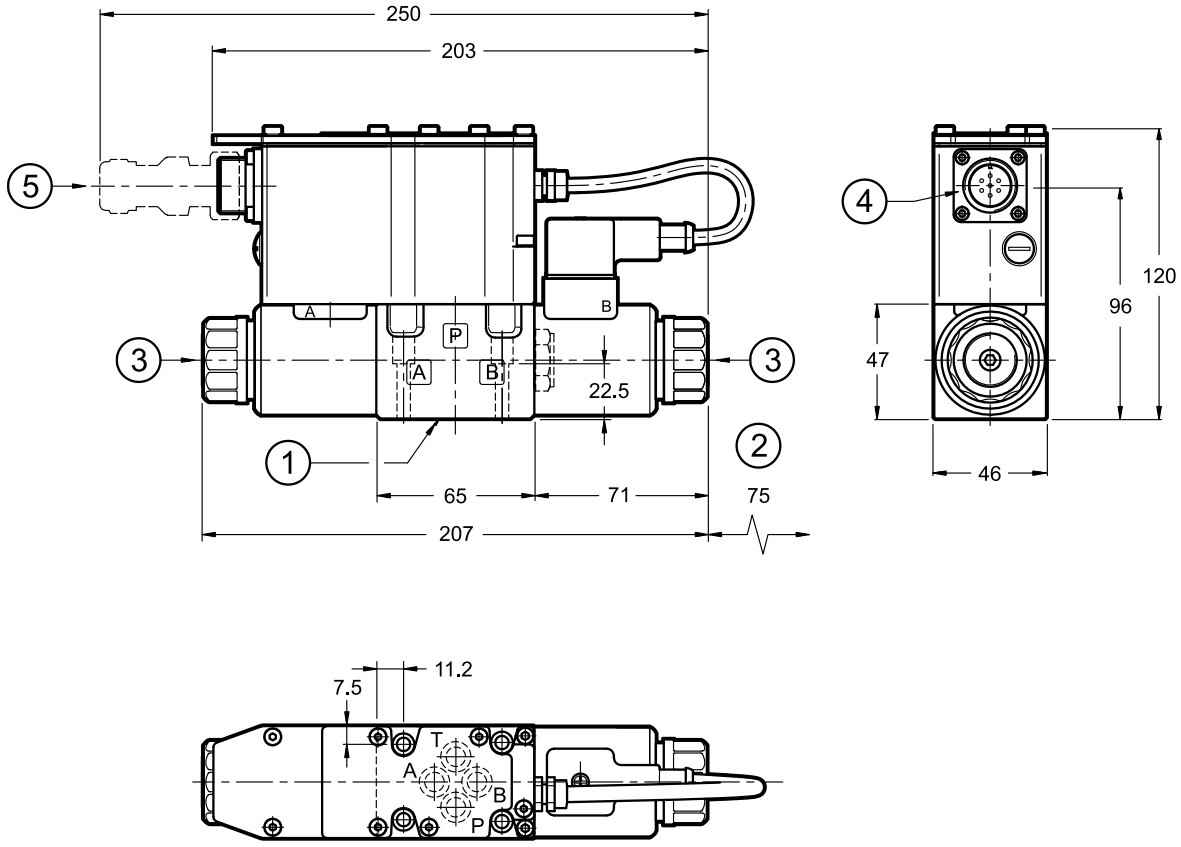
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)



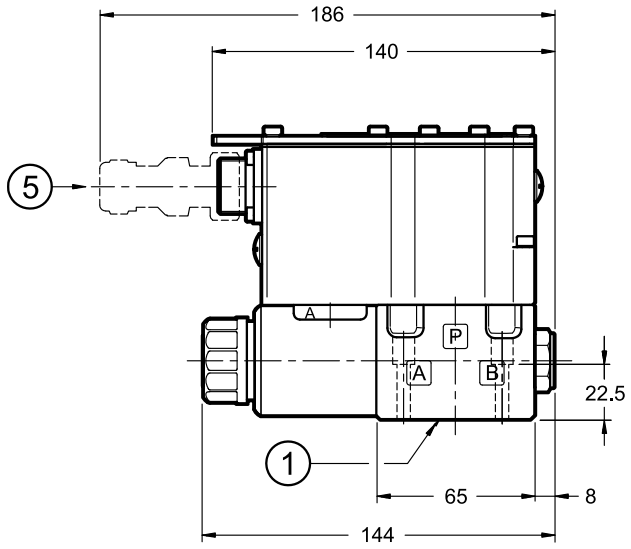
## 8 - DSE3G - OVERALL AND MOUNTING DIMENSIONS

**DSE3G-**/K11**

dimensions in mm




**DSE3G-*SA/K11**

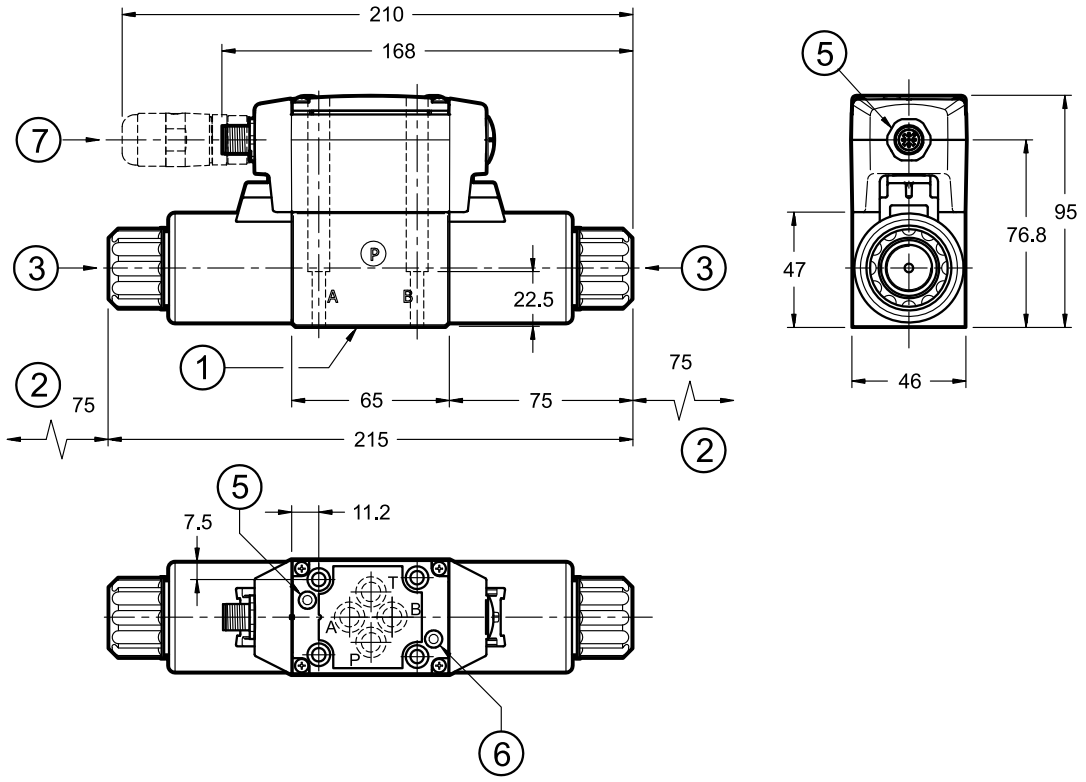



| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 2037 (9.25x1.78) 90 Shore |
| 2 | Coil removal space (solenoid B only) |
| 3 | Manual override by pin embedded in the solenoid tube |
| 4 | Main connection 6 pin + PE |
| 5 | Mating connector 6 poles + PE , female type MIL-5015-G<br>**To be ordered separately.**<br>See catalogue 89 000 |

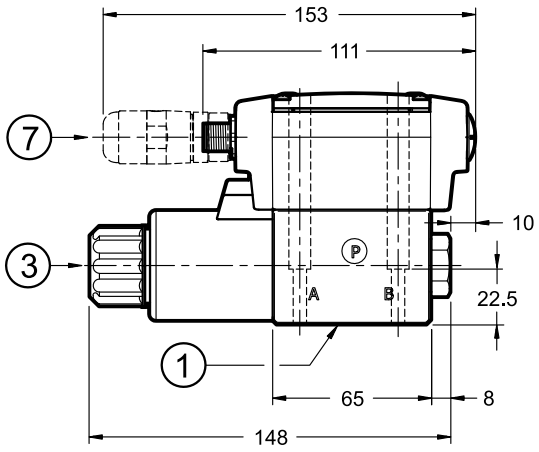
| |
|---|
| Fastening bolts: 4 bolts M5x30 - ISO 4762 |
| Torque: 5 Nm (A8.8) |
| Threads of mounting holes: M5x10 |

## 9 - DSE3GL - OVERALL AND MOUNTING DIMENSIONS

**DSE3GL-**/K12**




**DSE3GL-*SA/K12**



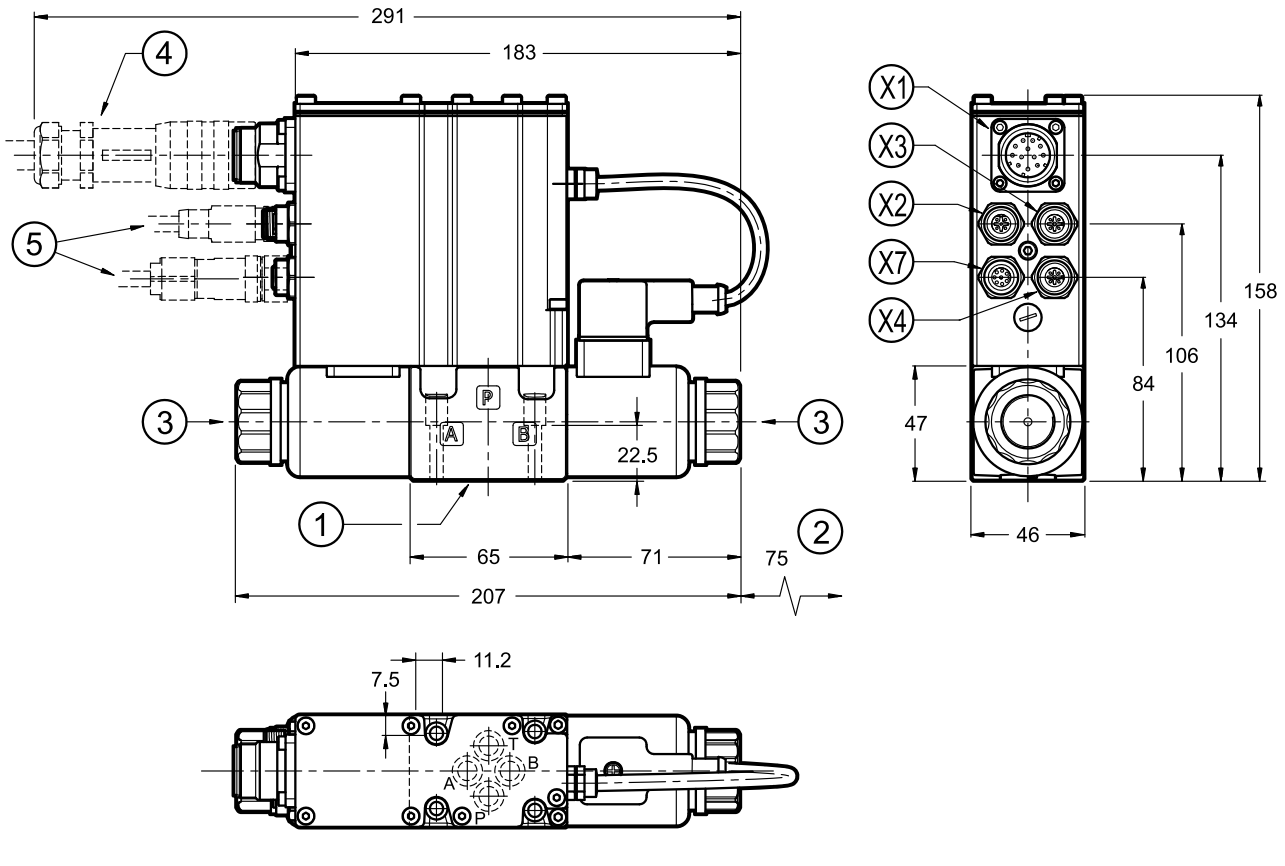

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 2037 (9.25x1.78) 90 Shore |
| 2 | Coil removal space |
| 3 | Standard manual override<br>embedded in the solenoid tube |
| 4 | Connection M12 A 5 pin |
| 5 | L1 LED |
| 6 | L2 LED |
| 7 | Mating connector M12 5 poles - code A, female<br>**To be ordered separately.**<br>See catalogue 89 000 |

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

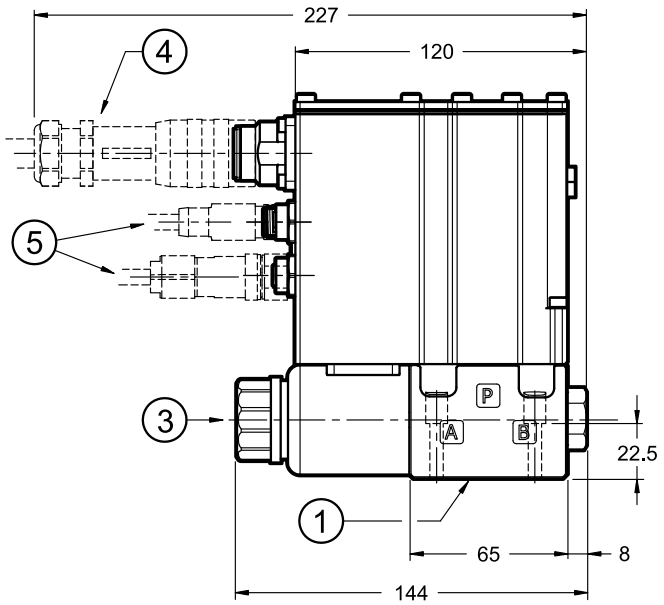
## 10 - DSE3GH - OVERALL AND MOUNTING DIMENSIONS

**DSE3GH-**/K16**

dimensions in mm




**DSE3GH-*SA/K16**




| | |
|---|---|
| X1 | Main connection 11 pin + PE |
| X2 | Fieldbus communication (IN) |
| X3 | Fieldbus communication (OUT) |
| X4 | X4 connection for analogue transducer |
| X7 | X7 connection for digital transducer |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 2037 (9.25x1.78) 90 Shore |
| 2 | Coil removal space (solenoid B only) |
| 3 | Manual override by pin integrated in the solenoid tube |
| 4 | Mating connector 11 poles + PE<br>**To be ordered separately.**<br>See catalogue 89 000 |
| 5 | Mating connectors for fieldbus communication and signals<br>**To be ordered separately.**<br>See catalogue 89 000 |

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

**NOTE**: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

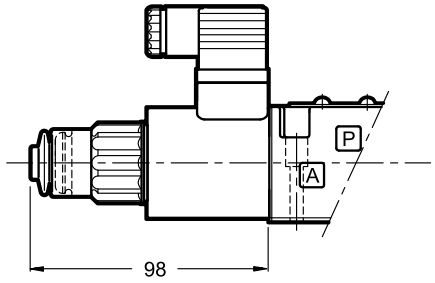
## 11 - MANUAL OVERRIDES

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

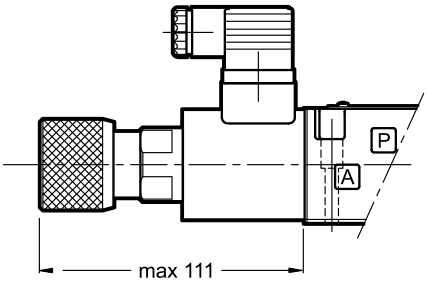
Three other types of manual overrides can fit the DSE3GL valve:

- **CM** version, manual override boot protected
- **CK1** version, turning knob override.
- **CS** version, with metal ring nut provided with a M8 screw and locknut.

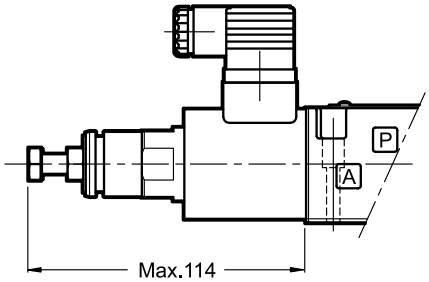
**CM Version -** Code: 3401150006




**CK1 Version -** Code: 3401150024




**CS Version -** Code: 3803210006




## 12 - 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.

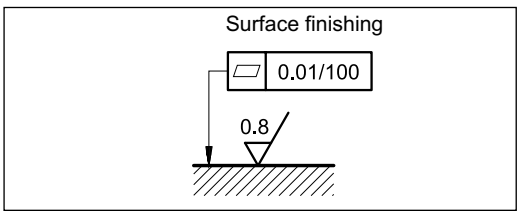
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

## 13 - 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 lapped surface with planarity and roughness equal to or better than those indicated in the drawing.

If minimum values are not observed, fluid can easily leak between the valve and the mounting interface.



## 14 - ACCESSORIES
(to be ordered separately)

### 14.1 - Mating connectors
Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

### 14.2 - Mating connectors and caps for fieldbus communication and for sensors.
Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

### 14.3 - Connection cable
The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

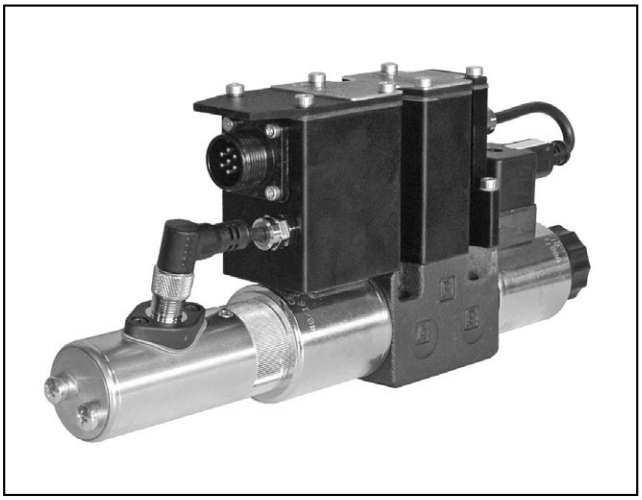
Cross section for power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm² (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm²

### 14.4 - Kit for start-up LINPC-USB
Device for service start-up and diagnostic. See catalogue 89 850.

## 15 - SUBPLATES
(see catalogue 51 000)

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



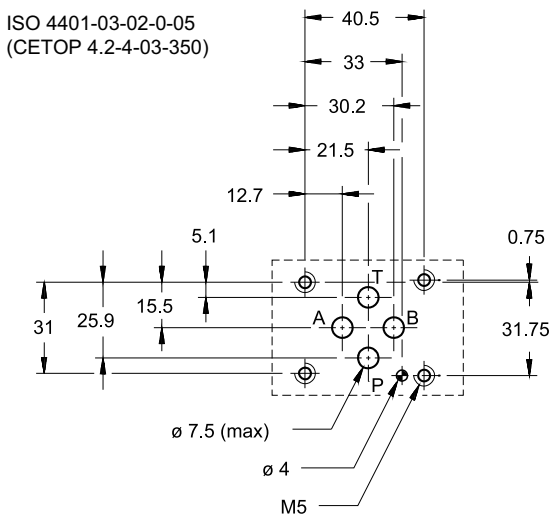
# DSE3J*

## PROPORTIONAL DIRECTIONAL VALVE WITH FEEDBACK AND INTEGRATED ELECTRONICS

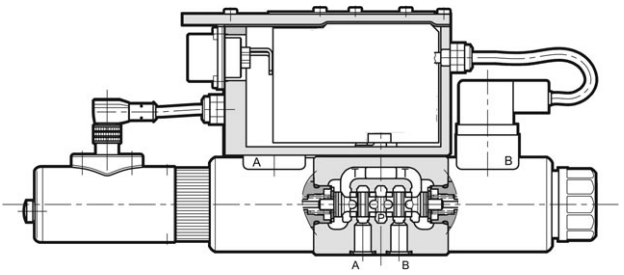
### SUBPLATE MOUNTING ISO 4401-03

**p** max **350** bar
**Q** max **80** l/min

### MOUNTING INTERFACE




### OPERATING PRINCIPLE




— The DSE3J* are proportional directional valves, direct operated, with closed loop position control. The mounting interface is 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 spool position, reducing both hysteresis and response times and optimizing the valve performance.

— The valves are available with different types of electronics, with analogue or fieldbus interfaces.

— The fail safe function is available for spools type Z.

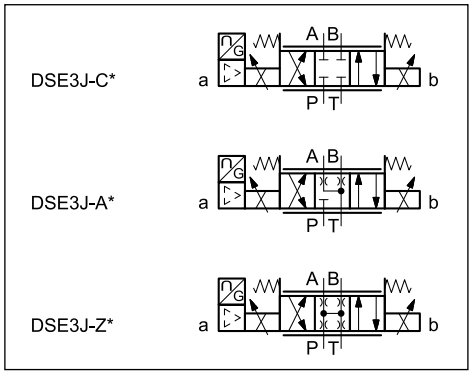
— Valves are easy to install. The driver manages digital settings directly.

### PERFORMANCES

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

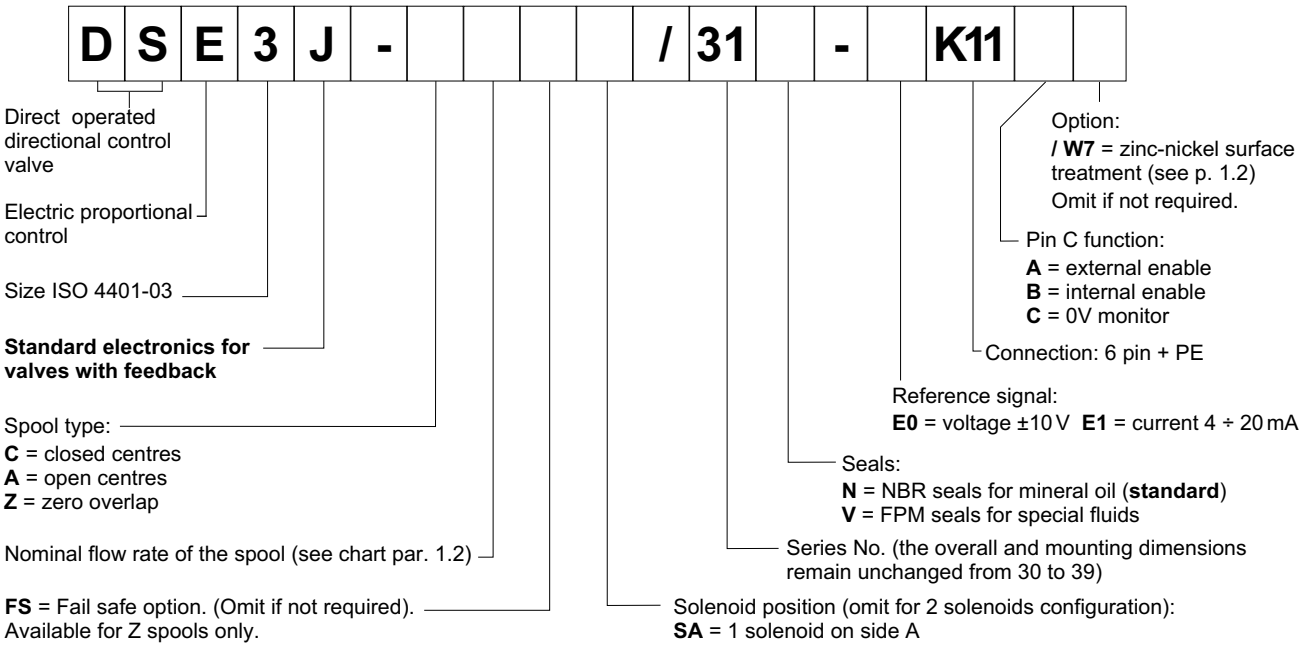
| | | |
|---|---|---|
| Max operating pressure: P - A - B ports<br>T port | bar | 350<br>210 |
| Nominal flow with Δp 10 bar P-T | l/min | 1 - 4 - 12 -18 - 30 |
| Response times | see paragraph 7 | |
| Hysteresis | % of $Q_{max}$ | < 0.2% |
| Repeatability | % of $Q_{max}$ | < 0.2% |
| Threshold | | < 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<br>double solenoid valve | kg | 2.2<br>2.7 |

### HYDRAULIC SYMBOLS (typical)



## 1 - IDENTIFICATION CODE

### 1.1 - Standard electronics




### 1.2 - Surface treatments

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 UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

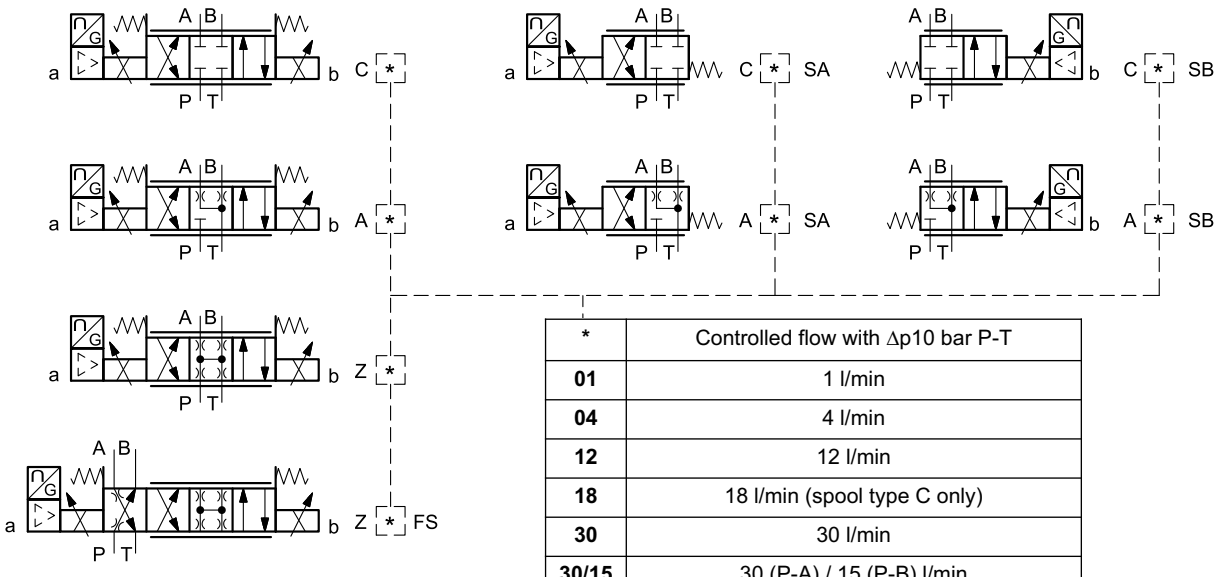
### 1.3 - Configurations

Valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

Configuration 2 solenoids (**NOTE**):
3 positions with spring centering

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external)
with spring centering
(for DSE3J and DSE3JH only)

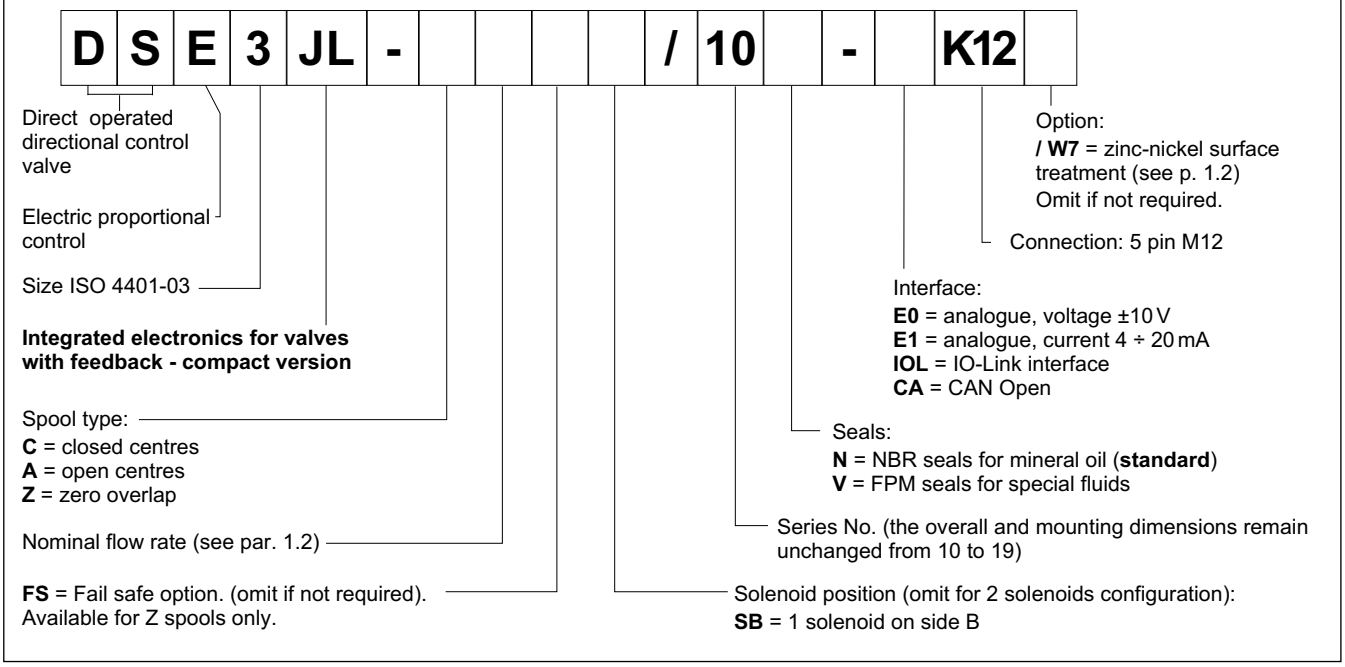
Configuration 1 solenoid on side B "**SB**":
2 positions (central + external)
with spring centering
(for DSE3JL only)



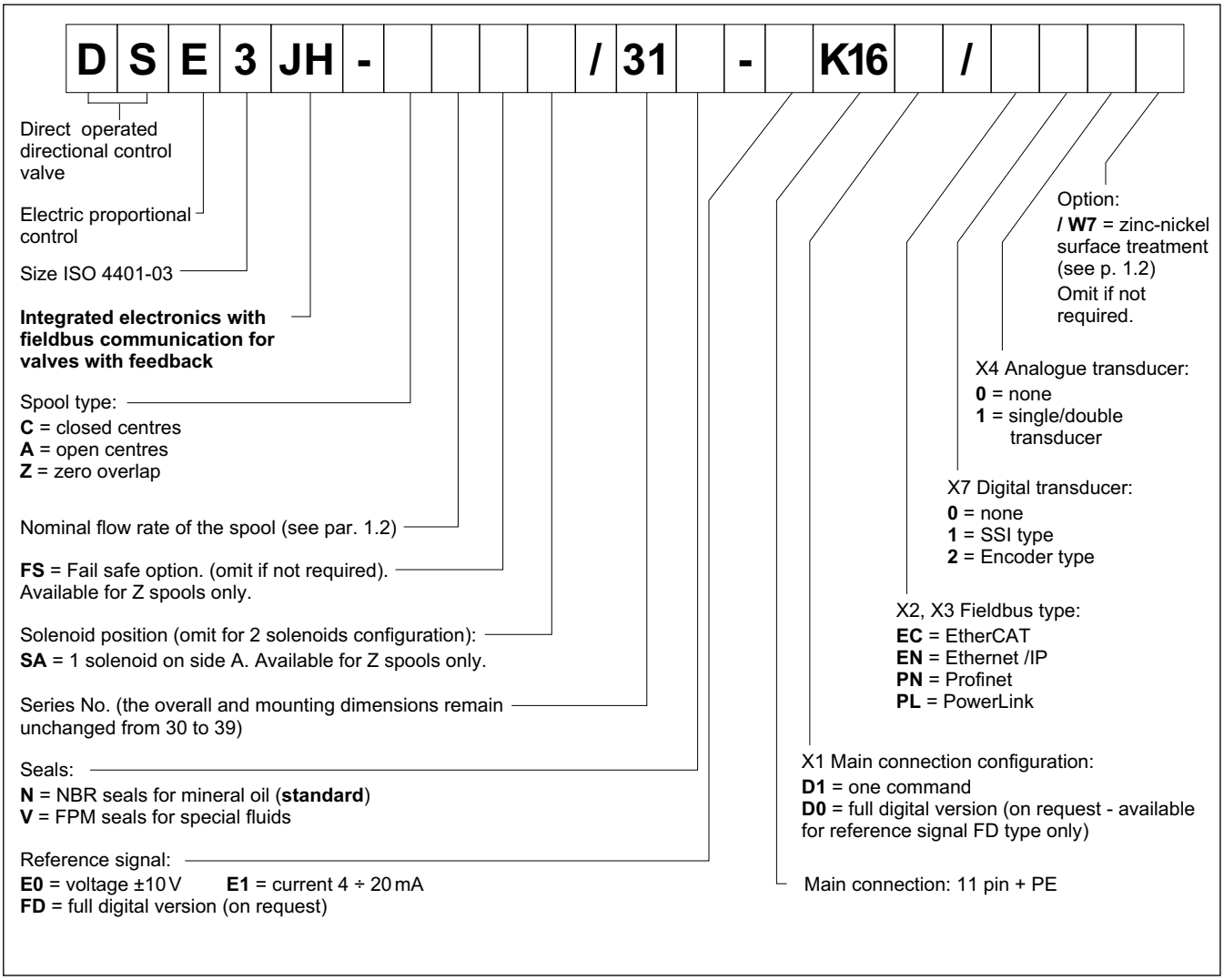

| * | Controlled flow with Δp10 bar P-T |
|---|---|
| **01** | 1 l/min |
| **04** | 4 l/min |
| **12** | 12 l/min |
| **18** | 18 l/min (spool type C only) |
| **30** | 30 l/min |
| **30/15** | 30 (P-A) / 15 (P-B) l/min |

**NOTE**: On DSE3JL the feedback is placed at side b

### 1.4 - Compact electronics




### 1.5 - Electronics with fieldbus communication



## 2 - ELECTRONICS COMMON DATA

| | | |
|---|---|---|
| Duty cycle | | 100% (continuous operation) |
| Protection class according to EN 60529 | | IP65 / IP67 (**NOTE**) |
| 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 | A | 3 |
| Managed breakdowns | | Overload and electronics overheating, LVDT sensor error, cable breakdown, supply voltage failure |
| Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2 | | According to 2014/30/EU standards |

**NOTE**: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the JH versions it is necessary to protect any unused connections with caps.

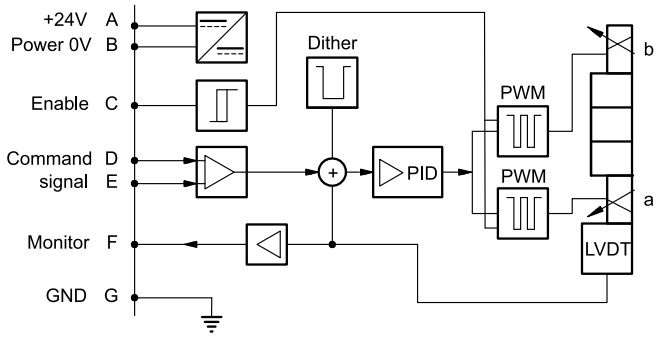
## 3 - DSE3J - STANDARD ELECTRONICS

### 3.1 - Electrical characteristics

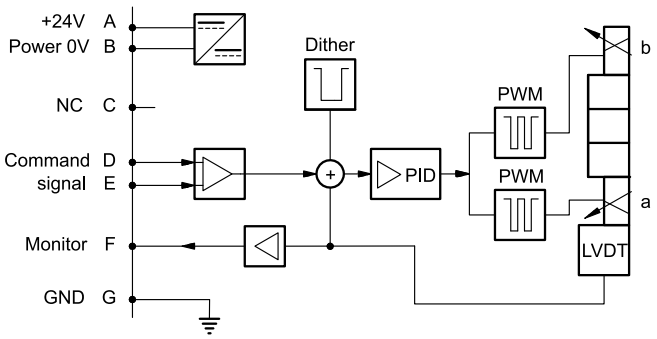
| | | | |
|---|---|---|---|
| Command signal: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication for diagnostic | | | LIN-bus Interface (by means of the optional kit) |
| Connection | | | 6 pin + PE (MIL-C-5015-G - DIN EN 175201-804) |

### 3.2 - On-board electronics diagrams

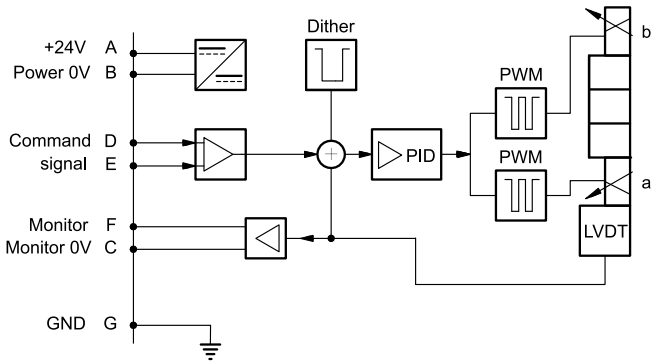
**VERSION A** - External Enable




**VERSION B** - Internal Enable

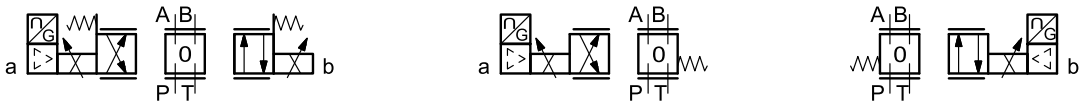



**VERSION C** - 0V Monitor

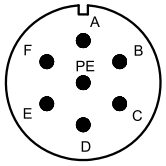


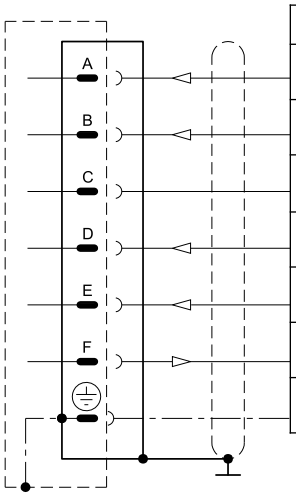
### 3.3 - Versions with voltage command (E0)

The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve 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** | | **+10V** | **0V** | **0V** | **+10V** |
| **MONITOR** | **-10V** | **0V** | **+10V** | | **+10V** | **0V** | **0V** | **+10V** |



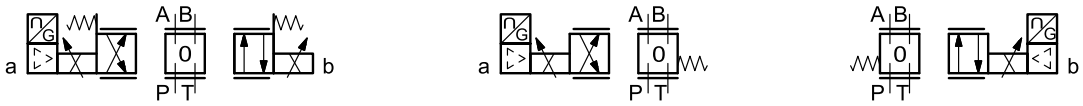




| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable 24 V DC | do not connect - | PIN F reference 0 V |
| **D** | ± 10 V | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | ± 10 V | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

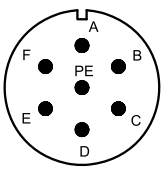
### 3.4 - Versions with current command (E1)

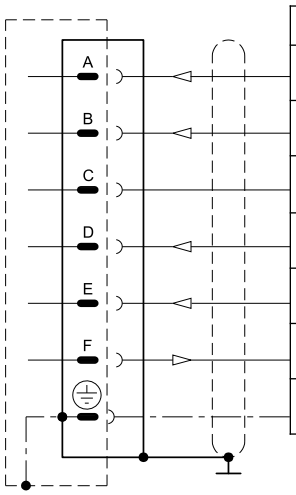
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

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** | **12 mA** | **20 mA** | | **20 mA** | **4 mA** | **4 mA** | **20 mA** |
| **MONITOR** | **4 mA** | **12 mA** | **20 mA** | | **20 mA** | **4 mA** | **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 | do not connect - | PIN F reference 0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | 4 ÷ 20 mA | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

## 4 - DSE3JL - COMPACT ELECTRONICS

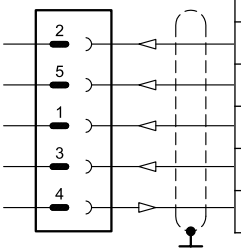
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cable is limited to 20 metres.

### 4.1 - Electrical characteristics

| | | | |
|---|---|---|---|
| Command signal: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal: | voltage (E0)<br>current (E1) | V DC<br>mA | 0 ÷ 5 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| IO-Link communication (IOL):<br>Data rate | | kBaud | IO-Link Port Class B<br>230,4 |
| Can Open communication (CA):<br>Data rate | | kbit | 10 ÷ 1000 |
| Data register (IOL and CA versions only) | | | solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations |
| Connection | | | 5-pin M12 code A (IEC 61076-2-101) |

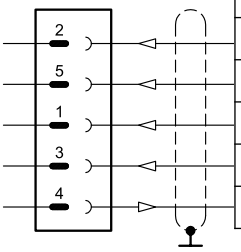
### 4.2 - Pin tables

**'E0' connection**

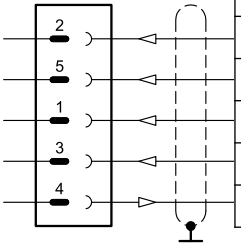

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | ± 10 V | Command |
| 3 | 0V | Command reference |
| 4 | 0 ÷ 5V | Monitor (0V reference: pin 5) |

**'E1' connection**

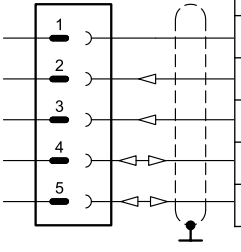

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | 4 ÷ 20 mA | Command |
| 3 | 0V | Command reference |
| 4 | 4 ÷ 20 mA | Monitor (0V reference: pin 5) |

**'IOL' connection**


| Pin | Values | Function |
|---|---|---|
| 2 | 2L+ 24 V DC | Supply of the power stage |
| 5 | 2L- 0 V (GND) | Internal galvanic isolation from PIN 3 |
| 1 | 1L+ +24 V DC | IO-Link supply voltage |
| 3 | 1L- 0V (GND) | |
| 4 | C/Q | IO-Link Communication |

**'CA' connection**


| Pin | Values | Function |
|---|---|---|
| 1 | CAN_SH | Shield |
| 2 | 24 V DC | Supply voltage |
| 3 | 0 V (GND) | |
| 4 | CAN H | Bus line (high) |
| 5 | CAN_L | Bus line (low) |

## 5 - DSE3JH - FIELDBUS ELECTRONICS

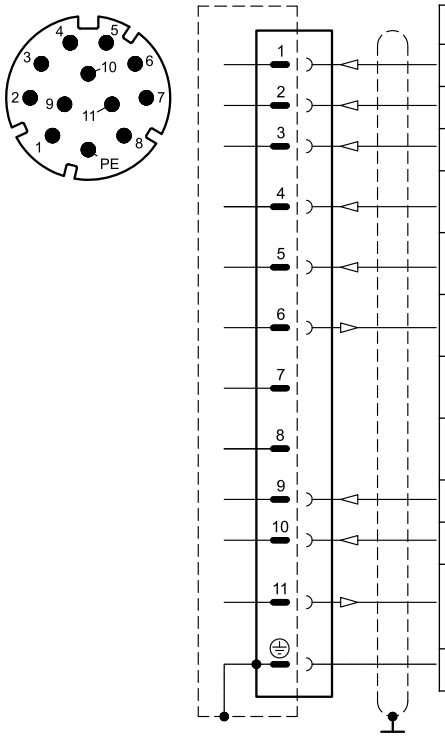
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 3.3 and 3.4.

### 5.1 - Electrical characteristics

| | | | |
|---|---|---|---|
| Command signal: | voltage (E0)<br>current (E1)<br>digital (FD) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm)<br>via fieldbus |
| Monitor signal: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication / diagnostic | | | via Bus register |
| Communication interface standards | | | IEC 61158 |
| Communication physical layer | | | fast ethernet, insulated 100 Base TX |
| Power connection | | | 11 pin + PE (DIN 43651) |

### 5.2 - X1 Main connection pin table




**D1: one command**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Command |
| **5** | 0 V | Command reference signal |
| **6** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Monitor<br>(0V reference pin 10) |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V reference pin 2) |
| **12** | GND | Ground (Earth) |

**D0: full digital**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | NC | do not connect |
| **5** | NC | do not connect |
| **6** | NC | do not connect |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V ref. pin 2) |
| **12** | GND | Ground (Earth) |

### 5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

**X2 (IN) connection** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**X3 (OUT) connection:** M12 D 4 pin female

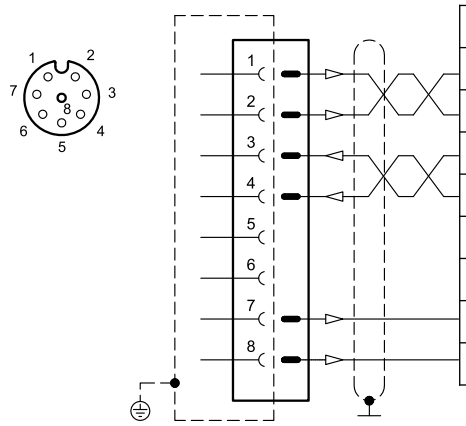

| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**NOTE**: Shield connection on connector housing is recommended.

### 5.4 - Digital transducer connection

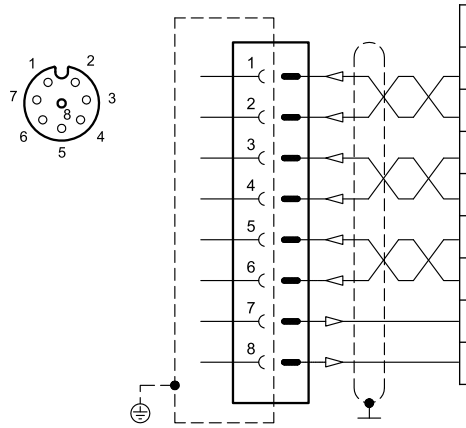
**X7 connection:** M12 A 8 pin female

**VERSION 1: SSI type**



| Pin | SSI Values | Function | Notes |
|---|---|---|---|
| **1** | CLK+ | Serial synchronous clock (+) | Input - digital signal |
| **2** | CLK- | Serial synchronous clock (-) | |
| **3** | MIS0+ | Serial position data (+) | |
| **4** | MIS0- | Serial position data (-) | |
| **5** | NC | - | do not connect |
| **6** | NC | - | |
| **7** | +24 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

**VERSION 2: ENCODER type**



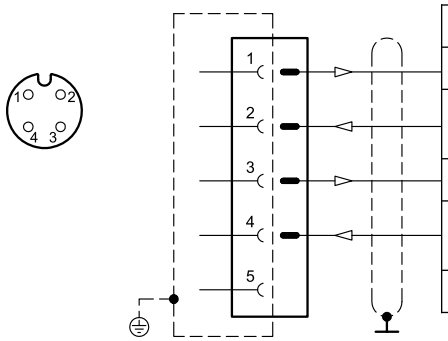
| Pin | Values | Function | Notes |
|---|---|---|---|
| **1** | ENC_Z+ | input channel Z+ | Input - digital signal |
| **2** | ENC_Z- | input channel Z- | |
| **3** | ENC_A+ | input channel A+ | |
| **4** | ENC_A- | input channel A+ | |
| **5** | ENC_B+ | input channel B+ | |
| **6** | ENC_B- | input channel B+ | |
| **7** | +5 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

### 5.5 - Analogue transducer connection

**X4 connection**: M12 A 4 pin female

**VERSION 1: single / double transducer**

(single or double is a software-selectable option)

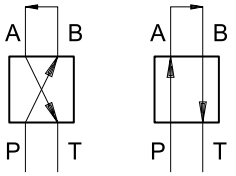


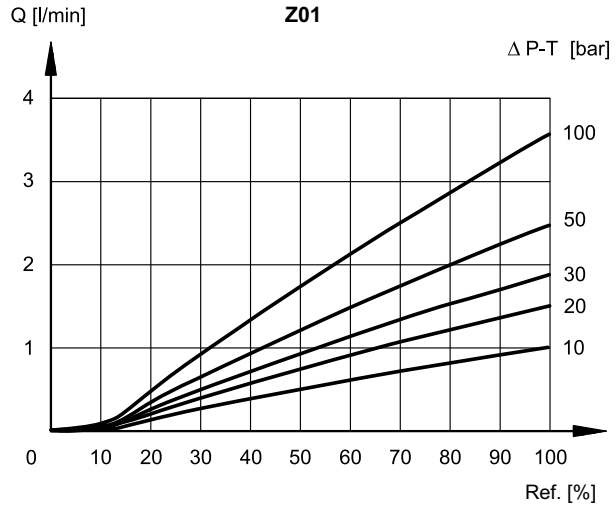
| Pin | Values | Notes |
|---|---|---|
| **1** | +24 V | Remote transducer power supply (out) 100 mA |
| **2** | ±10 V<br>4 ÷20 mA | Input signal of transducer 1 (range software selectable) |
| **3** | 0 V | Common reference signal for transducer power and signals |
| **4** | ±10 V<br>4 ÷20 mA | Input signal of transducer 2 (range software selectable) |
| **5** | - | |

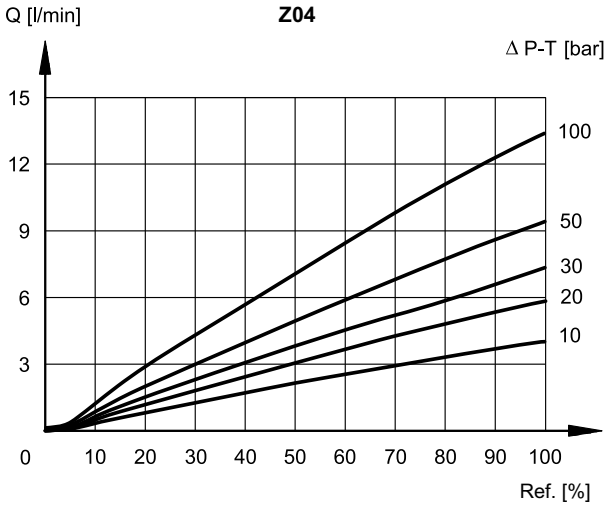
## 6 - CHARACTERISTIC CURVES

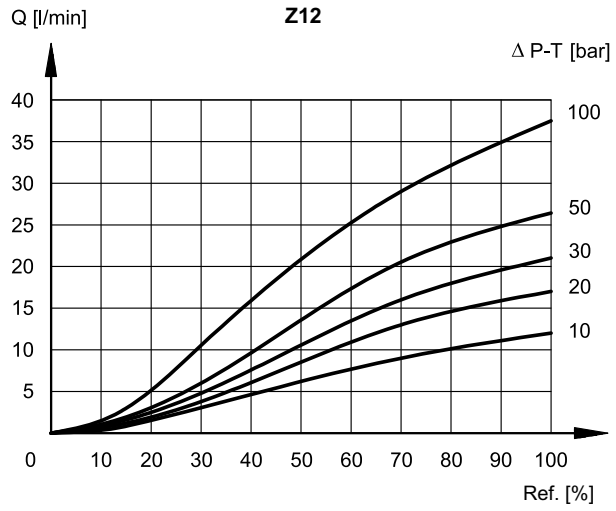
(obtained with mineral oil with viscosity of 36 cSt at 50°C and with digital integrated electronics)

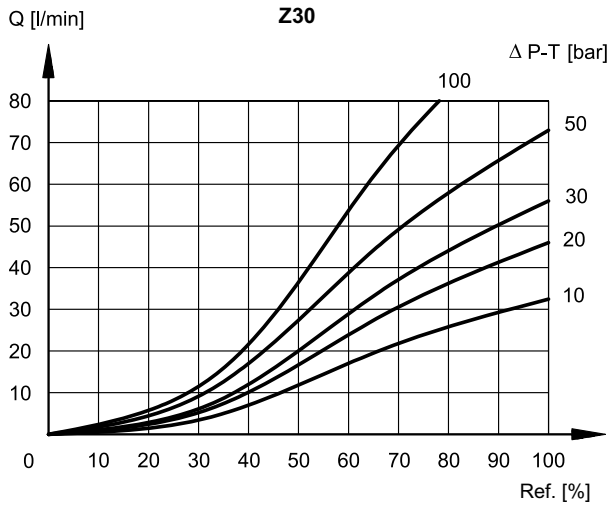
Typical flow rate curves related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.



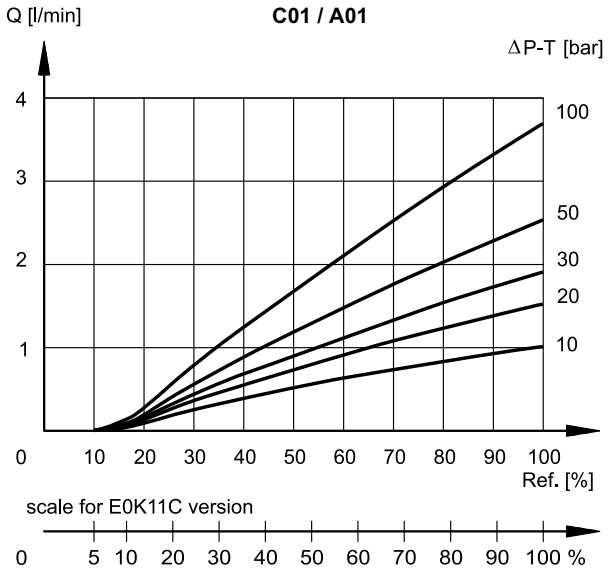



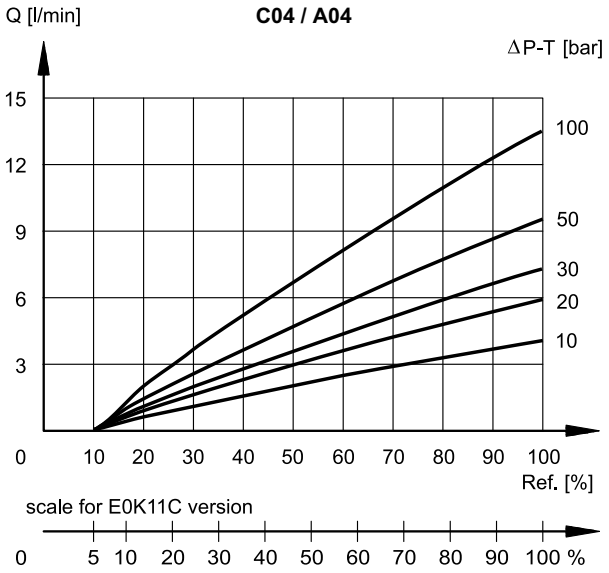



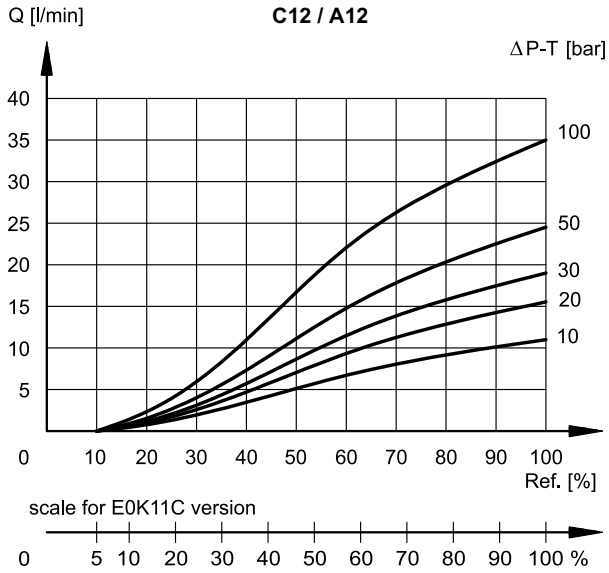
**C01 / A01**



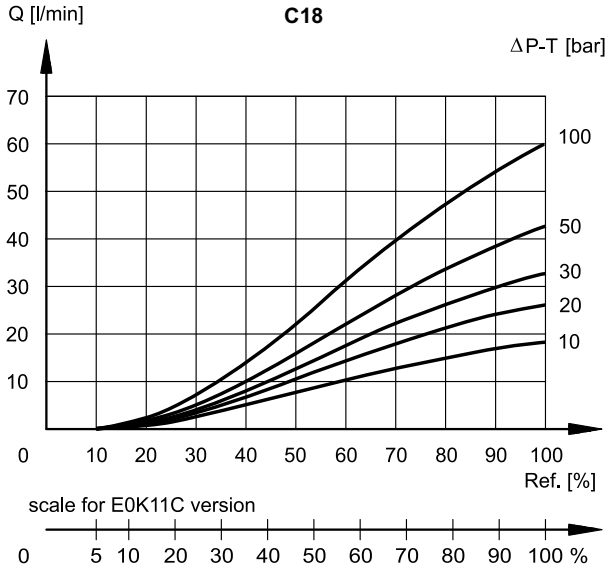

**C04 / A04**



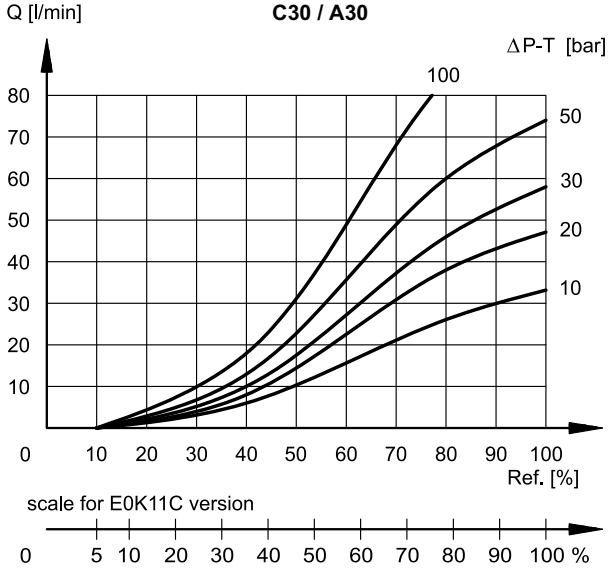

**C12 / A12**



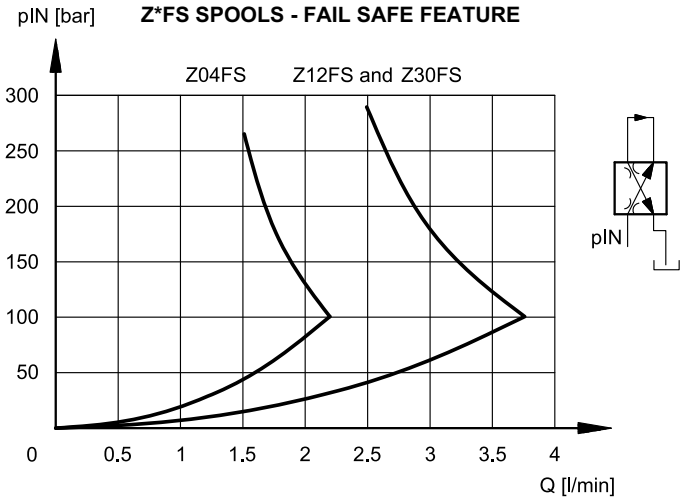

**C18**




**C30 / A30**



**Z*FS SPOOLS - FAIL SAFE FEATURE**

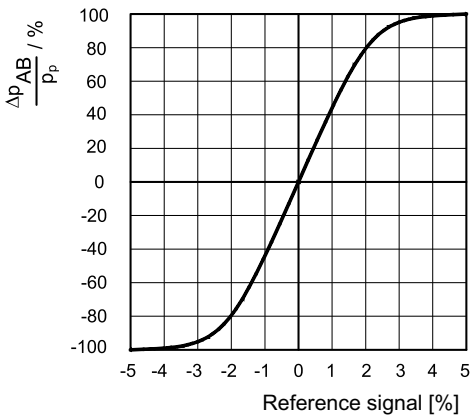



Flow P→B / A→T with valve in fail safe position, depending on the inlet pressure.

When a power failure (enabling OFF) occurs, the valve moves in 'fail safe' position, maintaining a minimum flow that allows the actuator to return slowly to a safe position.

During the black-out the centering springs retain the spool in fail safe-position.

**Z SPOOLS - PRESSURE GAIN**



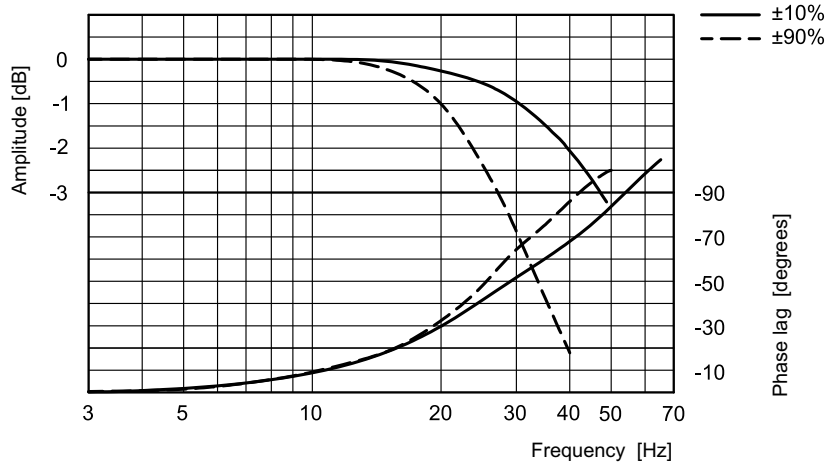

The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

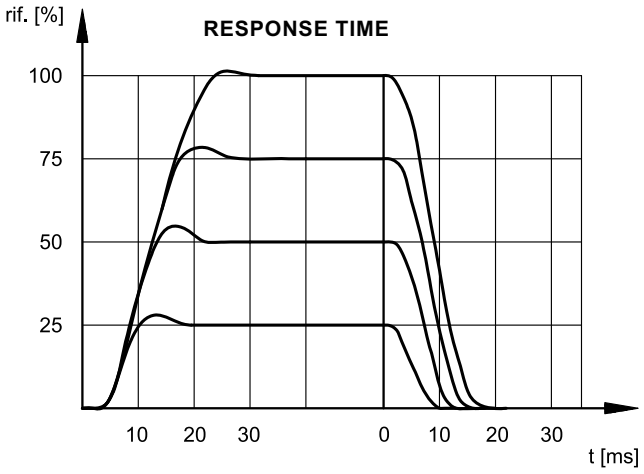
## 7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C and 140 bar Δp P→T)

**FREQUENCY RESPONSE (Z SPOOLS)**



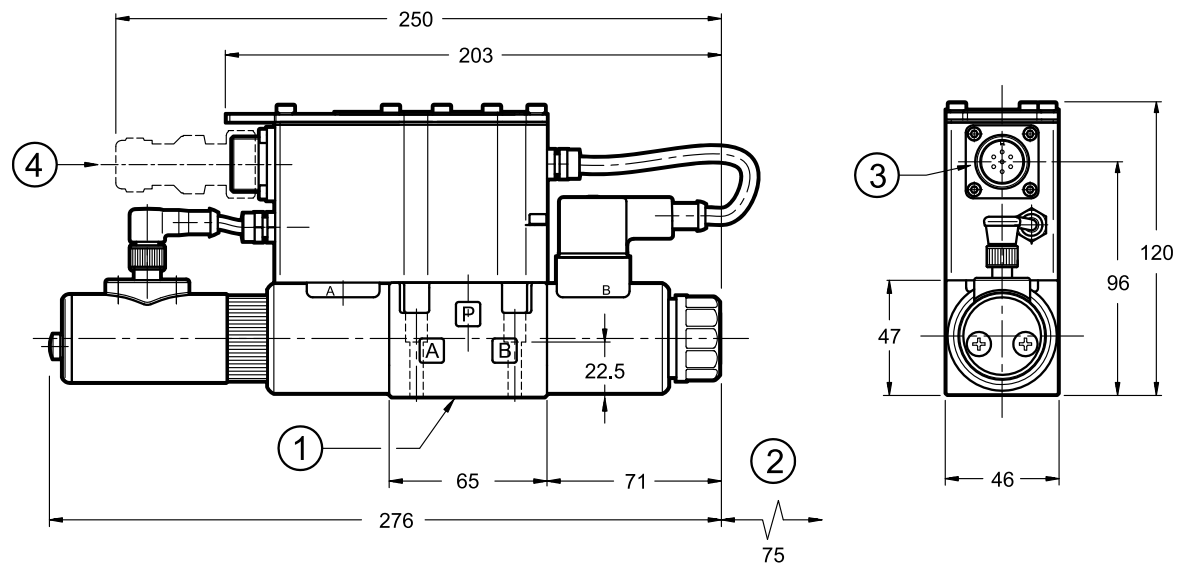

**RESPONSE TIME**

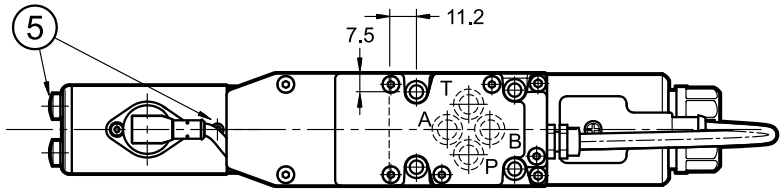


## 8 - DSE3J - OVERALL AND MOUNTING DIMENSIONS

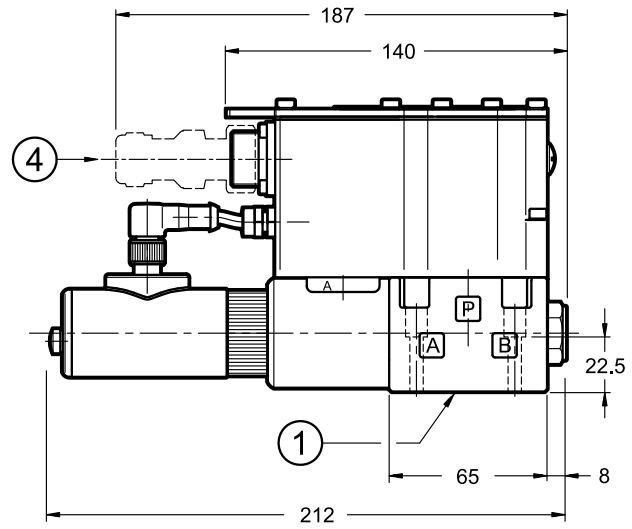
dimensions in mm

**DSE3J-**/K11**




**DSE3J-*SA/K11**



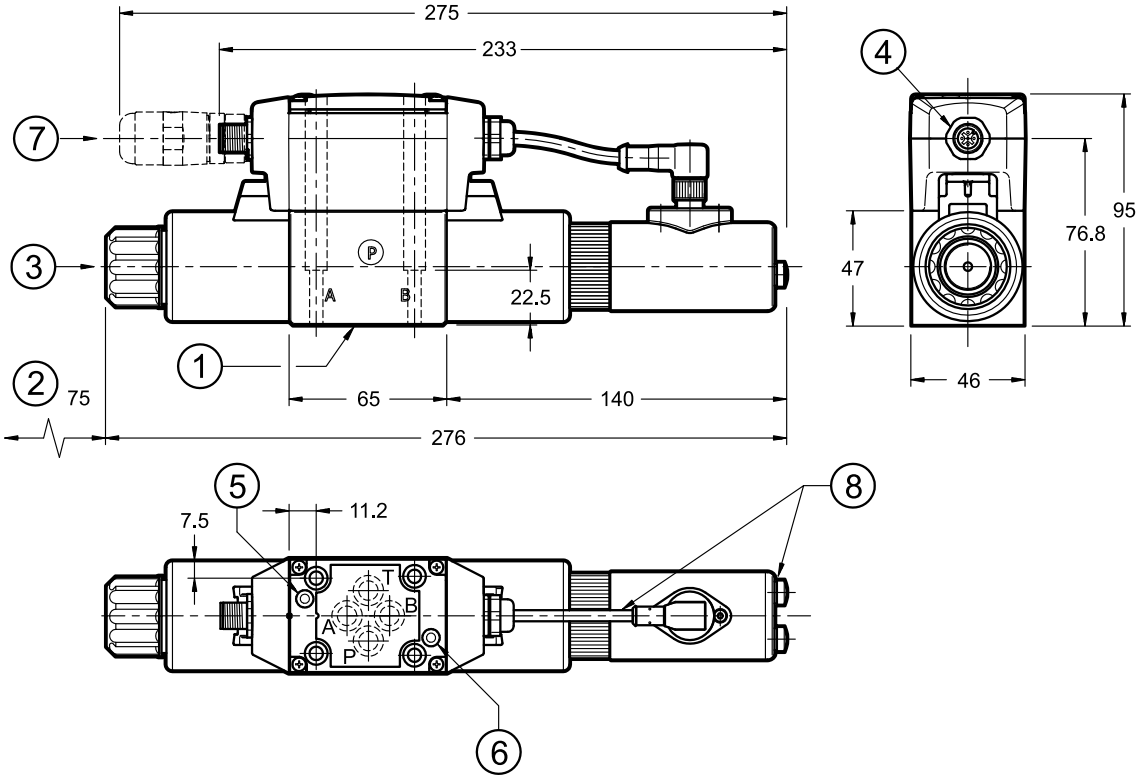

| |
|---|
| Valve fastening: 4 SHC screws M5x30 - ISO 4762 |
| Torque: 5 Nm (A8.8) |
| Threads of mounting holes: M5x10 |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 2037 (9.25x1.78) 90 Shore |
| 2 | Coil removal space (solenoid B only) |
| 3 | Main connection 6 pin + PE |
| 4 | Mating connector 6 poles + PE, female type MIL-5015-G<br>**To be ordered separately.**<br>See catalogue 89 000 |
| 5 | Adjustment sealing performed at factory.<br>Do not disassemble the transducer. |

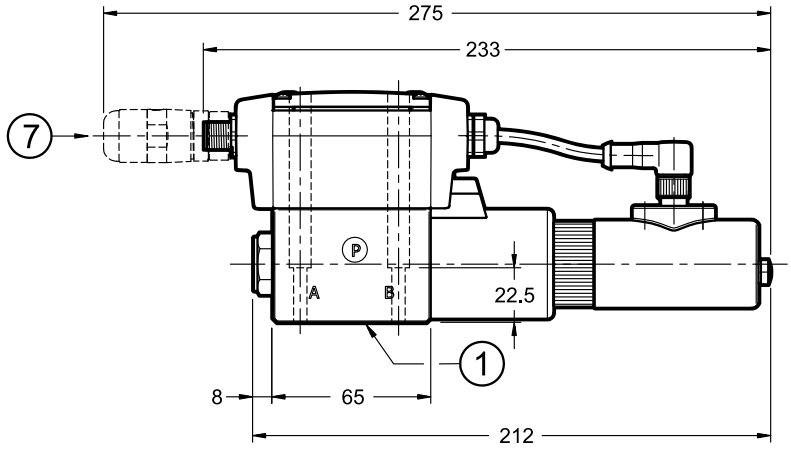
## 9 - DSE3JL - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

**DSE3JL-**/K12**




**DSE3JL-*SB/K12**



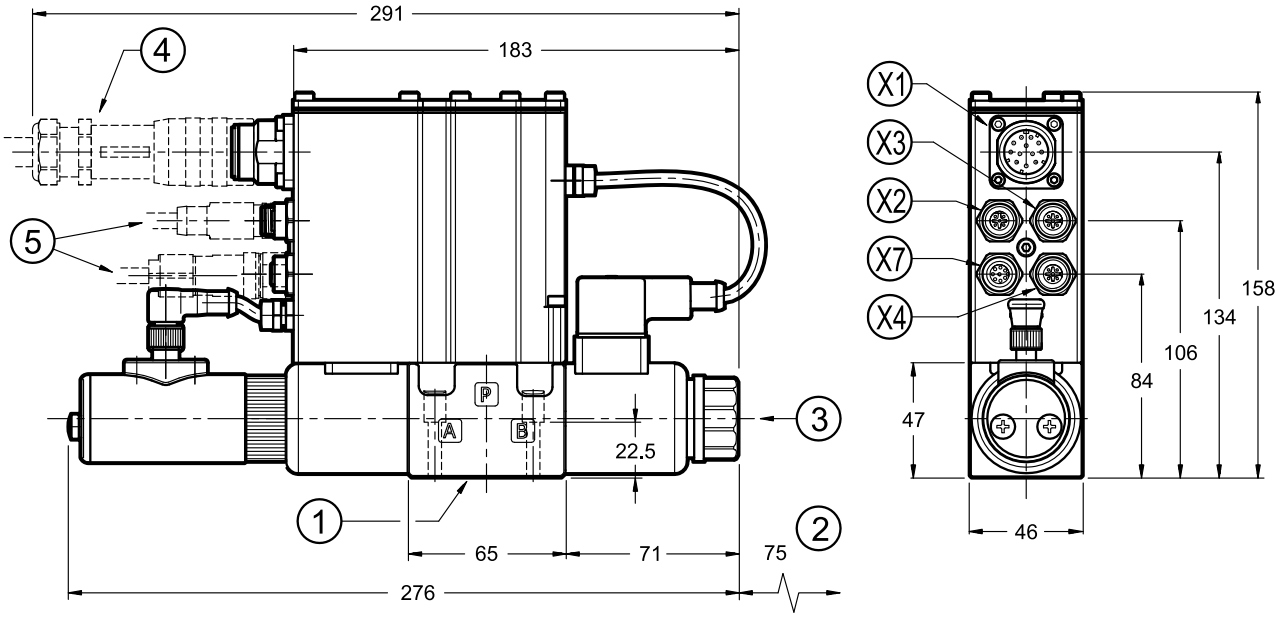

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 2037 (9.25x1.78) 90 Shore |
| 2 | Coil removal space |
| 3 | Manual override by pin integrated in the solenoid tube |
| 4 | Connection M12 A 5 pin |
| 5 | L1 LED |
| 6 | L2 LED |
| 7 | Mating connector M12 5 poles - code A, female. **To be ordered separately.**<br>See catalogue 89 000 |
| 8 | Adjustment sealing performed at factory.<br>Do not disassemble the transducer. |

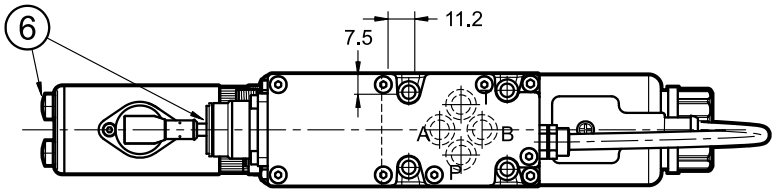
| |
|---|
| Valve fastening: 4 SHC screws M5x30 - ISO 4762 |
| Torque: 5 Nm (A8.8) |
| Threads of mounting holes: M5x10 |

## 10 - DSE3JH - OVERALL AND MOUNTING DIMENSIONS

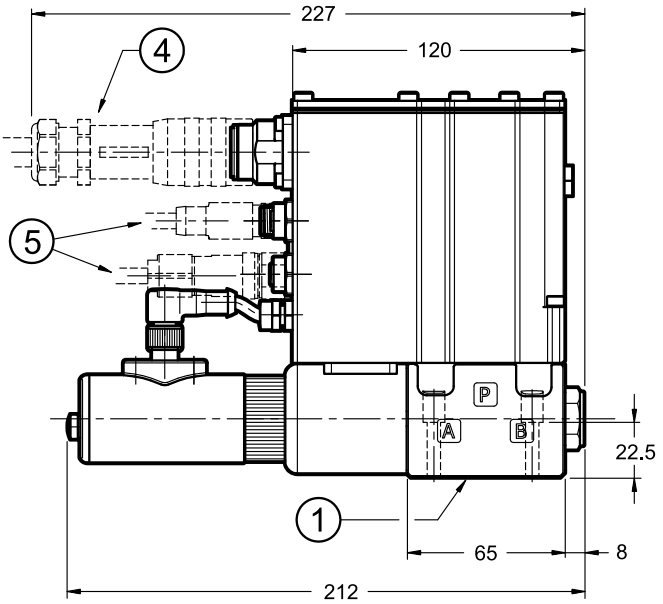
dimensions in mm

**DSE3JH-**/K16**




**DSE3JH-*SA/K16**




| | |
|---|---|
| X1 | Main connection 11 pin + PE |
| X2 | Fieldbus communication (IN) |
| X3 | Fieldbus communication (OUT) |
| X4 | X4 connection for analogue transducer |
| X7 | X7 connection for digital transducer |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 2037 (9.25x1.78) 90 Shore |
| 2 | Coil removal space (solenoid B only) |
| 3 | Manual override by pin integrated in the solenoid tube |
| 4 | Mating connector 11 poles + PE<br>**To be ordered separately.**<br>See catalogue 89 000 |
| 5 | Mating connectors for fieldbus communication and signals<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening: 4 SHC screws M5x30 ISO 4762 |
| Torque: 5 Nm (A8.8) |
| Threads of mounting holes: M5x10 |

**NOTE**: Depending on the chosen version, X4 and X7 connections may not be present.
Please refer to section 5 for connection descriptions and pinout.

## 11 - 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.

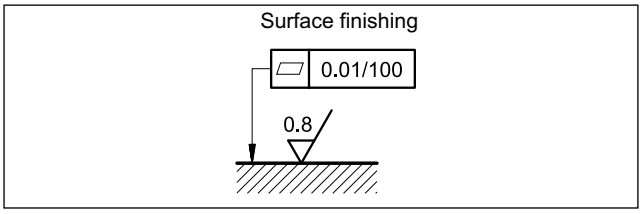
The fluid must be preserved in its physical and chemical characteristics.

## 12 - 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.




## 13 - ACCESSORIES

(to be ordered separately)

### 13.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

### 13.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

### 13.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 $mm^2$
- up to 40 m cable length : 1,5 $mm^2$ (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 $mm^2$

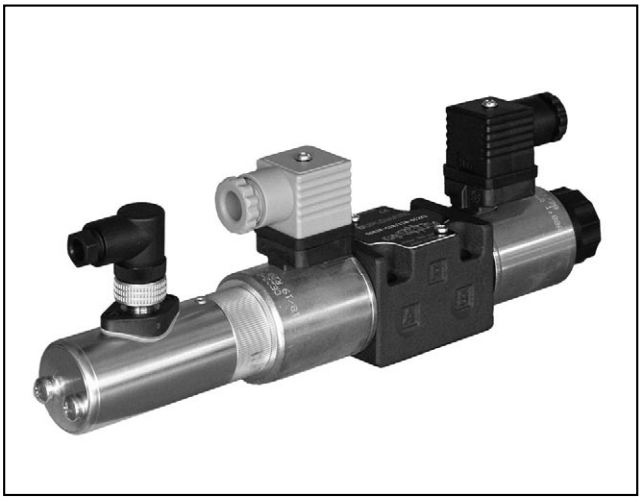
### 13.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

## 14 - SUBPLATES

(see catalogue 51 000)

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



# DSE3F

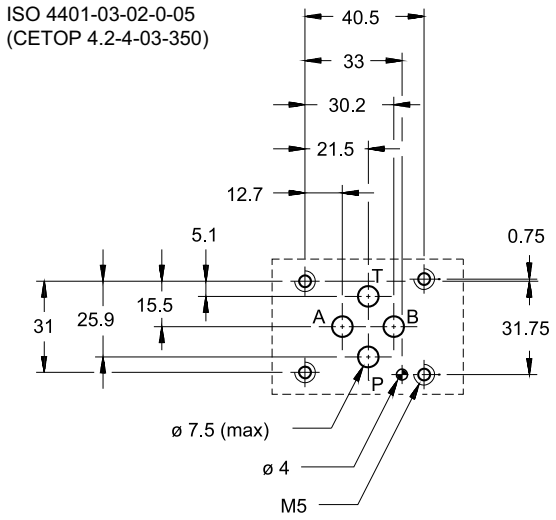
## DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL AND ELECTRICAL FEEDBACK

**SERIES 11**

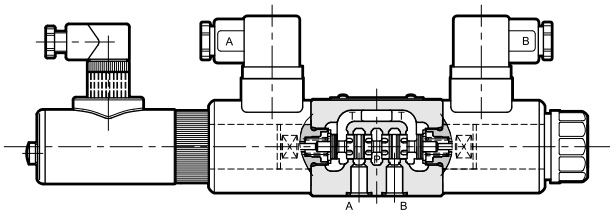
## SUBPLATE MOUNTING ISO 4401-03

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

### MOUNTING SURFACE




### OPERATING PRINCIPLE




— DSE3F is a direct operated directional valve with proportional control, electrical feedback with ports in compliance with ISO 4401-03 standards.

— It is suitable for directional and speed control of hydraulic actuators.

— The valve opening and hence flow rate can be modulated continuously in proportion to the reference signal.

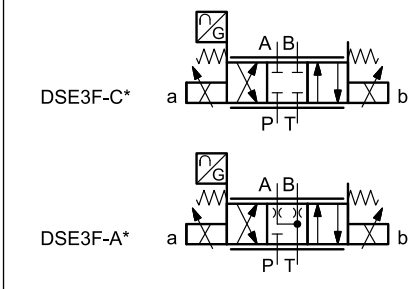
— The valve must be controlled directly by an external electronic card to maximize the valve performances: the input signal and the signal coming from the valve are compared to obtain an accurate positioning with a reduced hysteresis.

### PERFORMANCES

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

| | | |
|---|---|---|
| Max operating pressure:<br>- P - A - B ports<br>- T port | bar | <br>350<br>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<br>double solenoid valve | kg | 1,9<br>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

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
EN 175301-803
(ex DIN 43650) (**standard**)

Nominal solenoid voltage 12 VDC

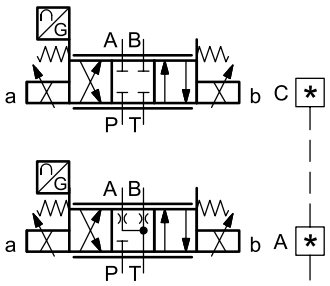
Seals:
**N** = NBR seals for mineral oil (**standard**)
**V** = FPM seals for special fluids

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

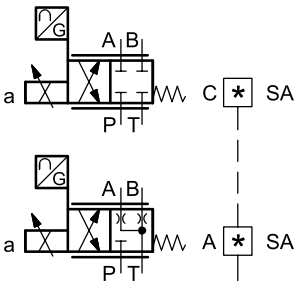
## 2 - CONFIGURATIONS

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

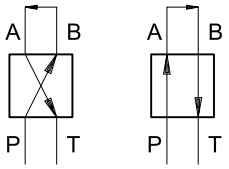



| * | Controlled flow with Δp 10 bar P-T |
|---|---|
| **08** | 8 l/min |
| **16** | 16 l/min |
| **26** | 26 l/min |

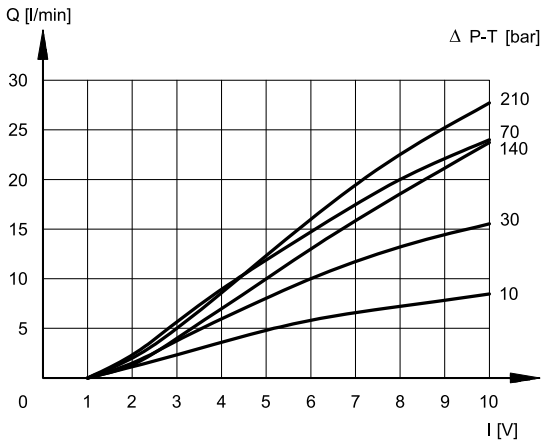
## 3 - CHARACTERISTIC CURVES

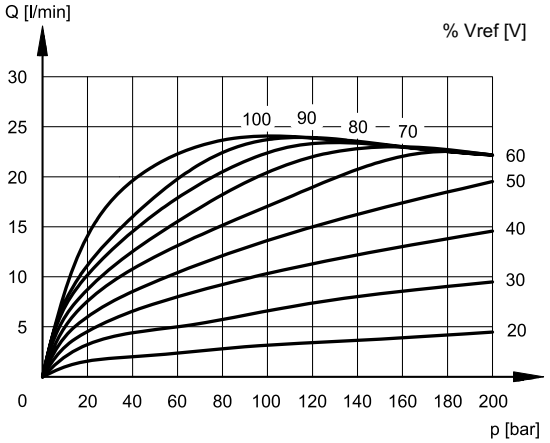
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronics type UEIK-*RSD)

Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values measured between P and T valve ports.

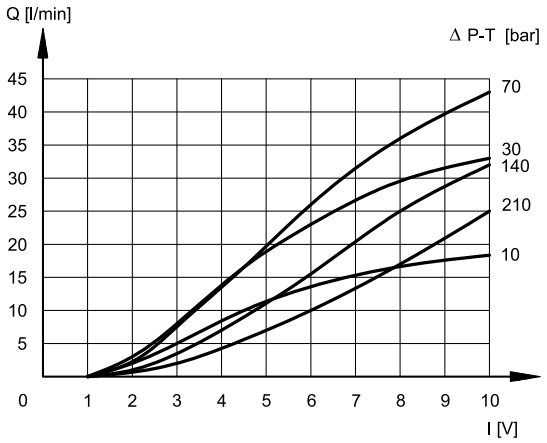


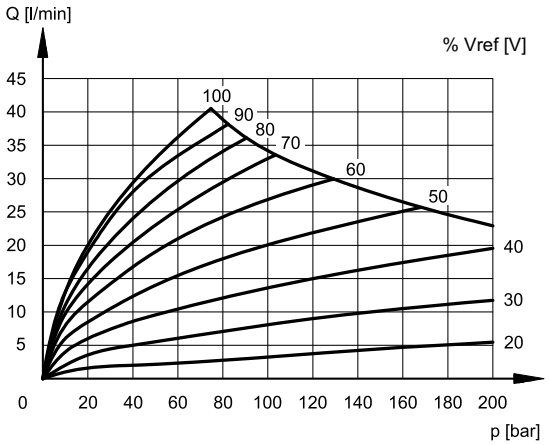

**C08 / A08**



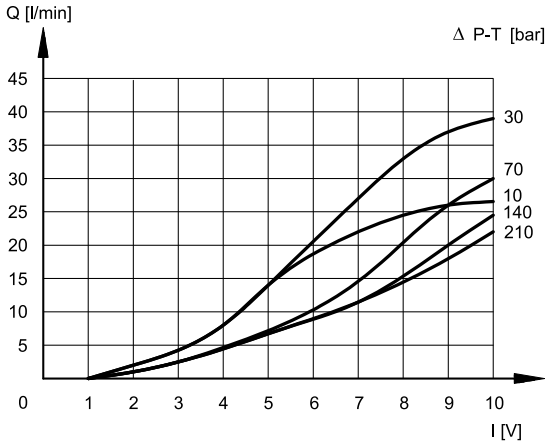



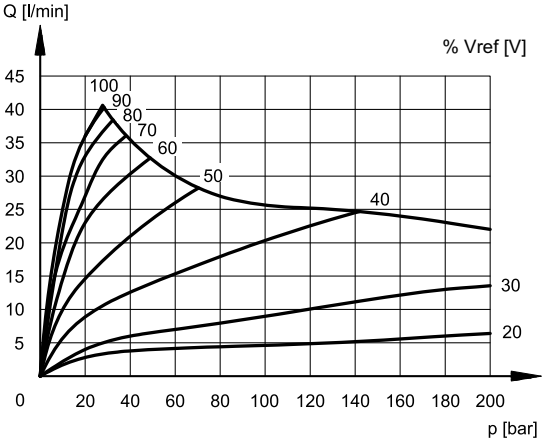

**C16 / A16**




**C26 / 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. Only the coil on side B 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 2014/30/EU | |
| **CLASS OF PROTECTION** Atmospheric agents (IEC EN 60529) | IP 65 | |

### 5.2 - Position transducer

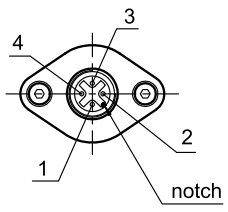
The DSE3F valve has an LVDT type position transducer with amplified signal. This type of transducer allows a precise control of the spool stroke and hence of the set flow rate, improving repeatability and hysteresis characteristics.

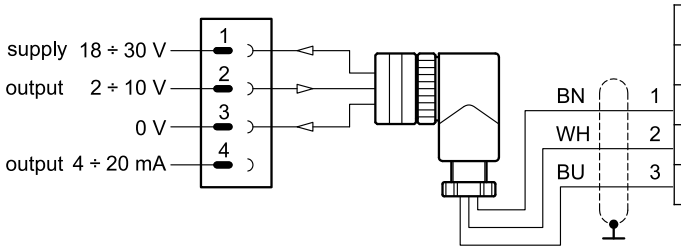
The transducer is fitted coaxially on the proportional solenoid and the connector features 360° positioning. The field-wireable mating connector is always included.

Use a screened cable to avoid interferences.

Technical specifications and wiring are indicated here below.

**The transducer is protected against polarity inversion on the power line.**

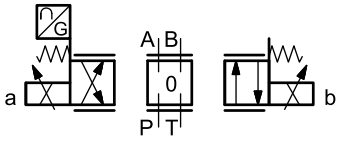


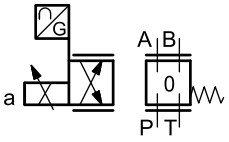




| pin on control card | |
|---|---|
| UEIK-*1RSD | EDM-J*/DSE3F |
| 8c | 13 |
| 24a | 10 |
| 22c | 15 (**NOTE**) |

**NOTE**: with jumper on pin 11

**signal / stroke**




transducer ouput 10V 6 V 2V 10 V 6 V

## 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.

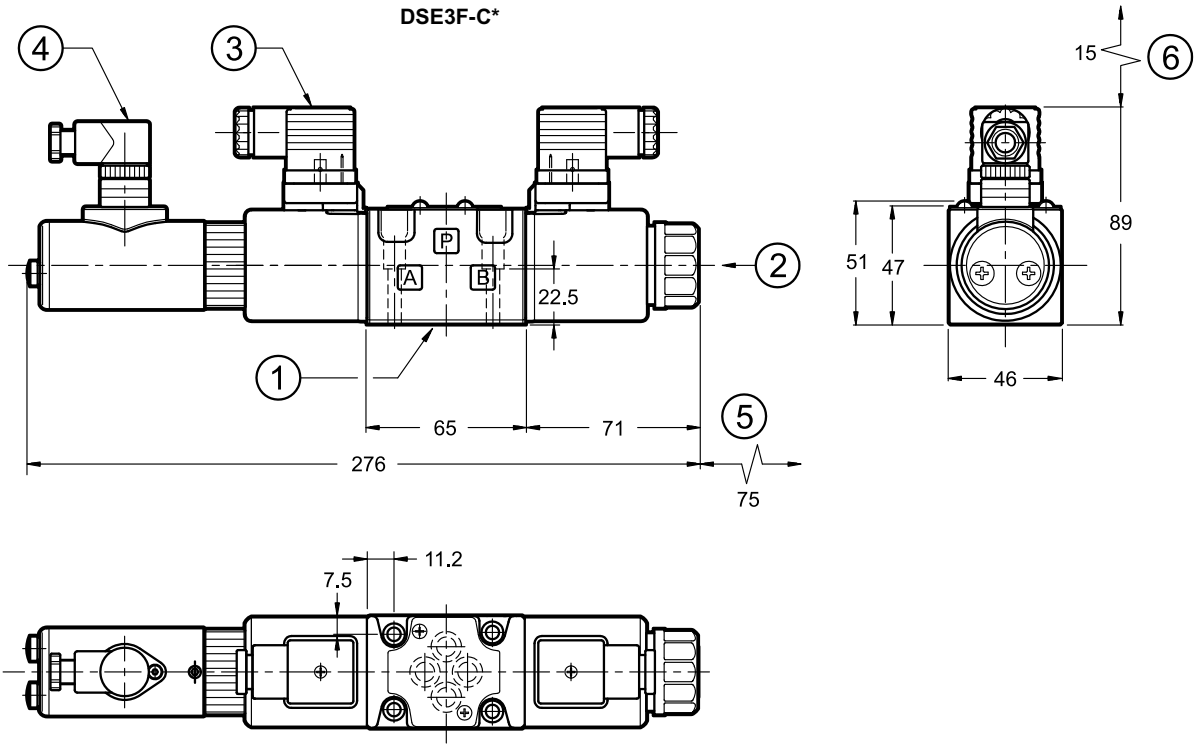
The table illustrates typical response times with the C16 spool and with $\Delta p$ = 30 bar P-T.

| **REFERENCE SIGNAL STEP** | 0 → 100% | 100 → 0% |
|---|---|---|
| Step response [ms] | 30 | 25 |

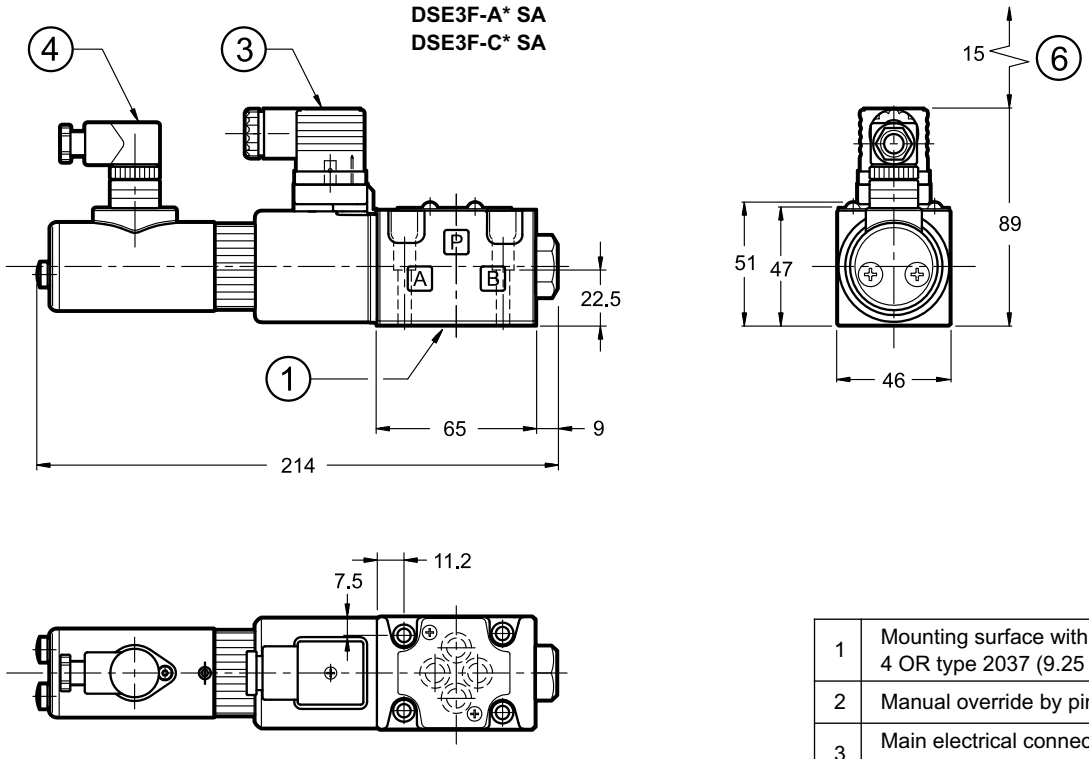
## 7 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

**DSE3F-A***
**DSE3F-C***




**DSE3F-A* SA**
**DSE3F-C* SA**




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 2037 (9.25 x 1.78) - 90 shore |
| 2 | Manual override by pin |
| 3 | Main electrical connector<br>EN 175301-803 (ex DIN 43650) |
| 4 | Electrical connector 4 pin<br>EC4S/M12S/10 code 3491001002 for position transducer (included) |
| 5 | Coil removal space |
| 6 | Removal space of the main electrical connector |

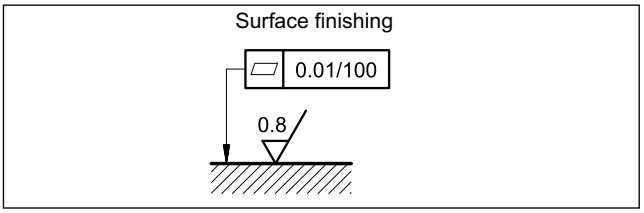
| |
|---|
| Fastening bolts:4 bolts M5x30 - ISO 4762 |
| Torque: 5 Nm (A8.8) |
| Threads of mounting holes: M5x10 |

## 8 - 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.




## 9 - ELECTRONIC CONTROL UNITS

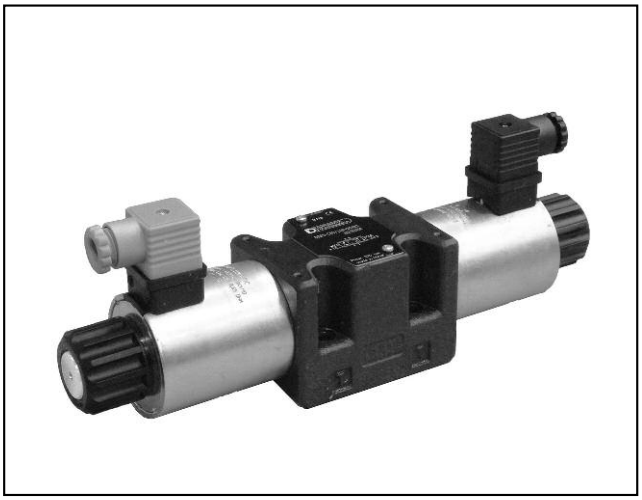
| | | | |
|---|---|---|---|
| **EDM-J2/*DSE3F** | for double solenoid valve | DIN EN 50022 rail mounting | see cat. 89 255 |
| **EDM-J1/*DSE3F** | for single solenoid valve | | |
| **UEIK-21RSD** | for double solenoid valve | Eurocard | see cat. 89 335 |
| **UEIK-11RSD** | for single solenoid valve | | see cat. 89 315 |

The card holder for Eurocard electronics is available. See catalogue 89 900.

## 10 - SUBPLATES

(see catalogue 51 000)

| |
|---|
| PMMD-AI3G rear ports |
| PMMD-AL3G side ports |
| Ports dimensions: 3/8” BSP |



# DSE5

## DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

### SERIES 10

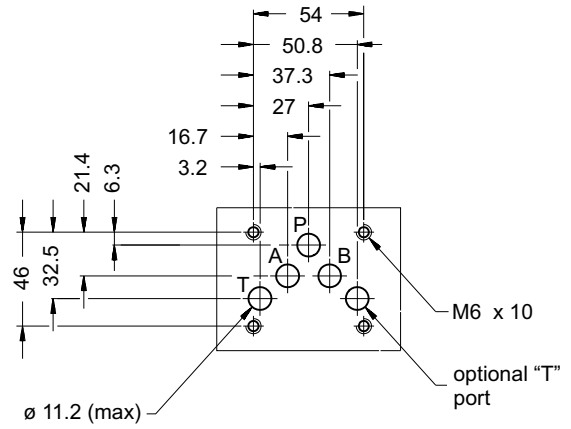
## SUBPLATE MOUNTING ISO 4401-05

**p** max **320** bar

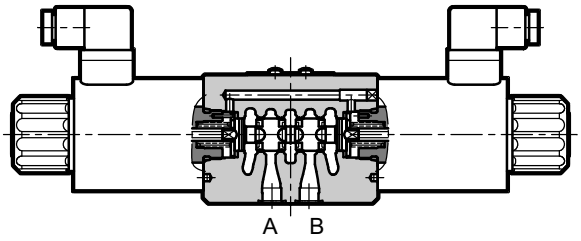
**Q** max **90** l/min

### 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).

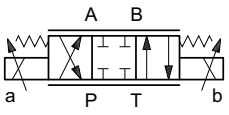
### PERFORMANCES

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

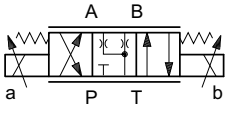
| | | |
|---|---|---|
| Maximum operating pressure:<br>- P - A - B ports<br>- T port : standard version<br>version with Y port | bar | <br>320<br>210<br>320 |
| Maximum flow with Δp 10 bar P-T | l/min | 30 - 60 |
| Step response | see paragraph 6 | |
| Hysteresis (with PWM 100 Hz) | % of Q max | < 6% |
| 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<br>double solenoid valve | kg | 4,4<br>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

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

Option: manual override (see at par. 9)

Coil electrical connection:
plug for connector type
EN 175301-803 (ex DIN 43650) (**standard**)

**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 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).

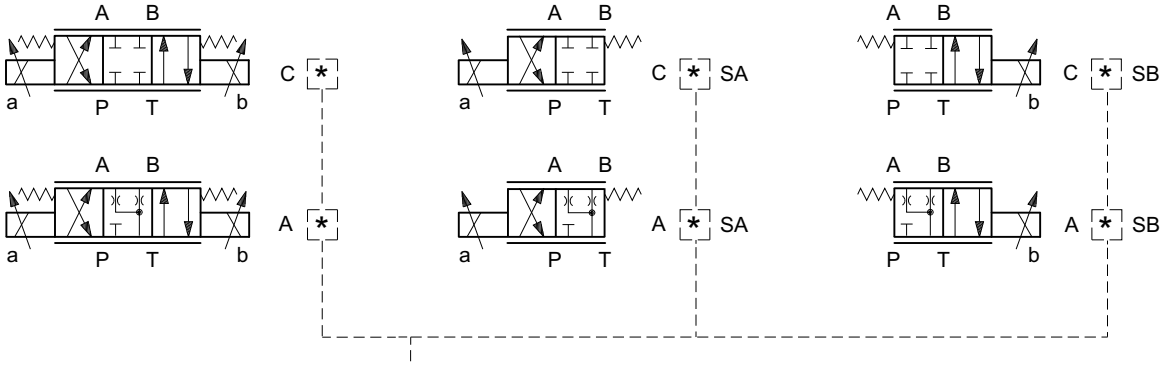
## 2 - CONFIGURATIONS

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



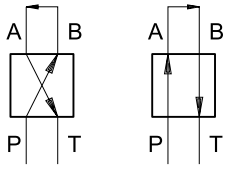

| * | Controlled flow with Δp 10 bar P-T |
|---|---|
| **30** | 30 l/min |
| **60** | 60 l/min |
| **60/30** | 60 (P-A) / 30 (B-T) l/min |

## 3 - CHARACTERISTIC CURVES

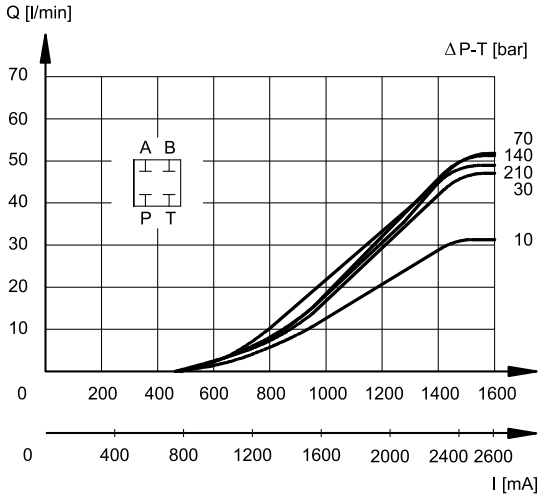
(obtained with mineral oil with viscosity of 36 cSt at 50°C and electronic control card)

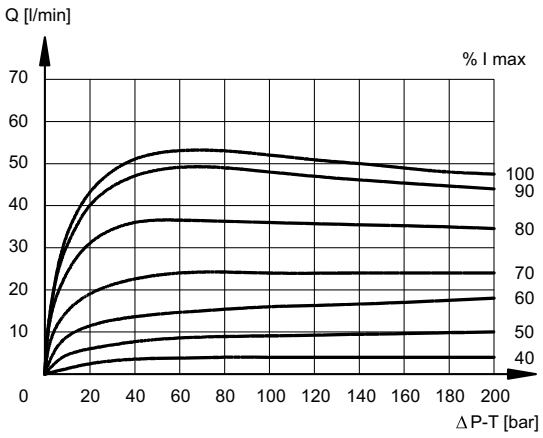
Typical constant flow rate control curves at Δp according to current supply to solenoid (D24 version, maximum current 1600 mA), measured for the various spools types available.

The reference Δp values are measured between ports P and T on the valve.

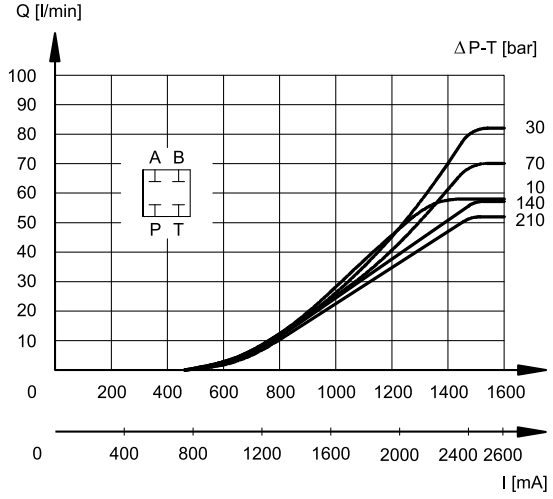


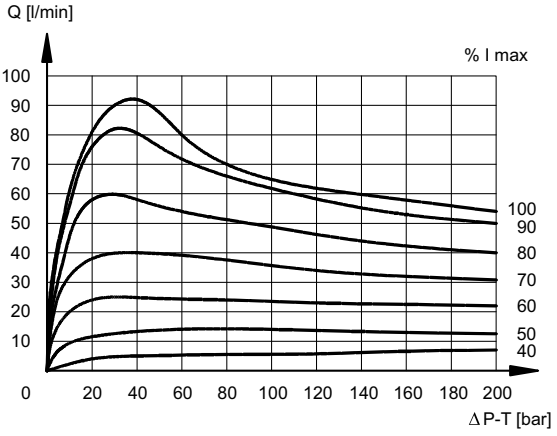

### SPOOL TYPE C30



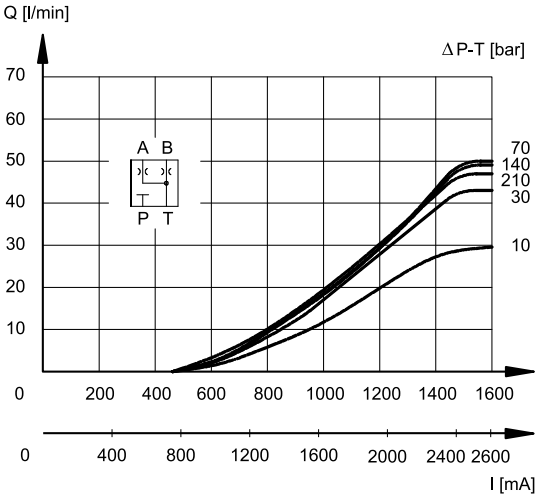



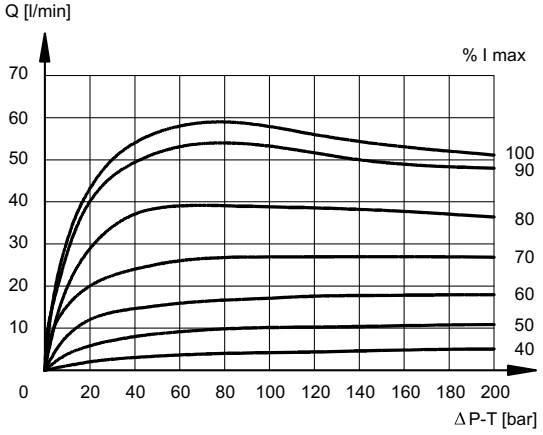

### SPOOL TYPE C60



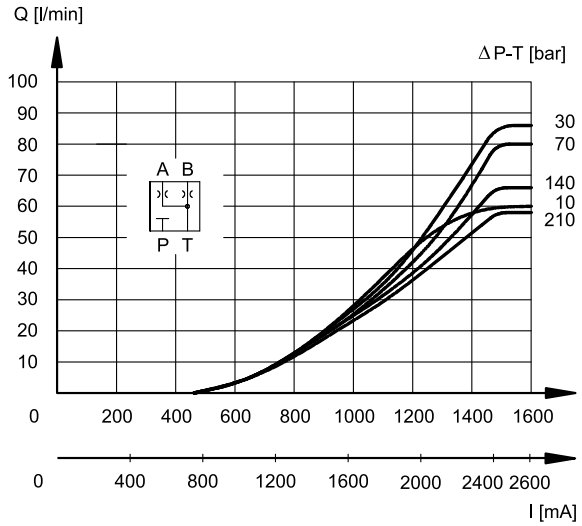



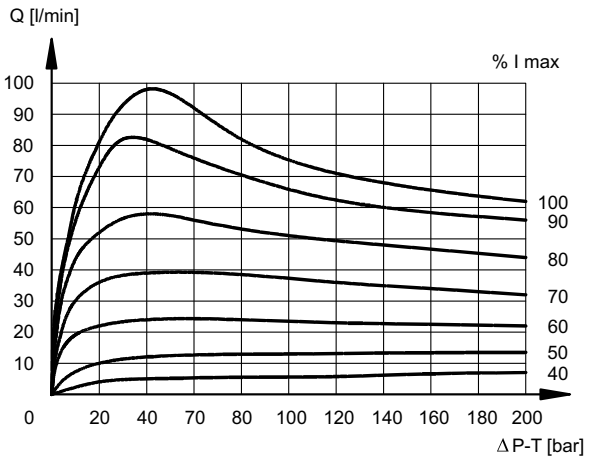

### SPOOL TYPE A30



**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 2014/30/EU | | |
| **CLASS OF PROTECTION**<br>atmospheric agents (IEC 60529)<br>coil insulation (VDE 0580)<br>Impregnation | IP 65<br>class H<br>class F | | |

## 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 position value following a step change of reference signal.

The table shows typical response times tested with spool type C60 and $\Delta p$ = 20 bar P-T.

| **REFERENCE SIGNAL STEP** | 0→100% | 100%→0 |
|---|---|---|
| Step response [ms] | 50 | 40 |

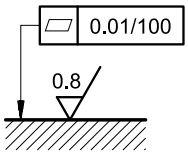
## 7 - INSTALLATION

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.

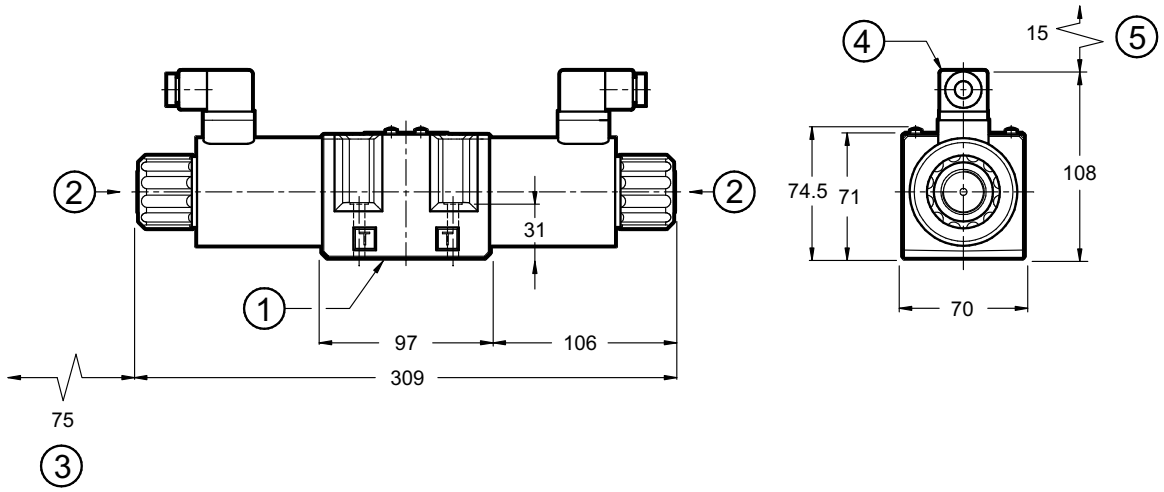
Surface finishing

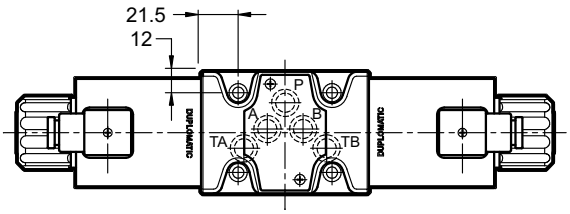


## 8 - OVERALL AND MOUNTING DIMENSIONS

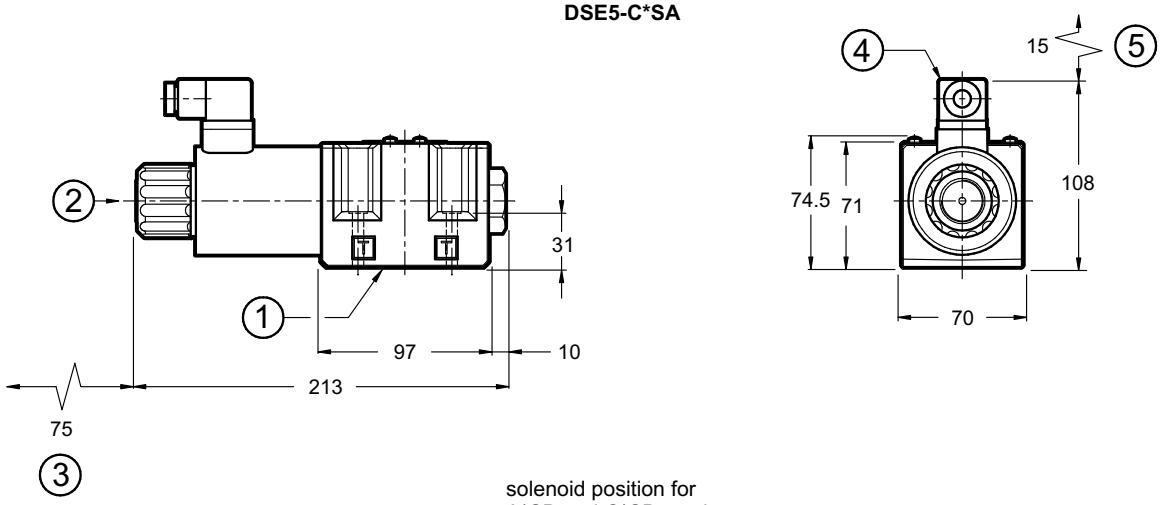
dimensions in mm

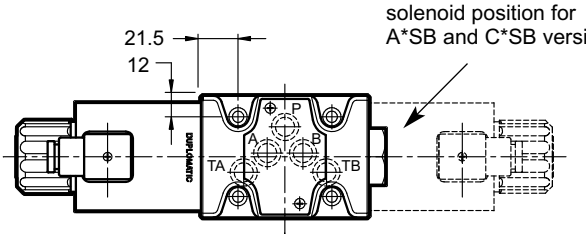
**DSE5-A***
**DSE5-C***




**DSE5-A*SA**
**DSE5-C*SA**



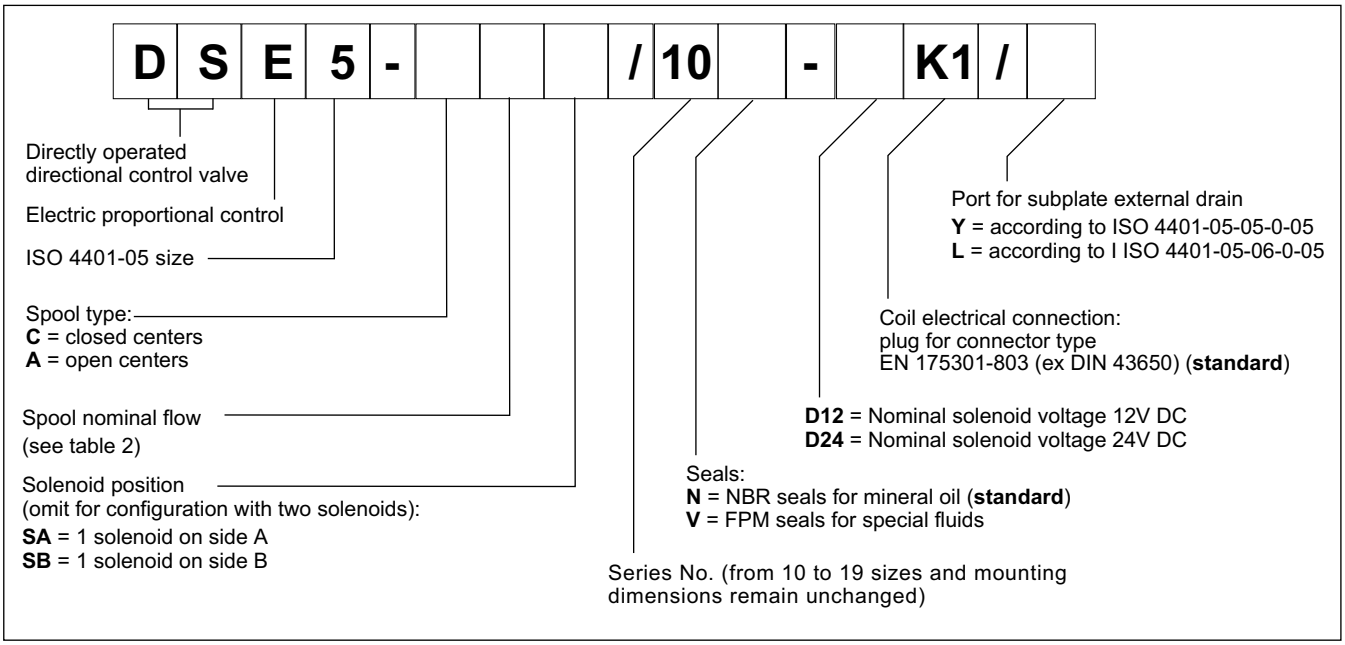




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) - 90 Shore<br>Additional for version Y:<br>1 OR 2037 (9.25x1.78) - 90 Shore<br>Additional for version L:<br>1 OR 2025 (6.07x1.78) - 90 Shore |
| 2 | Standard manual override integrated in the solenoid tube |
| 3 | Coil removal space |
| 4 | EN 175301-803 (ex DIN 43650)<br>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



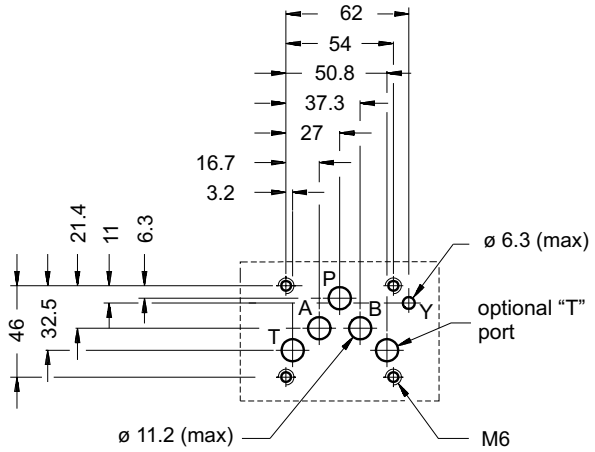

These versions allow the operation with pressures up to 320 bar on T port of the valve .

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

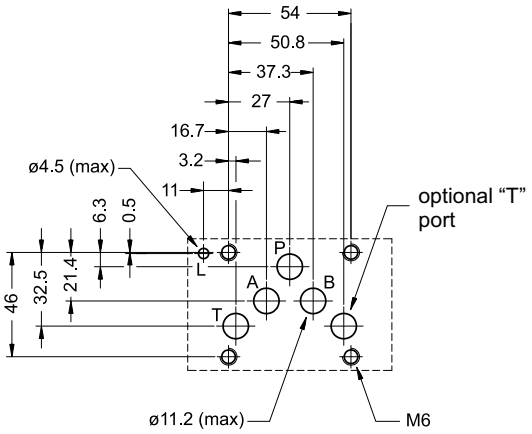
The drain port Y is realized on the valve mounting surface in compliance with ISO 4401-05-05-0-05 standard.

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



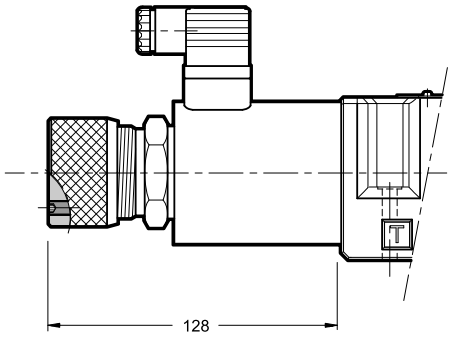
## 10 - MANUAL OVERRIDE

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 89 251 |
| **EDM-M151** | for solenoid 12V DC | | |

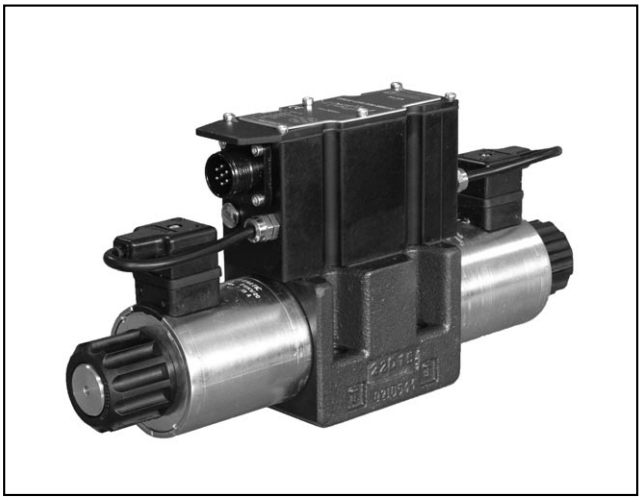
**DSE5- A*  DSE5-C***

| | | | |
|---|---|---|---|
| **EDM-M231** | for solenoid 24V DC | DIN EN 50022 rail mounting | see catalogue 89 251 |
| **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*

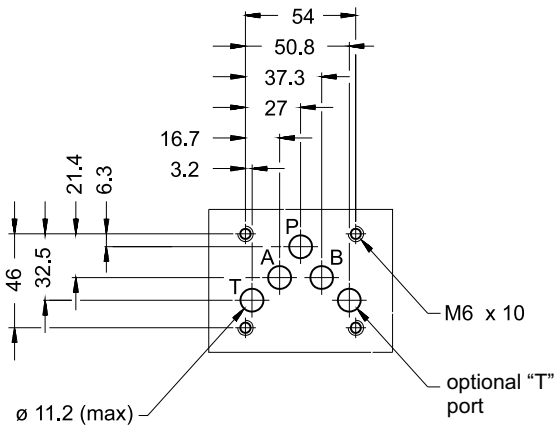
## PROPORTIONAL DIRECTIONAL CONTROL VALVE WITH INTEGRATED ELECTRONICS

### SUBPLATE MOUNTING ISO 4401-05

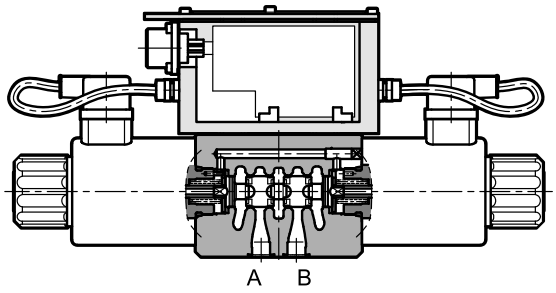
**p** max **320** bar
**Q** max **90** l/min

### MOUNTING SURFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)




### OPERATING PRINCIPLE




— The DSE5G* are proportional directional control valves, direct operated, with integrated electronics and mounting surface compliant with ISO 4401-05 standards.

— They are used for the control of position and speed of hydraulic actuators.

— Valves are available with different types of electronics,with analogue or fieldbus interfaces.

— A solenoid current monitoring signal is available.

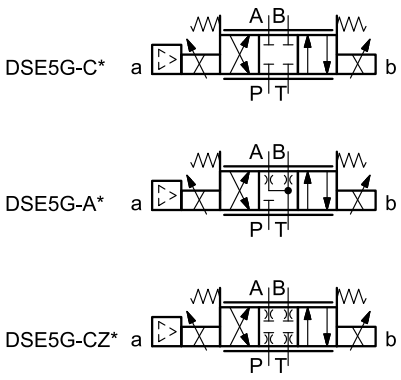
— The valves are easy to install. The driver manages digital settings directly.

### PERFORMANCES

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

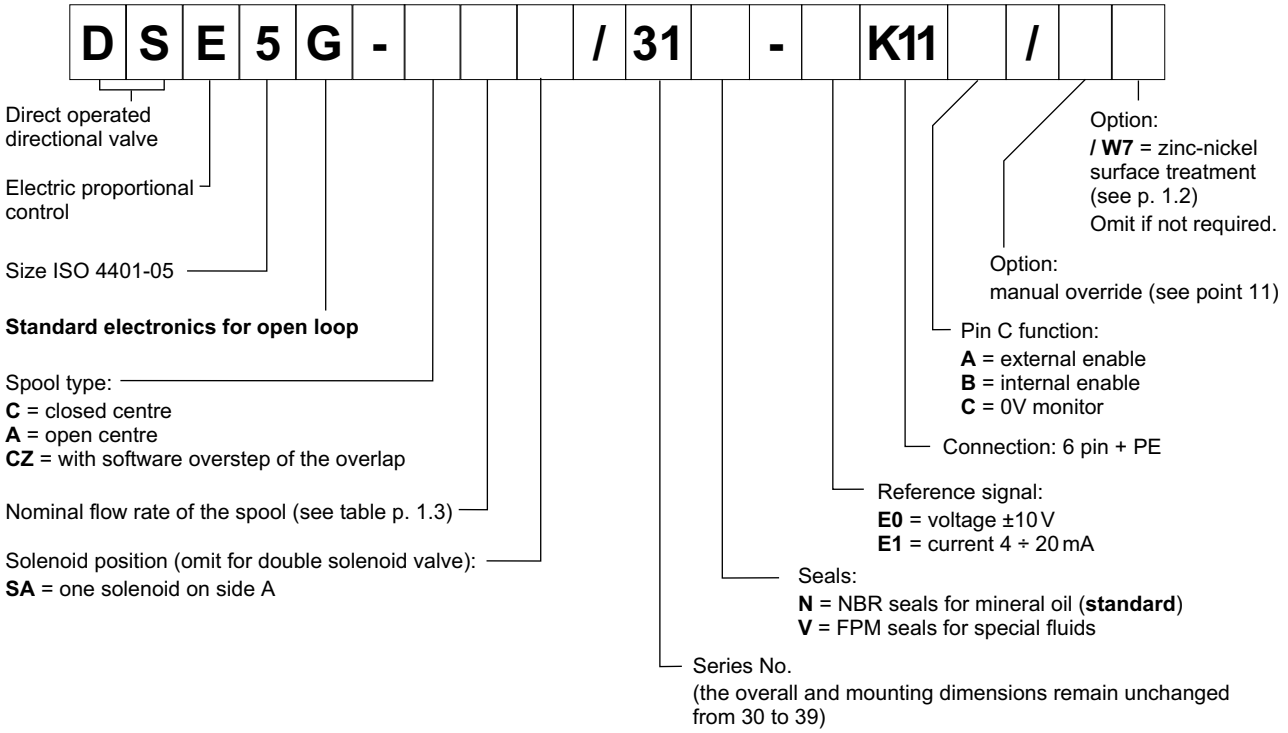
| | | |
|---|---|---|
| Maximum operating pressure:<br>- P - A - B ports<br>- T port | bar | <br>320<br>140 |
| Maximum flow with Δp 10 bar P-T | l/min | 30 - 60 |
| Response times | see point 7 | |
| Hysteresis | % of Q max | < 3% |
| Repeatability | % of Q max | < ±1% |
| Electrical characteristics | see point 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<br>double solenoid valve | kg | 5.0<br>6.5 |

### HYDRAULIC SYMBOLS (typical)



## 1 - IDENTIFICATION CODE

### 1.1 - Standard electronics




### 1.2 - Surface treatments

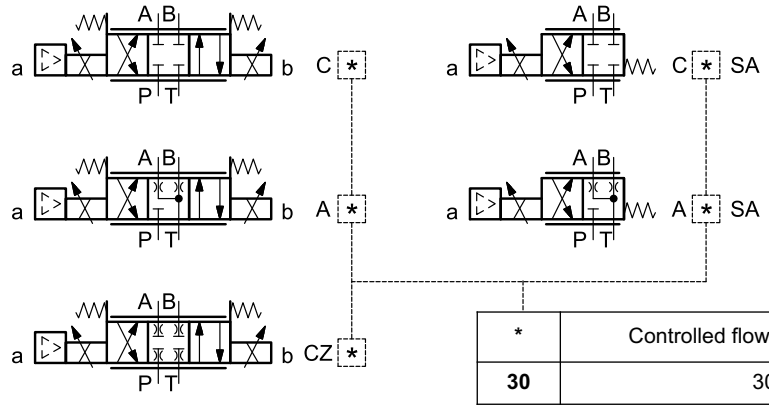
The standard valve is supplied with surface treatment of phosphating black. The zinc-nickel finishing on the valve body makes the valve suitable to ensure a salt spray resistance up to 240 hours. (test operated according to UNI EN ISO 9227 standards and test evaluation operated according to UNI EN ISO 10289 standards).

### 1.3 - Available configurations

The valve configuration depends on the combination of the following elements:
number of proportional solenoids, spool type, rated flow.

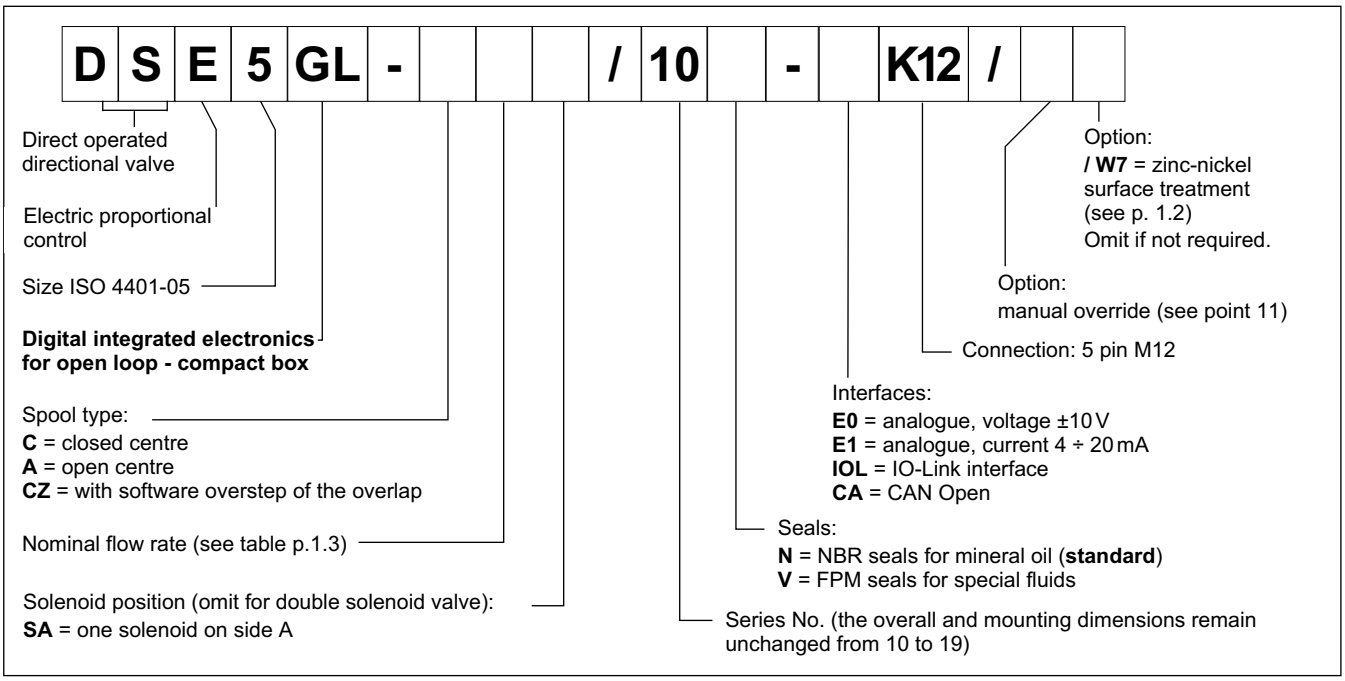
Configuration 2 solenoids :
3 positions with spring centreing

Configuration 1 solenoid on side A "**SA**":
2 positions (central + external)
with spring centreing

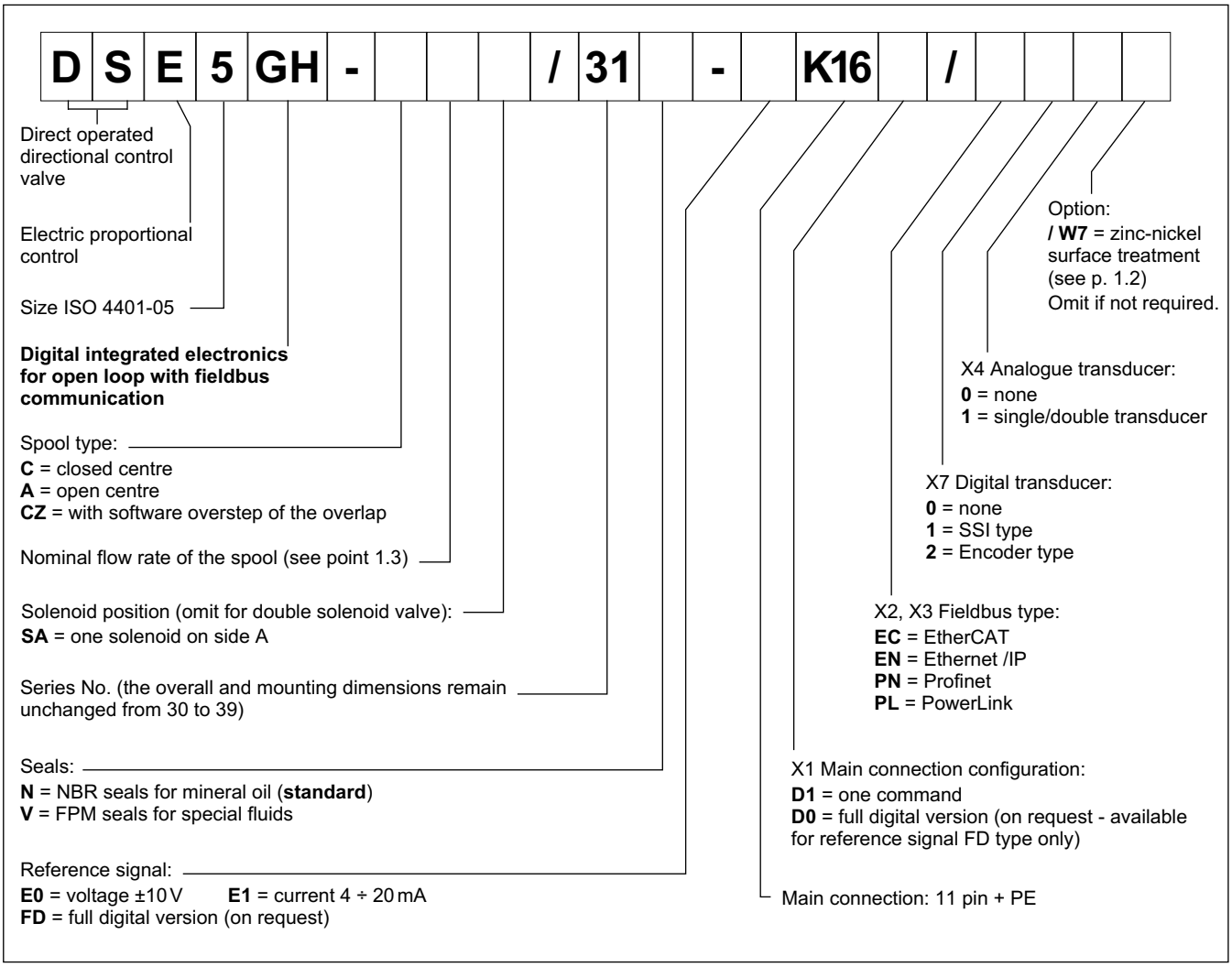



| * | Controlled flow with Δp 10 bar P-T |
|---|---|
| **30** | 30 l/min |
| **60** | 60 l/min |
| **60/30** | 60 (P-A) / 30 (P-B) l/min |

### 1.3 - Compact electronics




### 1.4 - Electronics with fieldbus communication



## 2 - ELECTRONICS COMMON DATA

| | | |
|---|---|---|
| Duty cycle | | 100% (continuous operation) |
| Protection class according to EN 60529 | | IP65/IP67 (**NOTE**) |
| 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 | A | 3 |
| Managed breakdowns | | Overload and electronics overheating, cable breakdown, supply voltage failures |
| Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2 | | According to 2014/30/EU standards |

**NOTE**: The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly. Moreover, on the GH versions it is necessary to protect with caps any unused connections.

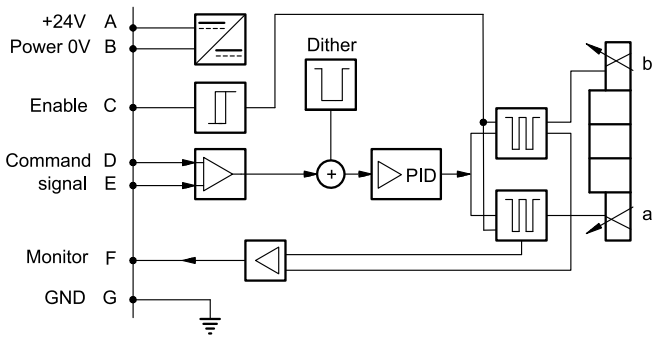
## 3 - DSE5G - STANDARD ELECTRONICS

### 3.1 - Electrical characteristics

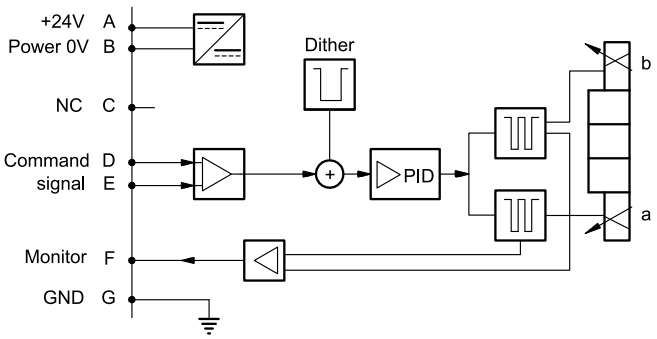
| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication for diagnostic | | LIN-bus Interface (by means of the optional kit) |
| Connection | | 6 pin + PE (MIL-C-5015-G - DIN EN 175201-804) |

### 3.2 - On-board electronics diagrams

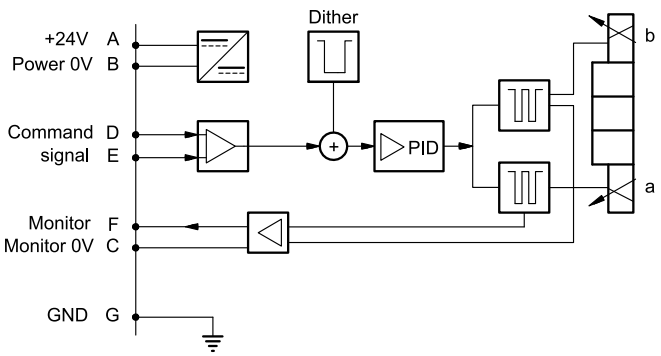
**VERSION A** - External Enable




**VERSION B** - Internal Enable

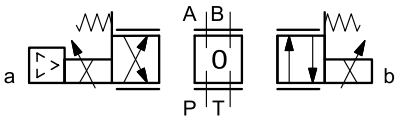


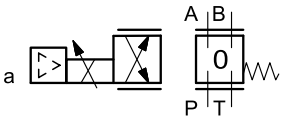

**VERSION C** - 0V Monitor



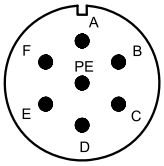
### 3.3 - Versions with voltage command (E0)

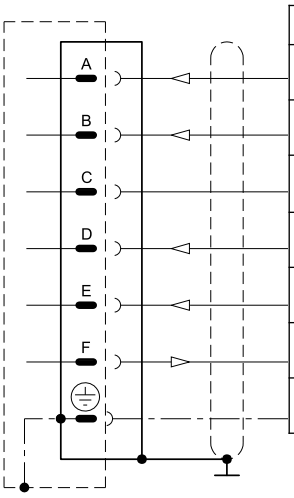
The reference signal is between -10V and +10V on double solenoid valve, and 0 ÷ 10V on single solenoid valve SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **COMMAND** | **-10V** | **0V** | **+10V** | **COMMAND** | **+10V** | **0V** |
| **MONITOR** | **-10V** | **0V** | **+10V** | **MONITOR** | **+10V** | **0V** |



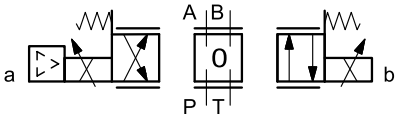



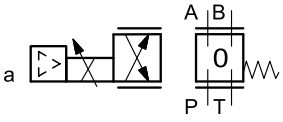

| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable 24 V DC | do not connect - | PIN F reference 0 V |
| **D** | ± 10 V | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | ± 10 V | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

### 3.4 - Versions with current command (E1)

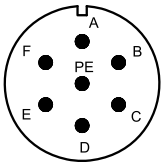
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower, the card shows a breakdown cable error. To reset the error is sufficient restoring the signal.

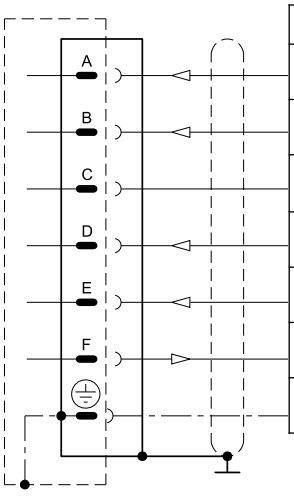
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **COMMAND** | **4 mA** | **12 mA** | **20 mA** | **COMMAND** | **20 mA** | **4 mA** |
| **MONITOR** | **4 mA** | **12 mA** | **20 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 | do not connect - | PIN F reference 0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | 4 ÷ 20 mA | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

## 4 - DSE5GL - COMPACT ELECTRONICS

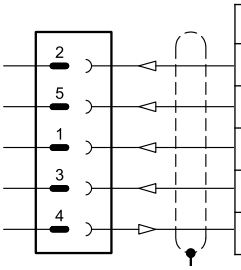
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

### 4.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>0 ÷ 5 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| IO-Link communication (IOL):<br>Data rate | <br>kBaud | IO-Link Port Class B<br>230,4 |
| Can Open communication (CA):<br>Data rate | kbit | 10 ÷ 1000 |
| Connection | | 5-pin M12 code A (IEC 61076-2-101) |

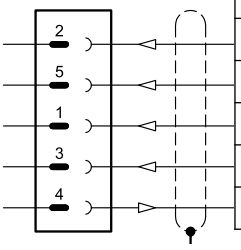
### 4.2 - Pin tables

**'E0' connection**

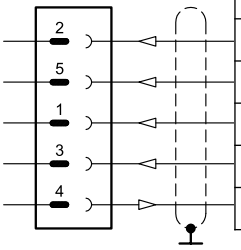

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | ± 10 V | Command |
| 3 | 0V | Command reference |
| 4 | 0 ÷ 5V | Monitor (0V reference: pin 5) |

**'E1' connection**

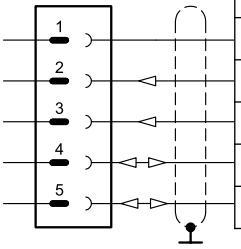

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | 4 ÷ 20 mA | Command |
| 3 | 0V | Command reference |
| 4 | 4 ÷ 20 mA | Monitor (0V reference: pin 5) |

**'IOL' connection**


| Pin | Values | | Function |
|---|---|---|---|
| 2 | 2L+ | 24 V DC | Supply of the power stage |
| 5 | 2L- | 0 V (GND) | Internal galvanic isolation from PIN 3 |
| 1 | 1L+ | +24 V DC | IO-Link supply voltage |
| 3 | 1L- | 0V (GND) | |
| 4 | C/Q | | IO-Link Communication |

**'CA' connection**


| Pin | Values | Function |
|---|---|---|
| 1 | CAN_SH | Shield |
| 2 | 24 V DC | Supply voltage |
| 3 | 0 V (GND) | |
| 4 | CAN H | Bus line (high) |
| 5 | CAN_L | Bus line (low) |

## 5 - DSE5GH - FIELDBUS ELECTRONICS

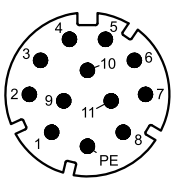
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

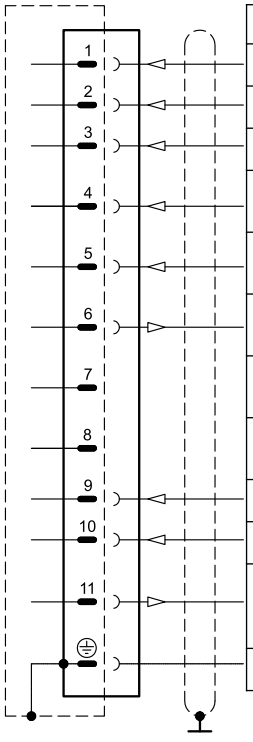
Command - valve position schemes as for the standard electronics. Please refer to pictures in points 3.3 and 3.4.

### 5.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal:<br>voltage (E0)<br>current (E1)<br>digital (FD) | <br>V DC<br>mA | <br>±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm)<br>via fieldbus |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication / diagnostic | | via Bus register |
| Communication interface standard | | IEC 61158 |
| Communication physical layer | | fast ethernet, insulated 100 Base TX |
| Power connection | | 11 pin + PE (DIN 43651) |

### 5.2 - X1 Main connection pin table




**D1: one command**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Command |
| **5** | 0 V | Command reference signal |
| **6** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Monitor<br>(0V reference pin 10) |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V reference pin 2) |
| **12** | GND | Ground (Earth) |

**D0: full digital**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | NC | do not connect |
| **5** | NC | do not connect |
| **6** | NC | do not connect |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V ref. pin 2) |
| **12** | GND | Ground (Earth) |

### 5.3 - FIELDBUS connections

Please wire following guidelines provided by the related standards communication protocol. Any connections present and not used must be protected with special caps so as not to nullify the protection against atmospheric agents.

**X2 (IN) connection** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

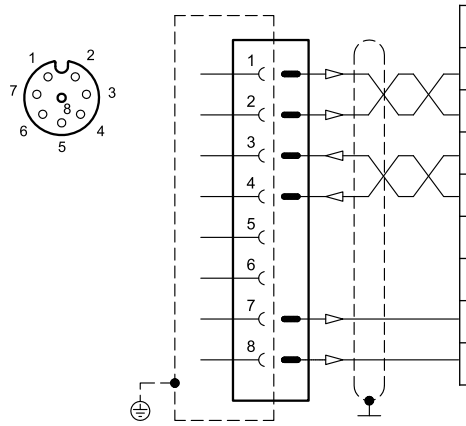
**X3 (OUT) connection:** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**NOTE**: Shield connection on connector housing is recommended.

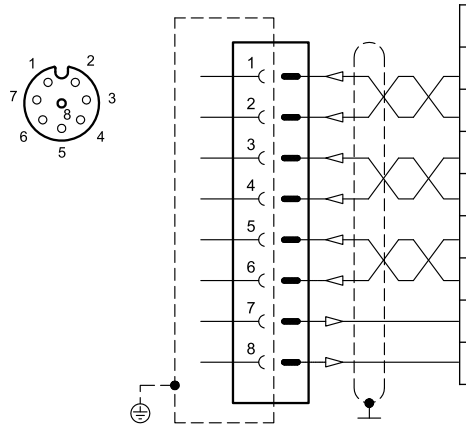
**5.4 - Digital transducer connection**
**X7 connection:** M12 A 8 pin female

**VERSION 1: SSI type**



| Pin | SSI Values | Function | Notes |
|---|---|---|---|
| **1** | CLK+ | Serial synchronous clock (+) | Input - digital signal |
| **2** | CLK- | Serial synchronous clock (-) | |
| **3** | MIS0+ | Serial position data (+) | |
| **4** | MIS0- | Serial position data (-) | |
| **5** | NC | - | do not connect |
| **6** | NC | - | |
| **7** | +24 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

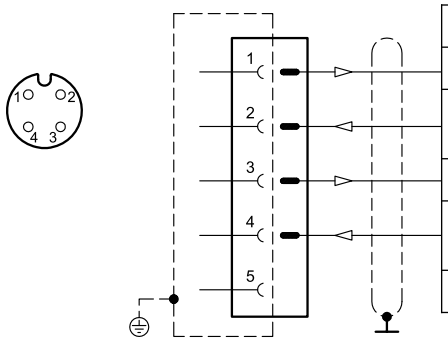
**VERSION 2: ENCODER type**



| Pin | Values | Function | Notes |
|---|---|---|---|
| **1** | ENC_Z+ | input channel Z+ | Input - digital signal |
| **2** | ENC_Z- | input channel Z- | |
| **3** | ENC_A+ | input channel A+ | |
| **4** | ENC_A- | input channel A+ | |
| **5** | ENC_B+ | input channel B+ | |
| **6** | ENC_B- | input channel B+ | |
| **7** | +5 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

**5.5 - Analogue transducer connection**
**X4 connection**: M12 A 4 pin female

**VERSION 1: single / double transducer**
(single or double is a software-selectable option)



| Pin | Values | Notes |
|---|---|---|
| **1** | +24 V | Remote transducer power supply (out) 100 mA |
| **2** | ±10 V<br>4 ÷20 mA | Input signal of transducer 1 (range software selectable) |
| **3** | 0 V | Common reference signal for transducer power and signals |
| **4** | ±10 V<br>4 ÷20 mA | Input signal of transducer 2 (range software selectable) |
| **5** | - | |

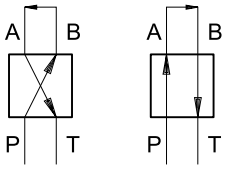
## 6 - CHARACTERISTIC CURVES

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

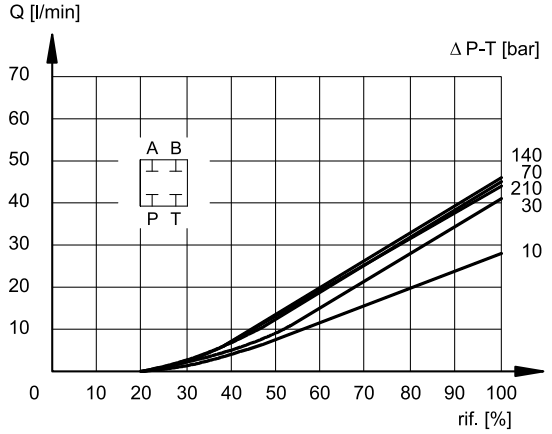
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools.

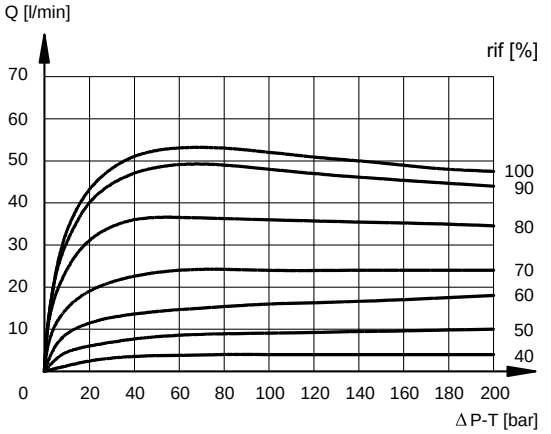
The curves are obtained with a constant meter-in with Δp of 5 bar and by setting the value of flow start at 20% of the reference signal.

**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.

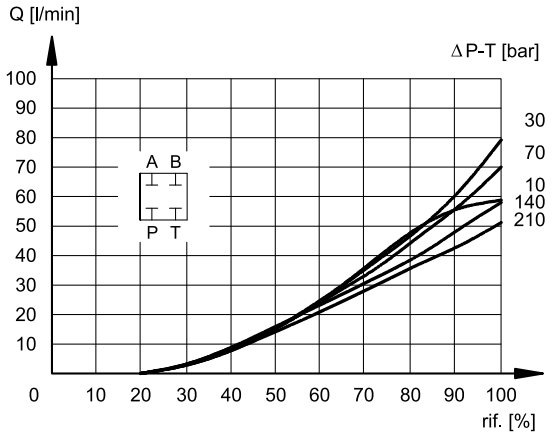


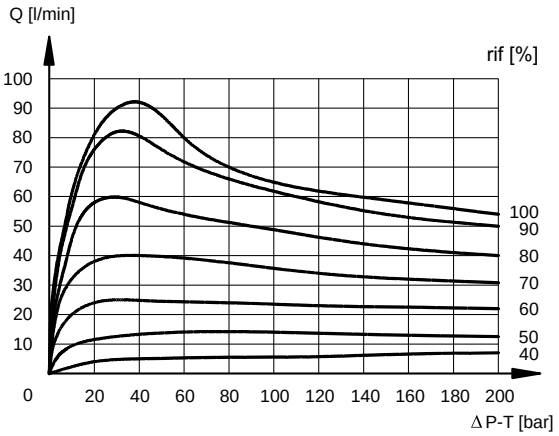

### SPOOL TYPE C30



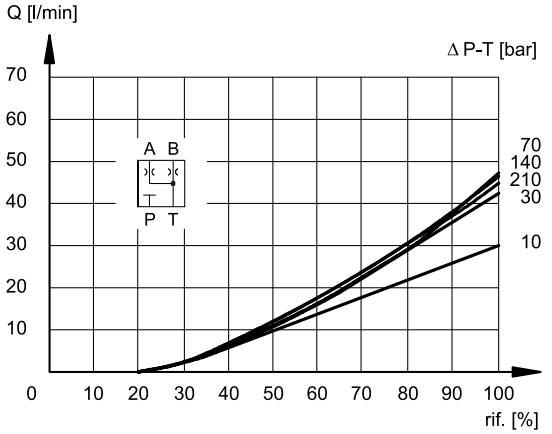



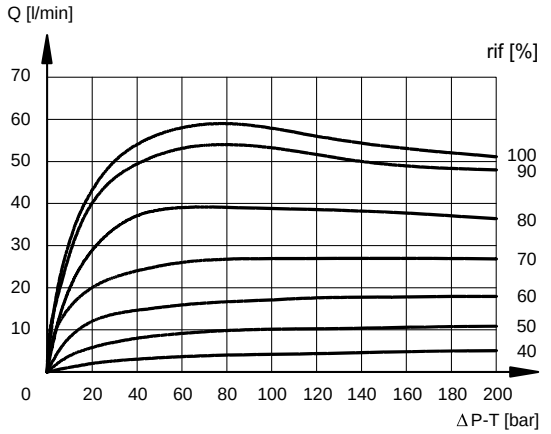

### SPOOL TYPE C60



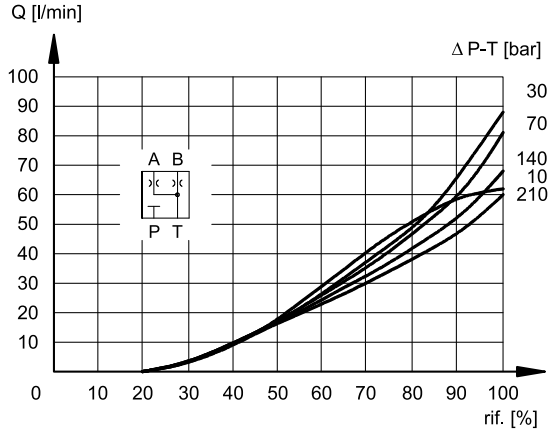



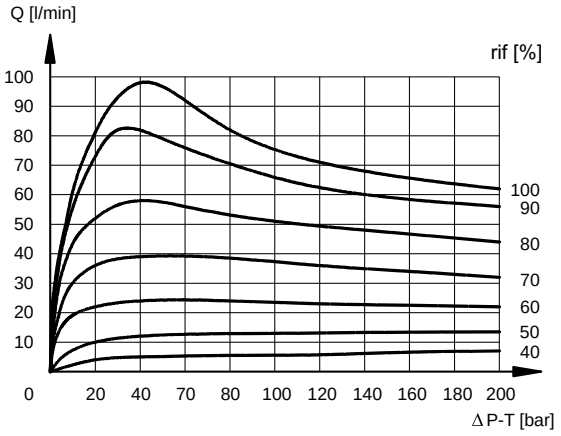

### SPOOL TYPE A30



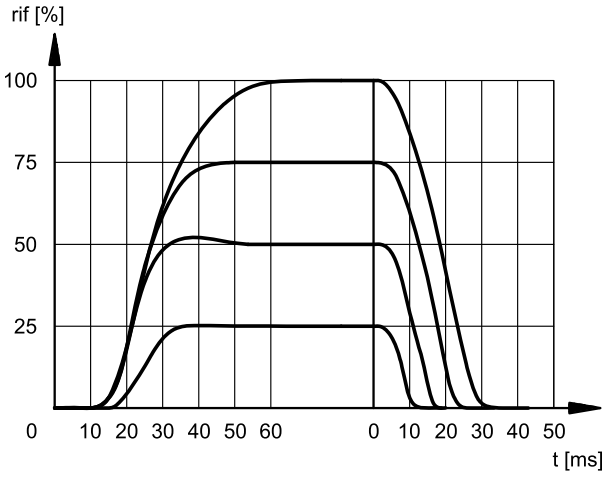
**SPOOL TYPE A60**




## 7 - RESPONSE TIMES

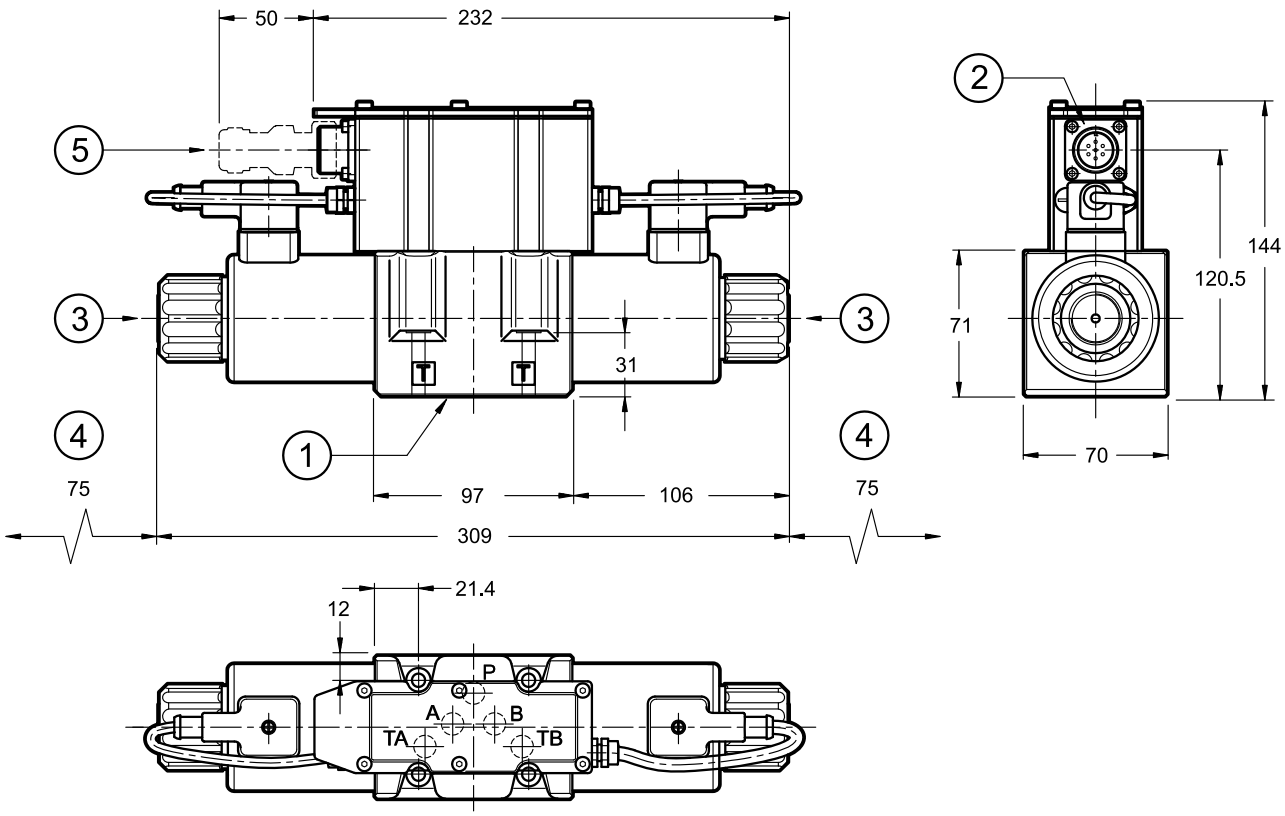
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)



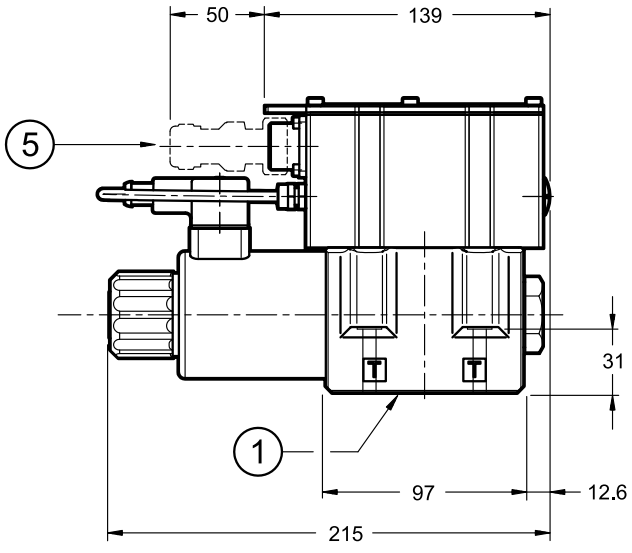
## 8 - DSE5G OVERALL AND MOUNTING DIMENSIONS

**DSE5G-**/K11**

dimensions in mm




**DSE5G-*SA/K11**



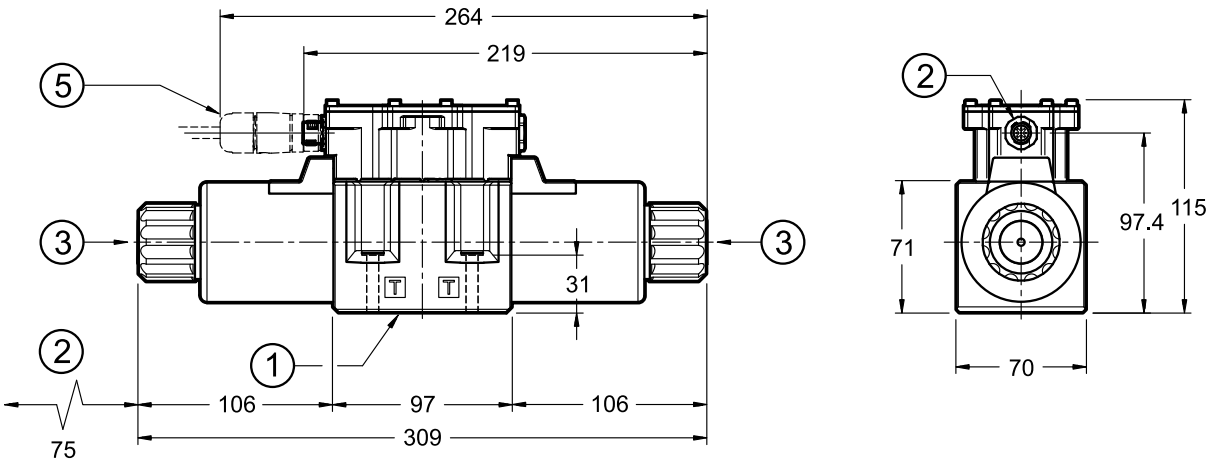

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Standard manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector 6 poles + PE,<br>female type MIL-5015-G<br>**To be ordered separately.**<br>See catalogue 89 000 |

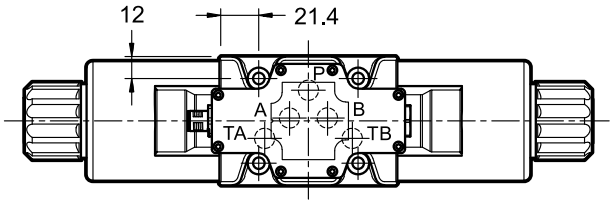
| |
|---|
| Fastening bolts: 4 SHC bolts M6x40 - ISO 4762 |
| Torque: 8 Nm (A8.8) |
| Threads of mounting holes: M6x10 |

## 9 - DSE5GL - OVERALL AND MOUNTING DIMENSIONS

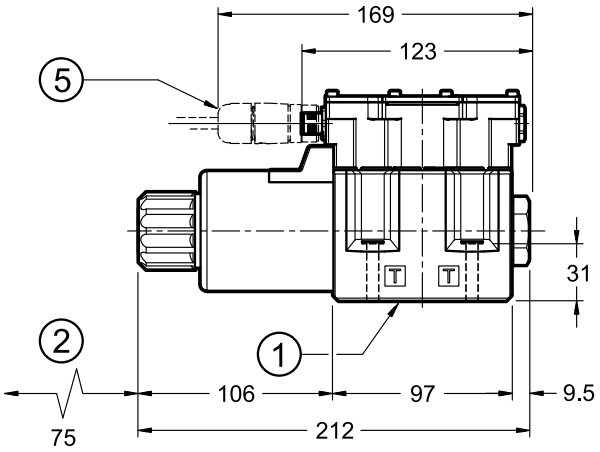
dimensions in mm

**DSE5GL-**/K12**




**DSE5GL-*SA/K12**



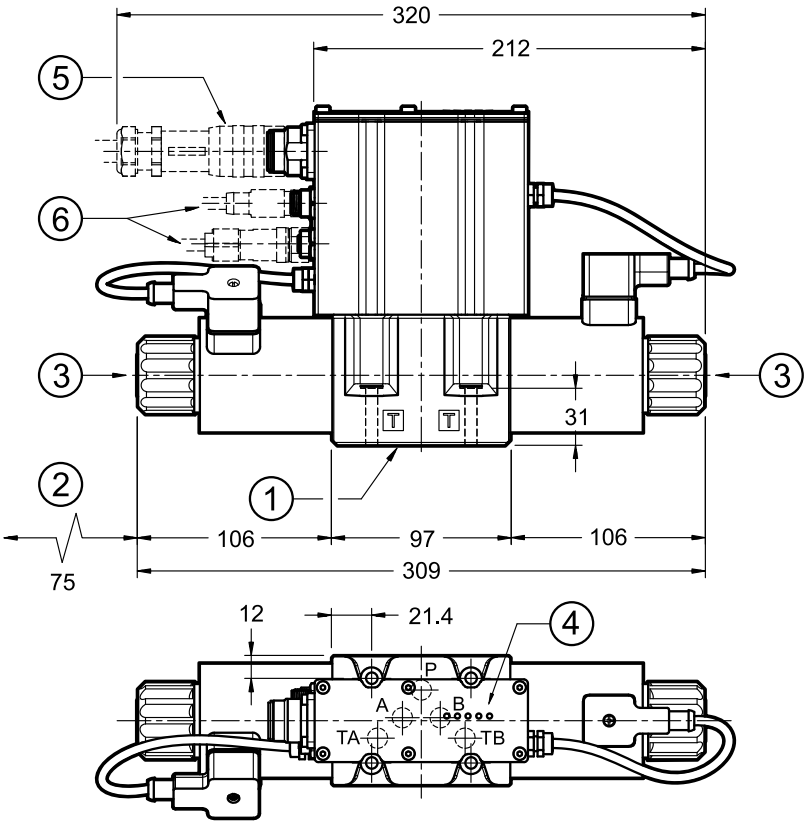

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) 90 Shore |
| 2 | Connection M12 A 5 pin |
| 3 | Standard manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector M12 5 poles - code A, female<br>**To be ordered separately.**<br>See catalogue 89 000 |

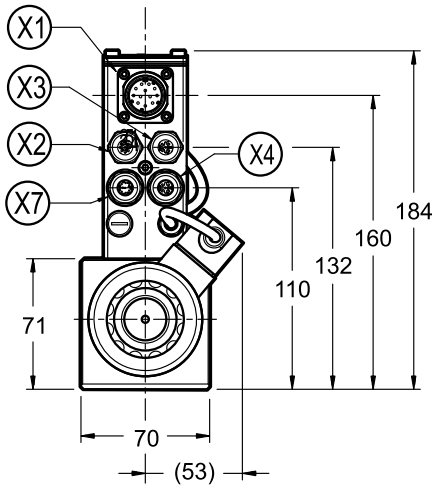
| |
|---|
| Fastening bolts: 4 SHC bolts M6x40 - ISO 4762 |
| Torque: 8 Nm (A8.8) |
| Threads of mounting holes: M6x10 |

## 10 - DSE5GH - OVERALL AND MOUNTING DIMENSIONS

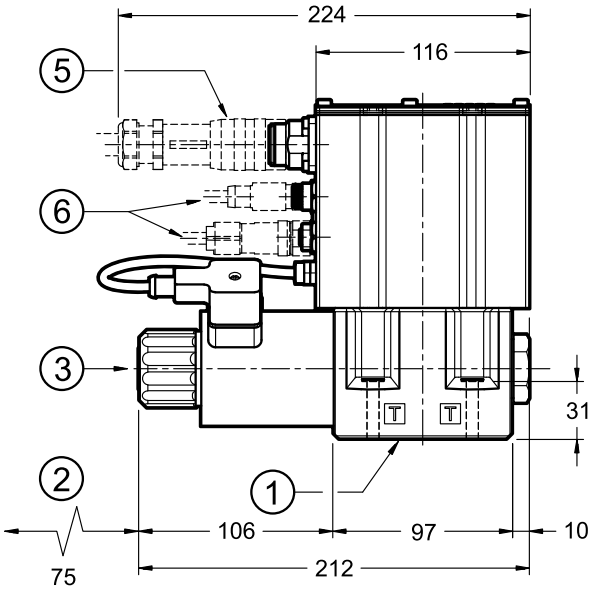
**DSE5GH-**/K16**

dimensions in mm




**DSE5GH-*SA/K16**




| | |
|---|---|
| X1 | Main connection 11 pin + PE |
| X2 | Fieldbus communication (IN) |
| X3 | Fieldbus communication (OUT) |
| X4 | X4 connection for analogue transducer |
| X7 | X7 connection for digital transducer |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) 90 Shore |
| 2 | Coil removal space |
| 3 | Manual override by pin integrated in the solenoid tube |
| 4 | Fieldbus LED |
| 5 | Mating connector 11 poles + PE<br>**To be ordered separately.**<br>See catalogue 89 000 |
| 6 | Mating connectors for fieldbus communication and signals<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Fastening bolts: 4 SHC bolts M6x40 - ISO 4762 |
| Torque: 8 Nm (A8.8) |
| Threads of mounting holes: M6x10 |

**NOTE 1**: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to point 5 for connection descriptions and pinout

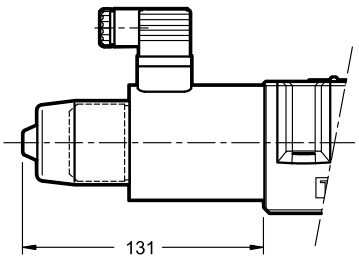
## 11 - MANUAL OVERRIDE

These valves have solenoids whose pin for manual operation is integrated in the tube. Actuate this override by pushing it with a suitable tool, minding not to damage the sliding surface.

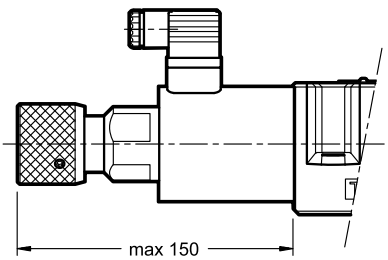
Three other types of manual overrides can fit the DSE5 and DSE5GL valve:

- **CM**: manual override boot protected.
- **CK**: turning knob override.
- **CK2**: push and twist

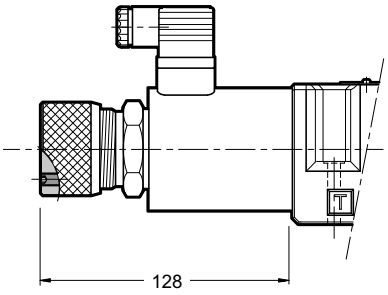
**CM version -** Code: 0239051




**CK2 version -** Code: 3401310004




**CK version -** Code: 3803260003




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

Spanner for set screw: 3 mm

## 12 - 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.

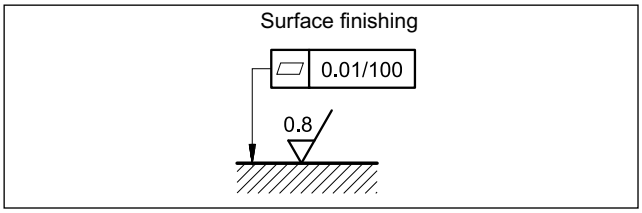
The fluid must be preserved in its physical and chemical characteristics.

## 13 - INSTALLATION

These 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.




## 14 - ACCESSORIES

(to be ordered separately)

### 14.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

### 14.2 - Mating connectors and caps for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

### 14.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 mm²
- up to 40 m cable length : 1,5 mm² (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 mm²

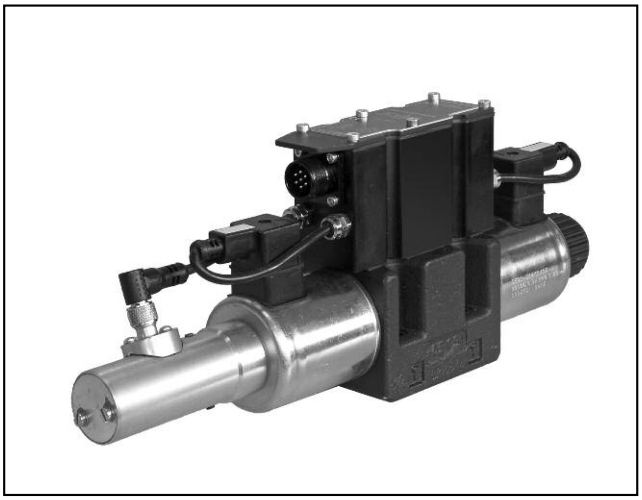
### 14.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic. See catalogue 89 850.

## 15 - SUBPLATES

(see catalogue 51 000)

| |
|---|
| PMD4-AI4G rear ports 3/4” BSP |
| PMD4-AL4G side ports 1/2” BSP |



# DSE5J

## DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL FEEDBACK AND INTEGRATED ELECTRONICS

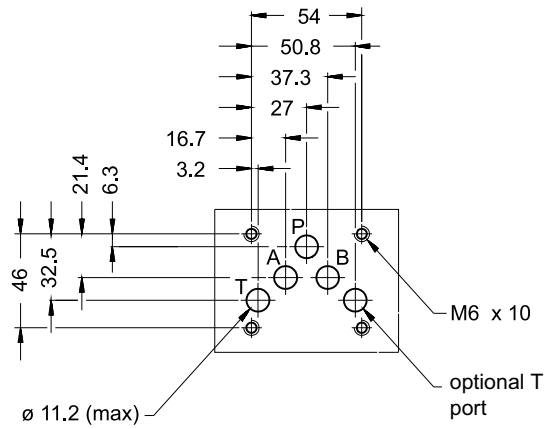
**SERIES 31**

## SUBPLATE MOUNTING ISO 4401-05

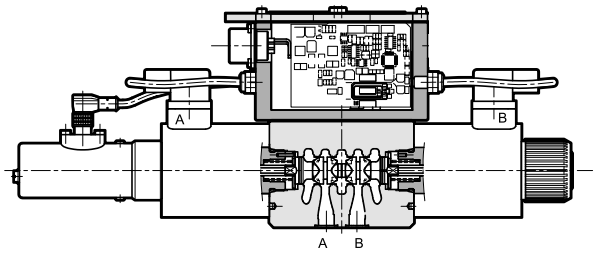
**p** max **320** bar
**Q** max **180** l/min

### MOUNTING INTERFACE

ISO 4401-05-04-0-05
(CETOP 4.2-4-05-320)




### 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).

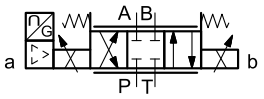
### PERFORMANCES

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

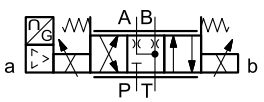
| | | |
|---|---|---|
| Max operating pressure: - P - A - B ports<br>- T port | bar | 320<br>210 |
| Nominal flow with Δp 10 bar P-T | l/min | 50 - 75 |
| Response times | see paragraph 7 | |
| Hysteresis | % of Q max | < 0,2% |
| Repeatability | % of Q max | < ± 0,1% |
| Threshold | | < 0,1% |
| Valve 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<br>double solenoid valve | kg | 5,6<br>7,1 |

### HYDRAULIC SYMBOLS (typical)

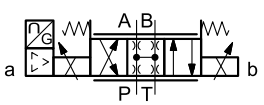
DSE5J-C*




DSE5J-A*




DSE5J-Z*



## 1 - IDENTIFICATION CODE

| D | S | E | 5 | J | - | | | | | / | 31 | | - | | K11 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Direct operated directional control valve

Electric proportional control

Size ISO 4401-05

Digital integrated electronics for valves with feedback

Spool type:
**C** = closed centre
**A** = open centre
**Z** = zero overlap
**RC** = regenerative closed centre

Nominal flow rate of the spool (see par. 2)

**FS** = Fail safe option (omit if not required).
Available on spools type Z only.

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

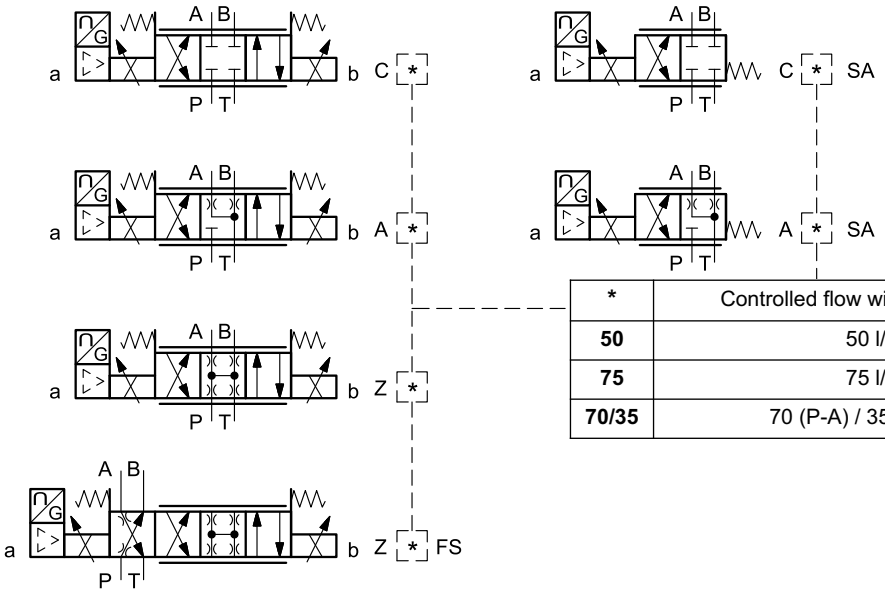
Pin C function:
**A** = external enable
**B** = internal enable
**C** = 0V monitor

## 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 |

| * | Controlled flow with Δp 5 bar |
|---|---|
| **75/45** | 75 (P-A, A-T) / 45 (B-P) l/min |

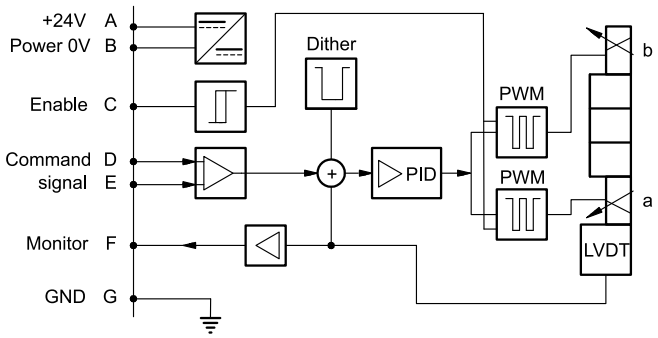
## 3 - ELECTRICAL CHARACTERISTICS

### 3.1 - Electrical on board electronics

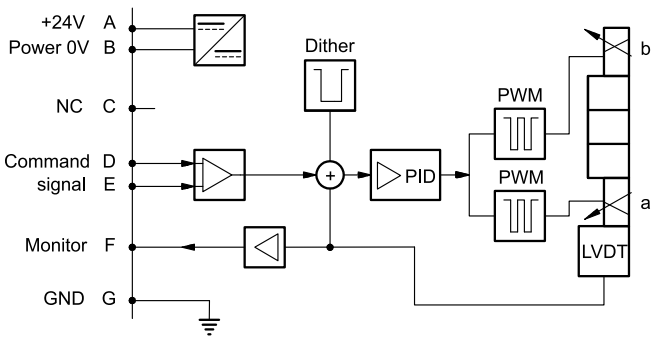
| | | | |
|---|---|---|---|
| Duty cycle | | | 100% (continuous operation) |
| Protection class according to EN 60529 | | | IP65 / IP67 |
| Supply voltage | | V DC | 24 (from 19 to 30 VDC), ripple max 3 Vpp |
| Power consumption | | VA | 40 |
| Maximum solenoid current | | A | 2.8 |
| Fuse protection, external | | | 3A |
| Command signals: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri > 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signals: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ro > 1 kOhm)<br>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)<br>emissions EN 61000-6-4<br>immunity EN 61000-6-2 | | | According to 2014/30/EU standards |

### 3.2 - On-board electronics diagrams

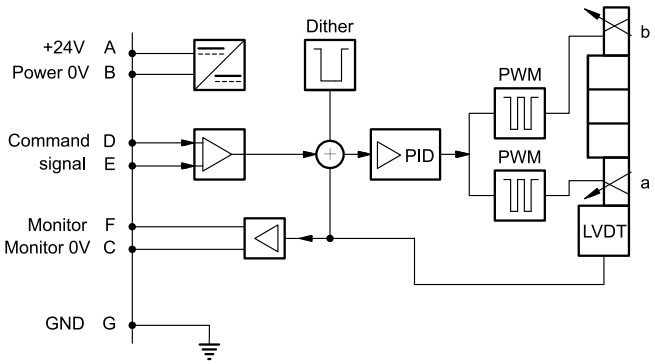
**VERSION A** - External Enable




**VERSION B** - Internal Enable

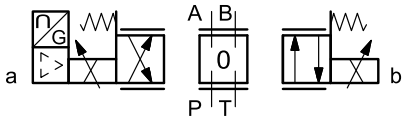



**VERSION C** - 0V Monitor

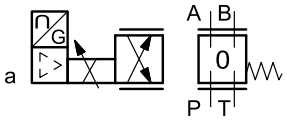


## 4 - VERSIONS WITH VOLTAGE COMMAND (E0)

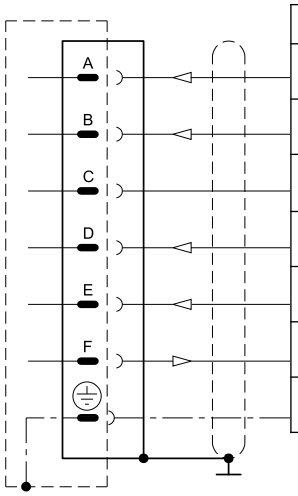
The reference signal is between -10V and +10V on double solenoid valves, and 0 ÷ 10V on single solenoid valves SA. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.




| | | | |
|---|---|---|---|
| **COMMAND** | **-10V** | **0V** | **+10V** |
| **MONITOR** | **-10V** | **0V** | **+10V** |




| | | | |
|---|---|---|---|
| **COMMAND** | **+10V** | **0V** | |
| **MONITOR** | **+10V** | **0V** | |

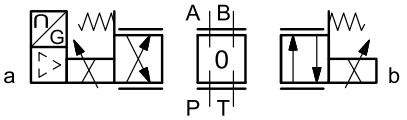



| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply Voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable<br>24 V DC | not used<br>- | PIN F reference<br>0 V |
| **D** | ± 10 V | Command (differential input) | | |
| **E** | 0 V | PIN D reference | |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

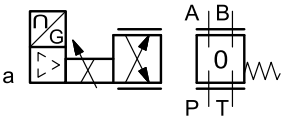
## 5 - VERSIONS WITH CURRENT COMMAND (E1)

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.

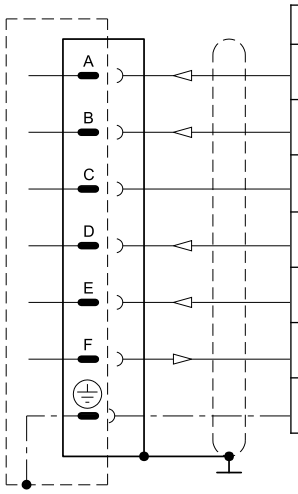
The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.




| | | | |
|---|---|---|---|
| **COMMAND** | **4 mA** | **12 mA** | **20 mA** |
| **MONITOR** | **4 mA** | **12 mA** | **20 mA** |




| | | | |
|---|---|---|---|
| **COMMAND** | **20 mA** | **4 mA** | |
| **MONITOR** | **20 mA** | **4 mA** | |

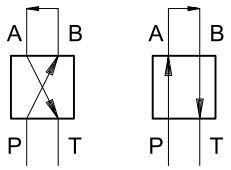



| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply Voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable<br>24 V DC | not used<br>- | PIN F reference<br>0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | PIN D reference | | |
| **F** | 4 ÷ 20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

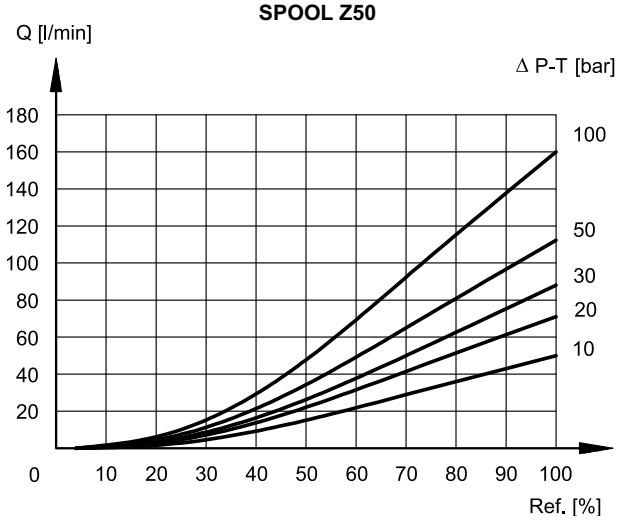
## 6 - CHARACTERISTIC CURVES

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

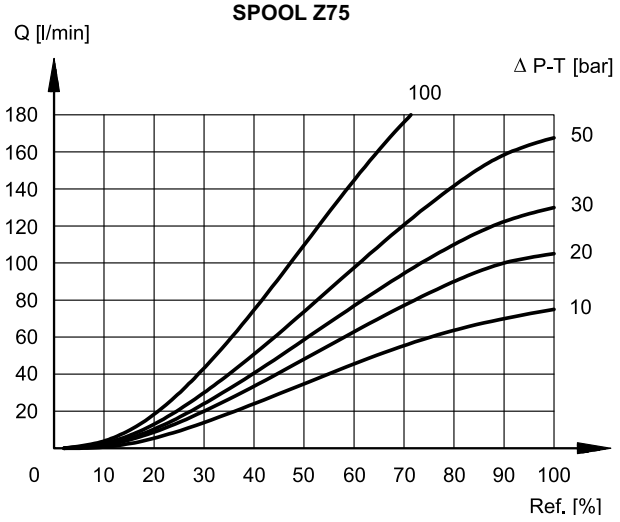
Typical flow rate curves related to the reference signal and measured for the available spools.
The Δp values are measured between P and T valve ports.



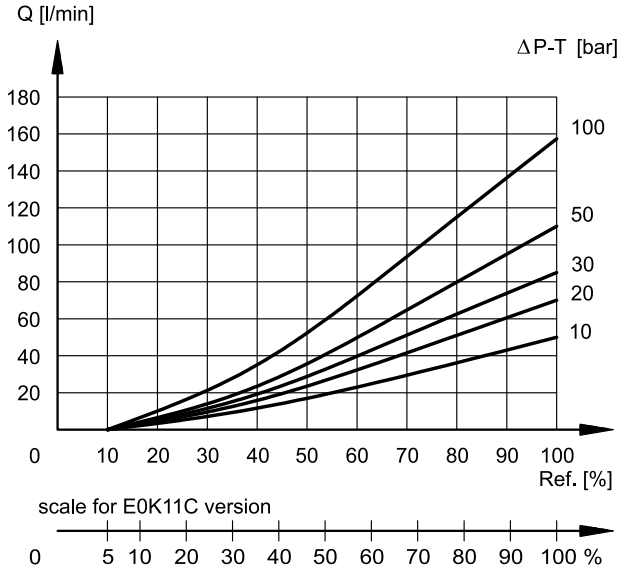

**SPOOL Z50**



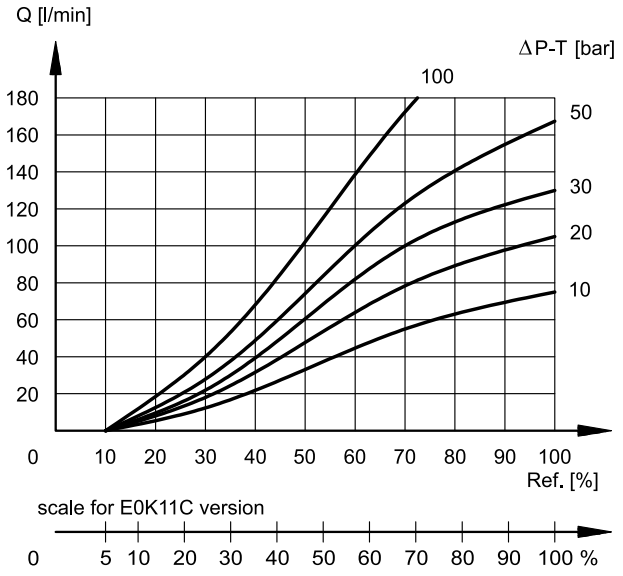

**SPOOL Z75**



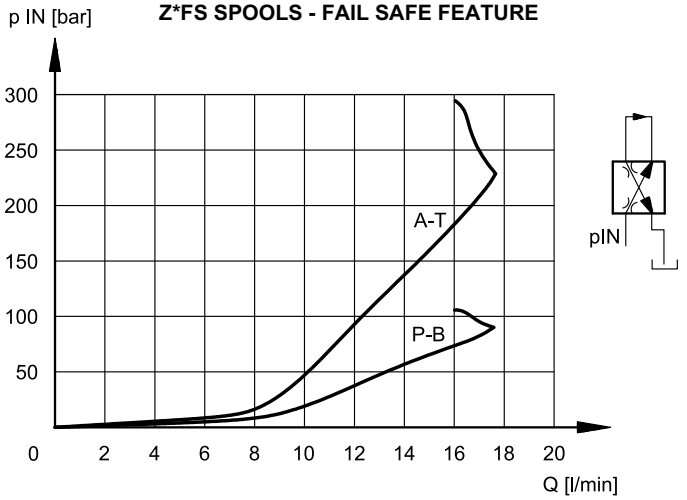

**SPOOLS A50 - C50**




**SPOOLS A75 - C75**



**Z*FS SPOOLS - FAIL SAFE FEATURE**

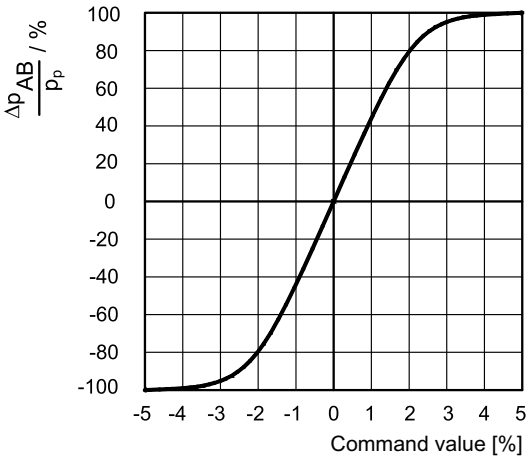



Flow P→B / A→T with valve in fail safe position, depending on the incoming pressure.

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**



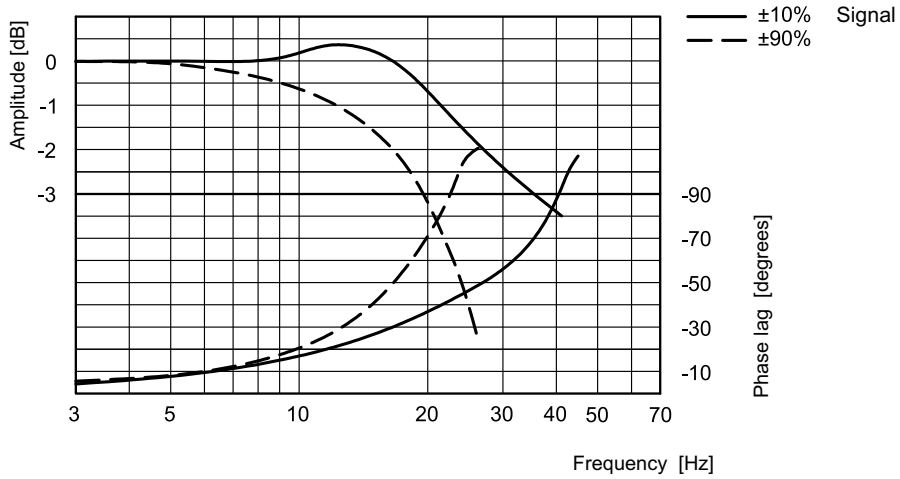

The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B (Δp AB) and the P system pressure, according to the reference signal.

In practice, the pressure gain states the valve reaction towards external disturbances aimed at changing the actuator position.

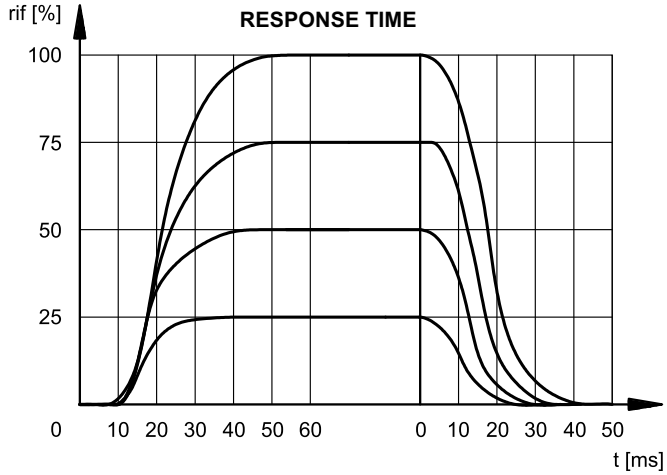
## 7 - RESPONSE TIMES

(obtained with mineral oil with viscosity of 36 cSt at 50°C 140 bar Δp P→T)

**FREQUENCY RESPONSE (SPOOL Z - 4/3 valve)**



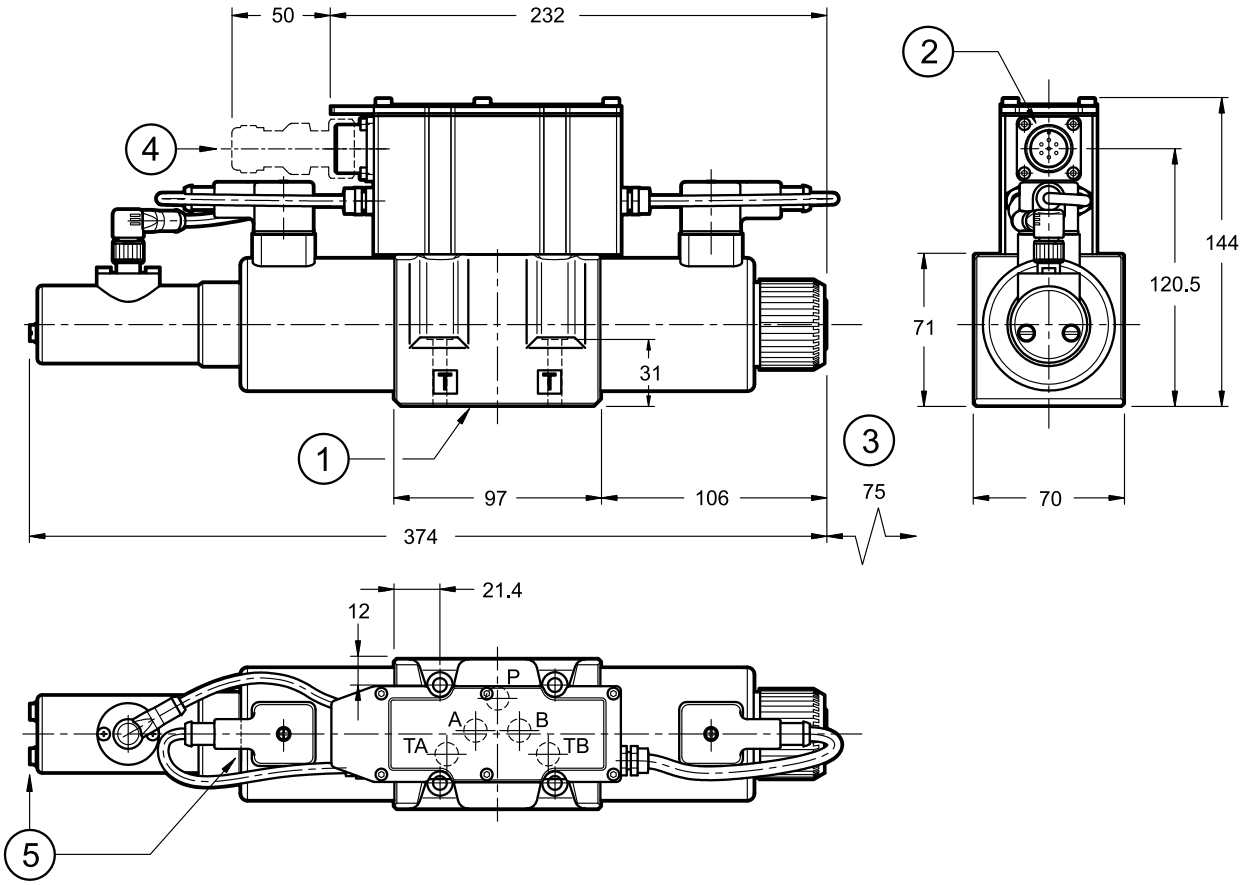

**RESPONSE TIME**



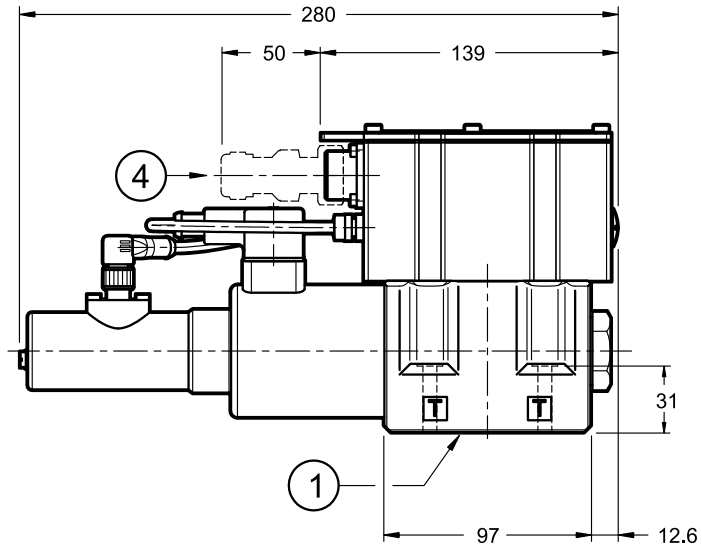
## 8 - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

**DSE5J-A***
**DSE5J-C*, DSE5J-RC***
**DSE5J-Z***




**DSE5J-A* SA**
**DSE5J-C* SA**




| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) 90 Shore |
| 2 | Main connection |
| 3 | Coil removal space (solenoid B only) |
| 4 | Mating connector.<br>**To be ordered separately.**<br>See paragraph 11 |
| 5 | Adjustment sealing performed at factory.<br>Do not disassemble the transducer. |

| |
|---|
| Fastening bolts: 4 SHC 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.

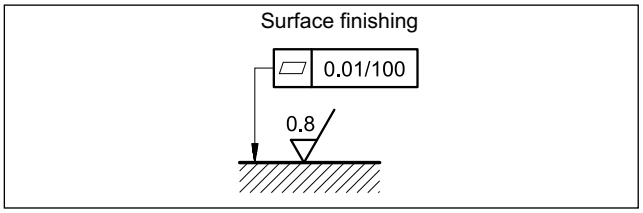
The fluid must be preserved in its physical and chemical characteristics.

## 10 - INSTALLATION

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.

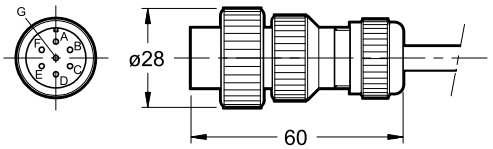



## 11 - ACCESSORIES

(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.

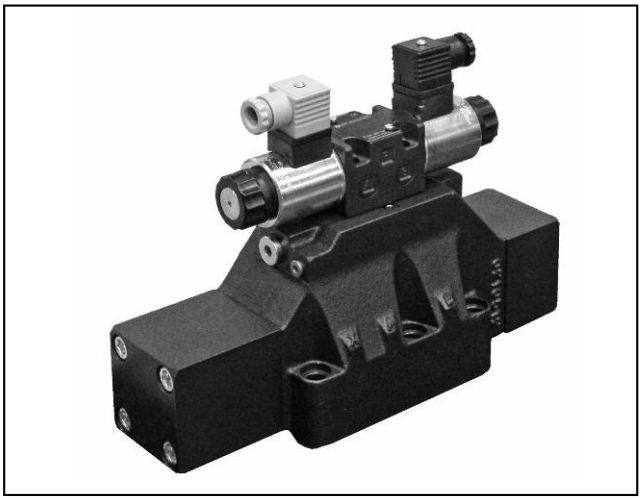
### 11.3 - Kit for start-up LINPC-USB

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 |



# DSPE*

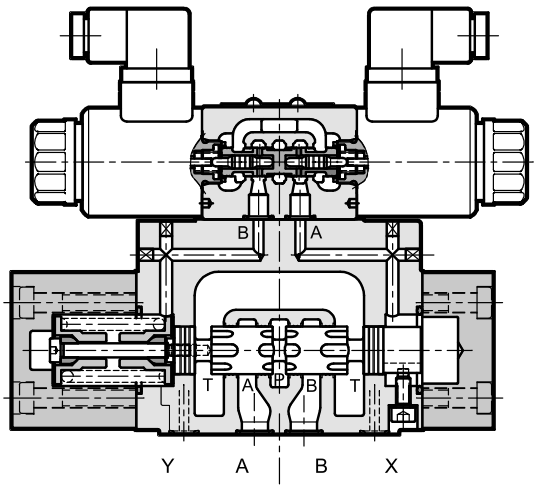
## PILOT OPERATED DIRECTIONAL VALVE WITH PROPORTIONAL CONTROL

### SERIES 11

| | |
|---|---|
| **DSPE5** | **CETOP P05** |
| **DSPE5R** | **ISO 4401-05** |
| **DSPE7** | **ISO 4401-07** |
| **DSPE8** | **ISO 4401-08** |
| **DSPE10** | **ISO 4401-10** |

**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. 16).

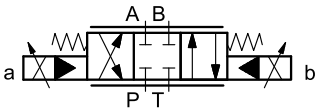
— They are available in CETOP P05, ISO 4401-05 , ISO 4401-07, ISO 4401-08 and ISO 4401-10 sizes. Each size can be supplied with different controlled flow rates, up to 1600 l/min.

### PERFORMANCES

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

| | | DSPE5 DSPE5R | DSPE7 | DSPE8 | DSPE10 |
|---|---|---|---|---|---|
| Max operating:<br>- P - A - B ports<br>- T port | bar | 350<br>see paragraph 6 | | | |
| Controlled flow rate with Δp 10 bar P-T | l/min | see paragraph 2 | | | |
| Step response | | see paragraph 5 | | | |
| Hysteresis (with PWM 100 Hz) | % Q max | < 4% | | | |
| Repeatability | % Q max | < ±2% | | | |
| Electrical characteristics | | 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: single solenoid valve<br>double solenoid valve | kg | 7,1<br>7,5 | 9,3<br>9,7 | 15,6<br>16 | 52,5<br>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
**7** = ISO 4401-07
**8** = ISO 4401-08
**10** = ISO 4401-10

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

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

Coil electrical connection: for connector type EN 175301-803 (ex DIN 43650)
**D12** = voltage 12V DC
**D24** = voltage 24V DC

Manual override: (see par. 7)

**NOTE**: This version is interchangeable with the model E4E Duplomatic

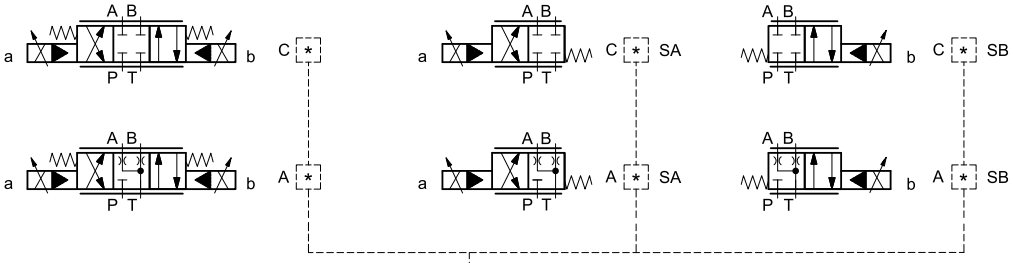
## 2 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of the following elements: number of proportional solenoids, spool type, rated flow.

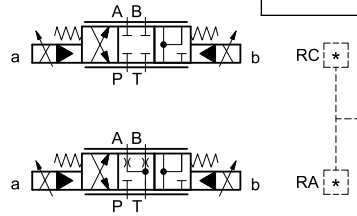
Configuration 2 solenoids:
3 positions with spring centering

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<br>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 |

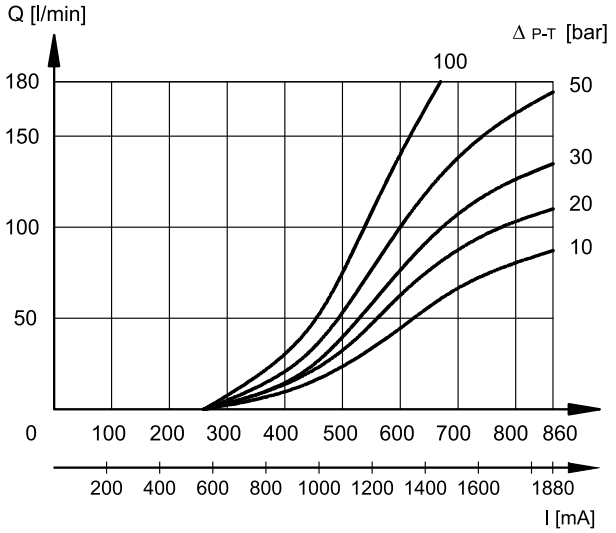
## 3 - CHARACTERISTIC CURVES

(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 the current supply to the solenoid, measured for the available spool types.
The reference Δp values are measured between valve ports P and T.

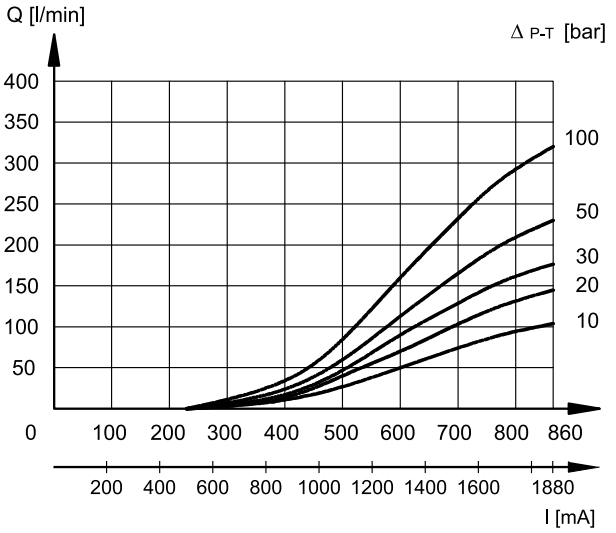
### 3.1 - Characteristic curves DSPE5 e DSPE5R

**SPOOL C80 - A80**

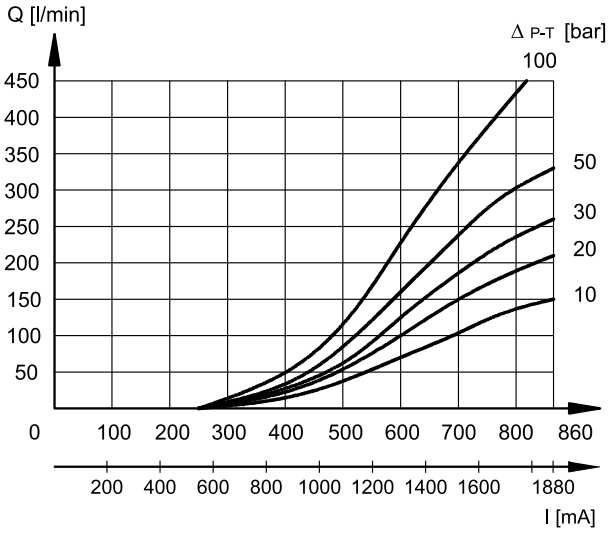



### 3.2 - Characteristic curves DSPE7

**SPOOL C100 - A100**

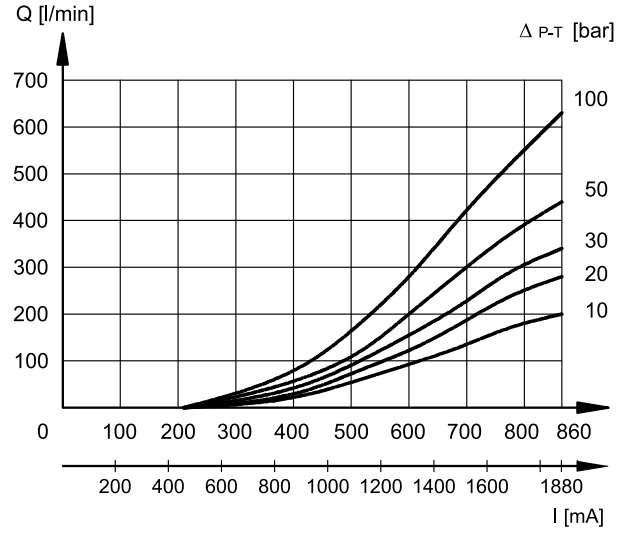



**SPOOL C150 - A150**

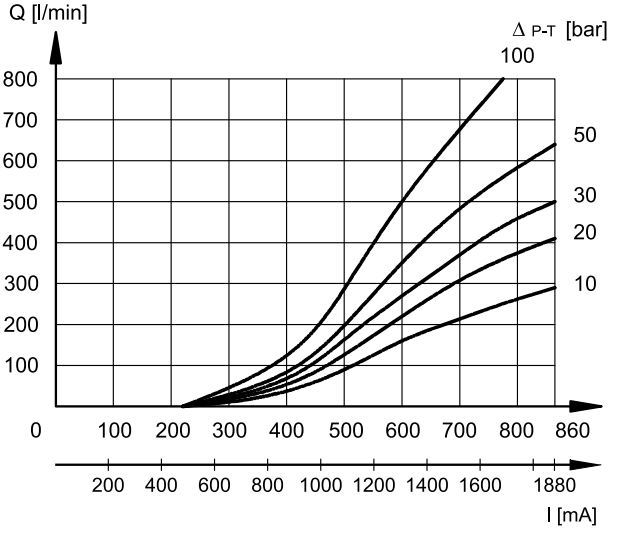


### 3.3 - Characteristic curves DSPE8

**SPOOL C200 - A200**

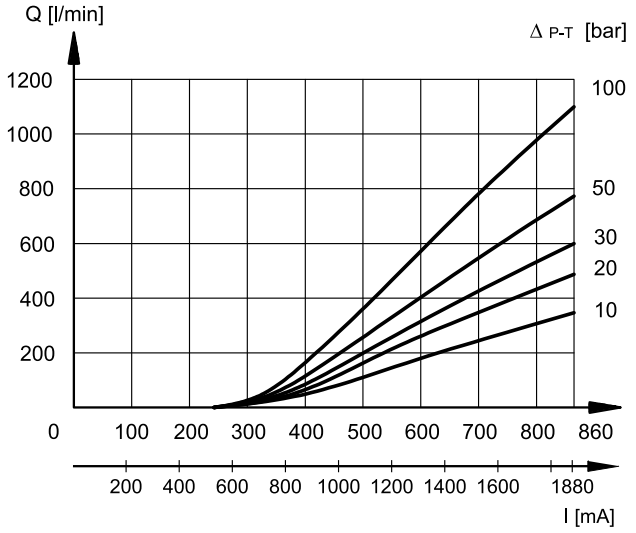



**SPOOL C300 - A300**

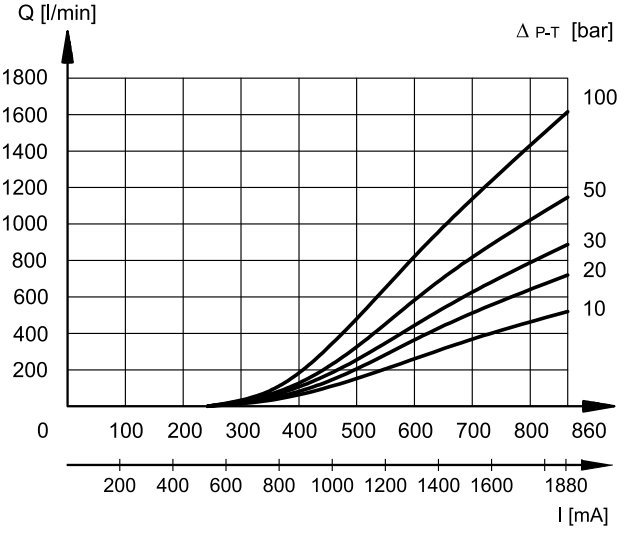



### 3.4 - Characteristic curves DSPE10

**SPOOL C350 - A350**




**SPOOL C500 - A500**



## 4 - 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 2014/30/EU | |
| **CLASS OF PROTECTION**<br>atmospheric agents (CEI EN 60529)<br>coil insulation (VDE 0580)<br>Impregnation | | IP 65<br>class H<br>class F | |

## 5 - 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] | |
| **DSPE5 / DSPE5R** | 50 | 40 |
| **DSPE7** | 80 | 50 |
| **DSPE8** | 100 | 70 |
| **DSPE10** | 200 | 120 |

## 6 - HYDRAULIC CHARACTERISTICS

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

| | | **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 |

| **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.**

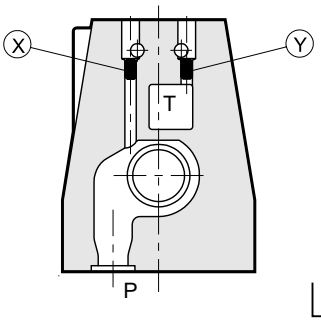
Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (piloting type: Z, see par. 1 and 12).

### 6.1 - Pilot and drain

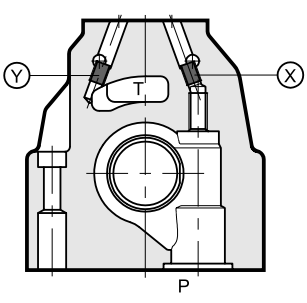
DSPE* valves are available with pilot and drain both internal and external. The version with external drain allows a higher back pressure on the unloading. The version with external pilot with reduced pressure must be used when higher pressures are needed.

| 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 |

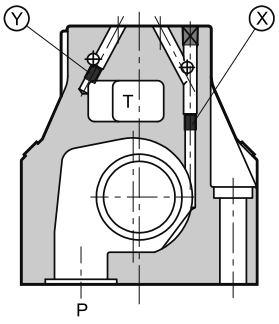
**DSPE5**
**DSPE5R**



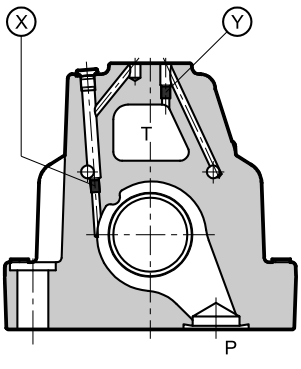

**DSPE7**




**DSPE8**




**DSPE10**




**X**: plug M5x6 for external pilot
**Y**: plug M5x6 for external drain

**X**: plug M6x8 for external pilot
**Y**: plug M6x8 for external drain

## 7 - MANUAL OVERRIDE

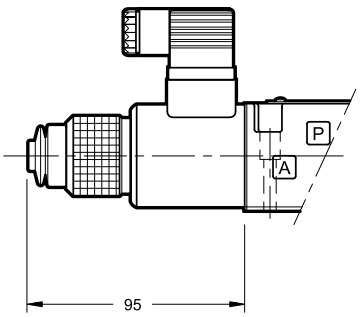
The standard valve has solenoids whose pin for the manual operation is integrated in the tube. The operation of this control must be executed with a suitable tool, minding not to damage the sliding surface.

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.

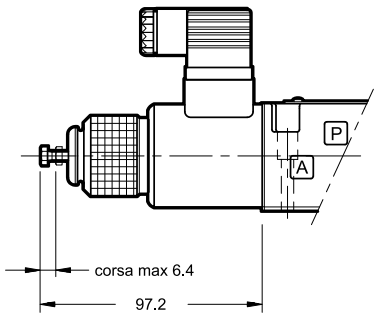
**NOTE:** The manual override use doesn't allow any proportional regulation; in fact, using this kind of override the main stage spool opens completely and the valve will behave as an on-off valve.

**CM version**



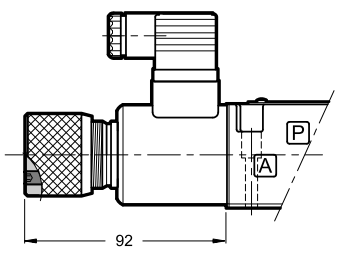

Code: 3803210003

**CS version**




Code: 3803210004

**CK version**

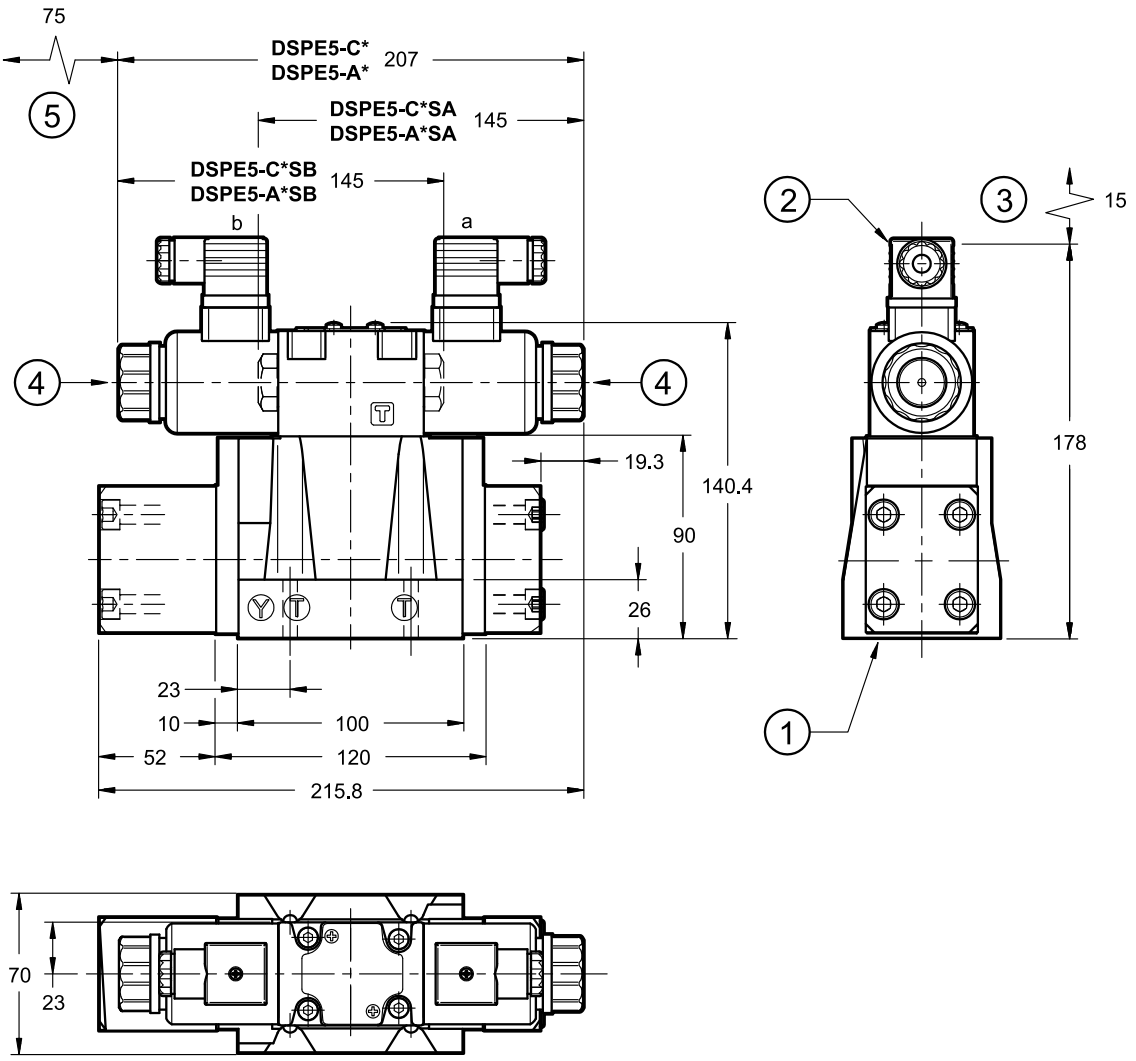



Allen key for set screw: 3 mm

Code: 3803210005

## 8 - OVERALL AND MOUNTING DIMENSIONS DSPE5 AND DSPE5R

dimensions in mm



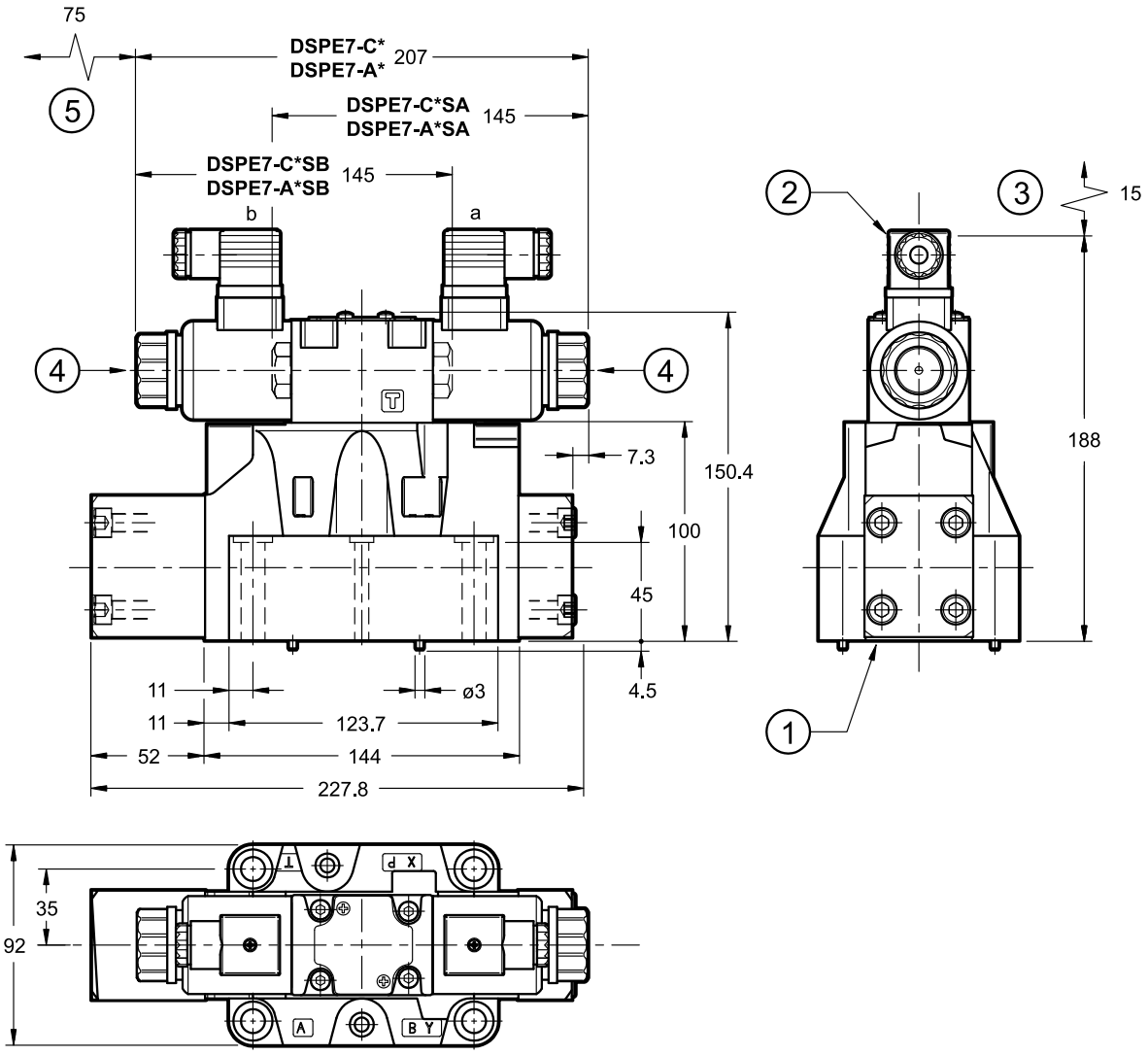

**NOTE**: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see par.12.
- Mounting surface at par. 13.

| |
|---|
| Valve fastening: N. 4 SHC screws M6x35 - ISO 4762 |
| Tightening torque: 8 Nm (A 8.8 bolts) |
| Thread of mounting holes: M6x10 |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 5 OR type 2050 (12.42x1.78) - 90 Shore<br>N. 2 OR type 2037 (9.25x1.78) - 90 Shore |
| 2 | EN 175301-803 (ex DIN 43650) electrical connector |
| 3 | Connector removal space |
| 4 | Standard manual override<br>embedded in the solenoid tube |
| 5 | Coil removal space |

## 9 - OVERALL AND MOUNTING DIMENSIONS DSPE7

dimensions in mm



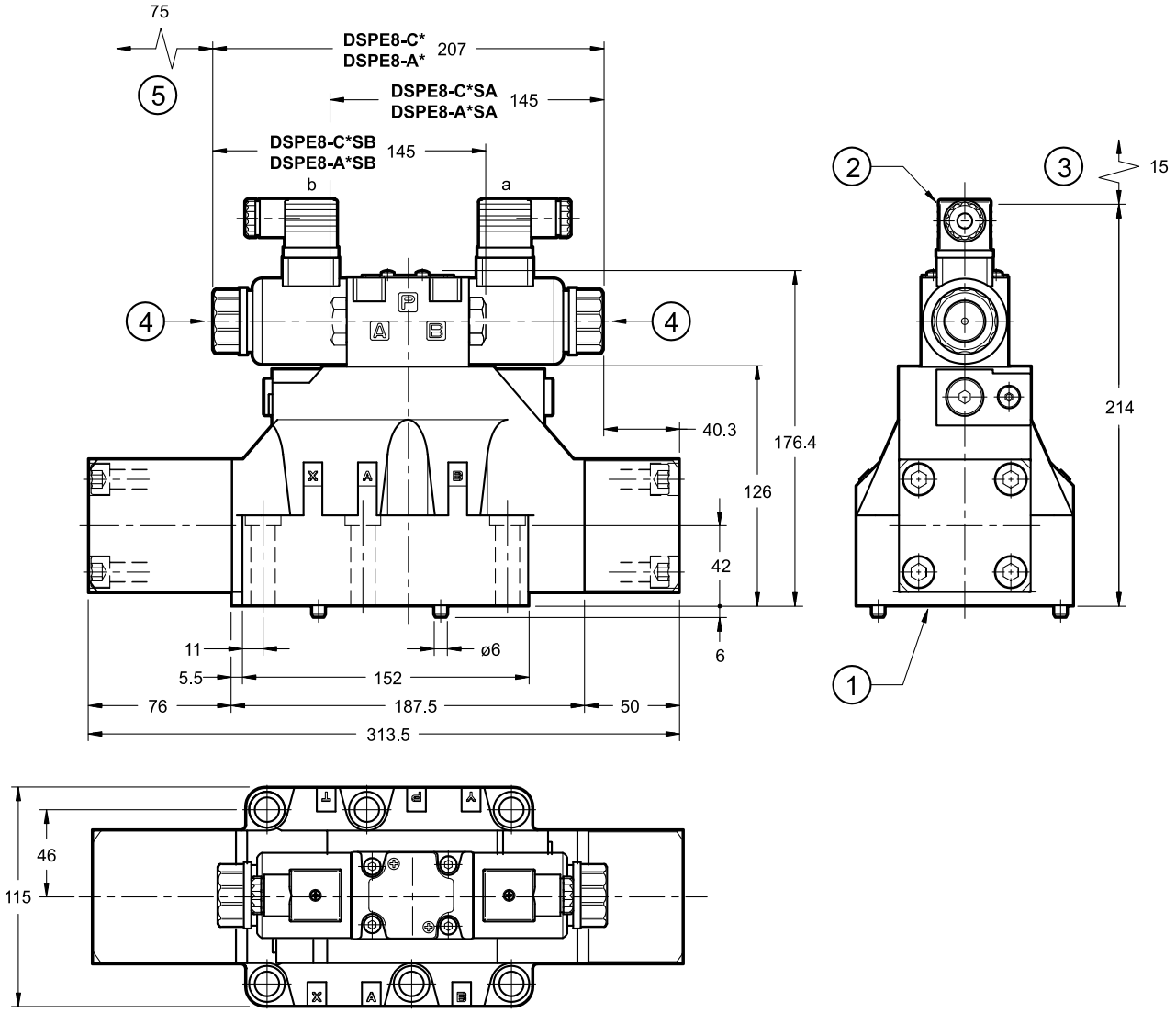

**NOTE**: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see par.12.
- Mounting surface at par. 13.

| | |
|---|---|
| Single valve fastening: | N. 4 SHC M10x60 bolts - ISO 4762<br>N. 2 SHC M6x60 bolts - ISO 4762 |
| Tightening torque: | M10x60: 40 Nm (A 8.8 bolts)<br>M6x60: 8 Nm (A 8.8 bolts) |
| Thread of mounting holes: | M6x18; M10x18 |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 130 (22.22x2.62) - 90 Shore<br>N. 2 OR type 2043 (10.82x1.78) - 90 Shore |
| 2 | EN 175301-803 (ex DIN 43650)<br>electrical connector |
| 3 | Connector removal space |
| 4 | Standard manual override<br>embedded in the solenoid tube |
| 5 | Coil removal space |

## 10 - OVERALL AND MOUNTING DIMENSIONS DSPE8

dimensions in mm



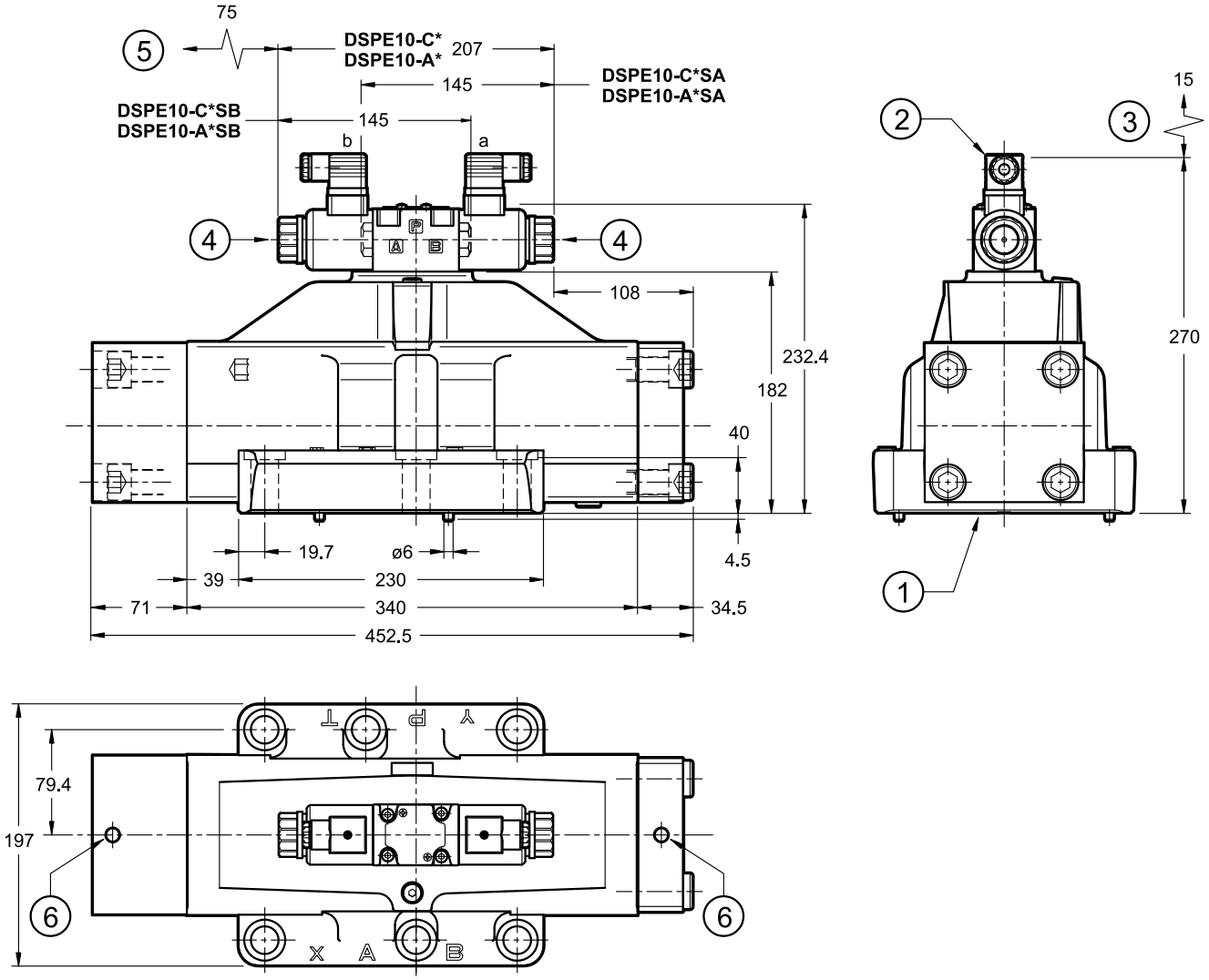

**NOTE**: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see par.12.
- Mounting surface at par. 13.

| |
|---|
| Valve fastening: N. 6 SHC M12x60 bolts - ISO 4762 |
| Tightening torque: 69 Nm (A 8.8 bolts) |
| Thread of mounting holes: M12x20 |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 3118 (29.82x2.62) - 90 Shore<br>N: 2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | EN 175301-803 (ex DIN 43650)<br>electrical connector |
| 3 | Connector removal space |
| 4 | Standard manual override<br>embedded in the solenoid tube |
| 5 | Coil removal space |

## 11 - OVERALL AND MOUNTING DIMENSIONS DSPE10

dimensions in mm




**NOTE**: for overall dimensions with Z option
(fixed adjustment pressure reducing valve) see par.12.
- Mounting surface at par. 13.

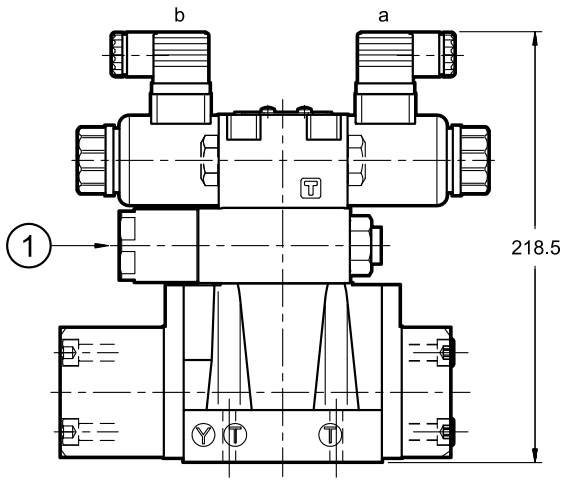
| |
|---|
| Valve fastening: N. 6 SHC M12x70 screw - ISO 4762 |
| Tightening torque: 330 Nm (A 8.8 bolts) |
| Thread of mounting holes: M20x40 |

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>N. 4 OR type 4150 (37.59x3.53) - 90 Shore<br>N: 2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | EN 175301-803 (ex DIN 43650)<br>electrical connector |
| 3 | Connector removal space |
| 4 | Standard manual override<br>embedded in the solenoid tube |
| 5 | Coil removal space |
| 6 | N. 2 M12 holes for eyebolts lifting |

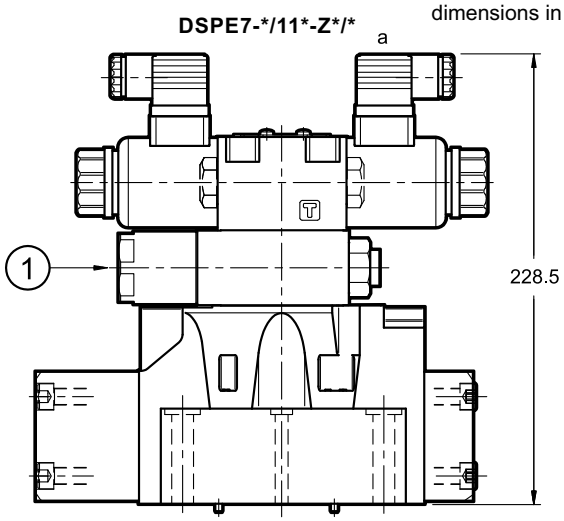
## 12 - OVERALL AND MOUNTING DIMENSIONS DSPE*-*/11*-Z*/*

dimensions in mm

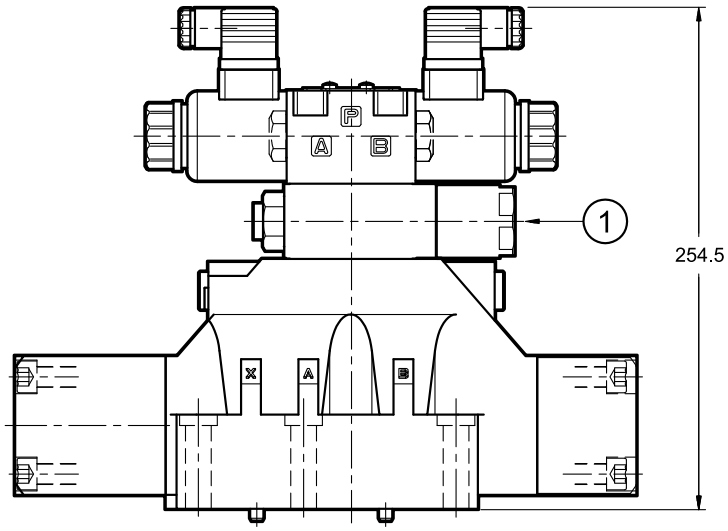
**DSPE5-*/11*-Z*/***




**DSPE7-*/11*-Z*/***

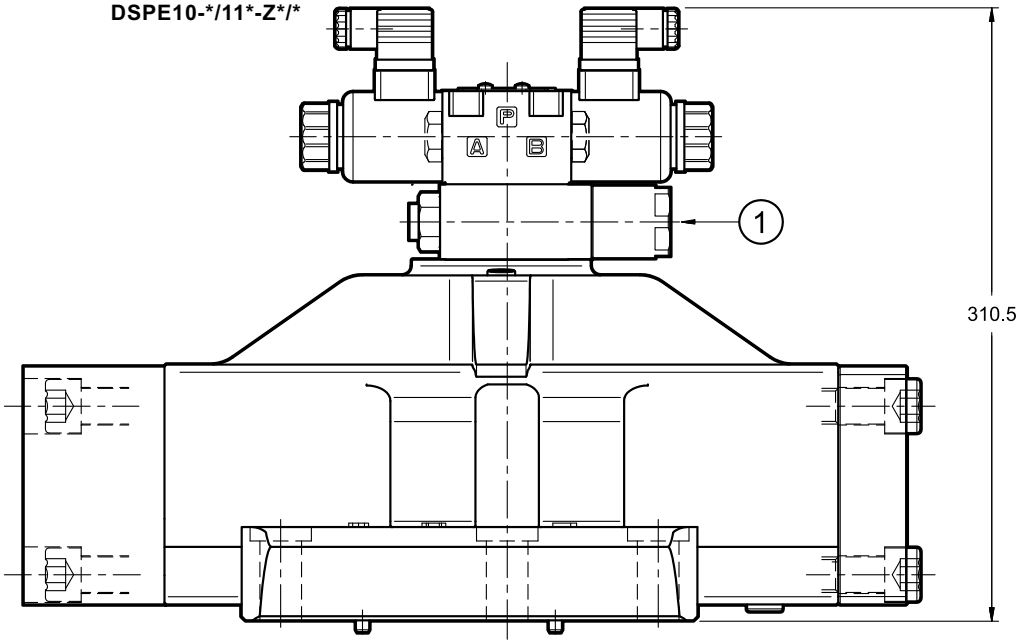



**DSPE8-*/11*-Z*/***




**NOTE:** for missing overall dimensions and characteristics see par. 8 - 9 - 10 - 11

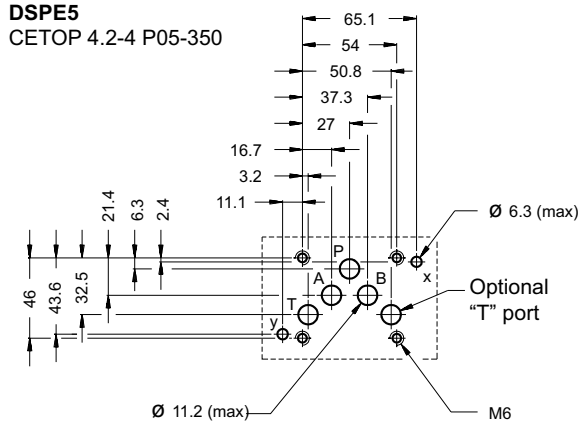
**DSPE10-*/11*-Z*/***



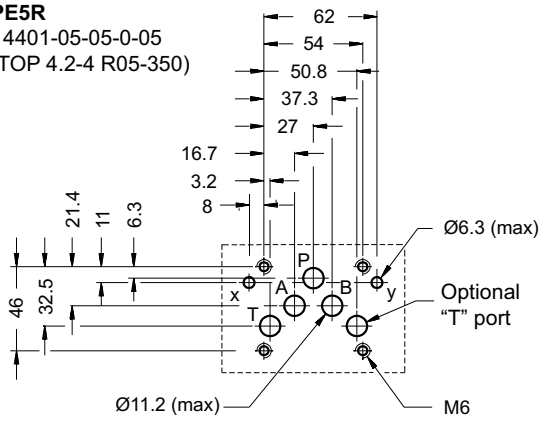

| | |
|---|---|
| 1 | 30 bar fixed adjustment pressure reducing valve |

## 13 - MOUNTING SURFACES

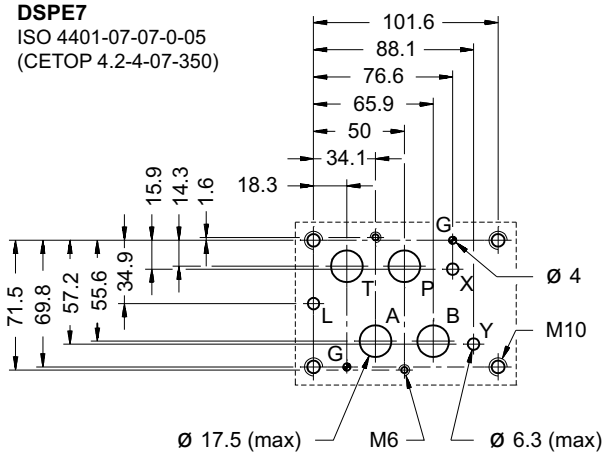
**DSPE5**
CETOP 4.2-4 P05-350



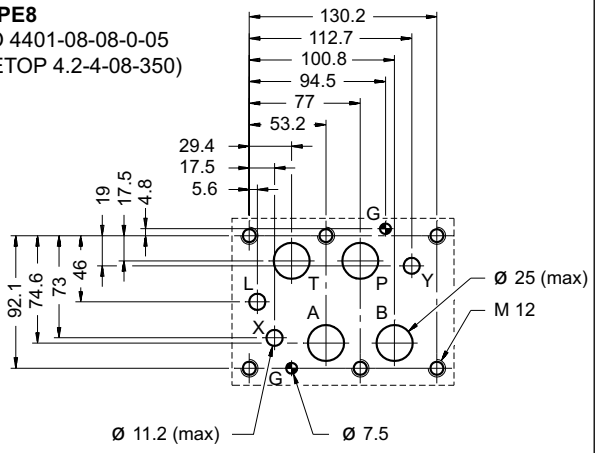

**DSPE5R**
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



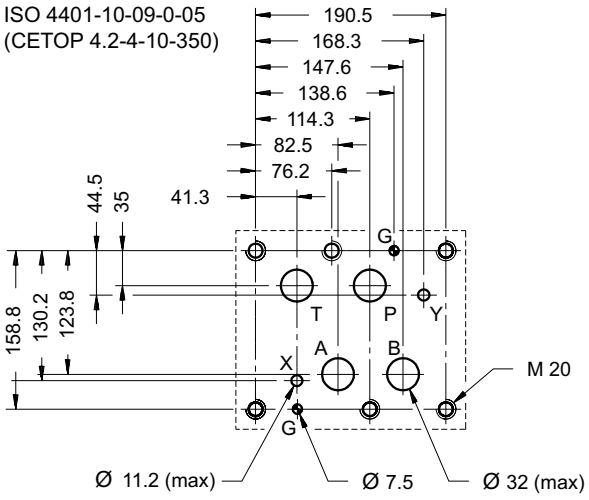

**DSPE7**
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)




**DSPE8**
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)




**DSPE10**
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)



## 14 - 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.

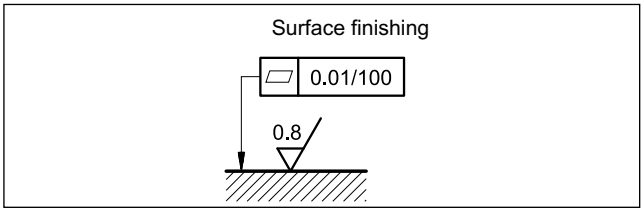
Using fluids at temperatures higher than 80 °C causes a faster degradation of the fluid and of the seals characteristics. The fluid must be preserved in its physical and chemical characteristics.

## 15 - 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.




## 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. 89 251 |
| **EDM-M141** | for solenoid 12V DC | | |

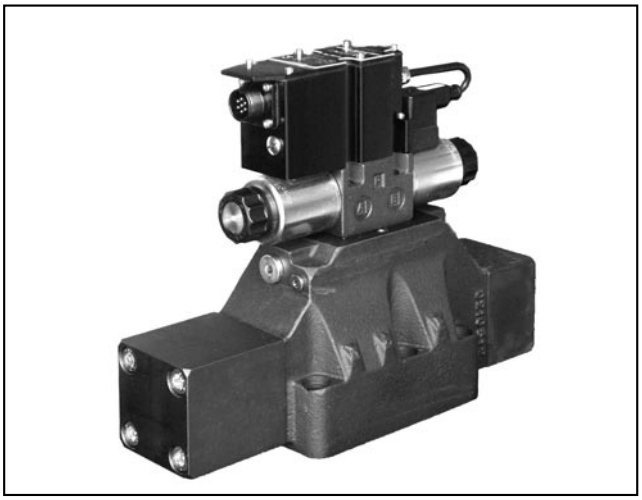
**DSPE* - A*** **DSPE* - C***

| | | | |
|---|---|---|---|
| **EDM-M211** | for solenoid 24V DC | rail mounting DIN EN 50022 | see cat. 89 251 |
| **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<br>X - Y | 3/4” BSP<br>1/4” BSP | 1” BSP<br>1/4” BSP | 1½” BSP<br>1/4” BSP | - |



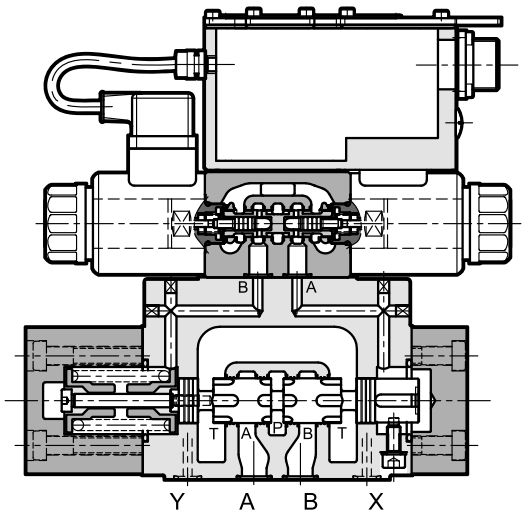
# DSPE*G*

## PROPORTIONAL DIRECTIONAL VALVES, PILOT OPERATED WITH INTEGRATED ELECTRONICS

### SUBPLATE MOUNTING

**DSPE5G*** **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



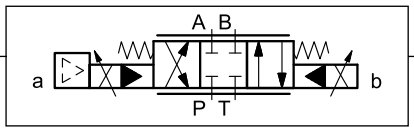

— The DSPE*G* are proportional directional control valves, pilot operated, with integrated electronics and with mounting interface in compliance with ISO 4401 standards.

— They control direction and flow of the fluid.

— The valves are available with different types of electronics, with analogue or fieldbus interfaces.

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

**HYDRAULIC SYMBOL (typical)**



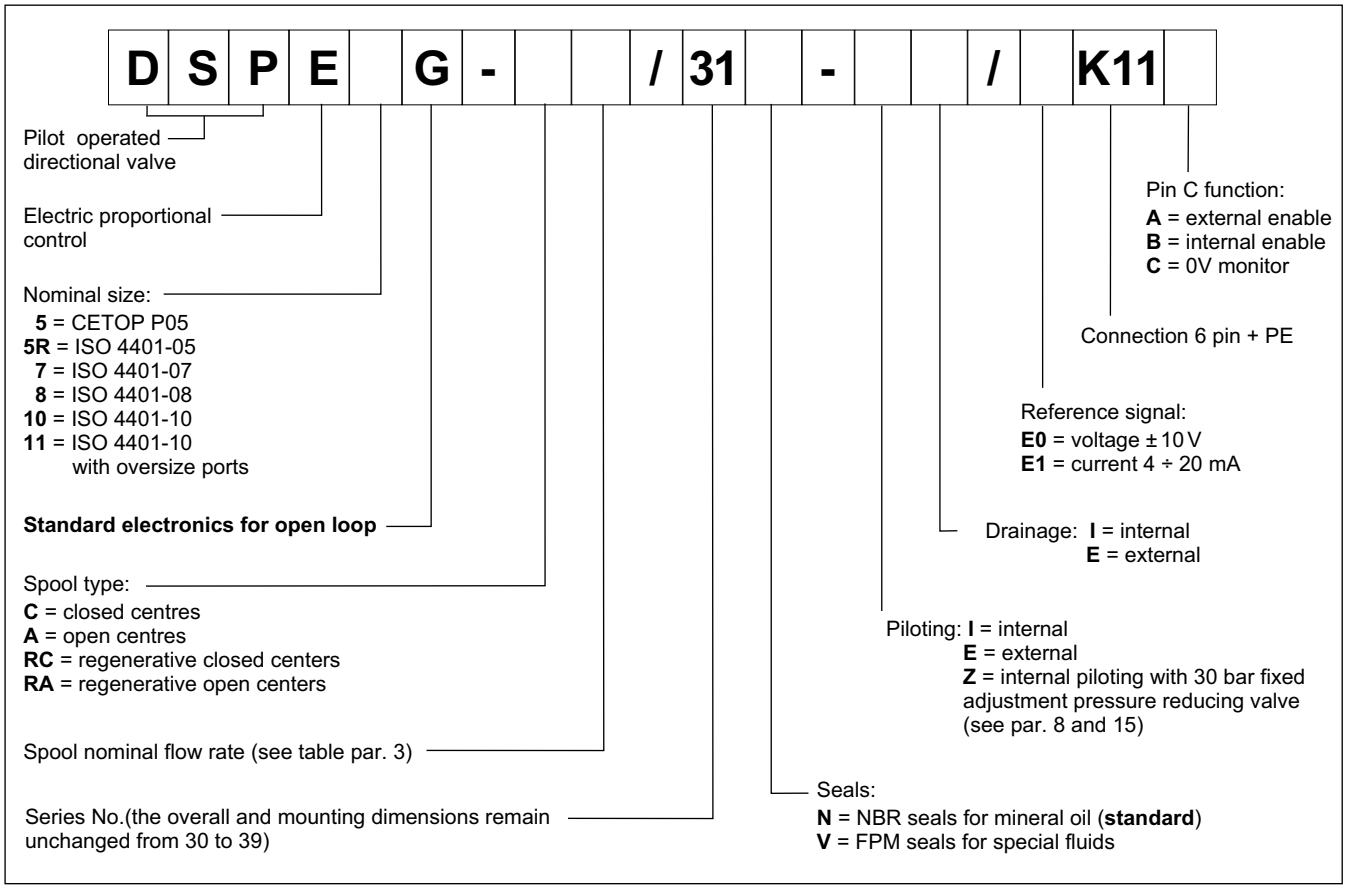

### PERFORMANCES

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

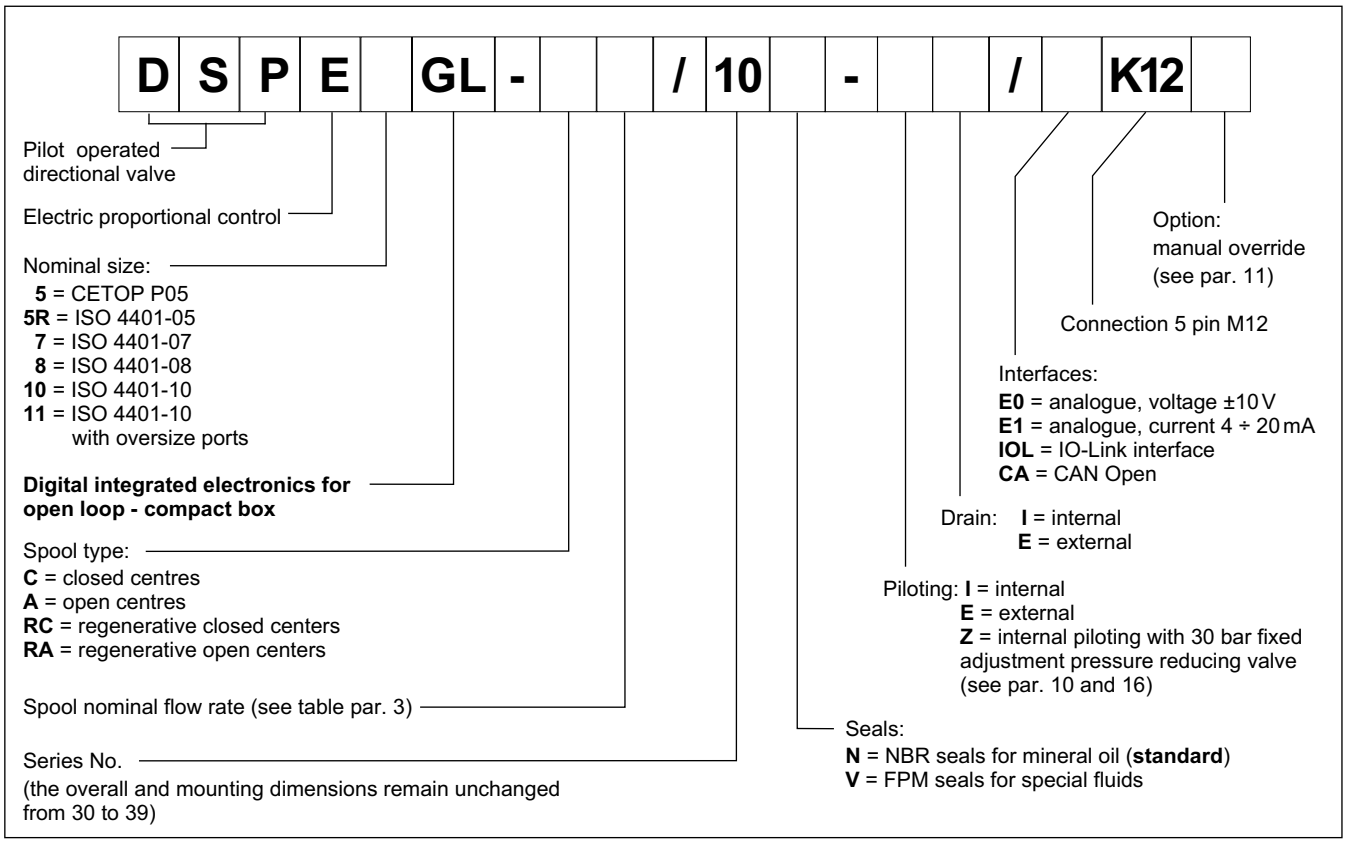
| | | DSPE5G* DSPE5RG* | DSPE7G* | DSPE8G* | DSPE10G* | DSPE11G* |
|---|---|---|---|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T port | bar | 350<br>see paragraph 10 | | | | |
| Max flowrate | l/min | 180 | 450 | 800 | 1600 | 2800 |
| Hysteresis | % Q max | < 2 % | | | | |
| Repeatability | % Q max | < ± 1% | | | | |
| Electrical characteristics | | 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 | 7.9 | 10.1 | 16.4 | 53.3 | 53 |

## 1 - IDENTIFICATION CODES

### 1.1 - Standard electronics




### 1.2 - Compact electronics



### 1.3 - Electronics with fieldbus communication

**D S P E _ GH - _ _ / 31 _ - _ _ - _ K16 _ / _ _ _**

Pilot operated directional valve

Electric proportional control

Nominal size:
**5** = CETOP P05
**5R** = ISO 4401-05
**7** = ISO 4401-07
**8** = ISO 4401-08
**10** = ISO 4401-10
**11** = ISO 4401-10 with oversize ports

**Digital integrated electronics for open loop with fieldbus communication**

Spool type:
**C** = closed centres
**A** = open centres
**RC** = regenerative closed centers
**RA** = regenerative open centers

Spool nominal flow rate (see table par. 3)

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)

Drain:
**I** = internal
**E** = external

Reference signal:
**E0** = voltage ±10 V **E1** = current 4 ÷ 20 mA
**FD** = full digital version (on request)

Connection 11 pin + PE

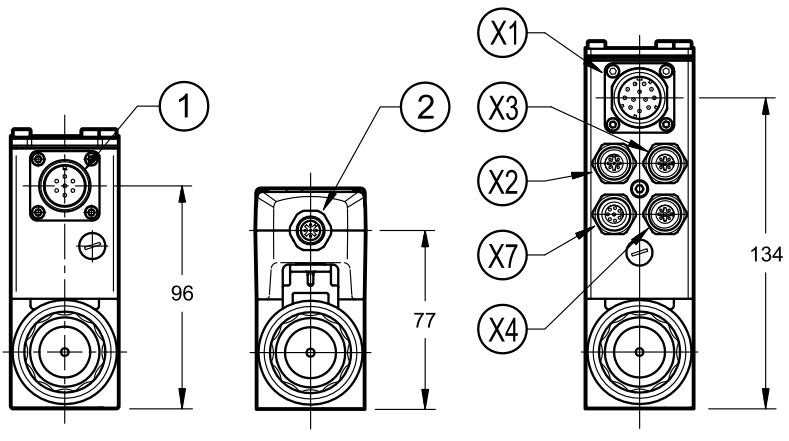
X1 Main connector configuration:
**D1** = one command
**D0** = full digital version
(on request - available for reference signal FD type only)

X2, X3 Field BUS type:
**CA** = CAN Open
**PD** = PROFIBUS DP
**EC** = EtherCAT
**EN** = Ethernet /IP
**PN** = Profinet
**PL** = PowerLink

X7 Digital transducer:
**0** = none
**1** = version 1 (SSI type)
**2** = version 2 (Encoder type)

X4 Analogue transducer:
**0** = none
**1** = version 1 (single /double transducer)

## 2 - COMPARISON AMONG INTEGRATED ELECTRONICS



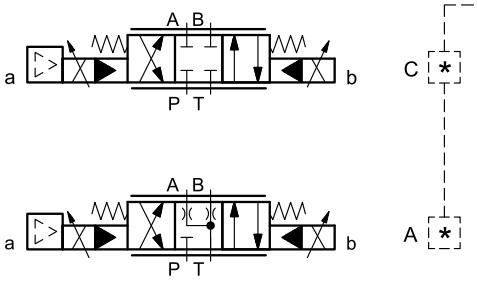

| | |
|---|---|
| 1 | Connection 6 pin + PE |
| 2 | Connection M12 5 pin, code A, male |
| X1 | Main connection 11 pin + PE |
| X2 | Fieldbus communication (IN) |
| X3 | Fieldbus communication (OUT) |
| X4 | Connection for analogue transducer |
| X7 | Connection for digital transducer |

**NOTE 1**: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 5, 6 and 7 for connections descriptions and pinouts.
**NOTE 2**: Related mating connectors have to be ordered separately. See catalogue 89 000.

## 3 - AVAILABLE CONFIGURATIONS

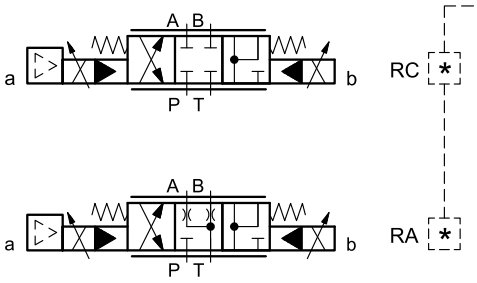
The valve configuration depends on the combination of spool type and rated flow.

**3 positions with spring centreing**




| 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 |

**regenerative spool**




| 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 |

## 4 - ELECTRONICS COMMON DATA

| | | |
|---|---|---|
| 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 | A | 3 |
| Managed breakdowns | | Overload and electronics overheating, cable breakdown, supply voltage failures |
| Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2 | | According to 2014/30/EU standards |

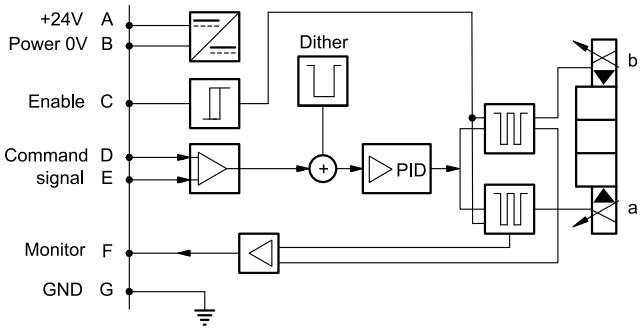
## 5 - DSPE*G - STANDARD ELECTRONICS

### 5.1 - Electrical characteristics

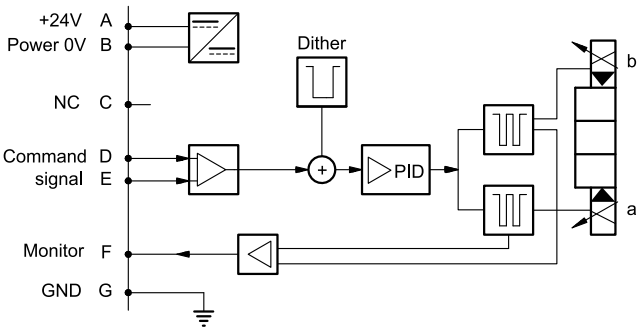
| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ± 10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | V DC<br>mA | ± 10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication for diagnostic | | LIN-bus Interface (by means of the optional kit) |
| Connection | | 6 pin + PE (MIL-C-5015-G - DIN EN 175201-804) |

### 5.2 - On-board electronics diagrams

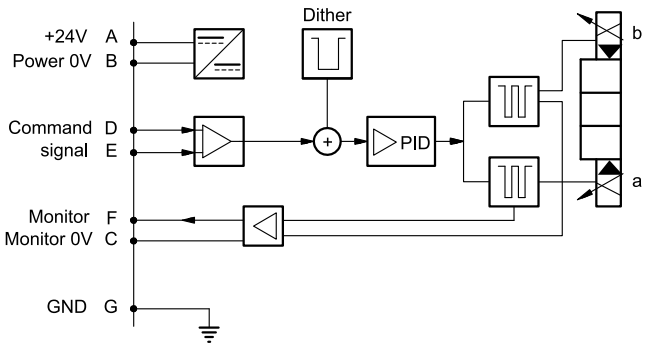
**VERSION A** - External Enable




**VERSION B** - Internal Enable

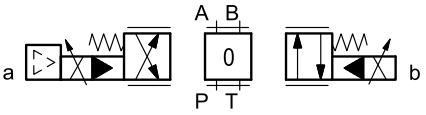



**VERSION C** - 0V Monitor

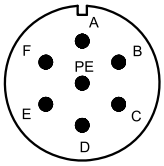


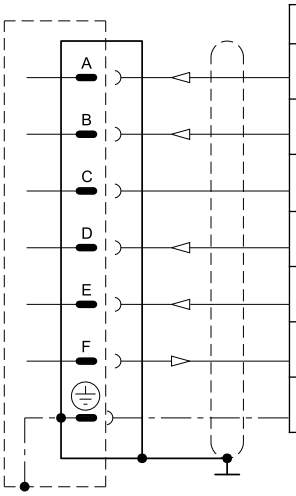
**5.3 - Versions with voltage command (E0)**

The reference signal is between -10V and +10V on double solenoid valves, 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** |



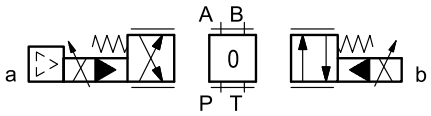




| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply Voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable 24 V DC | do not connect - | PIN F reference 0 V |
| **D** | ± 10 V | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | ± 10 V | Monitor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

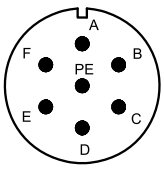
**5.4 - Versions with current command (E1)**

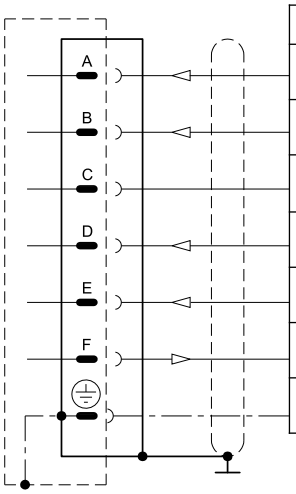
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

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** | **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 | do not connect - | PIN F reference 0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | 4 ÷ 20 mA | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

## 6 - DSPE*GL - COMPACT ELECTRONICS

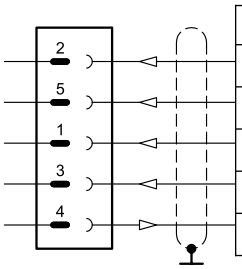
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

### 6.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>0 ÷ 5 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| IO-Link communication (IOL):<br>Data rate | <br>kBaud | <br>IO-Link Port Class B<br>230,4 |
| Can Open communication (CA):<br>Data rate | <br>kbit | <br>10 ÷ 1000 |
| Connection | | 5-pin M12 code A (IEC 61076-2-101) |

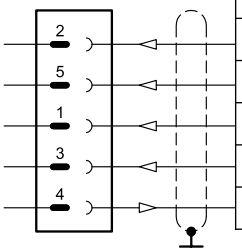
### 6.2 - Pin tables

**'E0' connection**

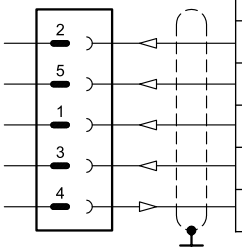

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | ± 10 V | Command |
| 3 | 0V | Command reference |
| 4 | 0 ÷ 5V | Monitor (0V reference: pin 5) |

**'E1' connection**

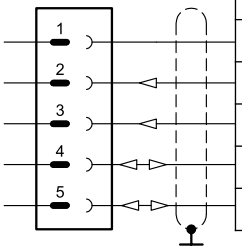

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | 4 ÷ 20 mA | Command |
| 3 | 0V | Command reference |
| 4 | 4 ÷ 20 mA | Monitor (0V reference: pin 5) |

**'IOL' connection**


| Pin | Values | Function |
|---|---|---|
| 2 | 2L+ 24 V DC | Supply of the power stage |
| 5 | 2L- 0 V (GND) | Internal galvanic isolation from PIN 3 |
| 1 | 1L+ +24 V DC | IO-Link supply voltage |
| 3 | 1L- 0V (GND) | |
| 4 | C/Q | IO-Link Communication |

**'CA' connection**


| Pin | Values | Function |
|---|---|---|
| 1 | CAN_SH | Shield |
| 2 | 24 V DC | Supply voltage |
| 3 | 0 V (GND) | |
| 4 | CAN H | Bus line (high) |
| 5 | CAN_L | Bus line (low) |

## 7 - DSPE*GH - FIELDBUS ELECTRONICS

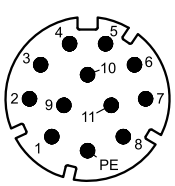
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

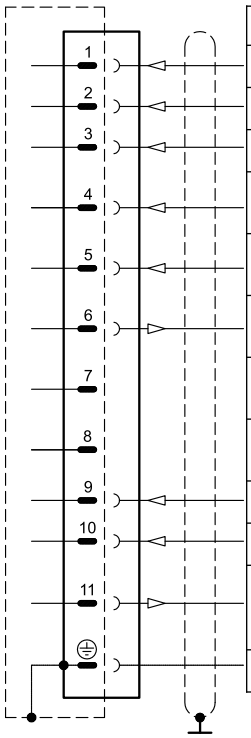
Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 5.3 and 5.4.

### 7.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal:<br>voltage (E0)<br>current (E1)<br>digital (FD) | <br>V DC<br>mA | <br>±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm)<br>via fieldbus |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication / diagnostic | | via Bus register |
| Communication interface standards<br>CAN Open<br>PROFIBUS DP<br>EtherCAT, Ethernet /IP, Profinet, PowerLink | | <br>EN 50325-4 + DS408<br>EN 50170-2 / IEC 61158<br>IEC 61158 |
| Communication physical layer<br>CAN Open<br>PROFIBUS DP<br>EtherCAT, Ethernet /IP, Profinet, PowerLink | | <br>optical insulated CAN ISO 11898<br>optical insulated RS485<br>fast ethernet, insulated 100 Base TX |
| Power connection | | 11 pin + PE (DIN 43651) |

### 7.2 - X1 Main connection pin table




**D1: one command**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Command |
| **5** | 0 V | Command reference signal |
| **6** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Monitor<br>(0V reference pin 10) |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V reference pin 2) |
| **12** | GND | Ground (Earth) |

**D0: full digital**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | NC | do not connect |
| **5** | NC | do not connect |
| **6** | NC | do not connect |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V ref. pin 2) |
| **12** | GND | Ground (Earth) |

### 7.3 - FIELDBUS connections

Please wire following guidelines provided by the relative standards communication protocol.

#### 7.3.1 - Communication connection CA (CAN Open)

**X2 (IN) connection**: M12 A 5 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | CAN_SH | Shield |
| **2** | NC | Do not connect |
| **3** | GND | Signal zero data line |
| **4** | CAN_H | Bus line (high) |
| **5** | CAN_L | Bus line (low) |

**X3 (OUT) connection**: M12 A 5 pin male


| Pin | Values | Function |
|---|---|---|
| **1** | CAN_SH | Shield |
| **2** | NC | Do not connect |
| **3** | GND | Signal zero data line |
| **4** | CAN_H | Bus line (high) |
| **5** | CAN_L | Bus line (low) |

#### 7.3.2 - Communication connection PD (PROFIBUS DP)

**X2 (IN) connection**: M12 B 5 pin male (IN)


| Pin | Values | Function |
|---|---|---|
| **1** | +5 V | Termination supply signal |
| **2** | PB_A | Bus line (high) |
| **3** | 0 V | Data line and termination signal 0 |
| **4** | PB_B | Bus line (low) |
| **5** | SHIELD | |

**X3 (OUT) connection**: M12 B 5 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | +5 V | Termination supply signal |
| **2** | PB_A | Bus line (high) |
| **3** | 0 V | Data line and termination signal 0 |
| **4** | PB_B | Bus line (low) |
| **5** | SHIELD | |

#### 7.3.3 - Communication connections: EC (EtherCat), EN (Ethernet/IP), PN (PROFINET), PL (POWERLINK)

**X2 (IN) connection** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**NOTE**: Shield connection on connector housing is recommended.

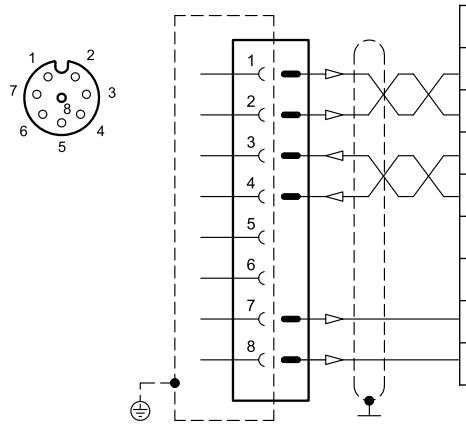
**X3 (OUT) connection:** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

### 7.4 - Digital transducer connection

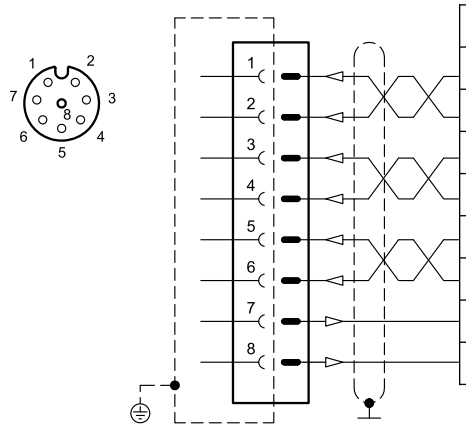
**X7 connection:** M12 A 8 pin female

**VERSION 1: SSI type**



| Pin | SSI Values | Function | Notes |
|---|---|---|---|
| **1** | CLK+ | Serial synchronous clock (+) | Input - digital signal |
| **2** | CLK- | Serial synchronous clock (-) | |
| **3** | MIS0+ | Serial position data (+) | |
| **4** | MIS0- | Serial position data (-) | |
| **5** | NC | - | do not connect |
| **6** | NC | - | |
| **7** | +24 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

**VERSION 2: ENCODER type**



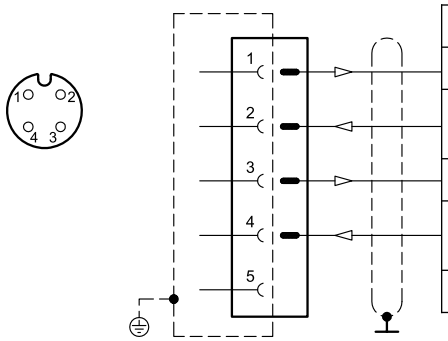
| Pin | Values | Function | Notes |
|---|---|---|---|
| **1** | ENC_Z+ | input channel Z+ | Input - digital signal |
| **2** | ENC_Z- | input channel Z- | |
| **3** | ENC_A+ | input channel A+ | |
| **4** | ENC_A- | input channel A+ | |
| **5** | ENC_B+ | input channel B+ | |
| **6** | ENC_B- | input channel B+ | |
| **7** | +5 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

### 7.5 - Analogue transducer connection

**X4 connection**: M12 A 4 pin female

**VERSION 1: single / double transducer**

(single or double is a software-selectable option)



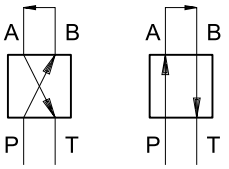
| Pin | Values | Notes |
|---|---|---|
| **1** | +24 V | Remote transducer power supply (out) 100 mA |
| **2** | ±10 V<br>4 ÷20 mA | Input signal of transducer 1 (range software selectable) |
| **3** | 0 V | Common reference signal for transducer power and signals |
| **4** | ±10 V<br>4 ÷20 mA | Input signal of transducer 2 (range software selectable) |
| **5** | - | |

## 8 - CHARACTERISTIC CURVES

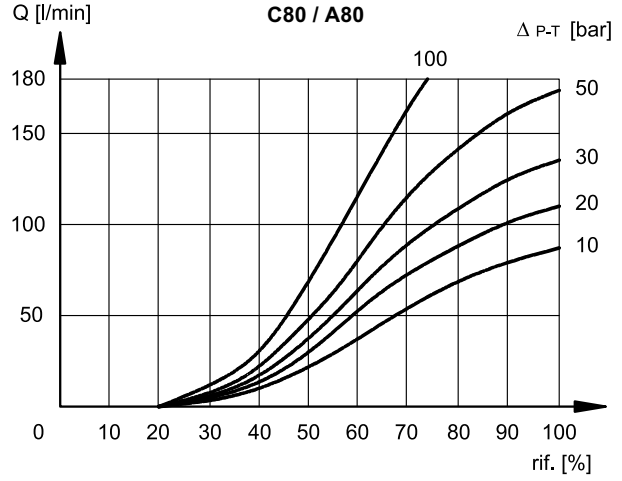
(obtained with mineral oil with viscosity of 36 cSt at 50°C and p = 140 bar)

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.

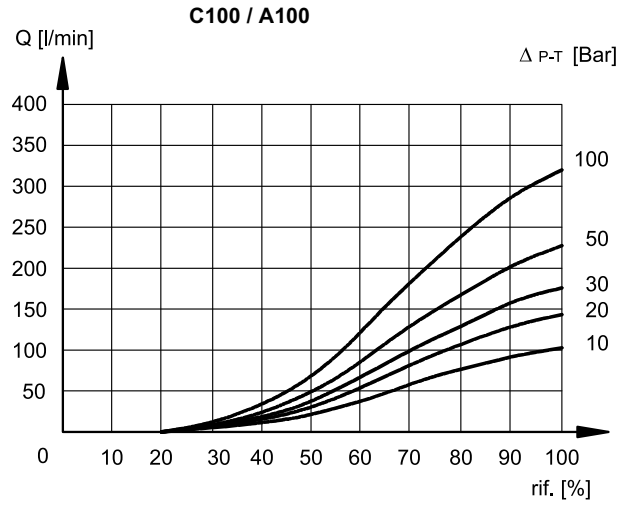
The adjustment of the curve is performed with a constant Δp of 30 bar by setting the value of flow start at 20% of the reference signal.

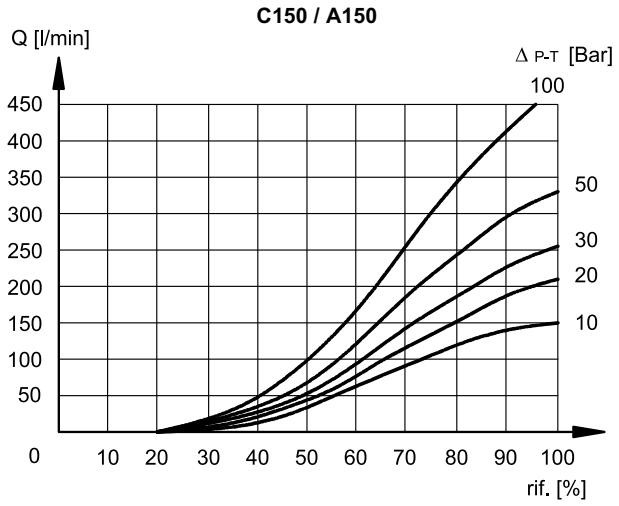



### 8.1 - Characteristic curves DSPE5G* and DSPE5RG*

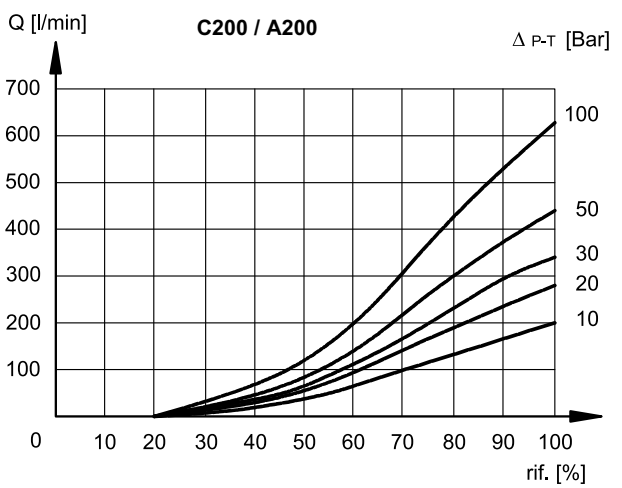


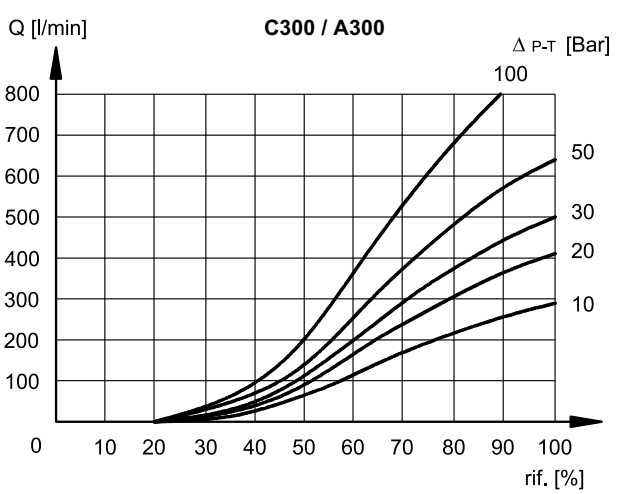

### 6.2 - Characteristic curves DSPE7G*



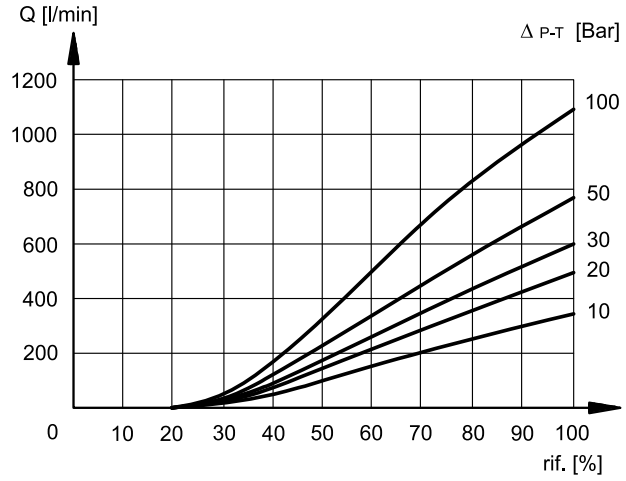

### 6.3 - Curve Characteristic DSPE8G*



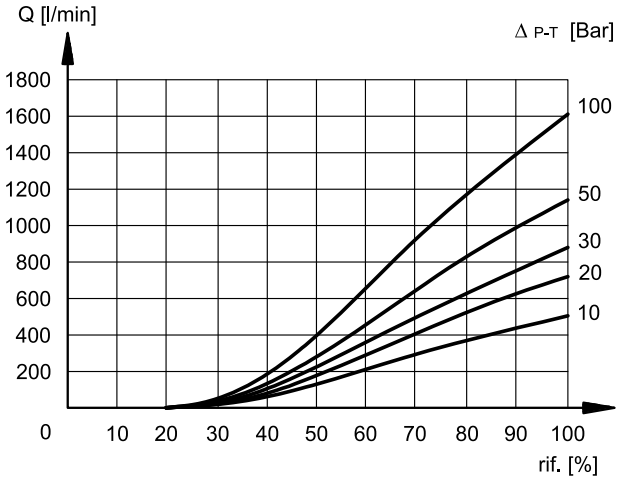



### 8.4 - Characteristic curves DSPE10G*

**C350 / A350**

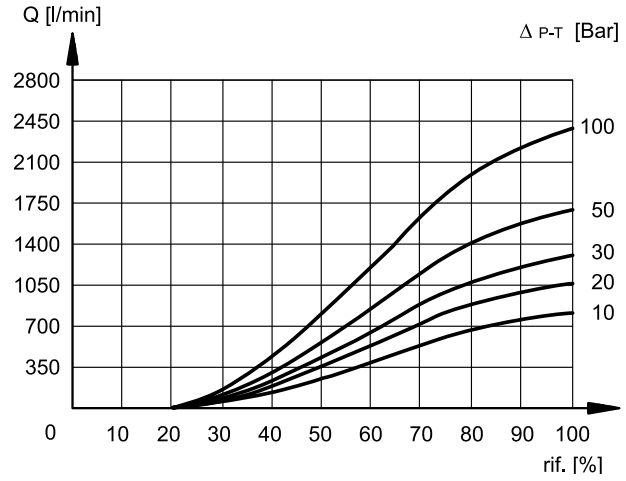



**C500 / A500**




### 8.5 - Characteristic curves DSPE11G*

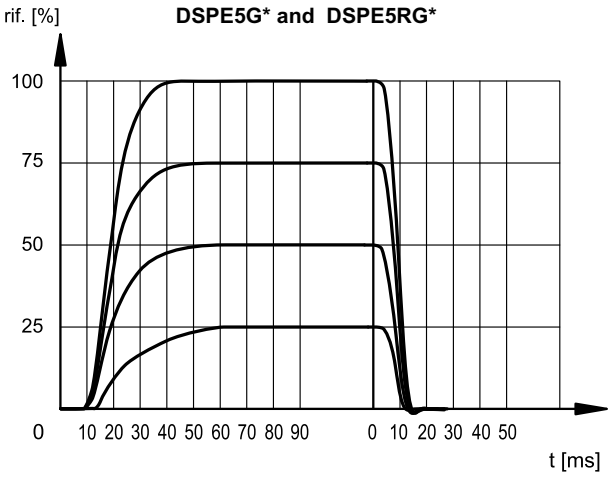
**C800 / A800**



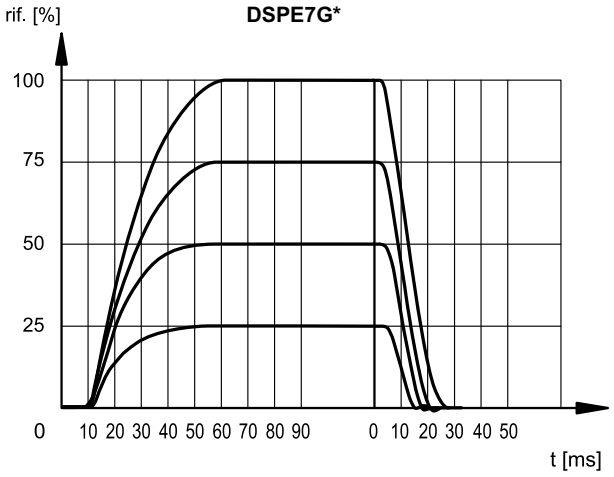
## 9 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure = 100 bar)

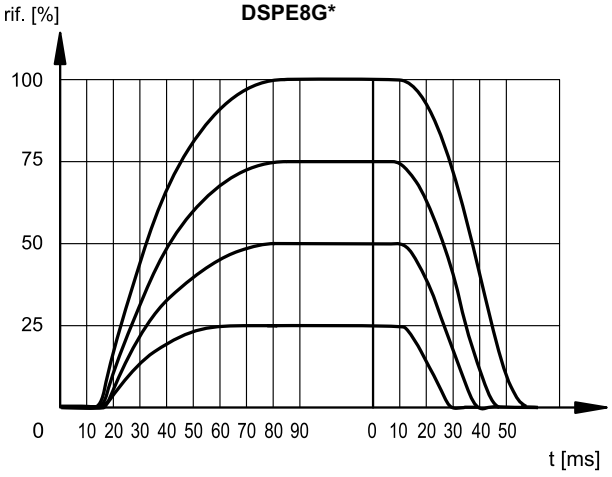
**DSPE5G* and DSPE5RG***



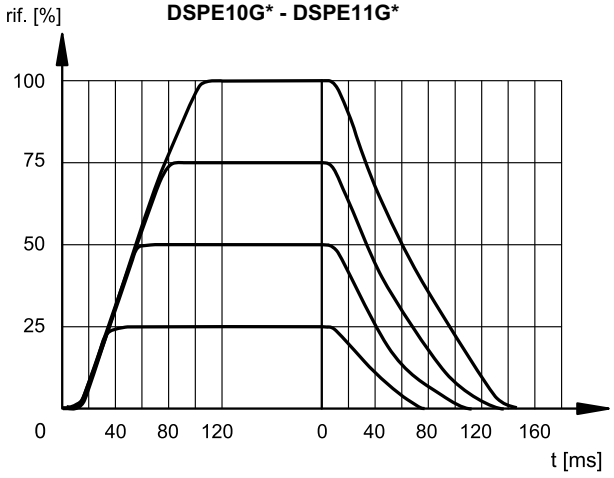

**DSPE7G***




**DSPE8G***




**DSPE10G* - DSPE11G***




## 10 - 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 |
|---|---|---|
| Pilot pressure on X port | 30 | 210 (**NOTE**) |
| Pressure on T port with internal drain | – | 10 |
| Pressure on T port with external drain | – | 250 |

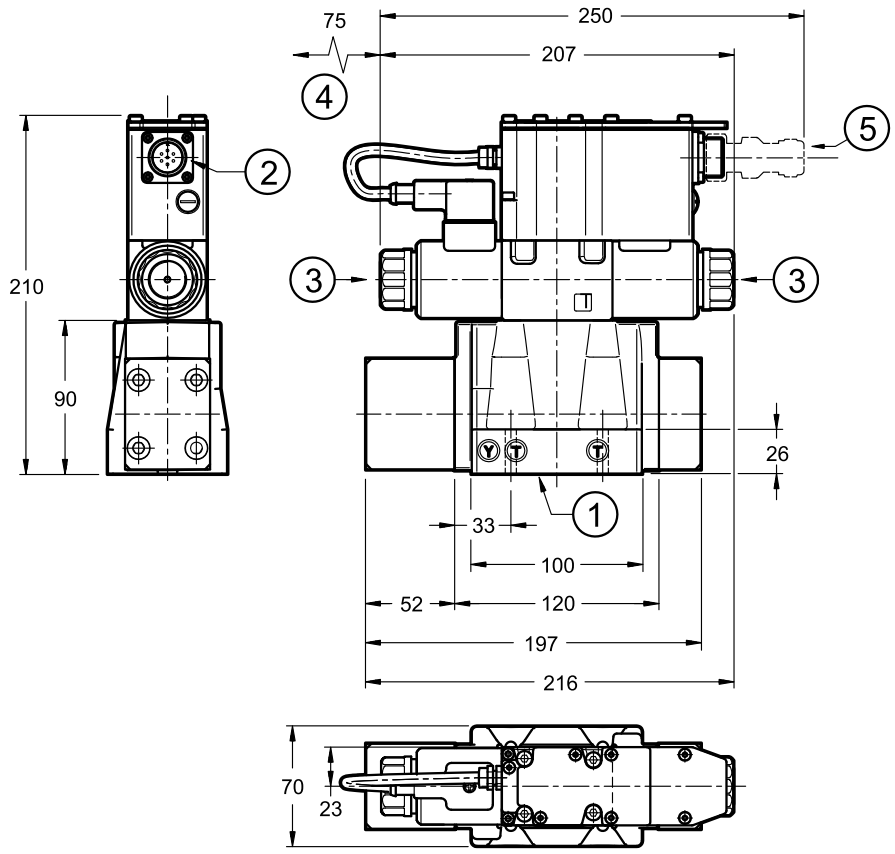
**NOTE**: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure.

Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (piloting type: Z, see section 1).

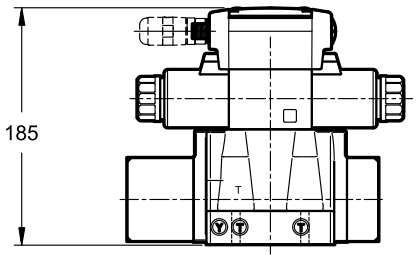
| | TYPE OF VALVE | Plug assembly X | Plug assembly Y |
|---|---|---|---|
| **IE** | INTERNAL PILOT AND EXTERNAL DRAIN | NO | YES |
| **II** | INTERNAL PILOT AND INTERNAL DRAIN | NO | NO |
| **EE** | EXTERNAL PILOT AND EXTERNAL DRAIN | YES | YES |
| **EI** | EXTERNAL PILOT AND INTERNAL DRAIN | YES | NO |

## 12 - OVERALL AND MOUNTING DIMENSIONS DSPE5G*

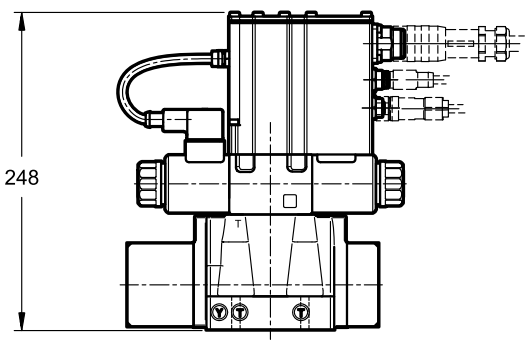
dimensions in mm




**DSPE5GL**




**DSPE5GH**

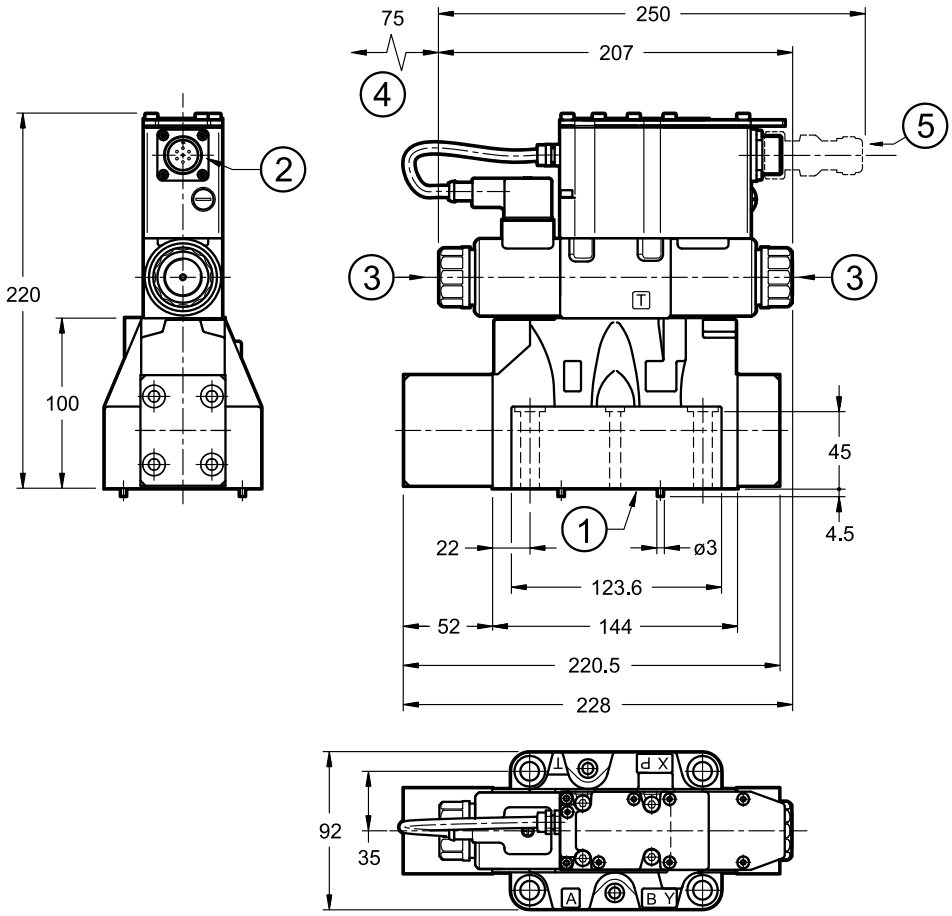



**NOTES**:
See mounting surface at section 17.

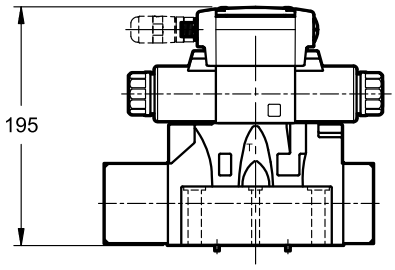
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) - 90 Shore<br>2 OR type 2037 (9.25x1.78) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening:<br>4 SHC ISO 4762 screws M6x35 |
| Tightening torque: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x10 |

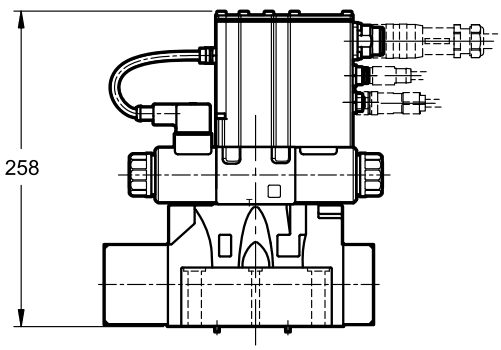
## 13 - OVERALL AND MOUNTING DIMENSIONS DSPE7G*




**DSPE7GL**




**DSPE7GH**



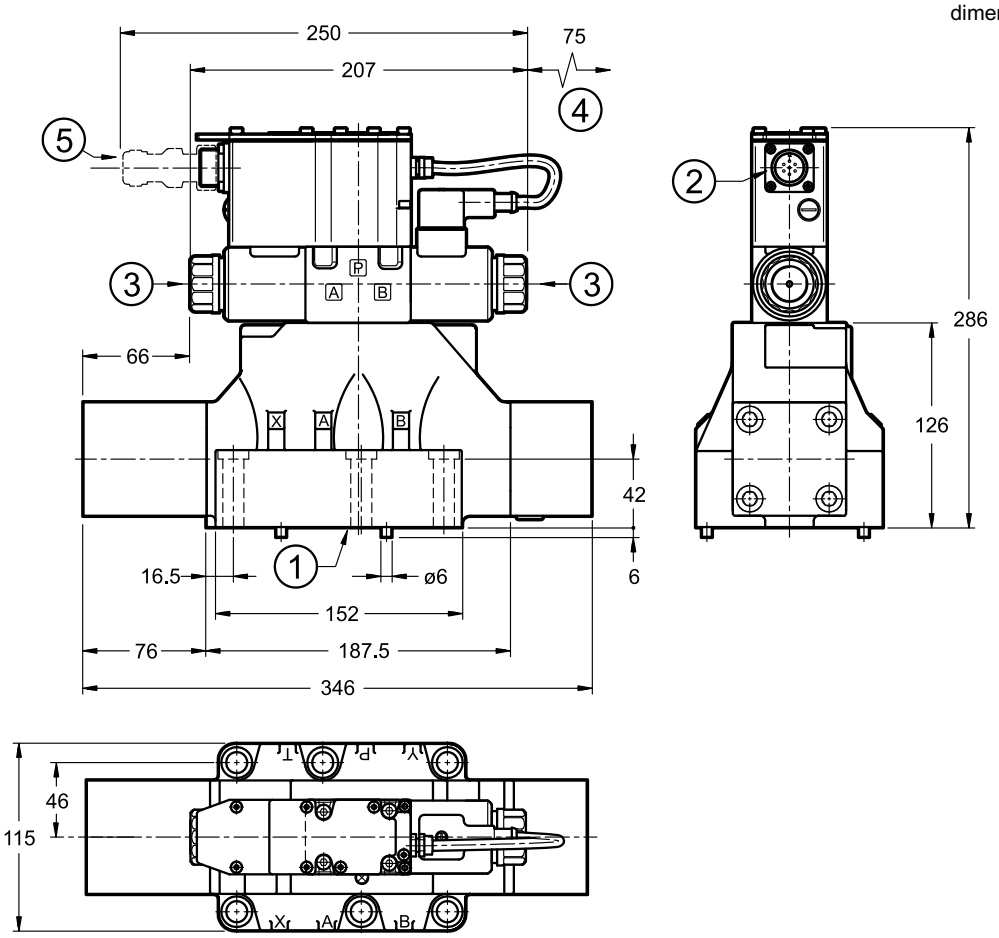

**NOTES**:
See mounting surface at section 17.

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 130 (22.22x2.62) - 90 Shore<br>2 OR type 2043 (10.82x1.78) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

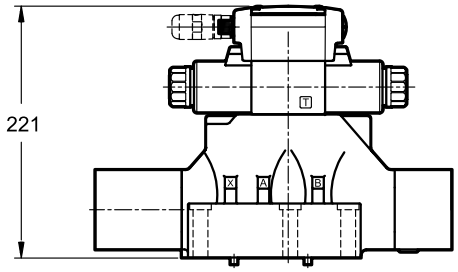
| |
|---|
| Valve fastening: 4 SHC screws ISO 4762 M10x60<br>2 SHC screws ISO 4762 M6x60 |
| Tightening torque: M10x60: 40 Nm (A8.8 screws)<br>M6x60: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x18; M10x18 |

## 14 - OVERALL AND MOUNTING DIMENSIONS DSPE8G*

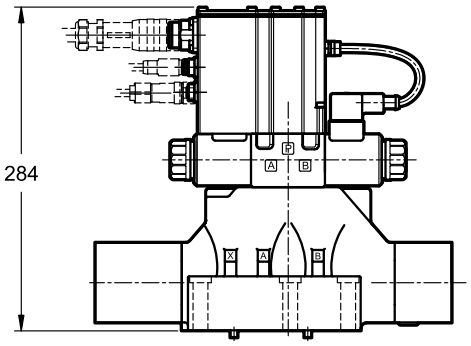
dimensions in mm




**DSPE8GL**




**DSPE8GH**



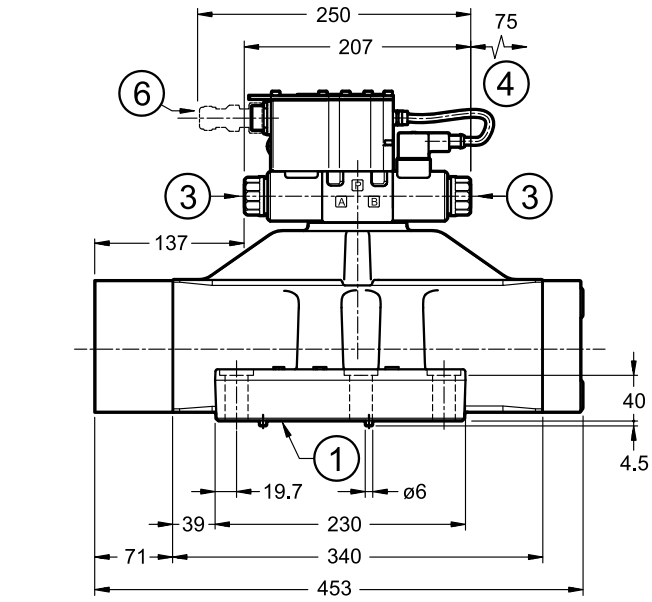

**NOTES**:
See mounting surface at section 17.

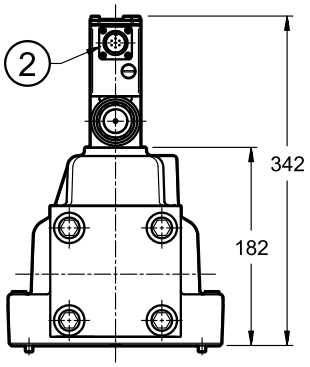
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 3118 (29.82x2.62) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

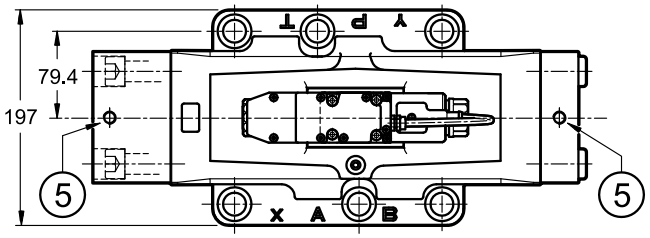
| |
|---|
| Valve fastening: 6 SHC ISO 4762 screws M12x60 |
| Tightening torque: 69 Nm (A8.8 screws) |
| Threads of mounting holes: M12x20 |

## 15 - OVERALL AND MOUNTING DIMENSIONS DSPE10G* / DSPE11G*

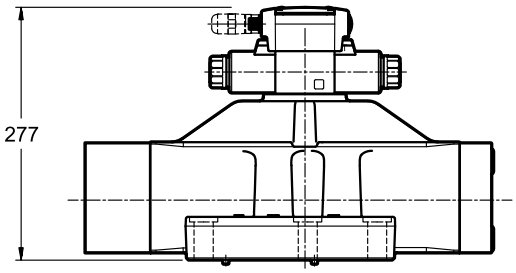
dimensions in mm



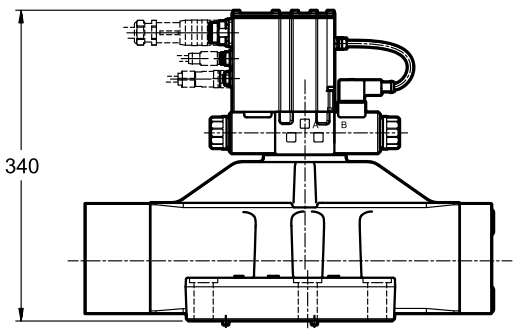




**DSPE10GL**




**DSPE10GH**




**NOTES**:
See mounting surface at section 17.

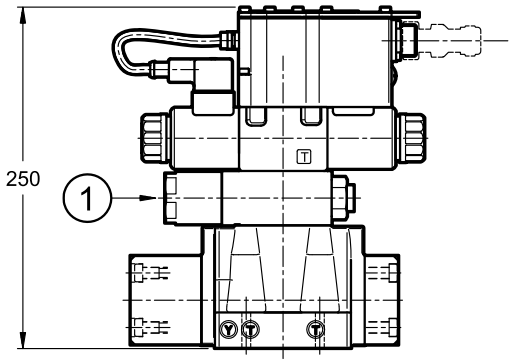
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>**DSPE10G***<br>4 OR type 4150 (37.59x3.53) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore<br>**DSPE11G***<br>4 OR type 4212 (53.57x3.53) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | M12 eyebolt seat for safe lift |
| 6 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening:<br>6 SHC screws ISO 4762 M20x70 |
| Tightening torque: 330 Nm (A8.8 screws) |
| Threads of mounting holes: M20x40 |

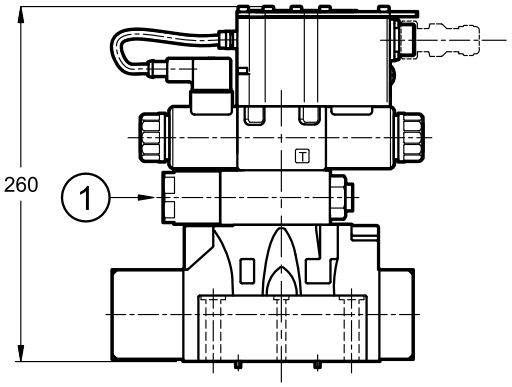
## 16 - OVERALL AND MOUNTING DIMENSIONS OF DSPE*G* WITH PILOT PATTERN TYPE Z

dimensions in mm

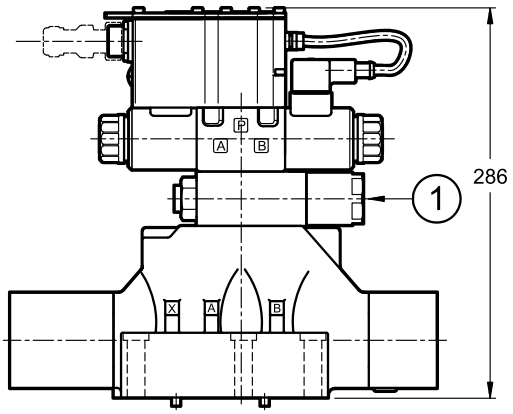
**DSPE5G***



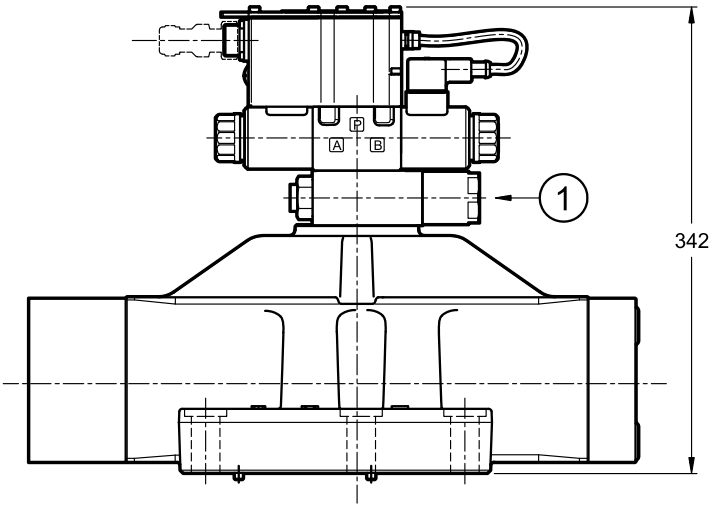

**DSPE7G***




**DSPE8G***



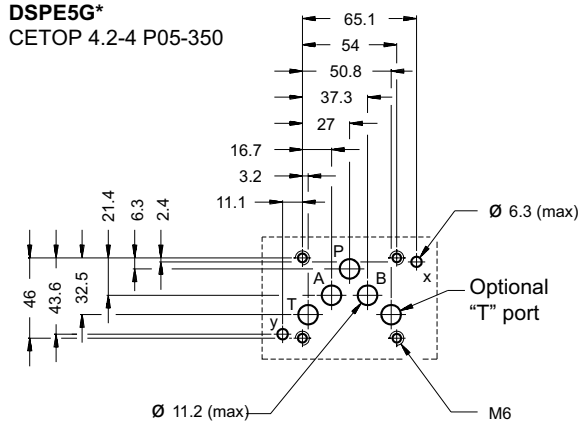

**DSPE10G***



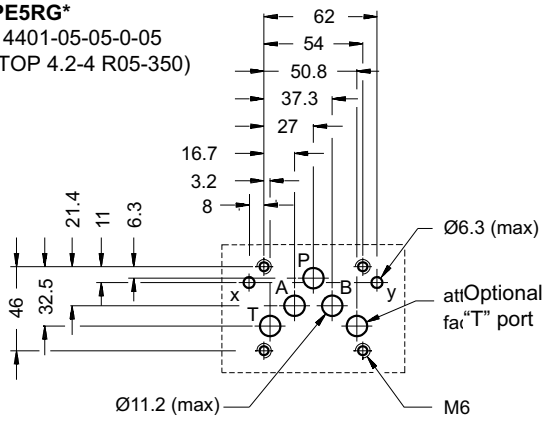

| | |
|---|---|
| 1 | 30 bar fixed adjustment pressure reducing valve |

## 17 - MOUNTING SURFACES

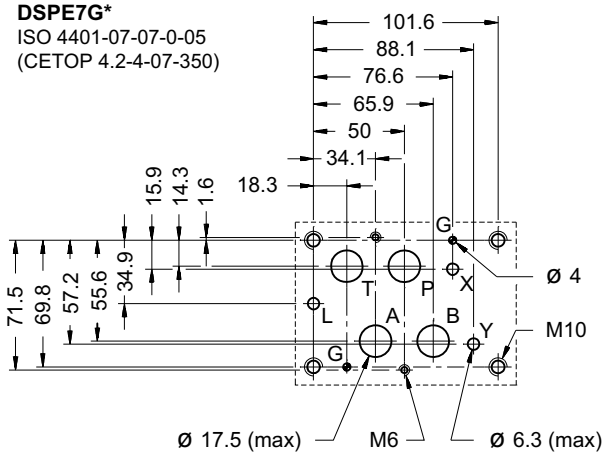
**DSPE5G***
CETOP 4.2-4 P05-350



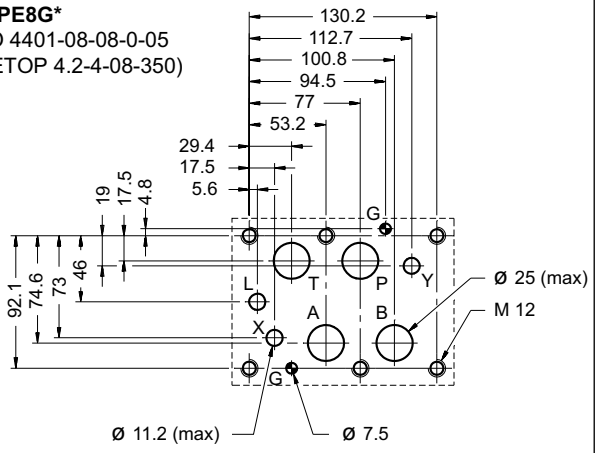

**DSPE5RG***
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



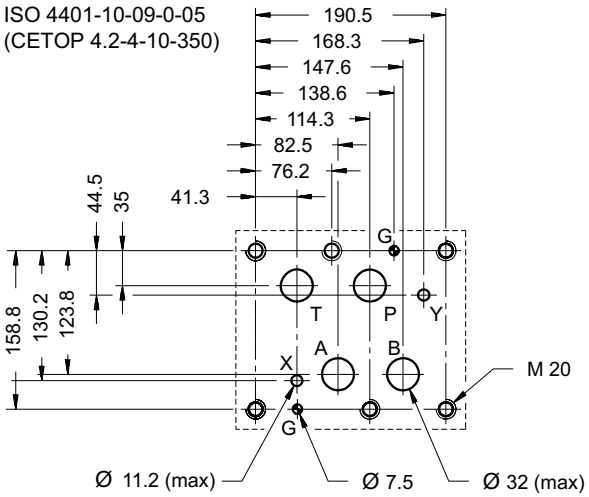

**DSPE7G***
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)




**DSPE8G***
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

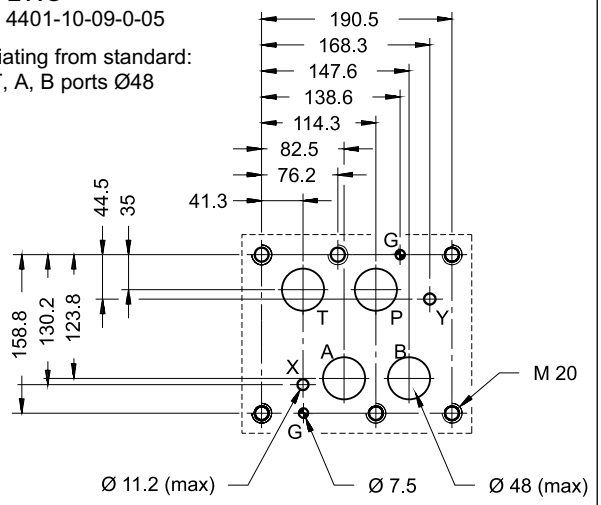



**DSPE10G***
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)




**DSPE11G***
ISO 4401-10-09-0-05

deviating from standard:
P, T, A, B ports Ø48



## 18 - 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.

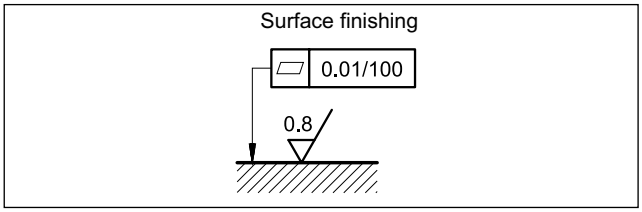
The fluid must be preserved in its physical and chemical characteristics.

## 19 - 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.




## 20 - ACCESSORIES

(to be ordered separately)

### 20.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

### 20.2 - Mating connectors for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

### 20.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 $mm^2$
- up to 40 m cable length : 1,5 $mm^2$ (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 $mm^2$

### 20.4 - Kit for start-up LINPC-USB

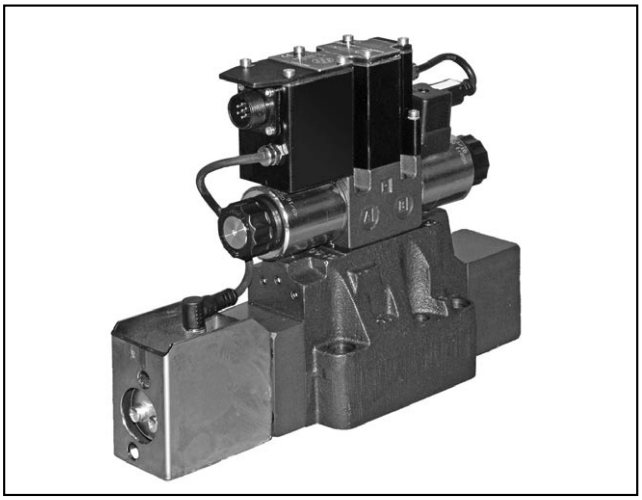
Device for service start-up and diagnostic, available for valves with K11 and K16 connections. See catalogue 89 850.

## 21 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DSPE5RG*, DSPE10G* and DSPE11G*.

| | DSPE5G* | DSPE7G* | DSPE8G* |
|---|---|---|---|
| Type with rear ports | PME4-AI5G | PME07-AI6G | - |
| Type with side ports | PME4-AL5G | PME07-AL6G | PME5-AL8G |
| P, T, A, B ports dimensions<br>X, Y ports dimensions | 3/4” BSP<br>1/4” BSP | 1” BSP<br>1/4” BSP | 1 ½” BSP<br>1/4” BSP |



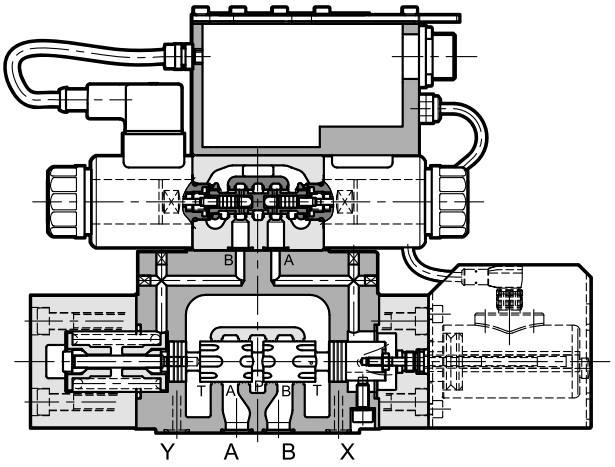
# DSPE*J*

## PROPORTIONAL DIRECTIONAL VALVE PILOT OPERATED WITH FEEDBACK AND INTEGRATED ELECTRONICS

### SUBPLATE MOUNTING

**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



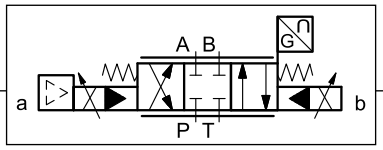

— The DSPE*J* are proportional directional valve operated with feedback and integrated electronics and with mounting interface in compliance with ISO 4401 standards.

— They are controlled directly by the integrated electronics. Transducer and digital card allow a fine control of the spool position, reducing both hysteresis and response times and oprimizing the valve performance.

— The valves are available with different types of electronics, with analogue or fieldbus interfaces.

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

**HYDRAULIC SYMBOL** (typical)



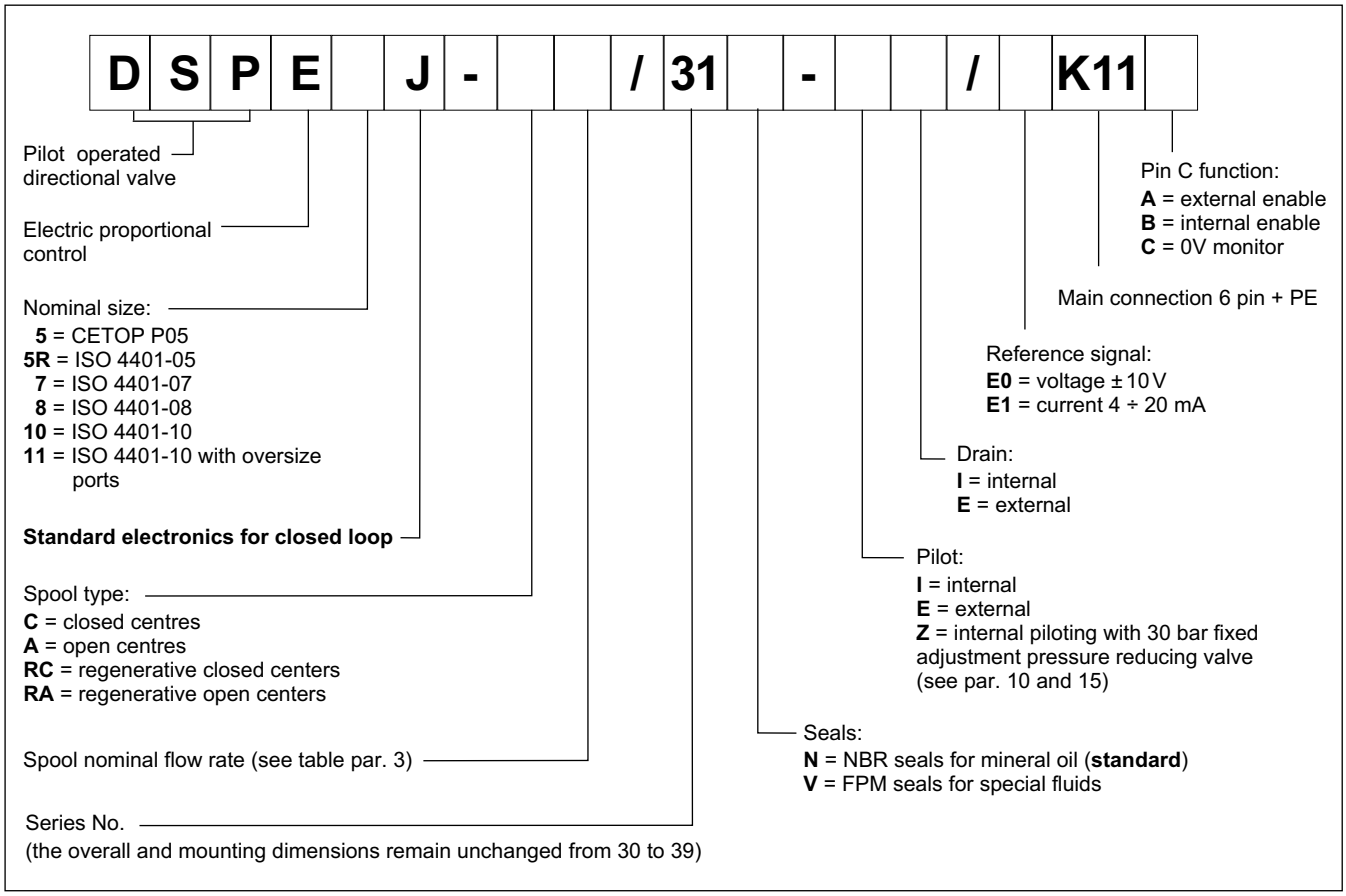

### PERFORMANCES

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

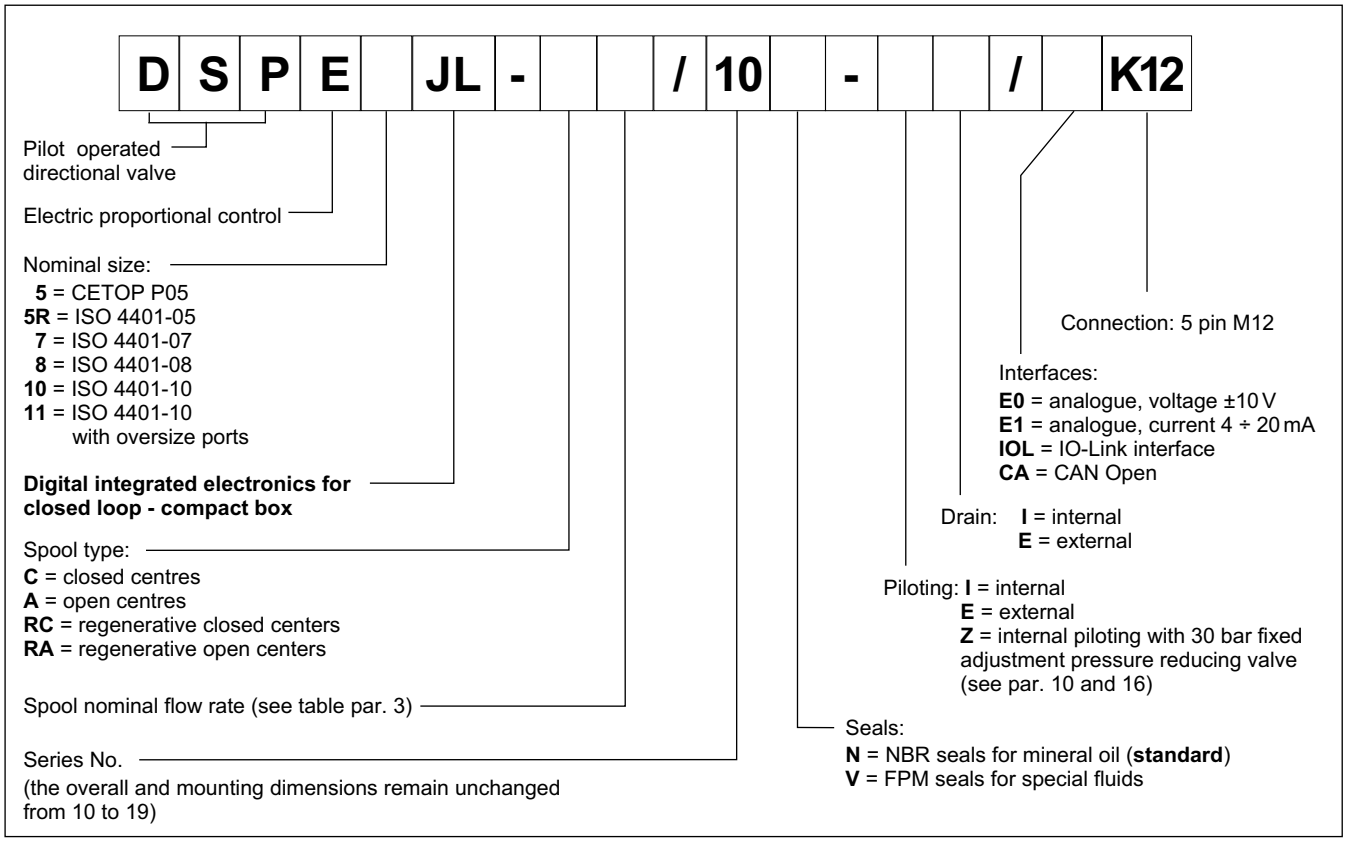
| | | DSPE5J* DSPE5RJ* | DSPE7J* | DSPE8J* | DSPE10J* | DSPE11J* |
|---|---|---|---|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T port | bar | 350<br>see paragraph 10 | | | | |
| Max flowrate | l/min | 180 | 450 | 800 | 1600 | 2800 |
| Hysteresis | % $Q_{max}$ | < 0,5% | | | | |
| Repeatability | % $Q_{max}$ | < ± 0,2% | | | | |
| Electrical characteristics | | 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 | 9 | 11 | 17.5 | 56.5 | 55 |

## 1 - IDENTIFICATION CODES

### 1.1 - Standard electronics




### 1.2 - Compact electronics



### 1.3 - Electronics with fieldbus communication

| D | S | P | E | | JH | - | | | / | 31 | | - | | | - | | K16 | | / | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Pilot operated directional valve

Electric proportional control

Nominal size:
**5** = CETOP P05
**5R** = ISO 4401-05
**7** = ISO 4401-07
**8** = ISO 4401-08
**10** = ISO 4401-10
**11** = ISO 4401-10 with oversize ports

**Digital integrated electronics for closed loop with fieldbus communication**

Spool type:
**C** = closed centres
**A** = open centres
**RC** = regenerative closed centers
**RA** = regenerative open centers

Spool nominal flow rate (see table par. 3)

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. 10 and 16)

Drain:
**I** = internal
**E** = external

Reference signal:
**E0** = voltage ±10 V **E1** = current 4 ÷ 20 mA
**FD** = full digital version (on request)

Connection 11 pin + PE

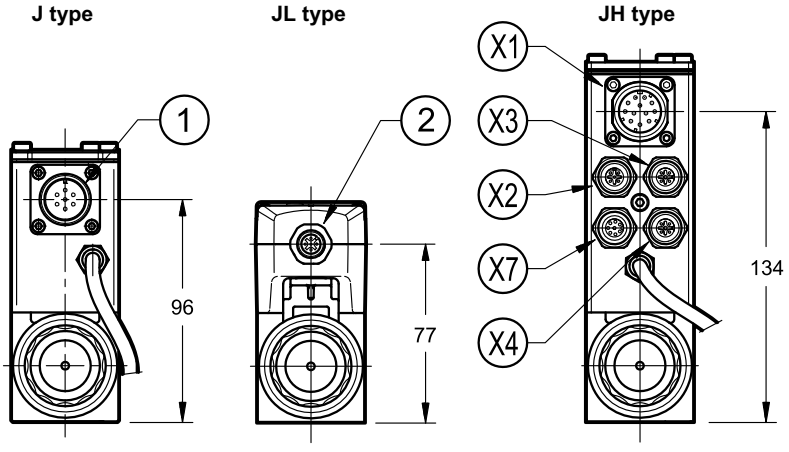
X1 Main connector configuration:
**D1** = one command
**D0** = full digital version
(on request - available for reference signal FD type only)

X2, X3 Field BUS type:
**CA** = CAN Open
**PD** = PROFIBUS DP
**EC** = EtherCAT
**EN** = Ethernet /IP
**PN** = Profinet
**PL** = PowerLink

X7 Digital transducer:
**0** = none
**1** = version 1 (SSI type)
**2** = version 2 (Encoder type)

X4 Analogue transducer:
**0** = none
**1** = version 1 (single /double transducer)

## 2 - COMPARISON AMONG INTEGRATED ELECTRONICS



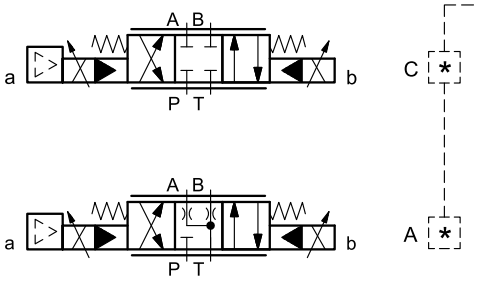

| | |
|---|---|
| 1 | Connection 6 pin + PE |
| 2 | Connection M12 5 pin, code A, male |
| X1 | Main connection 11 pin + PE |
| X2 | Fieldbus communication (IN) |
| X3 | Fieldbus communication (OUT) |
| X4 | Connection for analogue transducer |
| X7 | Connection for digital transducer |

**NOTE 1**: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 5, 6 and 7 for connections descriptions and pinouts.
**NOTE 2**: Related mating connectors have to be ordered separately. See catalogue 89 000.

## 3 - AVAILABLE CONFIGURATIONS

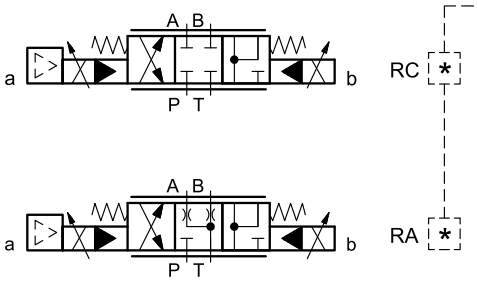
The valve configuration depends on the combination of spool type and rated flow.

**3 positions with spring centreing**




| 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 |

**regenerative spool**




| 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 |

## 4 - ELECTRONICS COMMON DATA

| | | |
|---|---|---|
| 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 | A | 3 |
| Managed breakdowns | | Overload and electronics overheating, cable breakdown, supply voltage failures |
| Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2 | | According to 2014/30/EU standards |

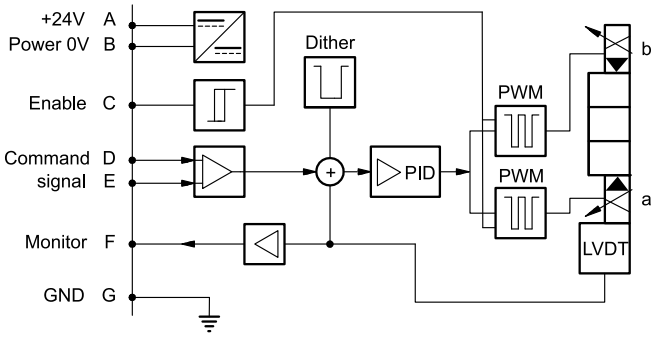
## 5 - DSPE*J* - STANDARD ELECTRONICS

### 5.1 - Electrical characteristics

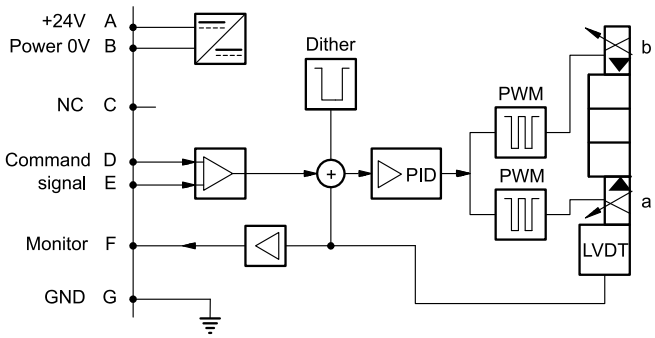
| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ± 10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (main spool position):<br>voltage (E0)<br>current (E1) | V DC<br>mA | ± 10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication for diagnostic | | LIN-bus Interface (by means of the optional kit) |
| Connection | | 6 pin + PE (MIL-C-5015-G - DIN EN 175201-804) |

### 5.2 - On-board electronics diagrams

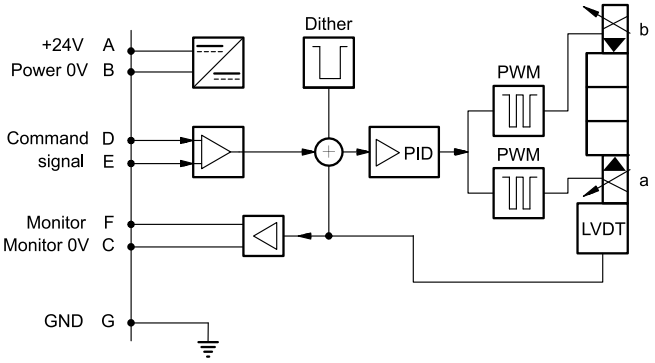
**VERSION A** - External Enable




**VERSION B** - Internal Enable

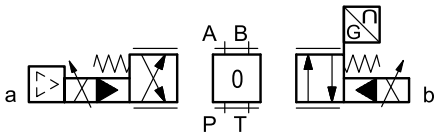



**VERSION C** - 0V Monitor

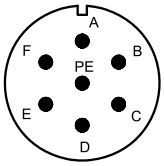


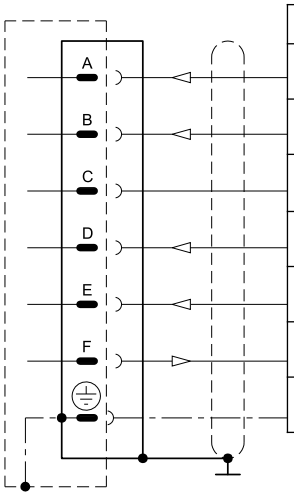
### 5.3 - Versions with voltage command (E0)

The reference signal is 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** |
| **MONITOR** | **-10V** | **0V** | **+10V** |



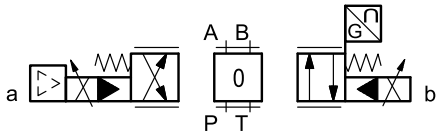




| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply Voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable 24 V DC | do not connect - | PIN F reference 0 V |
| **D** | ± 10 V | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | ± 10 V | Monitor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

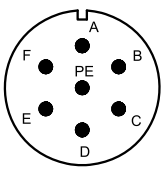
### 5.4 - Versions with current command (E1)

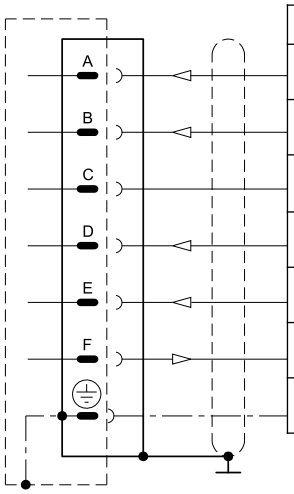
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

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** | **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 | do not connect - | PIN F reference 0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | 4 ÷ 20 mA | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

## 6 - DSPE*JL - COMPACT ELECTRONICS

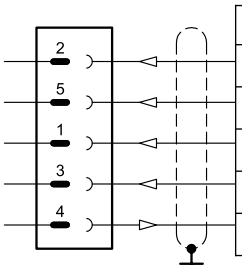
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

### 6.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>0 ÷ 5 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| IO-Link communication (IOL):<br>Data rate | <br>kBaud | <br>IO-Link Port Class B<br>230,4 |
| Can Open communication (CA):<br>Data rate | <br>kbit | <br>10 ÷ 1000 |
| Connection | | 5-pin M12 code A (IEC 61076-2-101) |

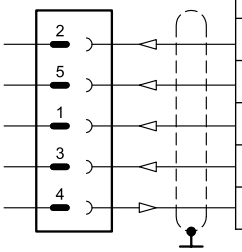
### 6.2 - Pin tables

**'E0' connection**

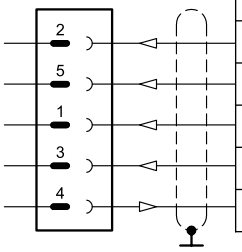

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | ± 10 V | Command |
| 3 | 0V | Command reference |
| 4 | 0 ÷ 5V | Monitor (0V reference: pin 5) |

**'E1' connection**

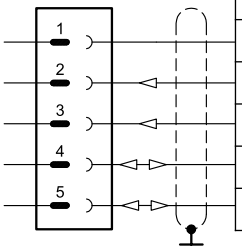

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | 4 ÷ 20 mA | Command |
| 3 | 0V | Command reference |
| 4 | 4 ÷ 20 mA | Monitor (0V reference: pin 5) |

**'IOL' connection**


| Pin | Values | Function |
|---|---|---|
| 2 | 2L+ 24 V DC | Supply of the power stage |
| 5 | 2L- 0 V (GND) | Internal galvanic isolation from PIN 3 |
| 1 | 1L+ +24 V DC | IO-Link supply voltage |
| 3 | 1L- 0V (GND) | |
| 4 | C/Q | IO-Link Communication |

**'CA' connection**


| Pin | Values | Function |
|---|---|---|
| 1 | CAN_SH | Shield |
| 2 | 24 V DC | Supply voltage |
| 3 | 0 V (GND) | |
| 4 | CAN H | Bus line (high) |
| 5 | CAN_L | Bus line (low) |

## 7 - DSPE*JH - FIELDBUS ELECTRONICS

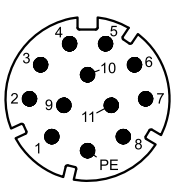
The 11 + PE pin connection allows separate supply voltage for electronics and solenoids.

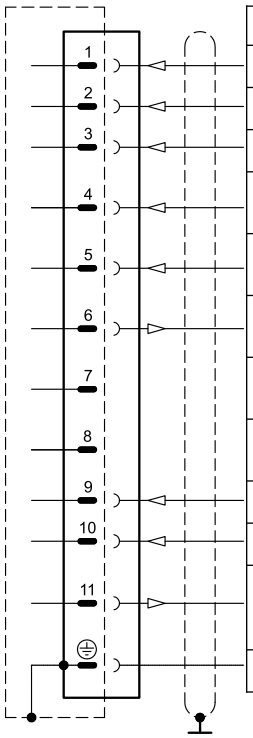
Command - valve position schemes as for the standard electronics. Please refer to pictures in par. 5.3 and 5.4.

### 7.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal:<br>voltage (E0)<br>current (E1)<br>digital (FD) | <br>V DC<br>mA | <br>±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm)<br>via fieldbus |
| Monitor signal (main spool position):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication / diagnostic | | via Bus register |
| Communication interface standards<br>CAN Open<br>PROFIBUS DP<br>EtherCAT, Ethernet /IP, Profinet, PowerLink | | <br>EN 50325-4 + DS408<br>EN 50170-2 / IEC 61158<br>IEC 61158 |
| Communication physical layer<br>CAN Open<br>PROFIBUS DP<br>EtherCAT, Ethernet /IP, Profinet, PowerLink | | <br>optical insulated CAN ISO 11898<br>optical insulated RS485<br>fast ethernet, insulated 100 Base TX |
| Power connection | | 11 pin + PE (DIN 43651) |

### 7.2 - X1 Main connection pin table




**D1: one command**

| Pin | Values | Function |
|---|---|---|
| 1 | 24 V DC | Main supply voltage |
| 2 | 0 V | |
| 3 | 24V DC | Enable |
| 4 | ± 10 V (E0)<br>4 ÷ 20 (E1) | Command |
| 5 | 0 V | Command reference signal |
| 6 | ± 10 V (E0)<br>4 ÷ 20 (E1) | Monitor<br>(0V reference pin 10) |
| 7 | NC | do not connect |
| 8 | NC | do not connect |
| 9 | 24 V DC | Logic and control supply |
| 10 | 0 V | |
| 11 | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V reference pin 2) |
| 12 | GND | Ground (Earth) |

**D0: full digital**

| Pin | Values | Function |
|---|---|---|
| 1 | 24 V DC | Main supply voltage |
| 2 | 0 V | |
| 3 | 24V DC | Enable |
| 4 | NC | do not connect |
| 5 | NC | do not connect |
| 6 | NC | do not connect |
| 7 | NC | do not connect |
| 8 | NC | do not connect |
| 9 | 24 V DC | Logic and control supply |
| 10 | 0 V | |
| 11 | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V ref. pin 2) |
| 12 | GND | Ground (Earth) |

### 7.3 - FIELDBUS connections

Please wire following guidelines provided by the relative standards communication protocol.

#### 7.3.1 - Communication connection CA (CAN Open)

**X2 (IN) connection**: M12 A 5 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | CAN_SH | Shield |
| **2** | NC | Do not connect |
| **3** | GND | Signal zero data line |
| **4** | CAN_H | Bus line (high) |
| **5** | CAN_L | Bus line (low) |

**X3 (OUT) connection**: M12 A 5 pin male


| Pin | Values | Function |
|---|---|---|
| **1** | CAN_SH | Shield |
| **2** | NC | Do not connect |
| **3** | GND | Signal zero data line |
| **4** | CAN_H | Bus line (high) |
| **5** | CAN_L | Bus line (low) |

#### 7.3.2 - Communication connection PD (PROFIBUS DP)

**X2 (IN) connection**: M12 B 5 pin male (IN)


| Pin | Values | Function |
|---|---|---|
| **1** | +5 V | Termination supply signal |
| **2** | PB_A | Bus line (high) |
| **3** | 0 V | Data line and termination signal 0 |
| **4** | PB_B | Bus line (low) |
| **5** | SHIELD | |

**X3 (OUT) connection**: M12 B 5 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | +5 V | Termination supply signal |
| **2** | PB_A | Bus line (high) |
| **3** | 0 V | Data line and termination signal 0 |
| **4** | PB_B | Bus line (low) |
| **5** | SHIELD | |

#### 7.3.3 - Communication connections: EC (EtherCat), EN (Ethernet/IP), PN (PROFINET), PL (POWERLINK)

**X2 (IN) connection** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**NOTE**: Shield connection on connector housing is recommended.

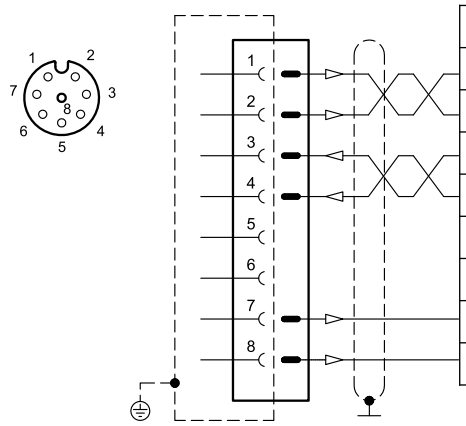
**X3 (OUT) connection:** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

### 7.4 - Digital transducer connection

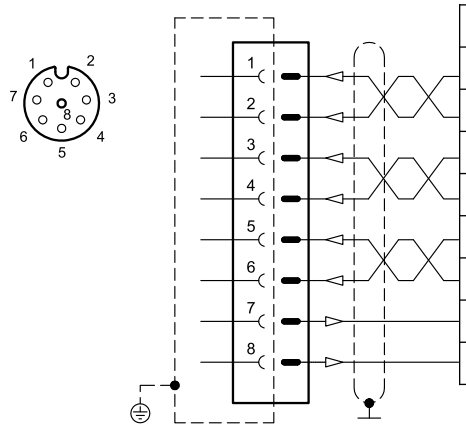
**X7 connection:** M12 A 8 pin female

**VERSION 1: SSI type**



| Pin | SSI Values | Function | Notes |
|---|---|---|---|
| **1** | CLK+ | Serial synchronous clock (+) | Input - digital signal |
| **2** | CLK- | Serial synchronous clock (-) | |
| **3** | MIS0+ | Serial position data (+) | |
| **4** | MIS0- | Serial position data (-) | |
| **5** | NC | - | do not connect |
| **6** | NC | - | |
| **7** | +24 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

**VERSION 2: ENCODER type**



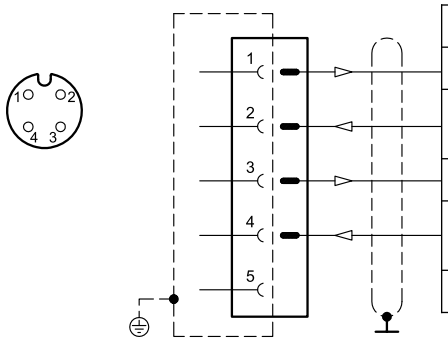
| Pin | Values | Function | Notes |
|---|---|---|---|
| **1** | ENC_Z+ | input channel Z+ | Input - digital signal |
| **2** | ENC_Z- | input channel Z- | |
| **3** | ENC_A+ | input channel A+ | |
| **4** | ENC_A- | input channel A+ | |
| **5** | ENC_B+ | input channel B+ | |
| **6** | ENC_B- | input channel B+ | |
| **7** | +5 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

### 7.5 - Analogue transducer connection

**X4 connection**: M12 A 4 pin female

**VERSION 1: single / double transducer**

(single or double is a software-selectable option)

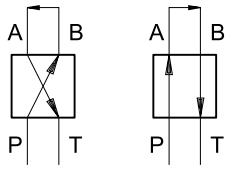


| Pin | Values | Notes |
|---|---|---|
| **1** | +24 V | Remote transducer power supply (out) 100 mA |
| **2** | ±10 V<br>4 ÷20 mA | Input signal of transducer 1 (range software selectable) |
| **3** | 0 V | Common reference signal for transducer power and signals |
| **4** | ±10 V<br>4 ÷20 mA | Input signal of transducer 2 (range software selectable) |
| **5** | - | |

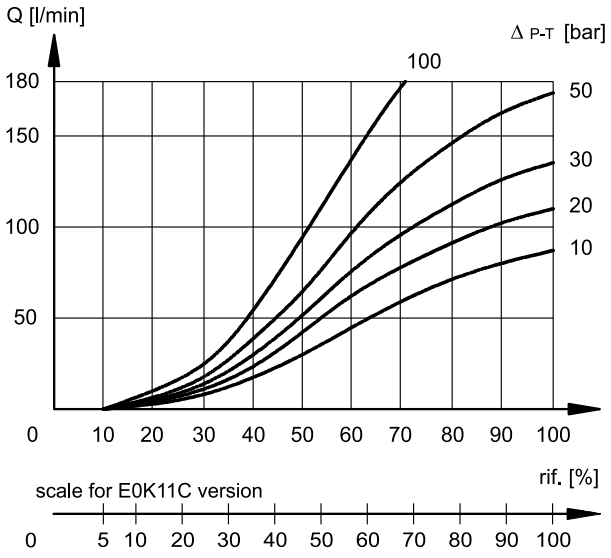
## 8 - CHARACTERISTIC CURVES

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

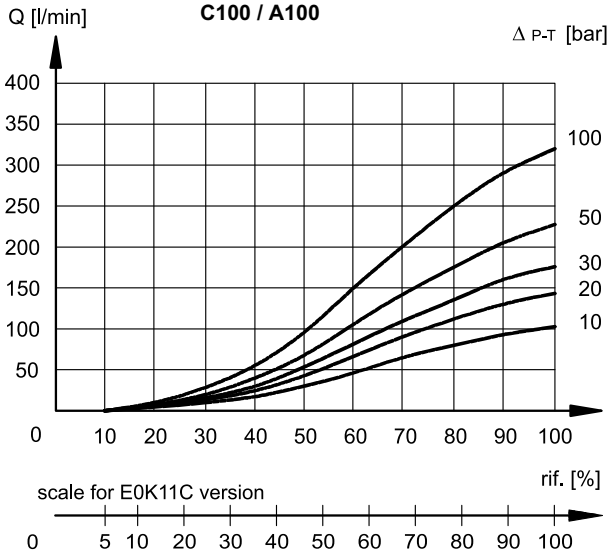
Typical flow rate curves at constant Δp related to the reference signal and measured for the available spools. The Δp values are measured between P and T valve ports.

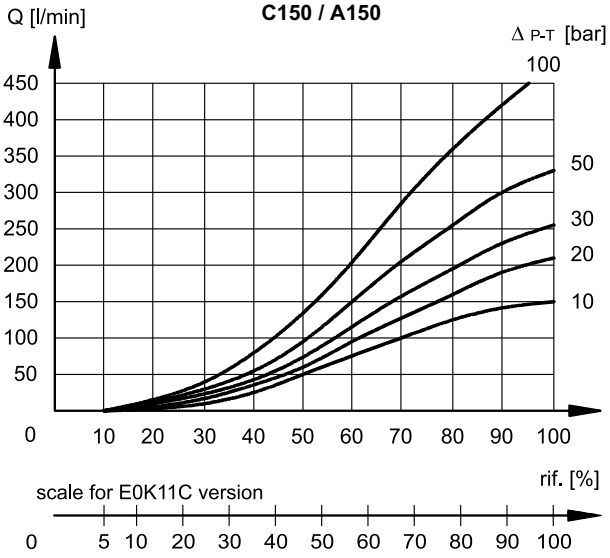



### 8.1 - Characteristic curves DSPE5J* and DSPE5RJ*

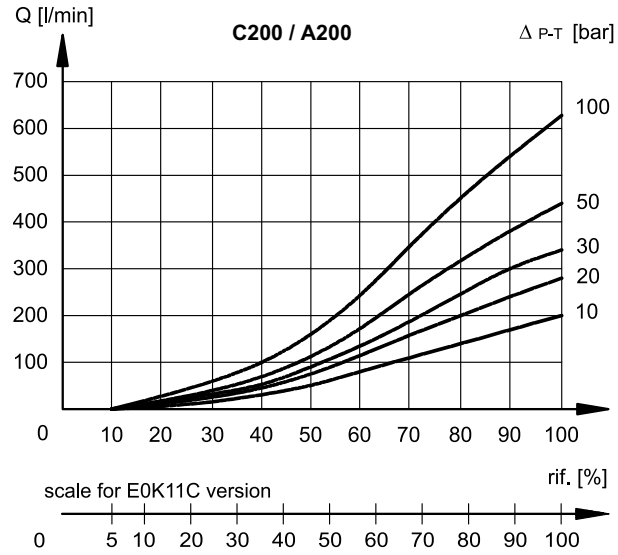


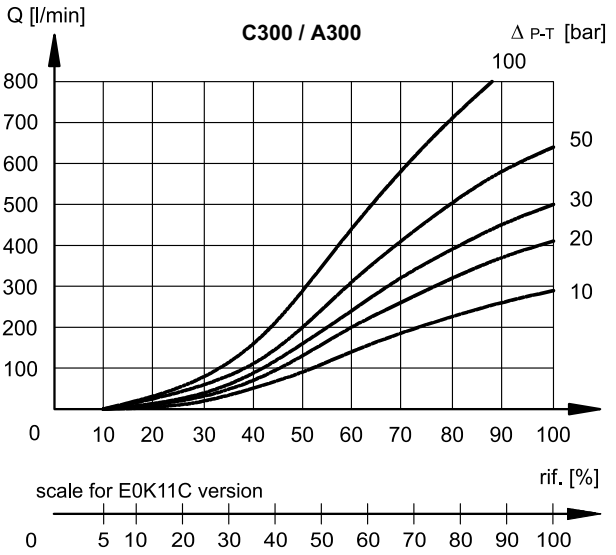

### 8.2 - Characteristic curves DSPE7J*



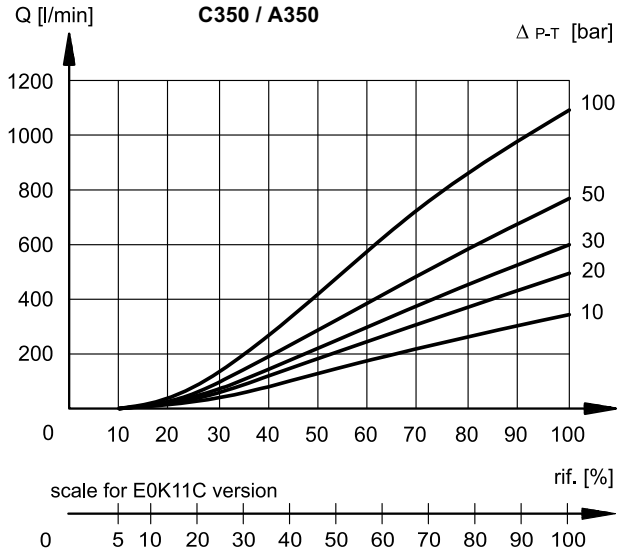



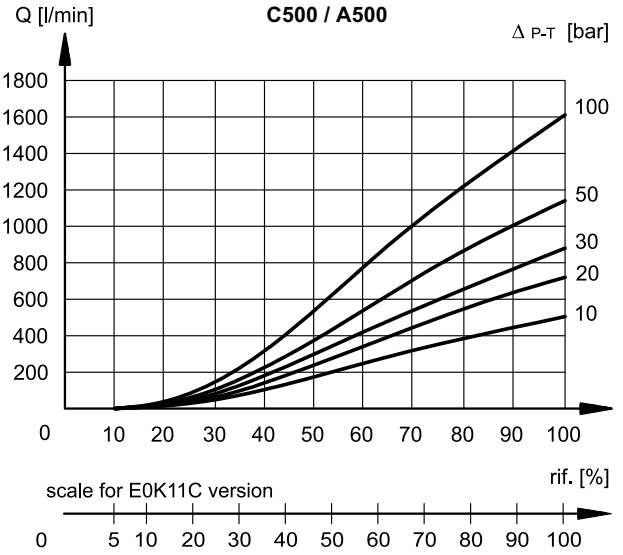
### 8.3 - Characteristic curves DSPE8J*



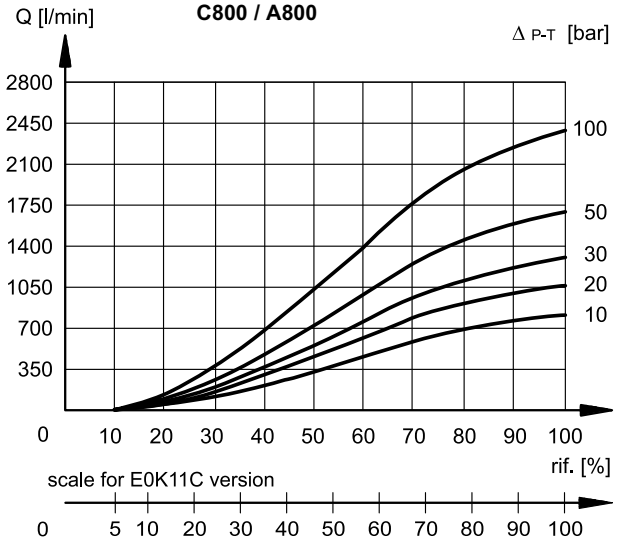




### 8.4 - Characteristic curves DSPE10J*



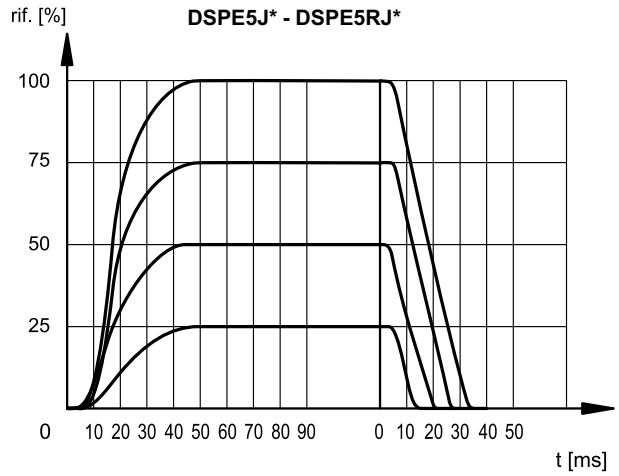



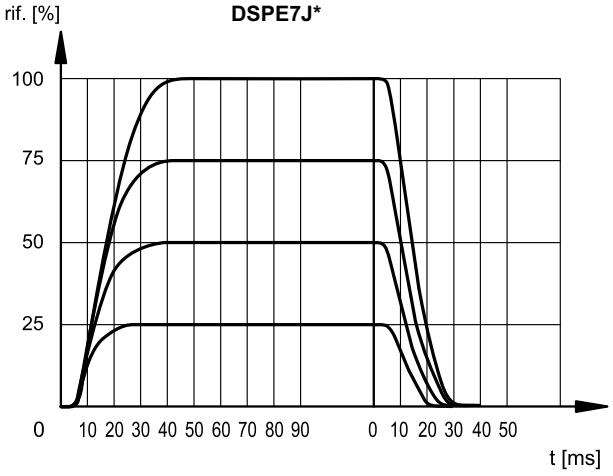

### 8.5 - Characteristic curves DSPE11J*

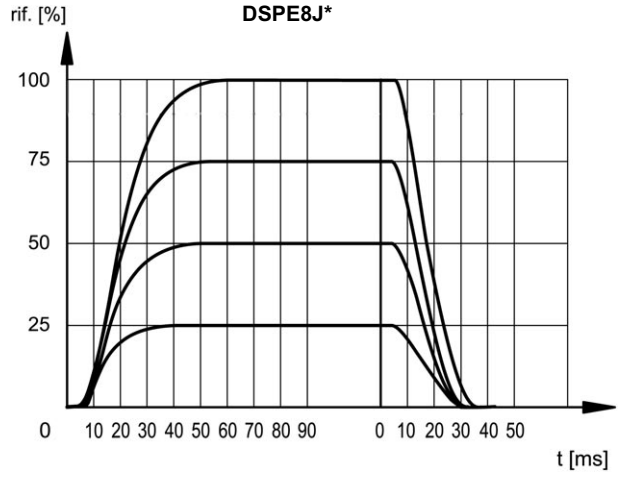


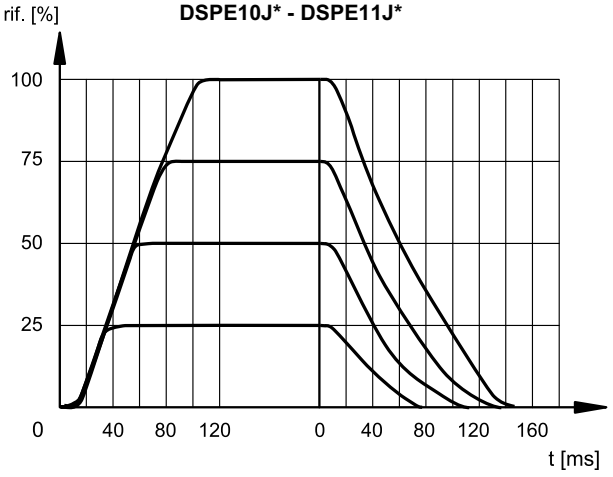
## 9 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure 100 bar)




## 10 - 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 |

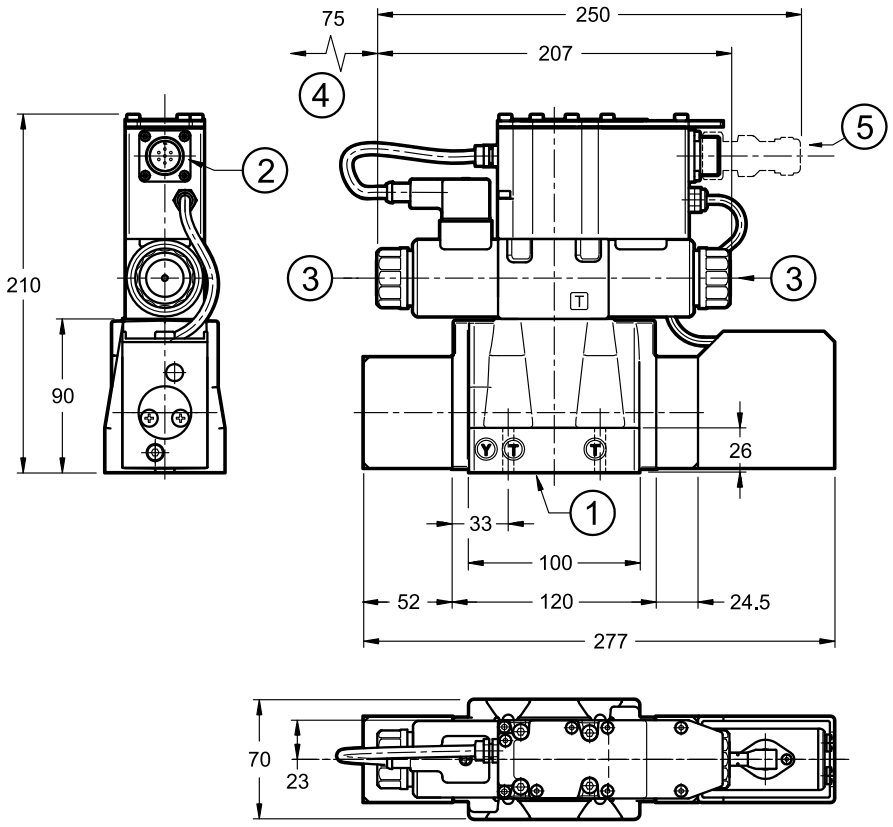
**NOTE**: if the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure.

Otherwise, the valve with internal pilot and pressure reducing valve with 30 bar fixed adjustment can be ordered (piloting type: Z, see section 1).

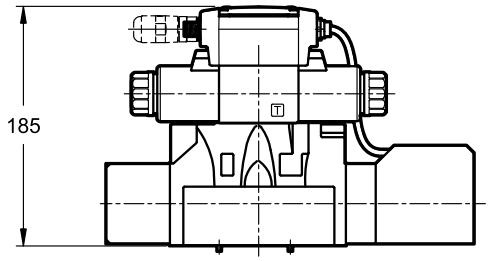
| | TYPE OF VALVE | Plug assembly X | Plug assembly Y |
|---|---|---|---|
| **IE** | INTERNAL PILOT AND EXTERNAL DRAIN | NO | YES |
| **II** | INTERNAL PILOT AND INTERNAL DRAIN | NO | NO |
| **EE** | EXTERNAL PILOT AND EXTERNAL DRAIN | YES | YES |
| **EI** | EXTERNAL PILOT AND INTERNAL DRAIN | YES | NO |

## 11 - DSPE5J* AND DSPE5RJ* - OVERALL AND MOUNTING DIMENSIONS

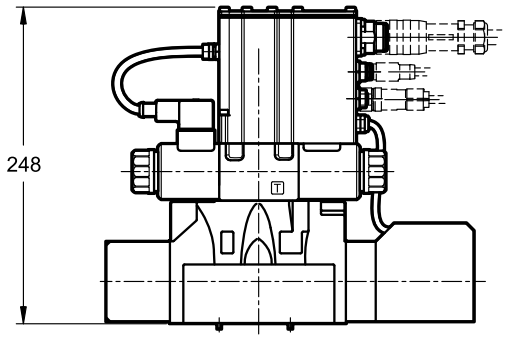
dimensions in mm




**DSPE5JL**




**DSPE5JH**




**NOTES:**

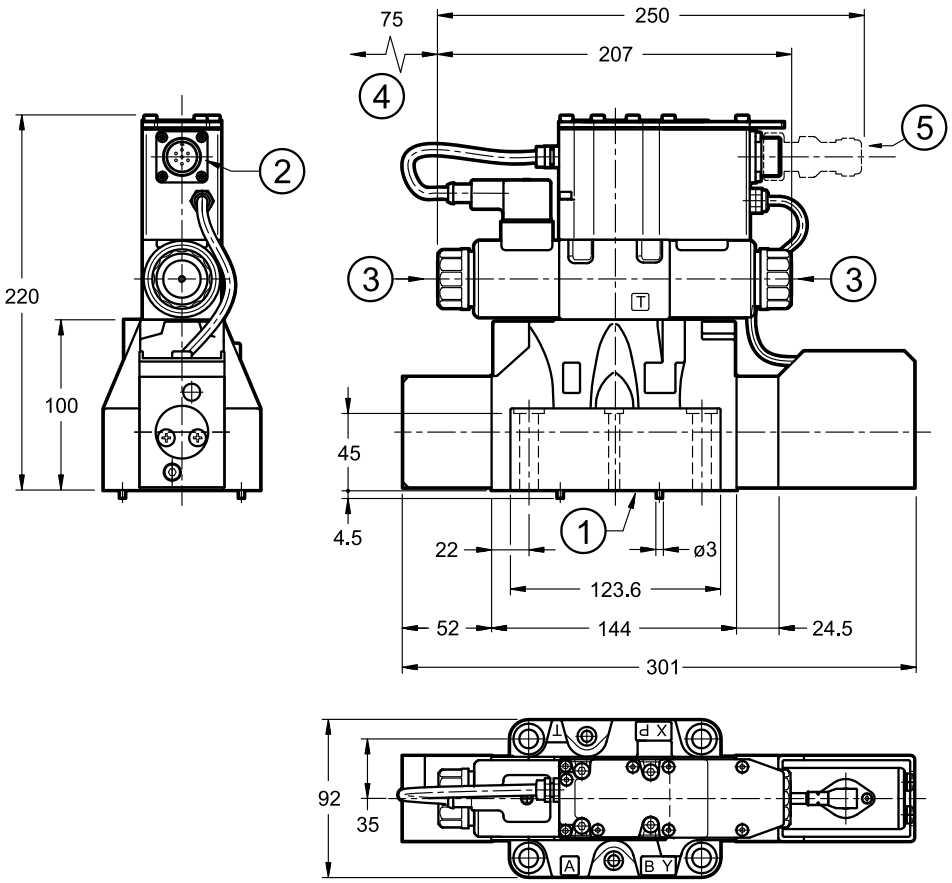
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.
- It is recommended to not disassemble the transducer.

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) - 90 Shore<br>2 OR type 2037 (9.25x1.78) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

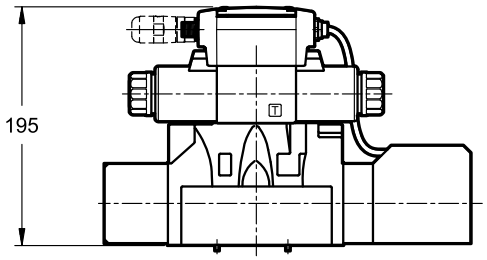
| |
|---|
| Valve fastening:<br>4 SHC screws M6x35 ISO 4762 |
| Tightening torque: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x10 |

## 12 - DSPE7J* - OVERALL AND MOUNTING DIMENSIONS

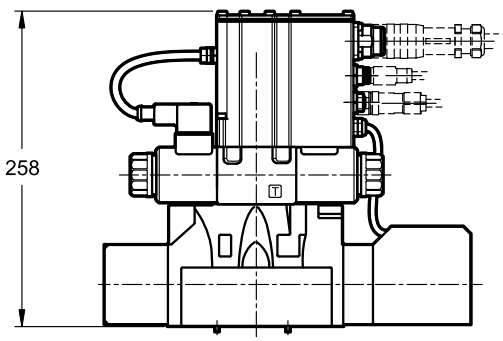
dimensions in mm




**DSPE7JL**




**DSPE7JH**




**NOTES:**

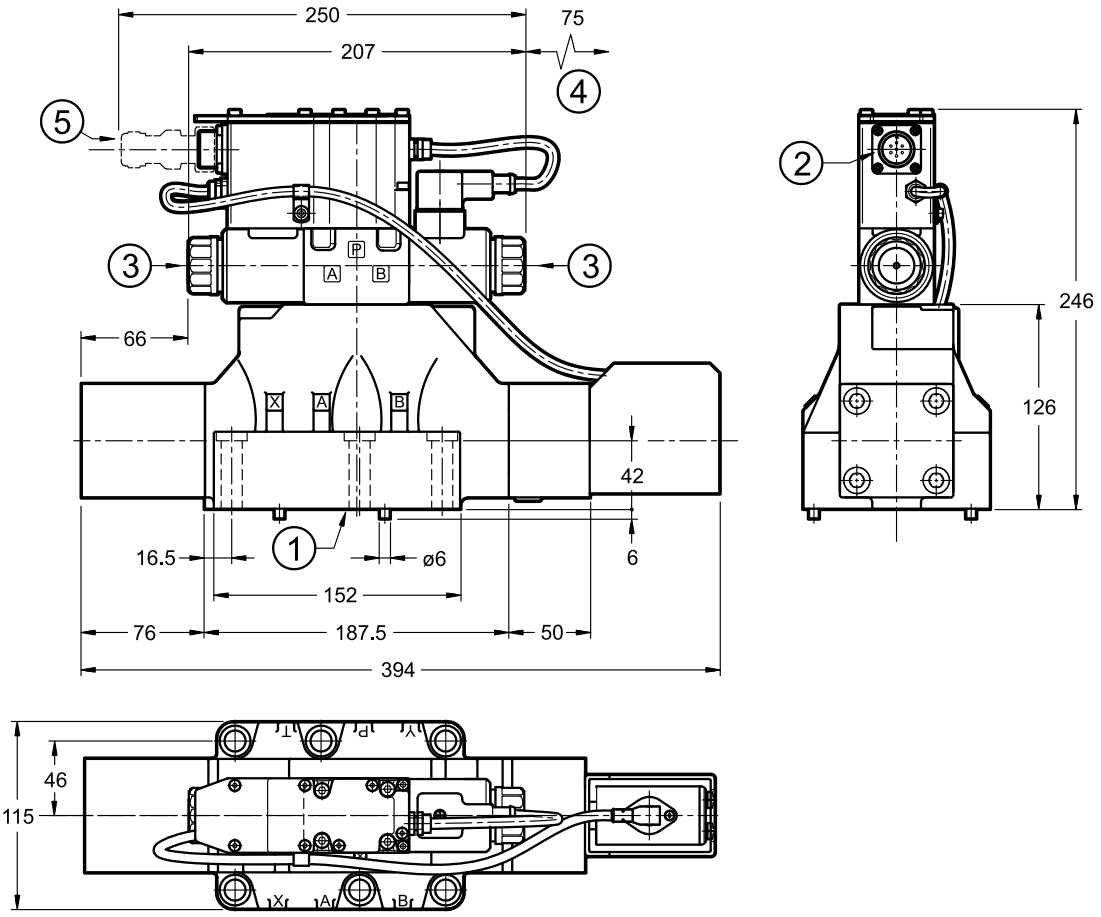
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.
- It is recommended to not disassemble the transducer.

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 130 (22.22x2.62) - 90 Shore<br>2 OR type 2043 (10.82x1.78) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

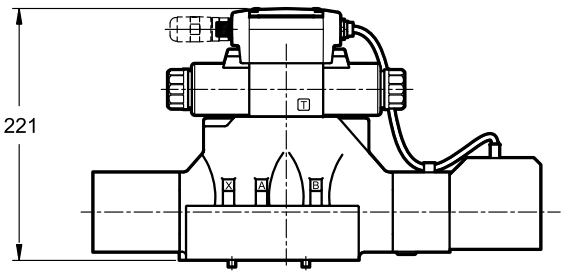
| |
|---|
| Valve fastening: 4 SHC screws M10x60 ISO 4762<br>2 SHC screws M6x60 ISO 4762 |
| Tightening torque: M10x60: 40 Nm (A8.8 screws)<br>M6x60: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x18; M10x18 |

## 13 - DSPE8J* - OVERALL AND MOUNTING DIMENSIONS

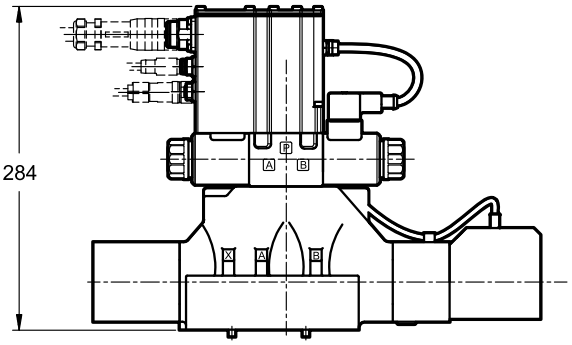
dimensions in mm




**DSPE8JL**




**DSPE8JH**




**NOTES:**

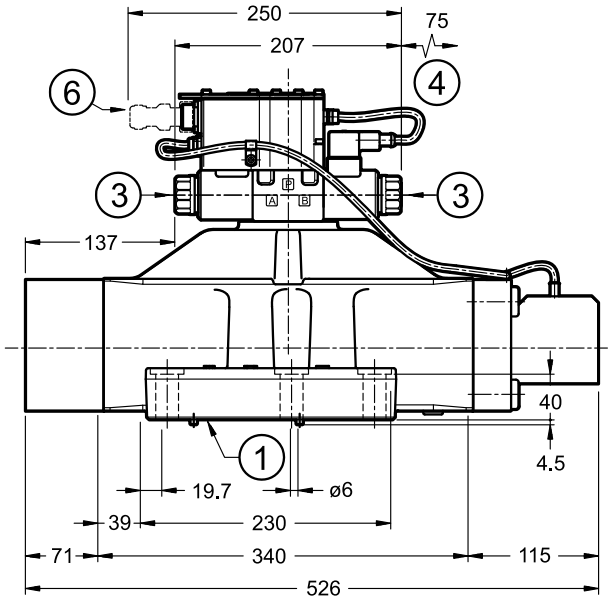
- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.
- It is recommended to not disassemble the transducer.

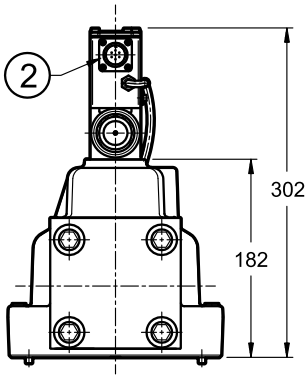
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 3118 (29.82x2.62) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

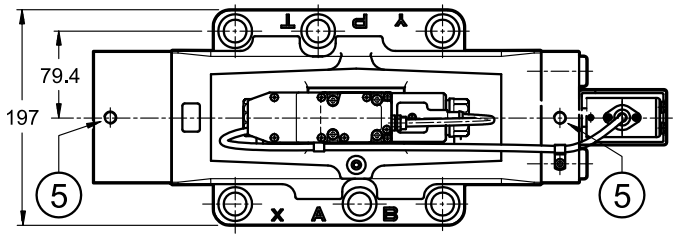
| |
|---|
| Valve fastening: 6 SHC screws M12x60 ISO 4762 |
| Tightening torque: 69 Nm (A8.8 screws) |
| Threads of mounting holes: M12x20 |

## 14 - DSPE10J* / DSPE11J* - OVERALL AND MOUNTING DIMENSIONS

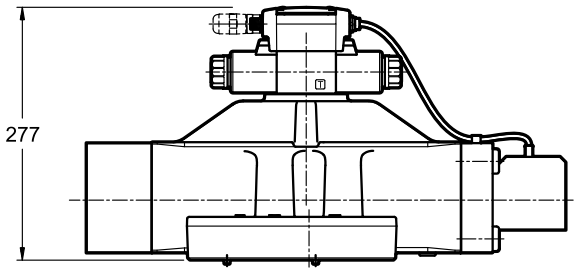
dimensions in mm



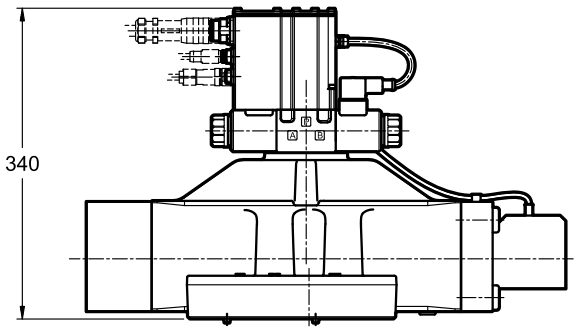




**DSPE10JL**




**DSPE10JH**




**NOTES:**

- Overall dimensions with Z option (fixed adjustment pressure reducing valve) at par. 15.
- Mounting surface at par. 16.
- It is recommended to not disassemble the transducer.

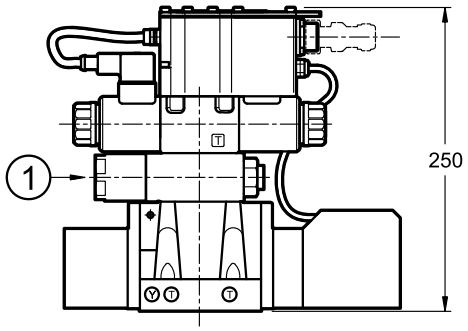
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>**DSPE10J***<br>4 OR type 4150 (37.59x3.53) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore<br>**DSPE11J***<br>4 OR type 4212 (53.57x3.53) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Coil removal space |
| 5 | M12 eyebolt seat for safe lift |
| 6 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening:<br>6 SHC screws M20x70 ISO 4762 |
| Tightening torque: 330 Nm (A8.8 screws) |
| Threads of mounting holes: M20x40 |

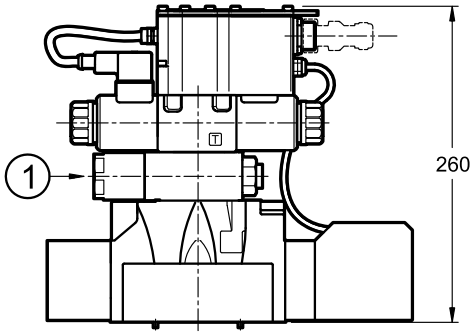
## 15 - OVERALL AND MOUNTING DIMENSIONS OF DSPE*J* WITH PILOT TYPE Z

dimensions in mm

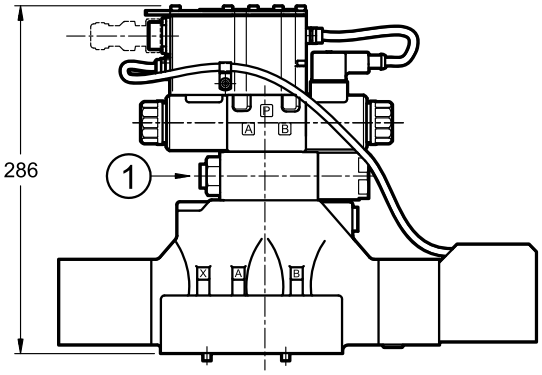
**DSPE5J***



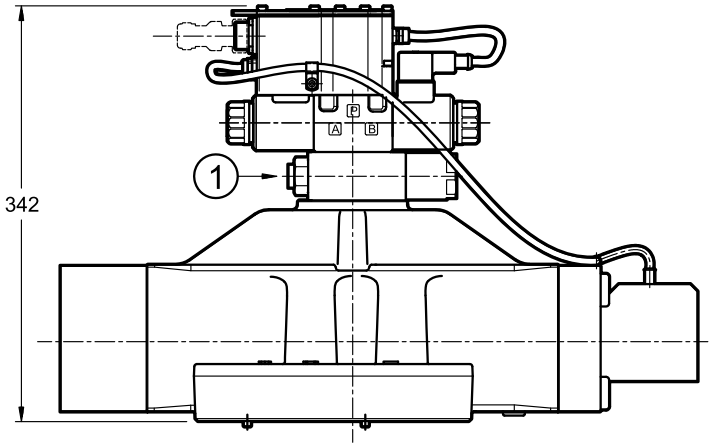

**DSPE7J***




**DSPE8J***



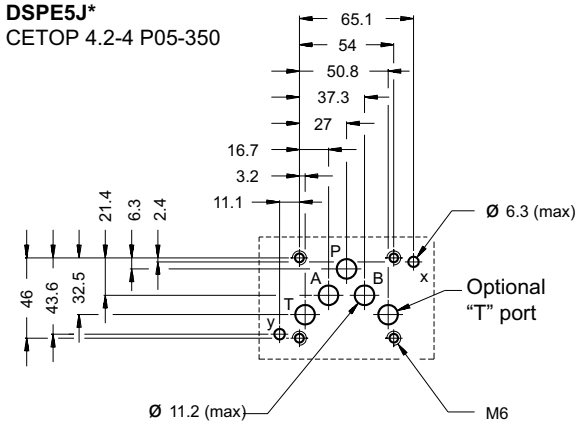

**DSPE10J* / DSPE11J***



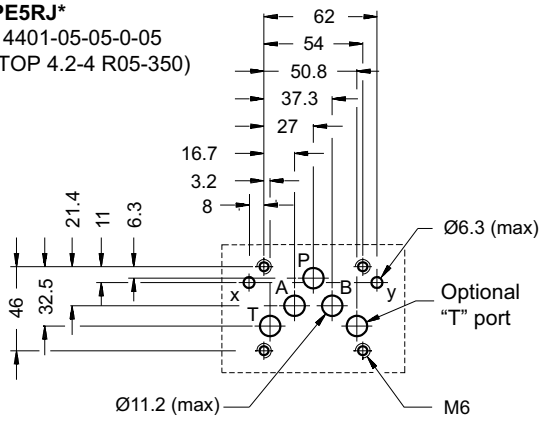

| | |
|---|---|
| 1 | 30 bar fixed adjustment pressure reducing valve |

## 16 - MOUNTING SURFACES

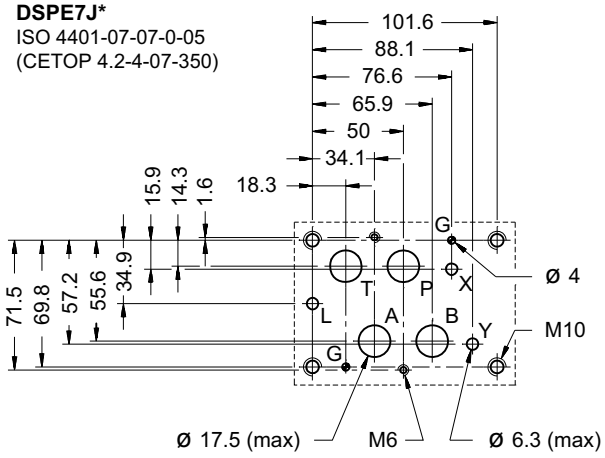
**DSPE5J***
CETOP 4.2-4 P05-350



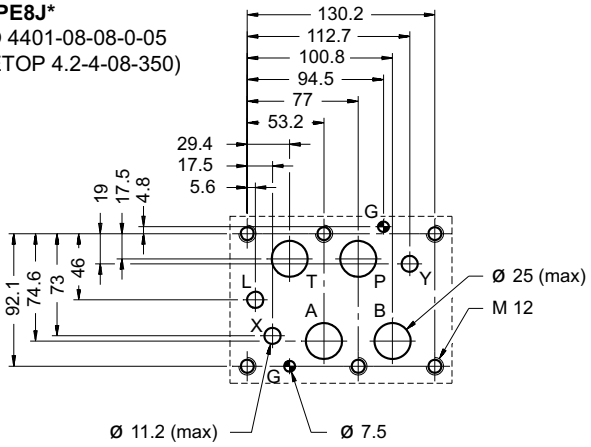

**DSPE5RJ***
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



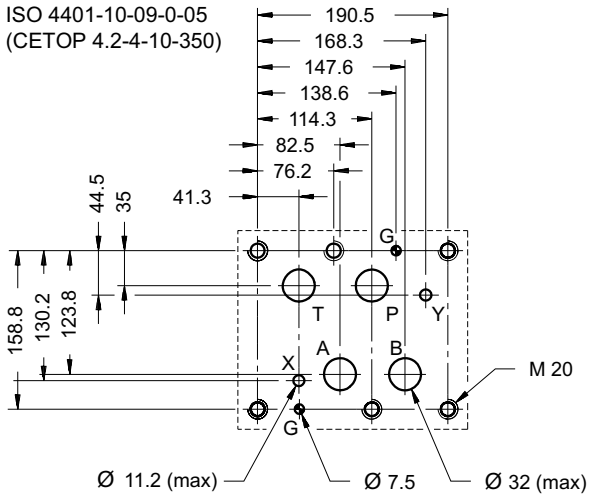

**DSPE7J***
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)




**DSPE8J***
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

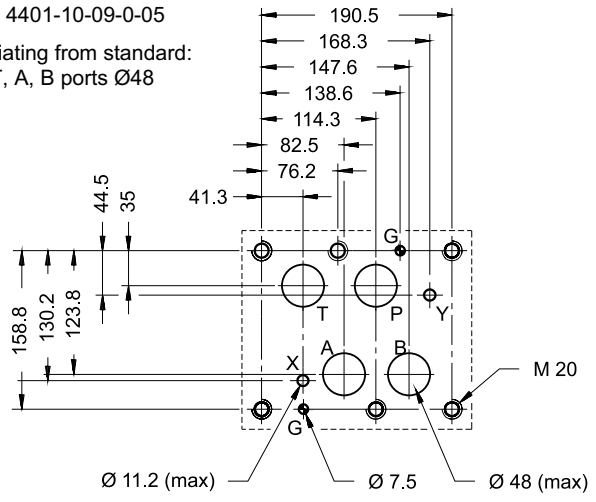



**DSPE10J***
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)




**DSPE11J***
ISO 4401-10-09-0-05

deviating from standard:
P, T, A, B ports Ø48



## 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.

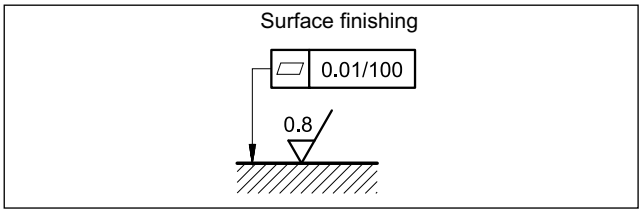
The fluid must be preserved in its physical and chemical characteristics.

## 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.




## 19 - ACCESSORIES

(to be ordered separately)

### 19.1 - Mating connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

### 19.2 - Mating connectors for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

### 19.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:
- up to 20 m cable length : 1,0 $mm^2$
- up to 40 m cable length : 1,5 $mm^2$ (IO-Link excluded)

Cross section for signals (command, monitor):
- 0,50 $mm^2$

### 19.4 - Kit for start-up LINPC-USB

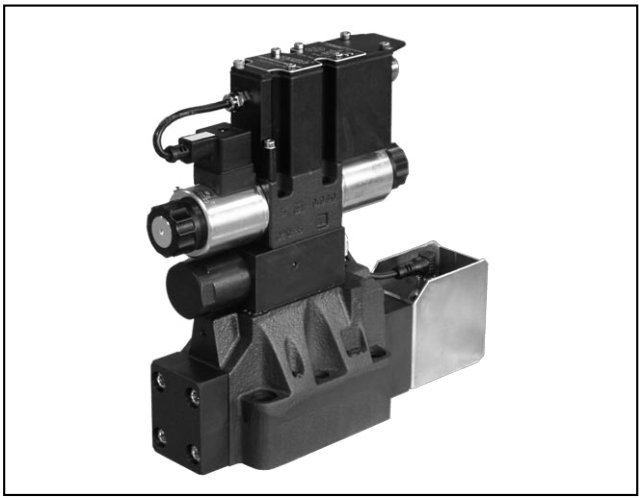
Device for service start-up and diagnostic, available for valves with K11 and K16 connections. See catalogue 89 850.

## 20 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DSPE5RJ*, DSPE10J* and DSPE11J*.

| | **DSPE5J*** | **DSPE7J*** | **DSPE8J*** |
|---|---|---|---|
| Type with rear ports | PME4-AI5G | PME07-AI6G | - |
| Type with side ports | PME4-AL5G | PME07-AL6G | PME5-AL8G |
| P, T, A, B ports dimensions<br>X, Y ports dimensions | 3/4” BSP<br>1/4” BSP | 1” BSP<br>1/4” BSP | 1 ½” BSP<br>1/4” BSP |



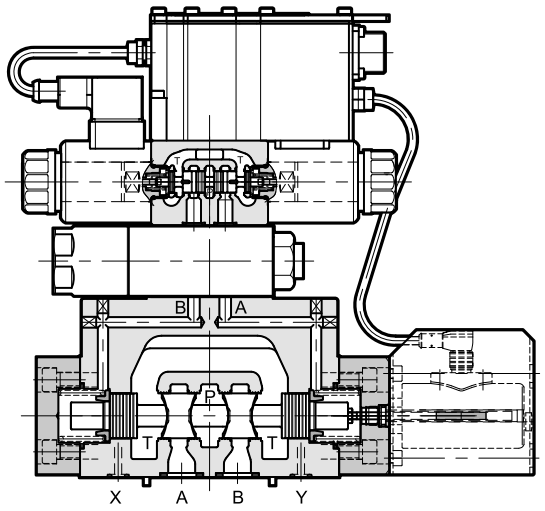
# DDPE*J*

## PROPORTIONAL DIRECTIONAL CONTROL VALVE, PILOT OPERATED, WITH FEEDBACK AND INTEGRATED ELECTRONICS

### SUBPLATE MOUNTING

**DDPE5RJ*** **ISO 4401-05**
**DDPE7J*** **ISO 4401-07**
**DDPE8J*** **ISO 4401-08**
**DDPE10J*** **ISO 4401-10**
**DDPE11J*** **ISO 4401-10** oversize ports

### OPERATING PRINCIPLE




— The DDPE*J* are proportional directional control valves, pilot-operated, with closed-loop position control of the main stage, with digital integrated electronics and with mounting interface in compliance with ISO 4401 standards.

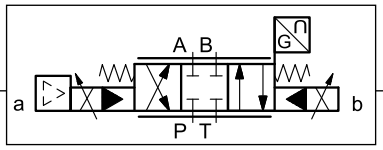
— They are controlled directly by an integrated digital amplifier. Transducer and digital card allow a fine control of the positioning of the spool, reducing hysteresis and response times.

— They are available with different types of electronics, with analogue or fieldbus interfaces.

— A monitoring signal of the main spool position is available.

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

**HYDRAULIC SYMBOL** (typical)



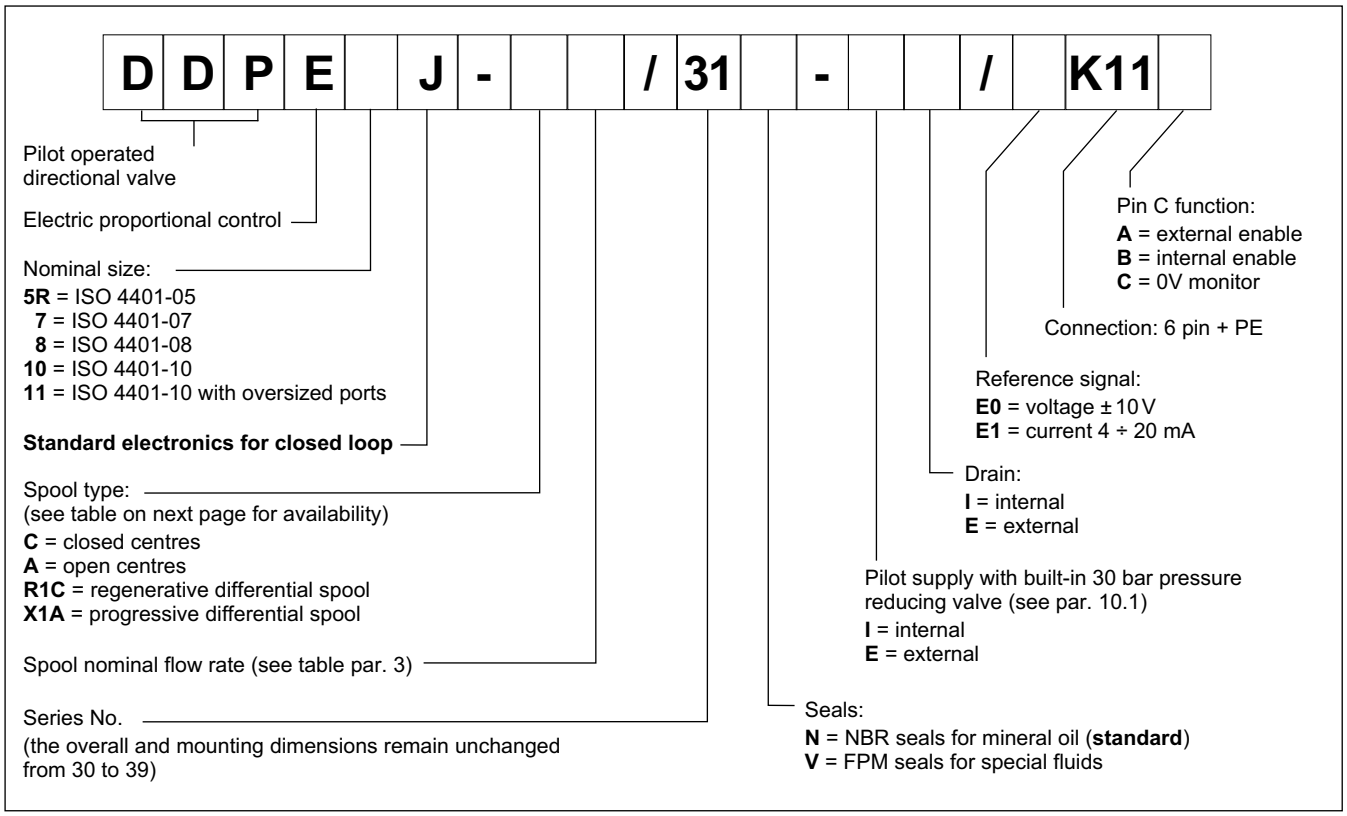

### PERFORMANCES

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

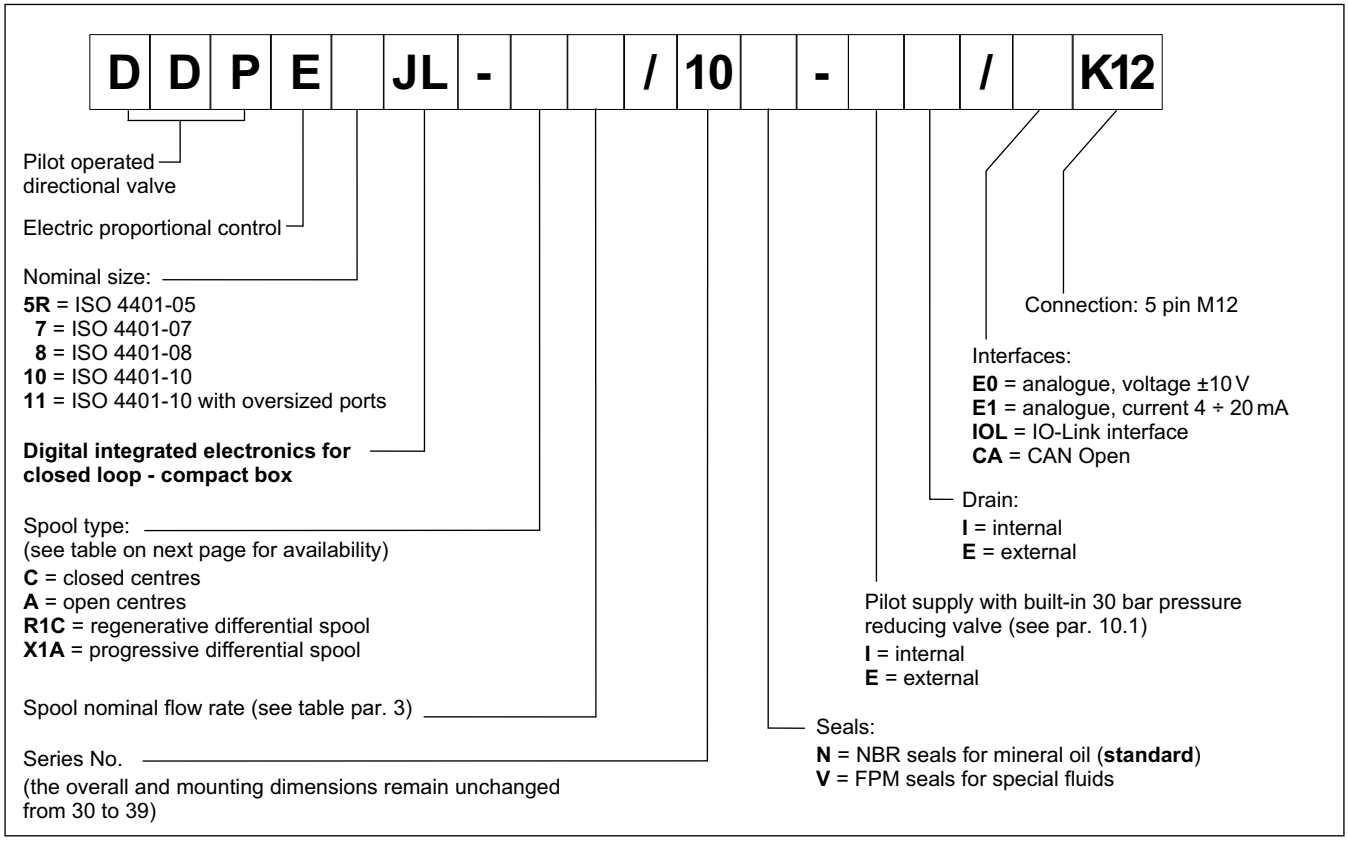
| | | DDPE5RJ* | DDPE7J* | DDPE8J* | DDPE10J* | DDPE11J* |
|---|---|---|---|---|---|---|
| Max operating pressure:<br>P - A - B ports<br>T port | bar | 350<br>see paragraph 10 | | | | |
| Rated flow at Δp 10 bar | l/min | 100 | 220 | 400 | 800 | 1000 |
| Hysteresis | % $Q_{max}$ | < 0.5% | | | | |
| Repeatability | % $Q_{max}$ | < ± 0.2% | | | | |
| Electrical characteristics | | 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 | 7.2 | 11.3 | 16.2 | 55 | 55 |

## 1 - IDENTIFICATION CODE

### 1.1 - Standard electronics




### 1.2 - Compact electronics



### 1.3 - Electronics with fieldbus communication

| D | D | P | E | | JH | - | | | / | 31 | | - | | | - | | K16 | | / | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Pilot operated directional valve

Electric proportional control

Nominal size:
**5R** = ISO 4401-05
**7** = ISO 4401-07
**8** = ISO 4401-08
**10** = ISO 4401-10
**11** = ISO 4401-10 with oversized ports

**Digital integrated electronics for closed loop with fieldbus communication**

Spool type:
(see table on next page for availability)
**C** = closed centres
**A** = open centres
**R1C** = regenerative differential spool
**X1A** = progressive differential spool

Spool nominal flow rate (see table par. 3)

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

Pilot supply with built-in 30 bar pressure reducing valve (see par. 10.1)
**I** = internal
**E** = external

Drain:
**I** = internal
**E** = external

Reference signal:
**E0** = voltage ±10 V **E1** = current 4 ÷ 20 mA
**FD** = full digital version (on request)

Main connector 11 pin + PE

X1 Main connector configuration:
**D1** = one command
**D0** = full digital version
(on request - available for reference signal FD type only)

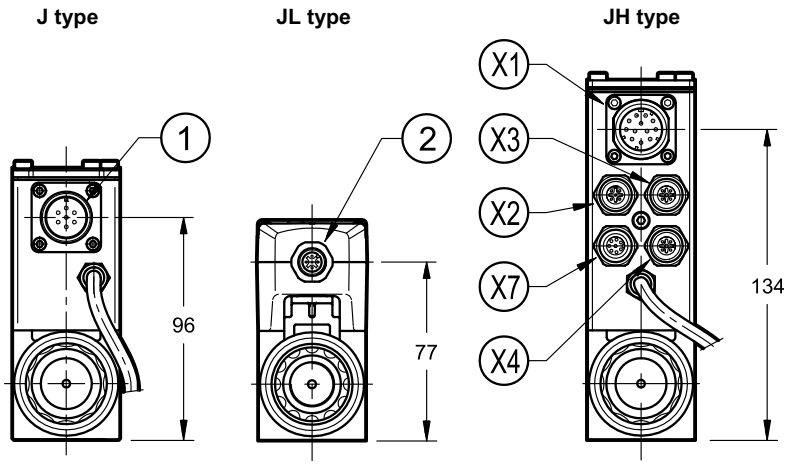
X2, X3 Field BUS type:
**CA** = CAN Open
**PD** = PROFIBUS DP
**EC** = EtherCAT
**EN** = Ethernet /IP
**PN** = Profinet
**PL** = PowerLink

X7 Digital transducer:
**0** = none
**1** = version 1 (SSI type)
**2** = version 2 (Encoder type)

X4 Analogue transducer:
**0** = none
**1** = version 1 (single /double transducer)

## 2 - COMPARISON AMONG INTEGRATED ELECTRONICS

dimensions in mm



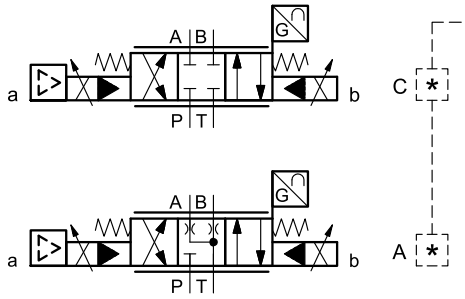

| | |
|---|---|
| 1 | Connection 6 pin + PE |
| 2 | Connection M12 5 pin, code A, male |
| X1 | Main connection 11 pin + PE |
| X2 | Fieldbus communication (IN) |
| X3 | Fieldbus communication (OUT) |
| X4 | Connection for analogue transducer |
| X7 | Connection for digital transducer |

**NOTE 1**: Depending on the chosen version, X4 and X7 connections may not be present. Please refer to sections 5, 6 and 7 for connections descriptions and pinouts.
**NOTE 2**: Related mating connectors have to be ordered separately. See catalogue 89 000.

## 3 - AVAILABLE CONFIGURATIONS

The valve configuration depends on the combination of spool type and rated flow.

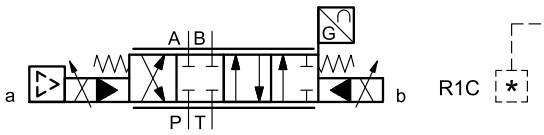
**3 positions with spring centreing**




| valve type | * | Nominal flow with Δp 10 bar P-T |
|---|---|---|
| DDPE5RJ | **100** | 100 l/min |
| DDPE7J | **120** | 120 l/min |
| | **220** | 220 l/min |
| DDPE8J | **250** | 250 l/min |
| | **400** | 400 l/min |
| DDPE10J | **800** | 800 l/min |
| DDPE11J | **1000** | 1000 l/min |

**regenerative differential spool**

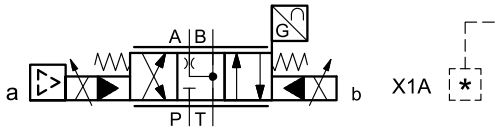
The R1C spool is specific for regenerative circuits made with external check valve.




| valve type | * | Nominal flow with Δp 10 bar P-T |
|---|---|---|
| DDPE7J | **220** | 220 l/min |

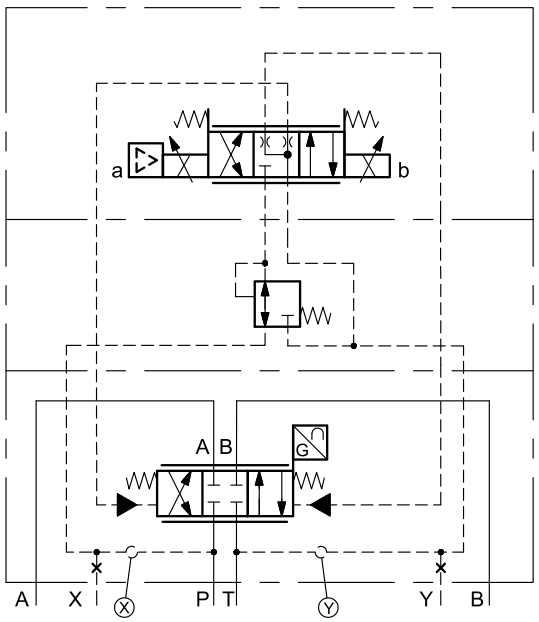
**progressive differential spool**

The X1A spool is specific for alternate p/Q control, typical of plastic injection cycles.




| valve type | * | Nominal flow with Δp 10 bar P-T |
|---|---|---|
| DDPE7J | **220** | 220 l/min |

detailed symbol (spool type C)



## 4 - ELECTRONICS COMMON DATA

| | | |
|---|---|---|
| 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 | A | 3 |
| Managed breakdowns | | Overload and electronics overheating, cable breakdown, supply voltage failures |
| Electromagnetic compatibility (EMC) emissions EN 61000-6-4, immunity EN 61000-6-2 | | According to 2014/30/EU standards |

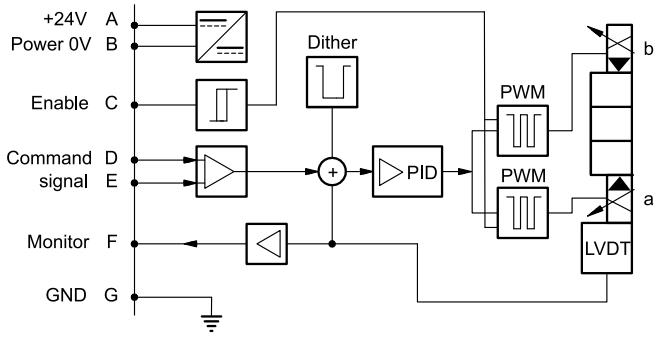
## 5 - DDPE*J - STANDARD ELECTRONICS

### 5.1 - Electrical characteristics

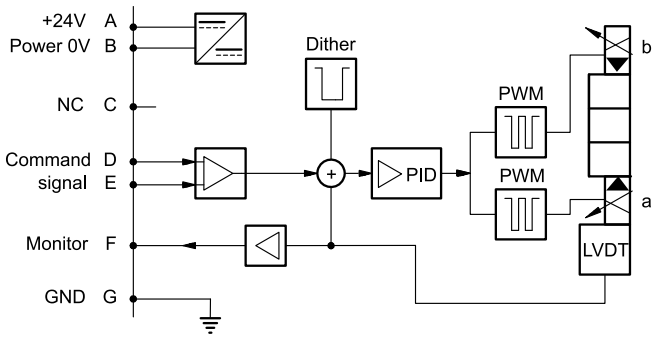
| | | |
|---|---|---|
| Command signal: voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication for diagnostic | | LIN-bus Interface (by means of the optional kit) |
| Connection | | 6 pin + PE (MIL-C-5015-G - DIN EN 175201-804) |

### 5.2 - On-board electronics diagrams

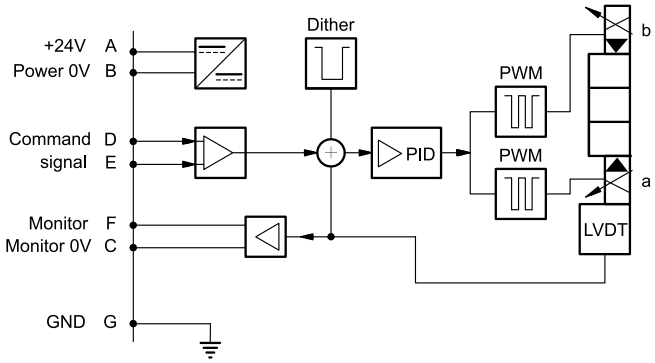
**VERSION A** - External Enable




**VERSION B** - Internal Enable

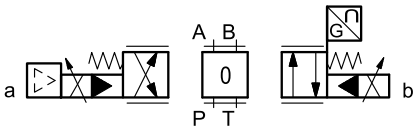



**VERSION C** - 0V Monitor

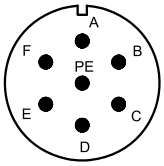


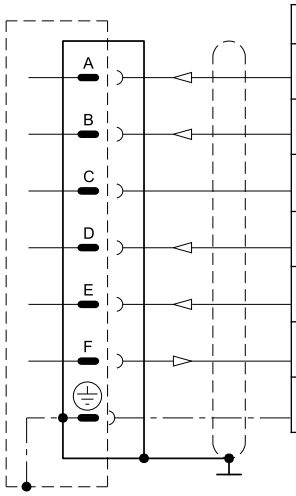
### 5.3 - Versions with voltage command (E0)

The reference signal is 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** |
| **MONITOR** | **-10V** | **0V** | **+10V** |



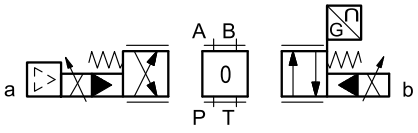




| Pin | Values | version A | version B | version C |
|---|---|---|---|---|
| **A** | 24 V DC | Supply Voltage | | |
| **B** | 0 V | | | |
| **C** | | Enable 24 V DC | do not connect - | PIN F reference 0 V |
| **D** | ± 10 V | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | ± 10 V | Monitor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

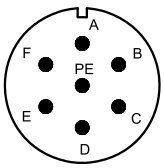
### 5.4 - Versions with current command (E1)

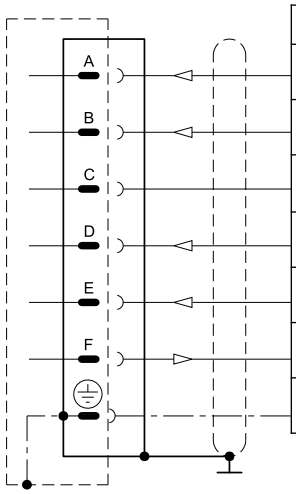
The reference signal is supplied in current 4 ÷ 20 mA. If the current for command is lower the card shows a breakdown cable error. To reset the error is sufficient to restore the signal.

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** | **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 | do not connect - | PIN F reference 0 V |
| **D** | 4 ÷ 20 mA | Command | | |
| **E** | 0 V | Command reference | | |
| **F** | 4 ÷ 20 mA | Monitor (0V reference: pin B) | | Monitor |
| **PE** | GND | Ground (Earth) | | |

## 6 - DDPE*JL - COMPACT ELECTRONICS

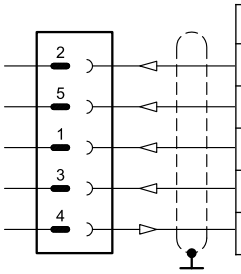
In versions 'IOL' and 'CA' pin 3 and pin 5 are galvanic isolated up to100 V to avoid earth loops. In IO-Link networks, the length of the connecting cables is limited to 20 metres.

### 6.1 - Electrical characteristics

| | | | |
|---|---|---|---|
| Command signal: | voltage (E0)<br>current (E1) | V DC<br>mA | ±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm) |
| Monitor signal : | voltage (E0)<br>current (E1) | V DC<br>mA | 0 ÷ 5 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| IO-Link communication (IOL):<br>Data rate | | kBaud | IO-Link Port Class B<br>230.4 |
| Can Open communication (CA):<br>Data rate | | kbit | 10 ÷ 1000 |
| Data register (IOL and CA versions only) | | | solenoid voltage supply, solenoid faults (shortcircuit, bad config, internal), box temperature, switch-on time, vibrations) |
| Connection | | | 5-pin M12 code A (IEC 61076-2-101) |

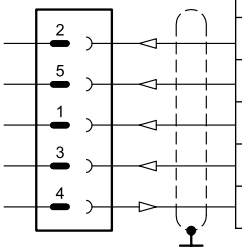
### 6.2 - Pin tables

**'E0' connection**

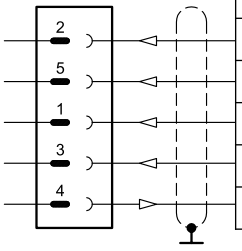

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | ± 10 V | Command |
| 3 | 0V | Command reference |
| 4 | 0 ÷ 5V | Monitor (0V reference: pin 5) |

**'E1' connection**

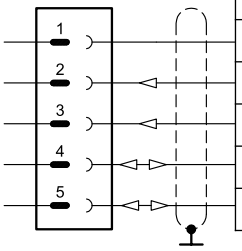

| Pin | Values | Function |
|---|---|---|
| 2 | 24 V DC | Supply voltage (solenoid and logic) |
| 5 | 0 V | |
| 1 | 4 ÷ 20 mA | Command |
| 3 | 0V | Command reference |
| 4 | 4 ÷ 20 mA | Monitor (0V reference: pin 5) |

**'IOL' connection**


| Pin | Values | | Function |
|---|---|---|---|
| 2 | 2L+ | 24 V DC | Supply of the power stage |
| 5 | 2L- | 0 V (GND) | Internal galvanic isolation from PIN 3 |
| 1 | 1L+ | +24 V DC | IO-Link supply voltage |
| 3 | 1L- | 0V (GND) | |
| 4 | C/Q | | IO-Link Communication |

**'CA' connection**


| Pin | Values | Function |
|---|---|---|
| 1 | CAN_SH | Shield |
| 2 | 24 V DC | Supply voltage |
| 3 | 0 V (GND) | |
| 4 | CAN H | Bus line (high) |
| 5 | CAN_L | Bus line (low) |

## 7 - DDPE*JH - FIELDBUS ELECTRONICS

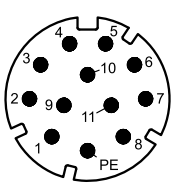
The 11+ PE pin connection allows separate supply voltage for electronics and solenoids.

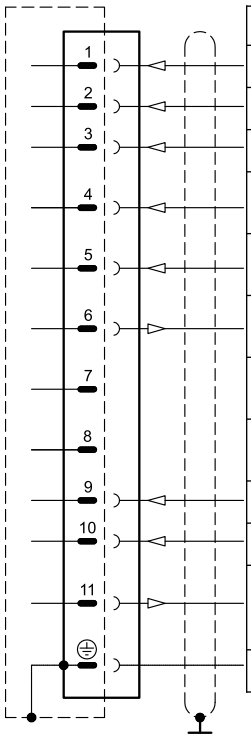
Command - valve position schemes as for the basic electronics. Please refer to pictures in par. 5.3 and 5.4.

### 7.1 - Electrical characteristics

| | | |
|---|---|---|
| Command signal:<br>voltage (E0)<br>current (E1)<br>digital (FD) | <br>V DC<br>mA | <br>±10 (Impedance Ri = 11 kOhm)<br>4 ÷ 20 (Impedance Ri = 58 Ohm)<br>via fieldbus |
| Monitor signal (current to solenoid):<br>voltage (E0)<br>current (E1) | <br>V DC<br>mA | <br>±10 (Impedance Ro > 1 kOhm)<br>4 ÷ 20 (Impedance Ro = 500 Ohm) |
| Communication / diagnostic | | via Bus register |
| Communication interface standards<br>CAN Open<br>PROFIBUS DP<br>EtherCAT, Ethernet /IP, Profinet, PowerLink | | <br>EN 50325-4 + DS408<br>EN 50170-2 / IEC 61158<br>IEC 61158 |
| Communication physical layer<br>CAN Open<br>PROFIBUS DP<br>EtherCAT, Ethernet /IP, Profinet, PowerLink | | <br>optical insulated CAN ISO 11898<br>optical insulated RS485<br>fast ethernet, insulated 100 Base TX |
| Power connection | | 11 pin + PE (DIN 43651) |

### 7.2 - X1 Main connection pin table




**D1: one command**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Command |
| **5** | 0 V | Command reference signal |
| **6** | ± 10 V (E0)<br>4 ÷ 20 (E1) | Monitor<br>(0V reference pin 10) |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V reference pin 2) |
| **12** | GND | Ground (Earth) |

**D0: full digital**

| Pin | Values | Function |
|---|---|---|
| **1** | 24 V DC | Main supply voltage |
| **2** | 0 V | |
| **3** | 24V DC | Enable |
| **4** | NC | do not connect |
| **5** | NC | do not connect |
| **6** | NC | do not connect |
| **7** | NC | do not connect |
| **8** | NC | do not connect |
| **9** | 24 V DC | Logic and control supply |
| **10** | 0 V | |
| **11** | 24 V DC | Fault (0V DC) or normal working (24V DC)<br>(0V ref. pin 2) |
| **12** | GND | Ground (Earth) |

### 7.3 - FIELDBUS connections

Please wire following guidelines provided by the relative standards communication protocol.

#### 7.3.1 - Communication connection CA (CAN Open)

**X2 (IN) connection**: M12 A 5 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | CAN_SH | Shield |
| **2** | NC | Do not connect |
| **3** | GND | Signal zero for data line |
| **4** | CAN_H | Bus line (high) |
| **5** | CAN_L | Bus line (low) |

**X3 (OUT) connection**: M12 A 5 pin male


| Pin | Values | Function |
|---|---|---|
| **1** | CAN_SH | Shield |
| **2** | NC | Do not connect |
| **3** | GND | Signal zero for data line |
| **4** | CAN_H | Bus line (high) |
| **5** | CAN_L | Bus line (low) |

#### 7.3.2 - Communication connection PD (PROFIBUS DP)

**X2 (IN) connection**: M12 B 5 pin male (IN)


| Pin | Values | Function |
|---|---|---|
| **1** | +5 V | Termination signal supply |
| **2** | PB_A | Bus line (high) |
| **3** | 0 V | Signal zero for data line and termination |
| **4** | PB_B | Bus line (low) |
| **5** | SHIELD | |

**X3 (OUT) connection**: M12 B 5 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | +5 V | Termination signal supply |
| **2** | PB_A | Bus line (high) |
| **3** | 0 V | Signal zero for data line and termination |
| **4** | PB_B | Bus line (low) |
| **5** | SHIELD | |

#### 7.3.3 - Communication connections: EC (EtherCat), EN (Ethernet/IP), PN (PROFINET), PL (POWERLINK)

**X2 (IN) connection** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

**NOTE**: Shield connection on connector housing is recommended.

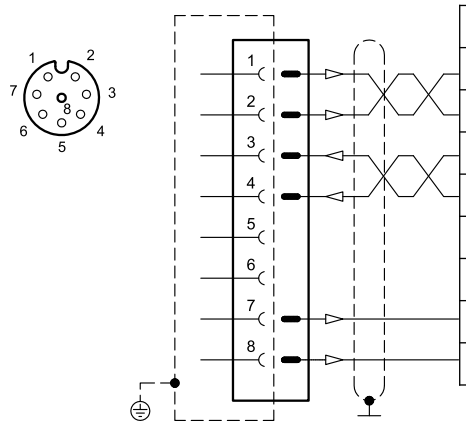
**X3 (OUT) connection:** M12 D 4 pin female


| Pin | Values | Function |
|---|---|---|
| **1** | TX+ | Transmitter |
| **2** | RX+ | Receiver |
| **3** | TX- | Transmitter |
| **4** | RX- | Receiver |
| HOUSING | shield | |

### 7.4 - Digital transducer connection

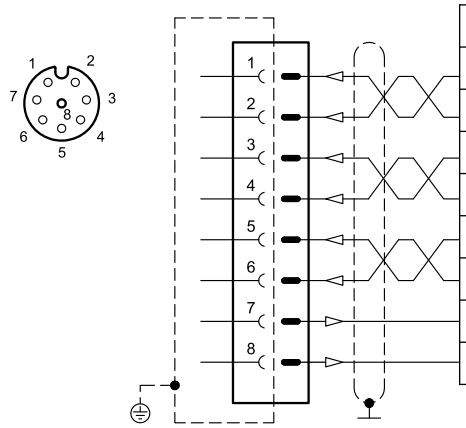
**X7 connection:** M12 A 8 pin female

**VERSION 1: SSI type**



| Pin | SSI Values | Function | Notes |
|---|---|---|---|
| **1** | CLK+ | Serial synchronous clock (+) | Input - digital signal |
| **2** | CLK- | Serial synchronous clock (-) | |
| **3** | MIS0+ | Serial position data (+) | |
| **4** | MIS0- | Serial position data (-) | |
| **5** | NC | - | do not connect |
| **6** | NC | - | |
| **7** | +24 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

**VERSION 2: ENCODER type**



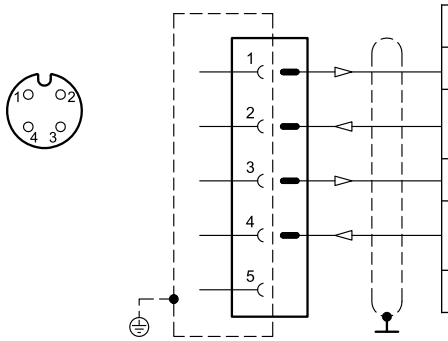
| Pin | Values | Function | Notes |
|---|---|---|---|
| **1** | ENC_Z+ | input channel Z+ | Input - digital signal |
| **2** | ENC_Z- | input channel Z- | |
| **3** | ENC_A+ | input channel A+ | |
| **4** | ENC_A- | input channel A+ | |
| **5** | ENC_B+ | input channel B+ | |
| **6** | ENC_B- | input channel B+ | |
| **7** | +5 V | transducer power supply | Output power supply |
| **8** | 0 V | - | Common GND |

### 7.5 - Analogue transducer connection

**X4 connection**: M12 A 4 pin female

**VERSION 1: single / double transducer**

(single or double is a software-selectable option)



| Pin | Values | Notes |
|---|---|---|
| **1** | +24 V | Remote transducer power supply (out) 100 mA |
| **2** | ±10 V<br>4 ÷20 mA | Input signal of transducer 1 (range software selectable) |
| **3** | 0 V | Common reference signal for transducer power and signals |
| **4** | ±10 V<br>4 ÷20 mA | Input signal of transducer 2 (range software selectable) |
| **5** | - | |

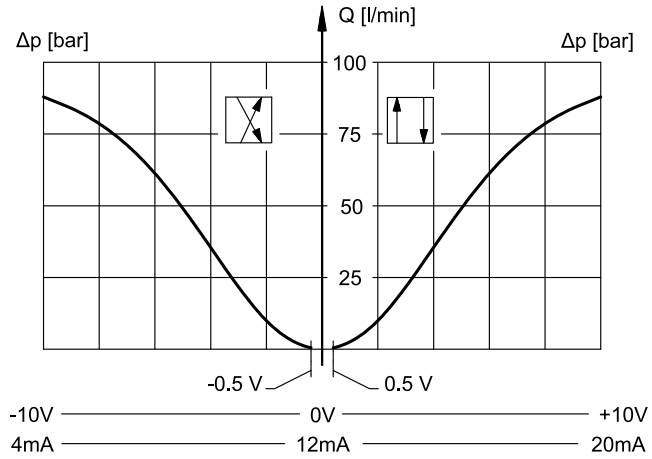
## 8 - CHARACTERISTIC CURVES

(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: Δp = 5 bar (Δp P→T = 10 bar).

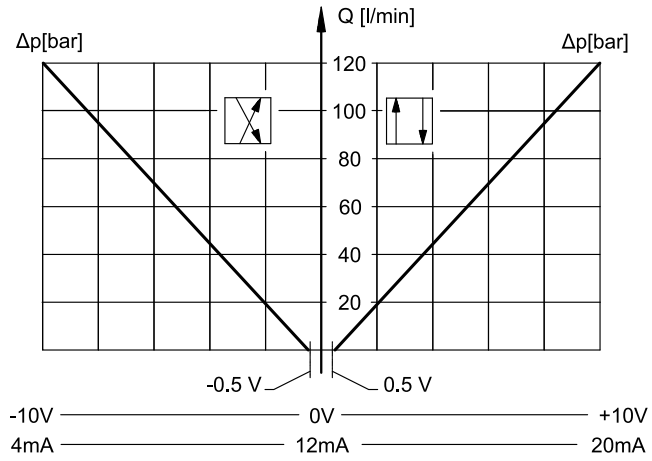
### 8.1 - Characteristic curves DDPE5RJ *

**SPOOL C100 / A100**

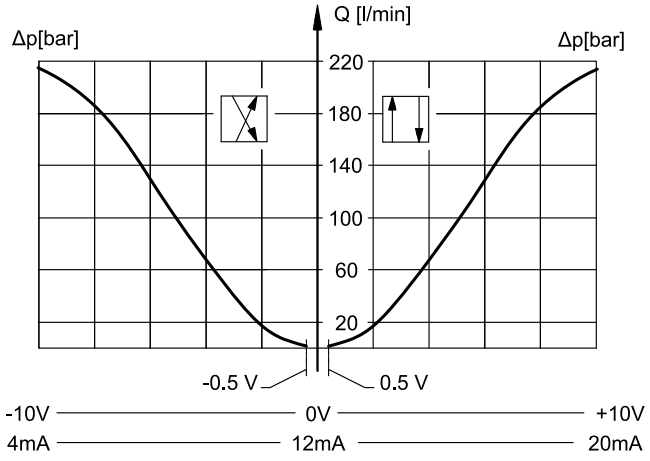



### 8.2 - Characteristic curves DDPE7J*

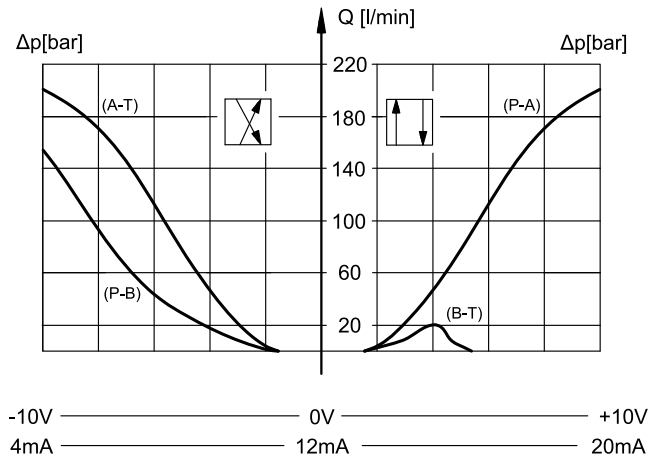
**SPOOL C120 / A120**



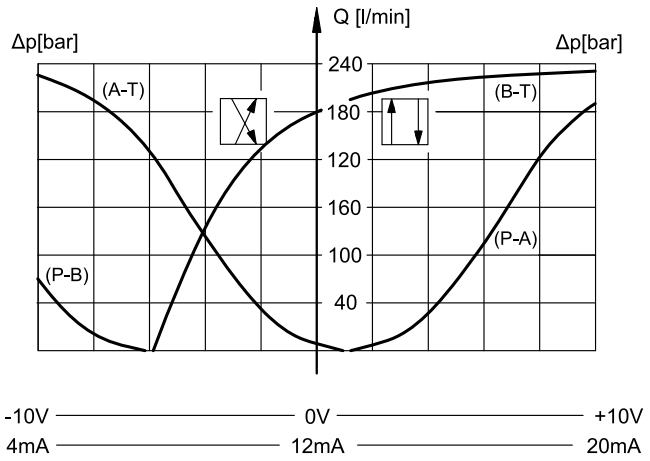

**SPOOL C220 / A220**




**SPOOL R1C220**

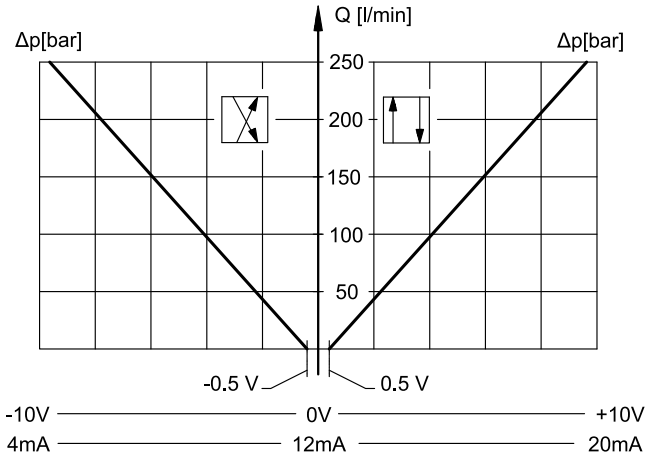



**SPOOL X1A220**

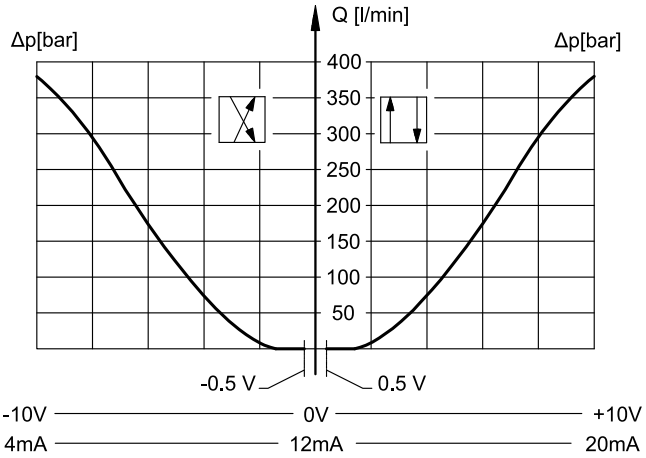


### 8.3 - Characteristic curves DDPE8J*

**SPOOL C250 / A250**

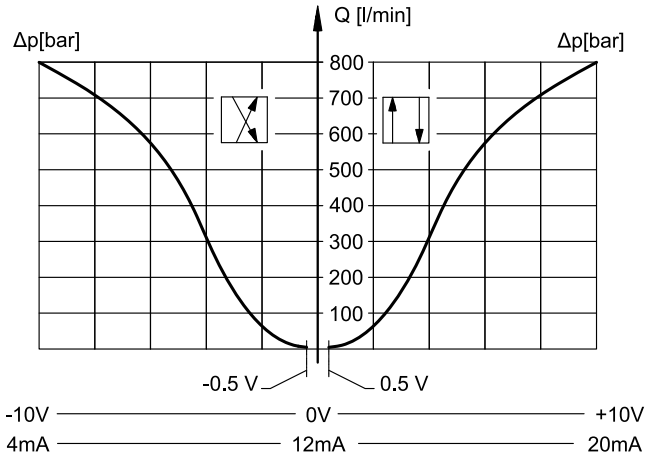



**SPOOL C400 / A400**



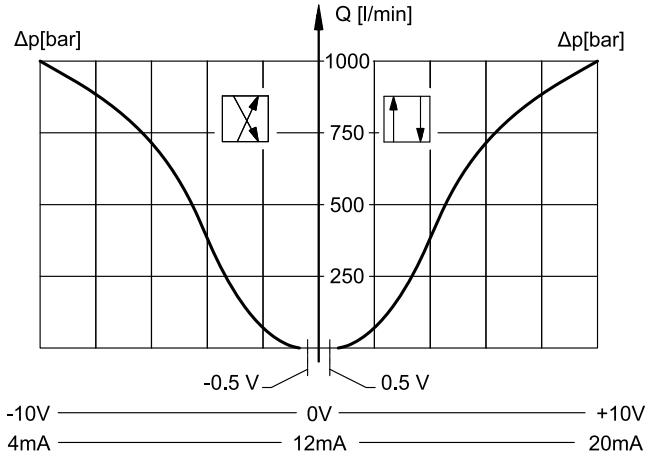

### 8.4 - Characteristic curves DDPE10J*

**SPOOL C800 / A800**




### 8.5 - Characteristic curves DDPE11J*

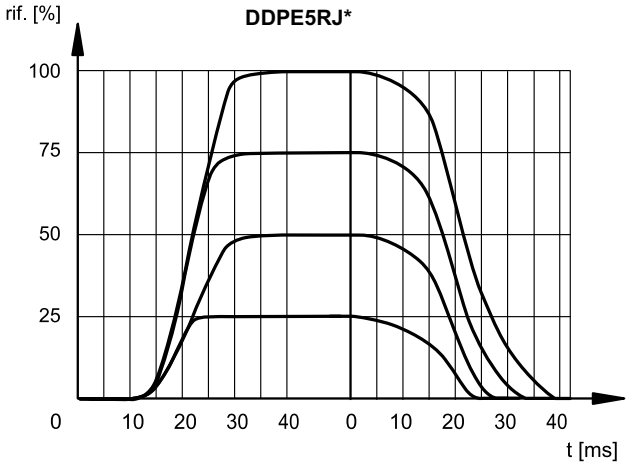
**SPOOL C1000 / A1000**



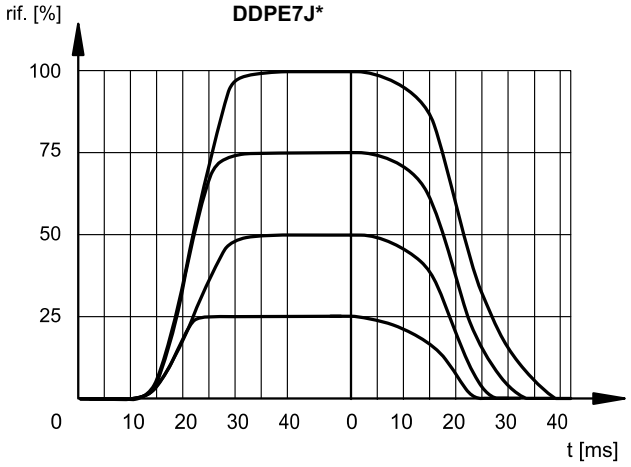
## 9 - STEP RESPONSE

(obtained with mineral oil with viscosity of 36 cSt at 50°C and static pressure 100 bar)

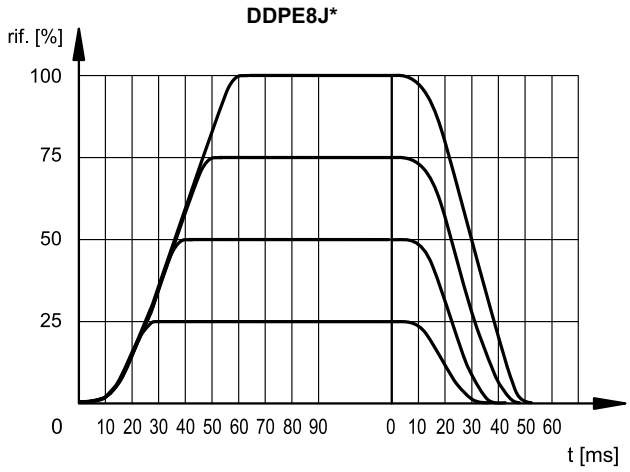
**DDPE5RJ***



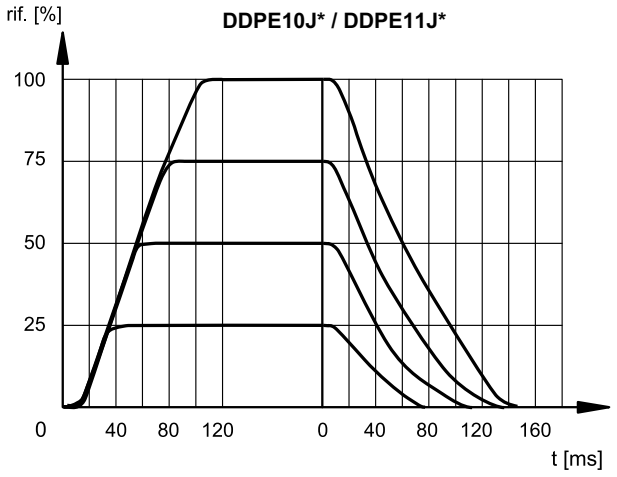

**DDPE7J***




**DDPE8J***




**DDPE10J* / DDPE11J***



## 10 - HYDRAULIC CHARACTERISTICS

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

| | | DDPE5RJ* | DDPE7J* | DDPE8J* | DDPE10J* | DDPE11J* |
|---|---|---|---|---|---|---|
| Max flow rate | l/min | 180 | 450 | 900 | 1600 | 3500 |
| Piloting flow requested with operation 0 →100% | l/min | 7 | 13 | 28 | 35 | 35 |
| Piloting volume requested with operation 0 →100% | $cm^3$ | 1.7 | 3.2 | 10 | 22 | 22 |

### 10.1 - Pilot supply and drain

The DDPE*J* valves are available with internal or external pilot supply and are always equipped with a 30 bar pressure reducing valve. Drain can be internal or external. The version with external drain allows a higher back pressure on the T line.

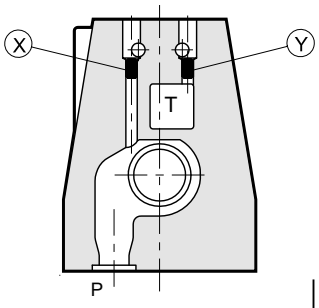
**PRESSURES** (bar)

| Pressure | MIN | MAX |
|---|---|---|
| Pilot pressure on X port | 30 (**NOTE**) | 350 |
| Pressure on T port with internal drain | - | 10 |
| Pressure on T port with external drain | - | 250 |

**NOTE**: The valve works well also with inlet pressure, starting from 10 bar. Low pressure affects response times, that will be slower.

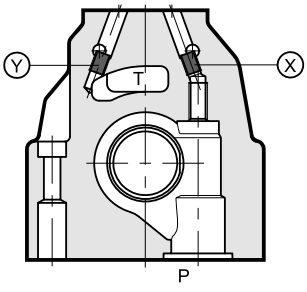
| | TYPE OF VALVE | Plug assembly X | Plug assembly Y |
|---|---|---|---|
| **IE** | INTERNAL PILOT AND EXTERNAL DRAIN | NO | YES |
| **II** | INTERNAL PILOT AND INTERNAL DRAIN | NO | NO |
| **EE** | EXTERNAL PILOT AND EXTERNAL DRAIN | YES | YES |
| **EI** | EXTERNAL PILOT AND INTERNAL DRAIN | YES | NO |

**DDPE5RJ***

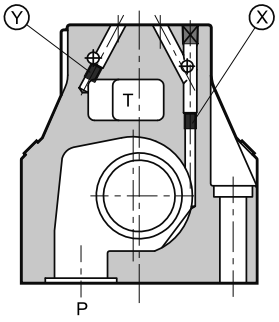



**Y**: plug M5x6 for external drain

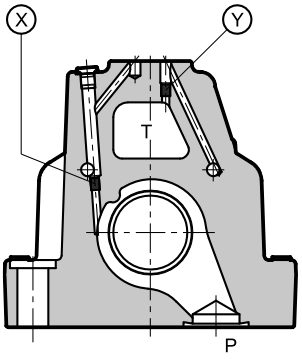
**DDPE7J***




**DDPE8J***



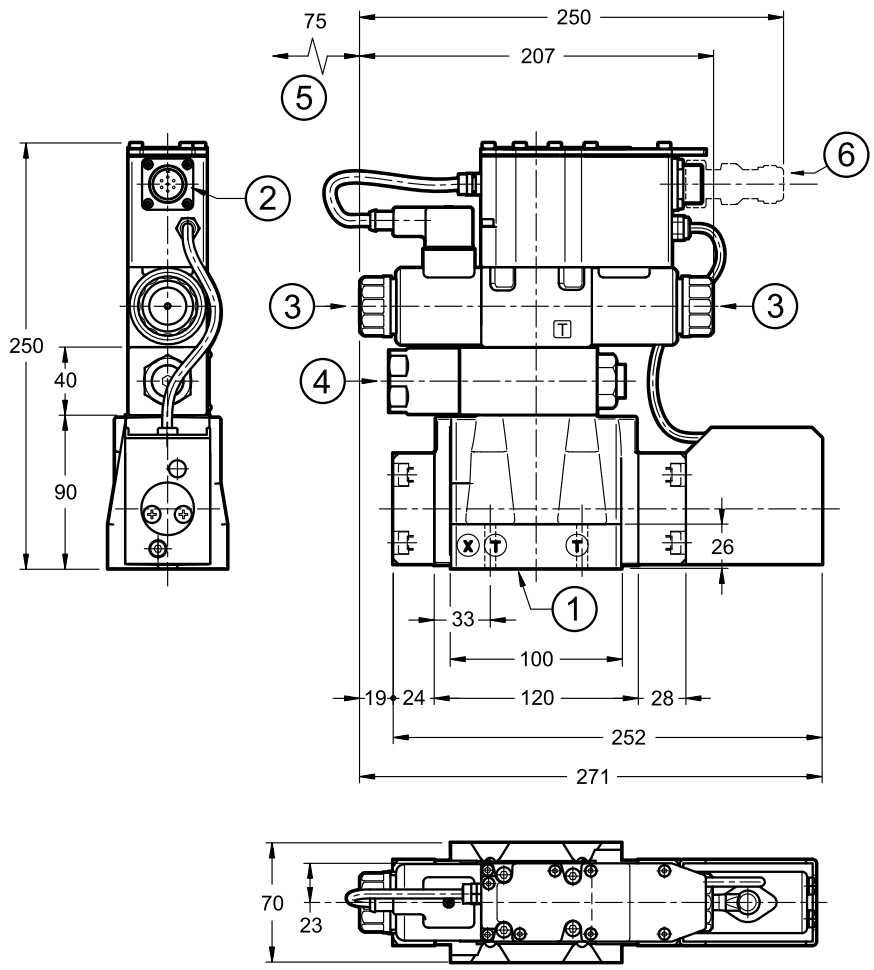

**DDPE10J*/DDPE11J***



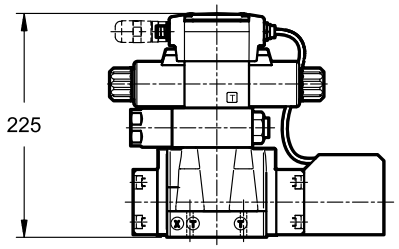

**Y**: plug M6x8 for external drain

## 11 - OVERALL AND MOUNTING DIMENSIONS DDPE5RJ

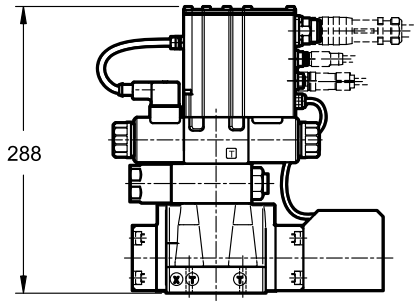
dimensions in mm




**DDPE5RJL**




**DDPE5RJH**



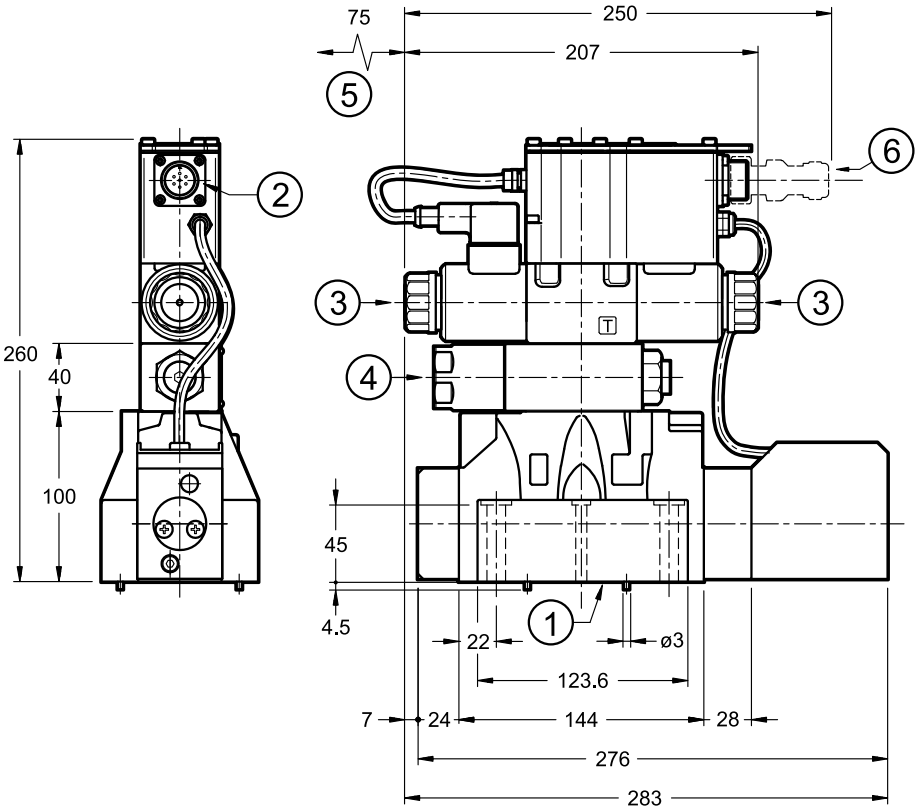

**NOTES**:
See mounting surface at section 15.
- Do not dismantle the transducer.

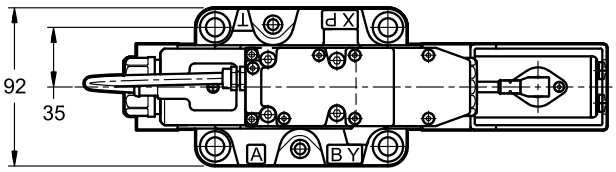
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>5 OR type 2050 (12.42x1.78) - 90 Shore<br>2 OR type 2037 (9.25x1.78) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override embedded in the solenoid tube |
| 4 | Pressure reducing valve |
| 5 | Coil removal space |
| 6 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening:<br>4 SHC ISO 4762 screws M6x35 |
| Tightening torque: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x10 |

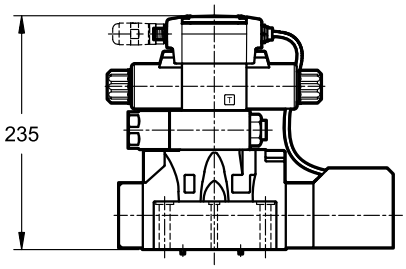
## 12 - OVERALL AND MOUNTING DIMENSIONS DDPE7J

dimensions in mm

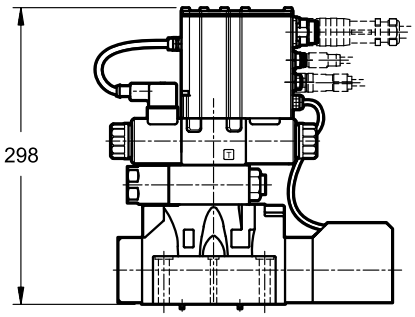



**DDPE7JL**




**DDPE7JH**



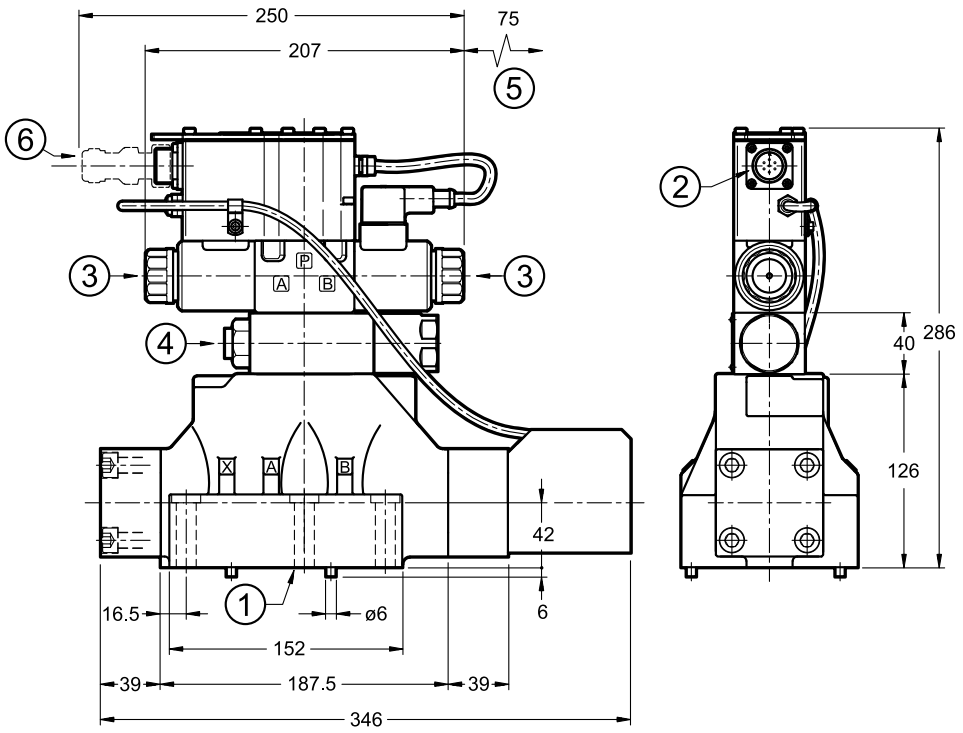

**NOTES**:
See mounting surface at section 15.
- Do not dismantle the transducer.

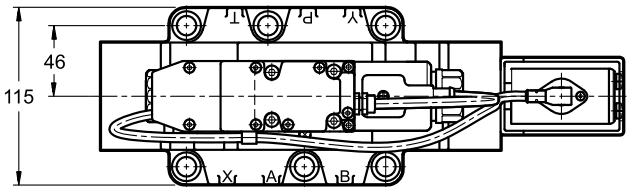
| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 130 (22.22x2.62) - 90 Shore<br>2 OR type 2043 (10.82x1.78) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Pressure reducing valve |
| 5 | Coil removal space |
| 6 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening: 4 SHC screws ISO 4762 M10x60<br>2 SHC screws ISO 4762 M6x60 |
| Tightening torque: M10x60: 40 Nm (A8.8 screws)<br>M6x60: 8 Nm (A8.8 screws) |
| Threads of mounting holes: M6x18; M10x18 |

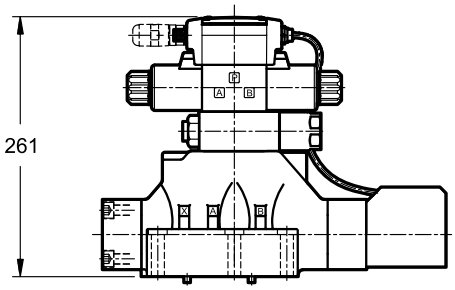
## 13 - OVERALL AND MOUNTING DIMENSIONS DDPE8J

dimensions in mm

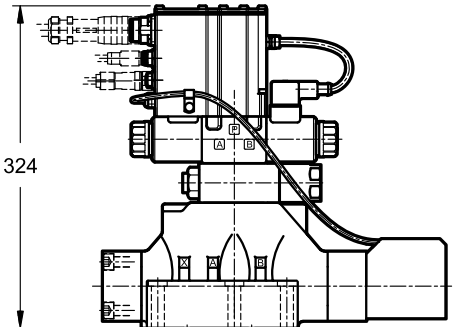



**DDPE8JL**




**DDPE8JH**



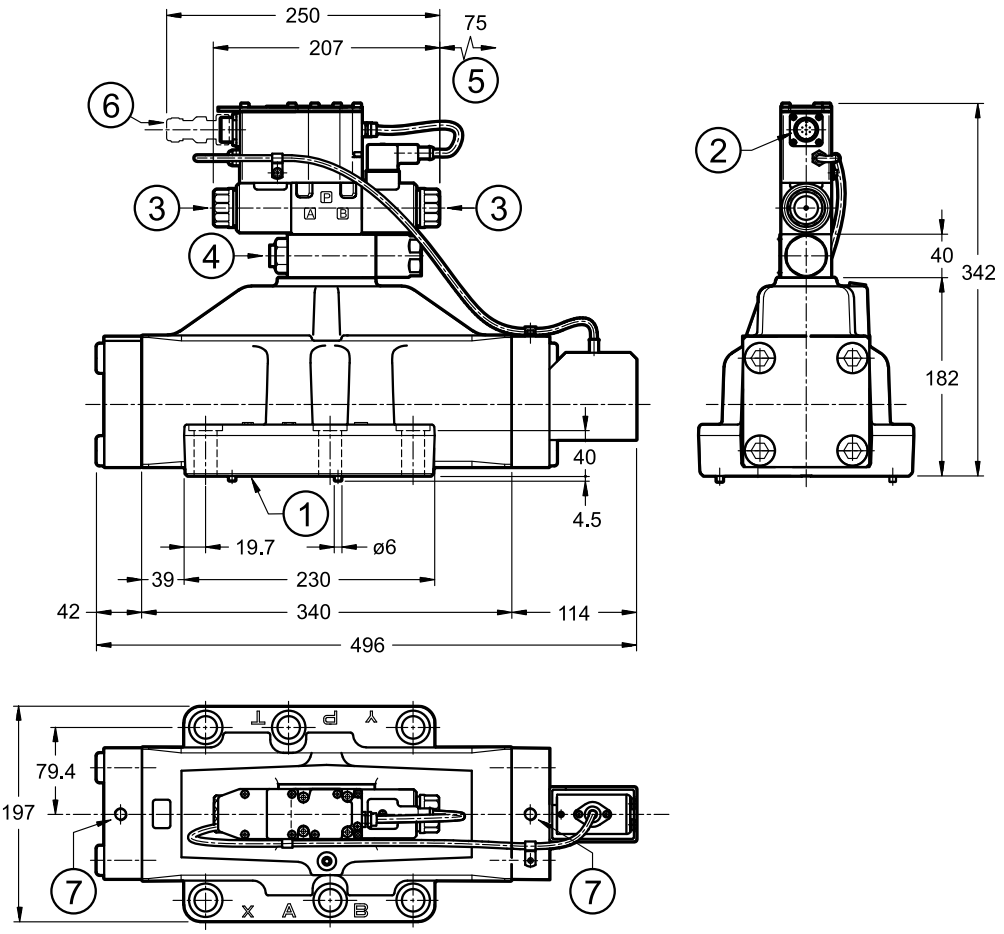

**NOTES**:
See mounting surface at section 15.
- Do not dismantle the transducer.

| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>4 OR type 3118 (29.82x2.62) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Pressure reducing valve |
| 5 | Coil removal space |
| 6 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |

| |
|---|
| Valve fastening: 6 SHC ISO 4762 screws M12x60 |
| Tightening torque: 69 Nm (A8.8 screws) |
| Threads of mounting holes: M12x20 |

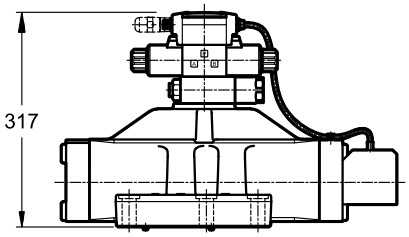
## 14 - OVERALL AND MOUNTING DIMENSIONS DDPE10J / DDPE11J

dimensions in mm

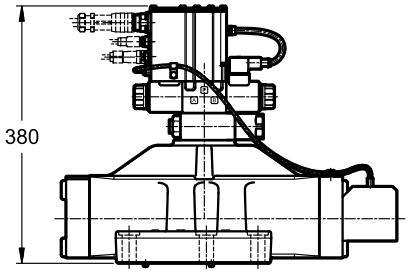



**NOTES**:
See mounting surface at section 15.
- Do not dismantle the transducer.

**DDPE10JL**




**DDPE10JH**

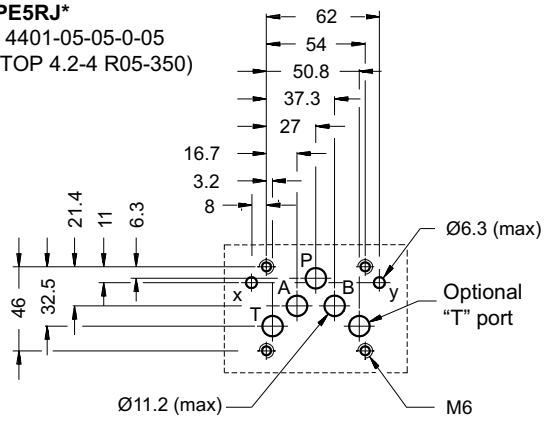



| | |
|---|---|
| 1 | Mounting surface with sealing rings:<br>**DDPE10J***<br>4 OR type 4150 (37.59x3.53) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore<br>**DDPE11J***<br>4 OR type 4212 (53.57x3.53) - 90 Shore<br>2 OR type 3081 (20.24x2.62) - 90 Shore |
| 2 | Main connection 6 pin + PE |
| 3 | Manual override<br>embedded in the solenoid tube |
| 4 | Pressure reducing valve |
| 5 | Coil removal space |
| 6 | Mating connector.<br>**To be ordered separately.**<br>See catalogue 89 000 |
| 7 | M12 eyebolt seat for safe lift |

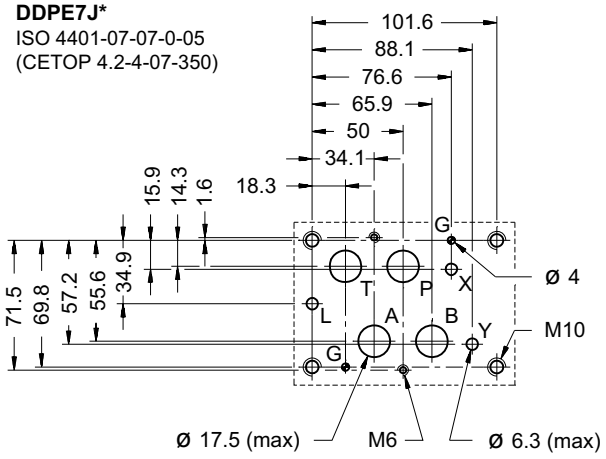
| |
|---|
| Valve fastening:<br>6 SHC screws ISO 4762 M20x70 |
| Tightening torque: 330 Nm (A8.8 screws) |
| Threads of mounting holes: M20x40 |

## 15 - MOUNTING SURFACES

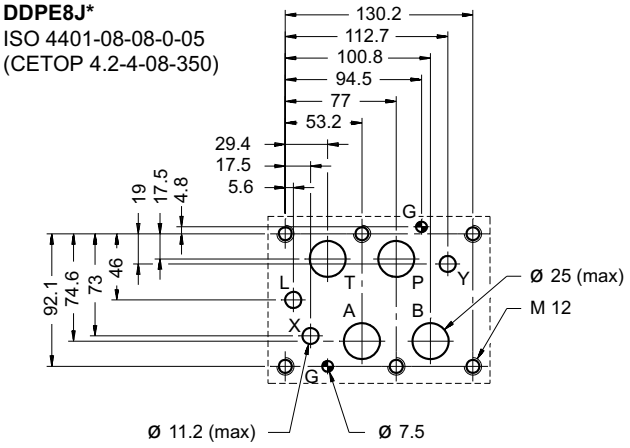
**DDPE5RJ***
ISO 4401-05-05-0-05
(CETOP 4.2-4 R05-350)



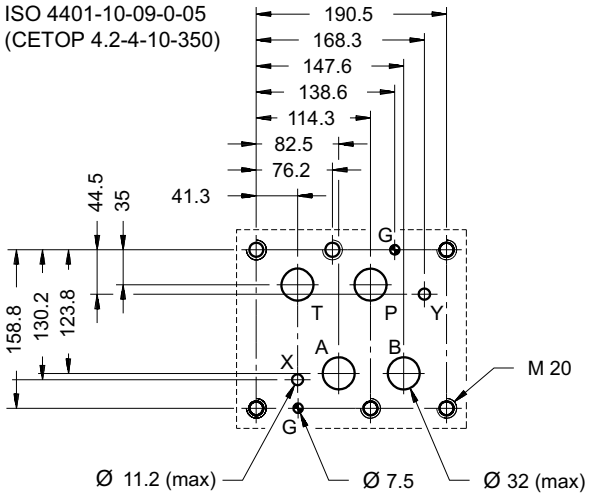

**DDPE7J***
ISO 4401-07-07-0-05
(CETOP 4.2-4-07-350)




**DDPE8J***
ISO 4401-08-08-0-05
(CETOP 4.2-4-08-350)

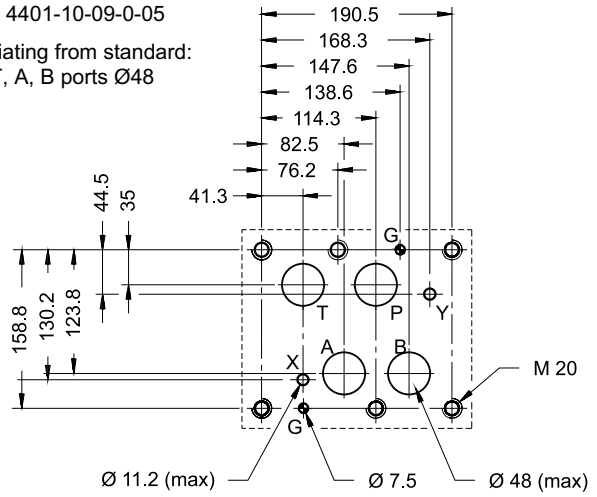



**DDPE10J***
ISO 4401-10-09-0-05
(CETOP 4.2-4-10-350)




**DDPE11J***
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 (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.

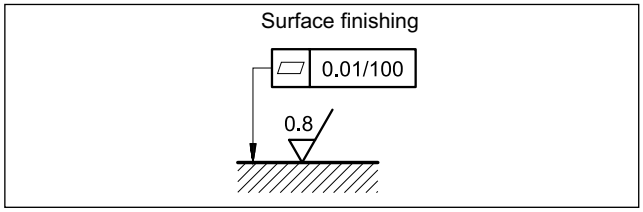
The fluid must be preserved in its physical and chemical characteristics.

## 17 - INSTALLATION

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 connectors

Mating connectors must be ordered separately. See catalogue 89 000.

For K11 and K16 versions we recommend the choice of a metal connector to avoid electromagnetic disturbances and to comply with EMC regulations on electromagnetic compatibility. If you opt for a plastic connector, make sure that it guarantees and maintains the IP and EMC protection characteristics of the valve.

### 18.2 - Mating connectors for fieldbus communication and for sensors.

Duplomatic offers spare parts to be wired and also ready-to-use cord sets. Please refer to cat. 89 000.

### 18.3 - Connection cable

The optimal wiring provides for 7 isolated conductors, with separate screen for the signal wires (command, monitor) and an overall screen.

Cross section for power supply:

- up to 20 m cable length : 1,0 $mm^2$
- up to 40 m cable length : 1,5 $mm^2$ (IO-Link excluded)

Cross section for signals (command, monitor):

- 0,50 $mm^2$

### 18.4 - Kit for start-up LINPC-USB

Device for service start-up and diagnostic, available for valves with K11 and K16 connections. See catalogue 89 850.

## 19 - SUBPLATES

(see catalogue 51 000)

No subplates are available for DDPE5RJ*, DDPE10J* and DDPE11J*.

| | DDPE7J* | DDPE8J* |
|---|---|---|
| Type with rear ports | PME07-AI6G | - |
| Type with side ports | PME07-AL6G | PME5-AL8G |
| P, T, A, B ports dimensions<br>X, Y ports dimensions | 1” BSP<br>1/4” BSP | 1 1/2” BSP<br>1/4” BSP |