

# DXE3J

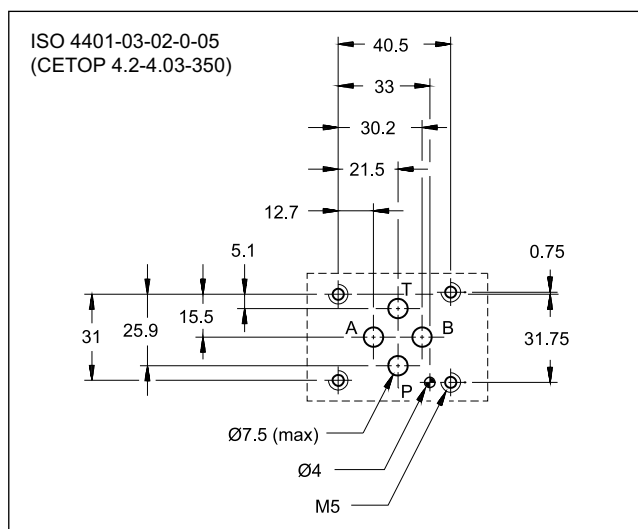
## HIGH RESPONSE SERVO-PROPORTIONAL VALVE WITH INTEGRATED ELECTRONICS SERIES 31

### SUBPLATE MOUNTING ISO 4401-03

**p** max **350** bar

**Q** max **70** l/min

### MOUNTING INTERFACE



### PERFORMANCES

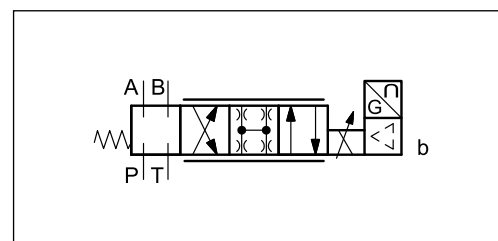
(with mineral oil of viscosity 36 cSt at 50°C)

Maximum operating pressure Ports P - A - B Port T	bar	350 250
Rated flow Q nom (with $\Delta p$ 70 bar P - T)	l/min	1 - 2 - 5 - 10 - 20 - 40
Hysteresis	% In	< 0.2
Threshold	% In	< 0.1
Thermal drift (with $\Delta T = 40$ °C)	% In	< 1.0
Response time (0-100%)	ms	≤ 10
Vibration on the three axes	g	30
Ambient temperature range	°C	-20 / +60
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	5 ÷ 400
Fluid contamination degree	according to ISO 4406:1999 class 17/15/12 (16/14/11 for longer life)	
Recommended viscosity	cSt	25
Mass	kg	2.6

### OPERATING PRINCIPLE

- 
- The DXE3J valve is a four-way (3 + fail-safe position) servo-proportional valve where the spool moves inside a sleeve. It is operated by a proportional solenoid highly dynamic, which achieves high performance and it not requires pilot pressure. The spool position is controlled by a linear transducer (LVDT) in closed loop which ensures high precision and repeatability.
  - It is available in six different flow ranges up to 40 l/min, with spools with zero overlap.
  - A version for potentially explosive atmospheres according to ATEX 2014/34/EU II 3GD is available.
  - The valve is featured by integral electronic based on SMD technology which ensures standard regulations and simplifies the electric wiring. The unit doesn't require any adjustment other than the possible electronic regulation of the zero.
  - Two types of integrated electronics are available, with analogue or fieldbus interfaces.
  - Suitable for control applications with closed loop of position, velocity and pressure. With a power down or without the enable input, the spool moves itself at fail-safe position.

### HYDRAULIC SYMBOL



## 1 - IDENTIFICATION CODE

### 1.1 - Standard electronics

D	X	E	3	J	-	LZ	/	31	-	K11
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Servo-proportional valve with spool in sleeve

Electric proportional control

Size ISO 4401-03

**Standard electronics for closed loop**

**K3** = Version for potentially explosive atmospheres compliant with ATEX 2014/34/EU II 3GD (par. 2). Omit if not required.

Spool with linear flowrate curve and zero overlap, low leakage

Rated flow (with  $\Delta p = 70$  bar P - T)

<b>01</b> = 1 l/min	<b>10</b> = 10 l/min
<b>02</b> = 2 l/min	<b>20</b> = 20 l/min
<b>05</b> = 5 l/min	<b>40</b> = 40 l/min

Fail safe type

**F1** = closed centre  
**F3** = float  
**FC** = cross centre

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

6 + PE pole connection

Command value:  
**E0** = voltage  $\pm 10$  V  
**E1** = current  $4 \div 20$  mA

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

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

### 1.2 - Available versions

	P → A	P → B	A → T	B → T
<b>F1</b>	20	30	30	30
<b>F3</b>	20	30		

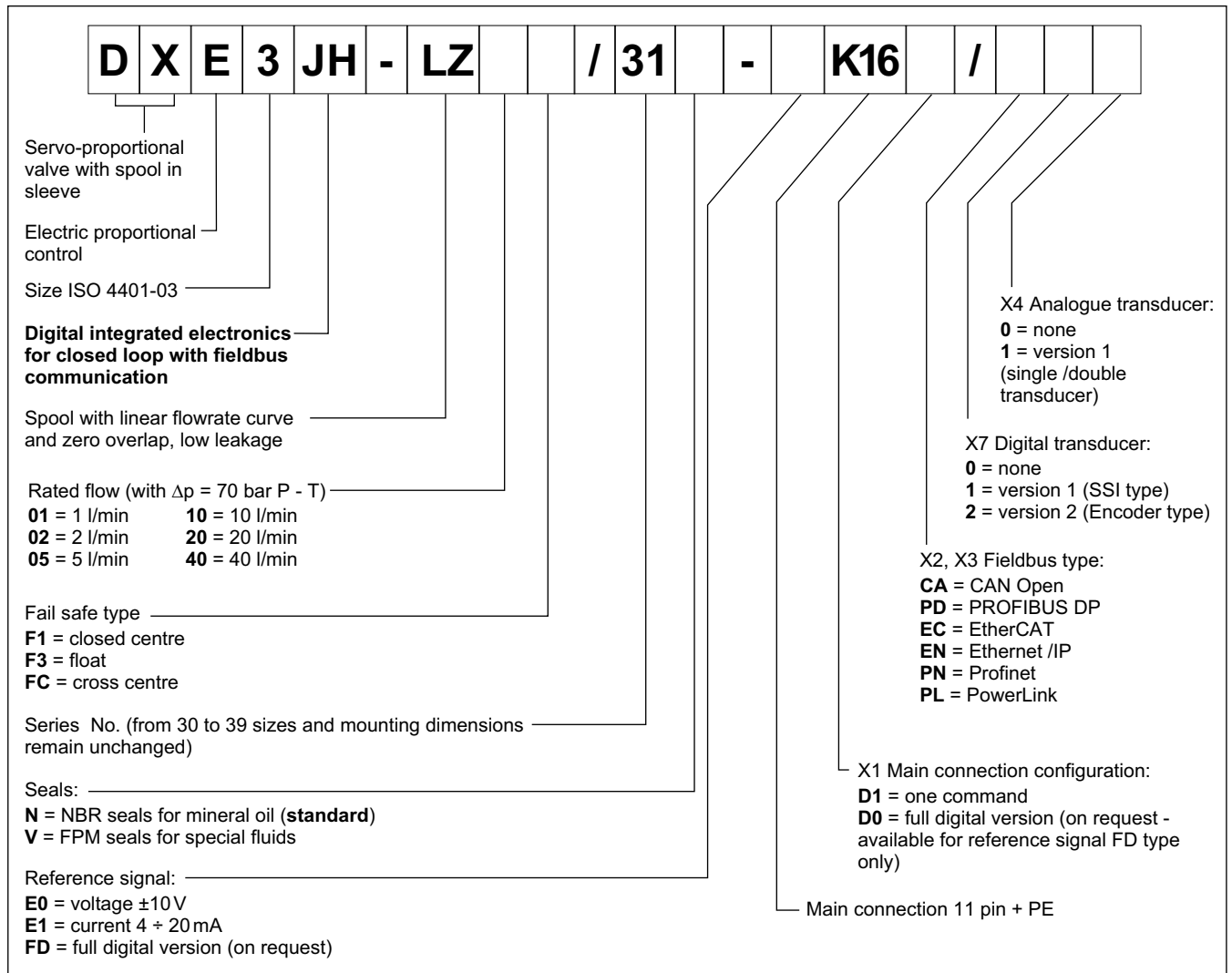
flow rate	fail safe type		
	F1	F3	FC
<b>01</b>	■	-	-
<b>02</b>	■	-	-
<b>05</b>	■	■	■
<b>10</b>	■	■	■
<b>20</b>	■	■	■
<b>40</b>	■	■	■

■ available    - not available

**FAIL SAFE POSITION**

When a power failure occurs, the electronics de-energizes the solenoid and the spool will take the fail safe position by spring return.

## 1.3 - Electronics with fieldbus communication



## 2 - ATEX 2014/34/EU RATED VERSION

Valves suitable for use in potentially explosive atmospheres certified according to ATEX 2014/34/EU classified under ATEX II 3GD are now available.

The electrical and technical characteristics and dimensions of ATEX certified valves are identical to those of standard valves.

**The supply is always delivered together with the ATEX declaration of conformity and the operating and maintenance user manual, where are described all the information for the proper use of valves in potentially explosive atmospheres.**

TYPE EXAMINATION CERTIFICATE N°: **AR20ATEX046**

### 2.1 - Identification code

To order the ATEX-rated version, simply insert letters K3 in the initial part of the identification code. The description becomes DXE3JK3. Please use the identification code shown at par. 1.1 to order.

Example:

- DXE3JK3-LZ40F1/31N-E0K11A

### 2.2 - Classification

The valves DXE3JK3 are ATEX marked as below:

MARKING FOR GASES, VAPOURS AND MISTS:

II 3G Ex ec IIC T4 Gc

EX: Specific marking of explosion protection as ATEX 2014/34/EU directive and related technical specification requests

II: Group II for surface plants

3: Category 3 normal protection, eligible for zone 2

G: for use in areas in which explosive atmospheres caused by gases, vapours, mists

Ex ec: "ec" protection type, increased safety

IIC: Gas group

(automatically eligible for group IIA and IIB)

T4: Temperature class (max surface temperature)

Gc: Protection level for electrical devices (EPL)

Equipment for explosive gas atmospheres, having an "enhanced" level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences.

MARKING FOR DUSTS:

II 3D Ex tc IIIC T135°C Dc

EX: Specific marking of explosion protection as ATEX 2014/34/EU directive and related technical specification requests

II: Group II for surface plants

3: Category 3 normal protection, eligible for zone 22

D: for use in areas in which explosive atmospheres are caused by explosive dusts

Ex tc: "tc" protection type, protected by enclosures

IIIC: Dusts group

(automatically eligible for group IIIA and IIIB)

T135°C: Temperature class (max surface temperature)

Dc: Protection level for electrical devices (EPL)

Equipment for explosive dust atmospheres, having an "enhanced" level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences.

### 2.3 - IP protection degree

The IP protection degree of the valve is IP66/IP68 according to IEC EN 60529.

**NOTE:** the test carried out to reach IP68 is: duration 1 h, depth 1 m.

The IP degree is guaranteed only with mating connector of equivalent IP degree, installed and tightened correctly.

### 2.4 - Operating temperatures

The operating ambient temperature must be between -20°C and +60 °C.

The fluid temperature must be between -20°C and +80°C.

The valves are T4 (T135° C) class temperature classified, so they are eligible for operation also at higher class temperature (T3, T2, T1 (T200° C)).

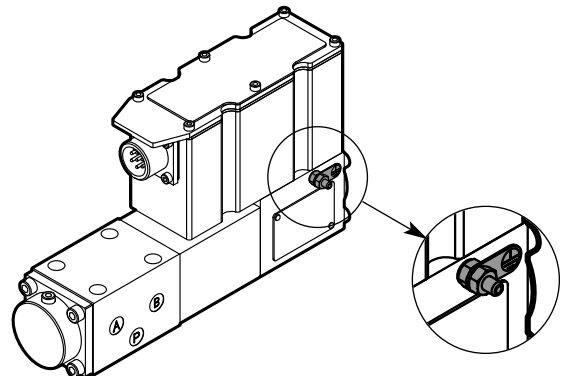
### 2.5 - Connectors

The connector is not supplied with the valve, but can be ordered separately. **The connector must be suitable for the intended conditions of use.**

Duplomatic can provide 7-pin connectors to wire, metal type, suitable for use with DXE3JK3 valves (see catalogue 89 000, connectors type EX7S).

### 2.6 - Grounding points

The ATEX certified valves are supplied with a grounding point with M4 screw.



The grounding point must always be wired with the general earthing system by means of a suitable conductive line.

## 3 - ELECTRONICS COMMON DATA

Duty cycle		100% (continuous operation)
Protection class according to IEC EN 60529		IP66/IP68 ( <b>NOTE</b> )
Supply voltage	V DC	24 (from 19 to 30 VDC), ripple max 3 Vpp
Power consumption	VA	35
Maximum solenoid current	A	2.6
Fuse protection, external	A	(fast), max current 4A
Managed breakdowns		Overload and electronics overheating, LVDT sensor error, 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. The test carried out to reach IP68 is: duration 1 h, depth 1 m

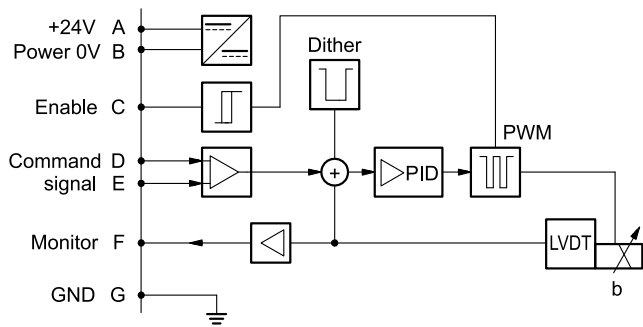
## 4 - DXE3J - STANDARD ELECTRONICS

### 4.1 - Electrical characteristics

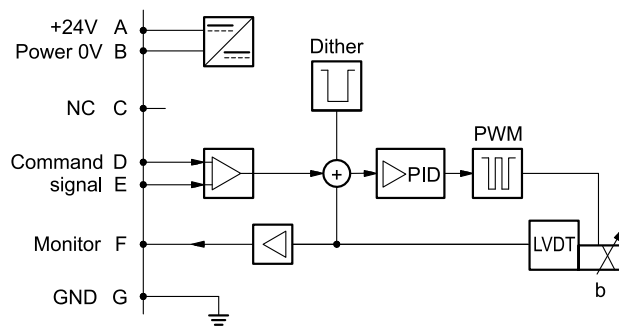
Command signal: voltage (E0) current (E1)	V DC mA	$\pm 10$ (Impedance $R_i = 11 \text{ k}\Omega$ ) $4 \div 20$ (Impedance $R_i = 58 \text{ }\Omega$ )
Monitor signal (current to solenoid): voltage (E0) current (E1)	V DC mA	$\pm 10$ (Impedance $R_o > 1 \text{ k}\Omega$ ) $4 \div 20$ (Impedance $R_o = 500 \text{ }\Omega$ )
Communication for diagnostic		LIN-bus Interface (by means of the optional kit)
Connection		6 pin + PE (MIL-C-5015-G - DIN EN 175201-804)

### 4.2 - On-board electronics diagrams

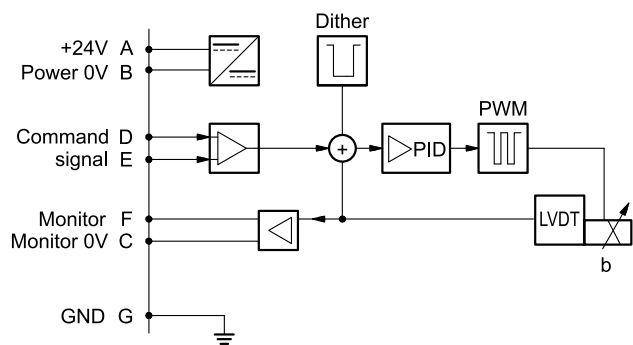
#### VERSION A - External Enable



#### VERSION B - Internal Enable

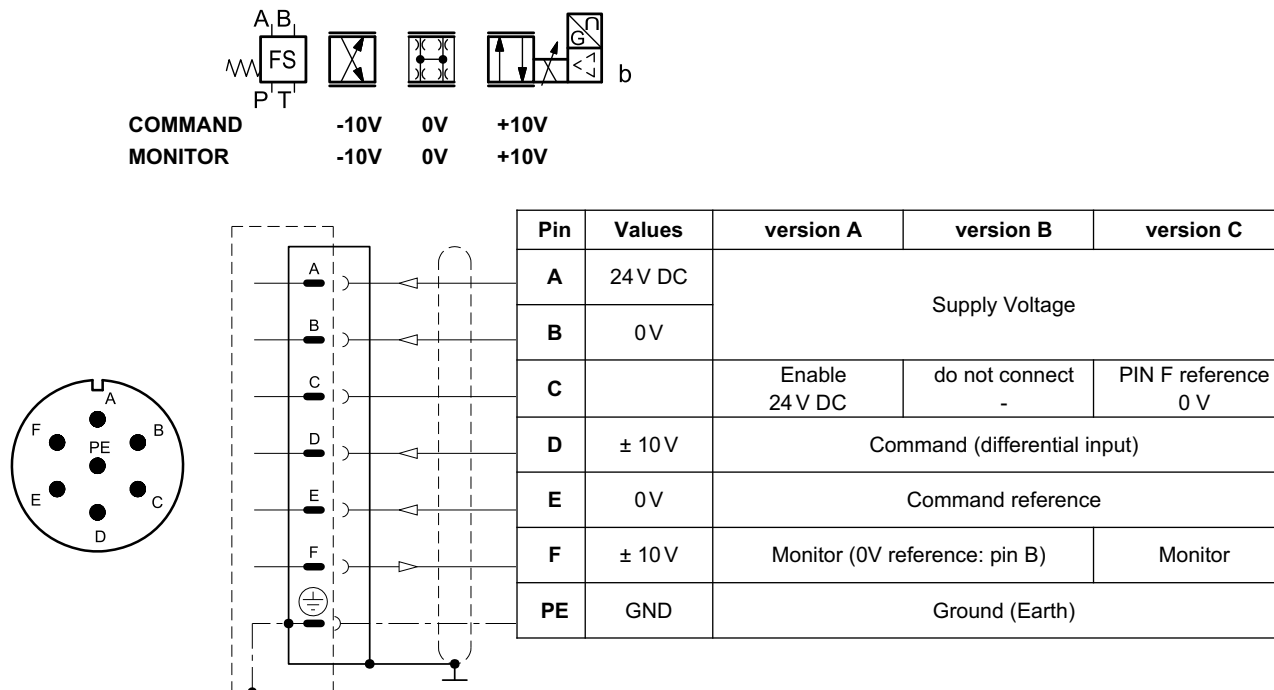


#### VERSION C - 0V Monitor



### 4.3 - Version with voltage command (E0)

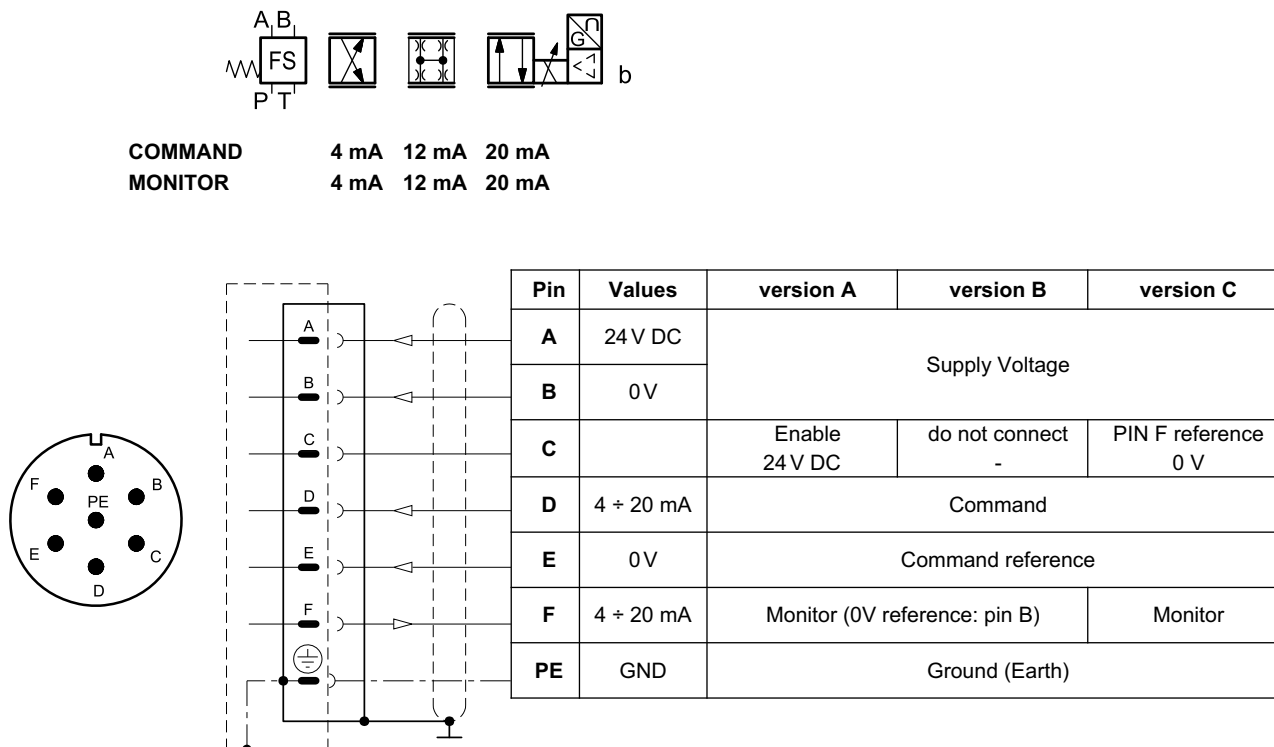
The reference signal must be between -10V and +10V. The monitor feature of versions B and C becomes available with a delay of 0,5 sec from the power-on of the card.



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

The reference signal is supplied in current  $4 \div 20$  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.



## 5 - DXE3JH - 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. 4.3 and 4.4.

### 5.1 - Electrical characteristics

Command signal:	voltage (E0) current (E1) digital (FD)	V DC mA	$\pm 10$ (Impedance $R_i = 11 \text{ k}\Omega$ ) $4 \div 20$ (Impedance $R_i = 58 \text{ }\Omega$ ) via fieldbus
Monitor signal (current to solenoid):	voltage (E0) current (E1)	V DC mA	$\pm 10$ (Impedance $R_o > 1 \text{ k}\Omega$ ) $4 \div 20$ (Impedance $R_o = 500 \text{ }\Omega$ )
Communication / diagnostic			via Bus register
Communication interface standards	CAN Open PROFIBUS DP EtherCAT, Ethernet /IP, Profinet, PowerLink		EN 50325-4 + DS408 EN 50170-2 / IEC 61158 IEC 61158
Communication physical layer	CAN Open PROFIBUS DP EtherCAT, Ethernet /IP, Profinet, PowerLink		optical insulated CAN ISO 11898 optical insulated RS485 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	$\pm 10 \text{ V}$ (E0) $4 \div 20$ (E1)	Command
5	0 V	Command reference signal
6	$\pm 10 \text{ V}$ (E0) $4 \div 20$ (E1)	Monitor (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) (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) (0V ref. pin 2)
12	GND	Ground (Earth)

## 5.3 - FIELDBUS connections

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

### 5.3.1 - 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)

### 5.3.2 - 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	0V	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	0V	Data line and termination signal 0
4	PB_B	Bus line (low)
5	SHIELD	

### 5.3.3 - 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	

**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	

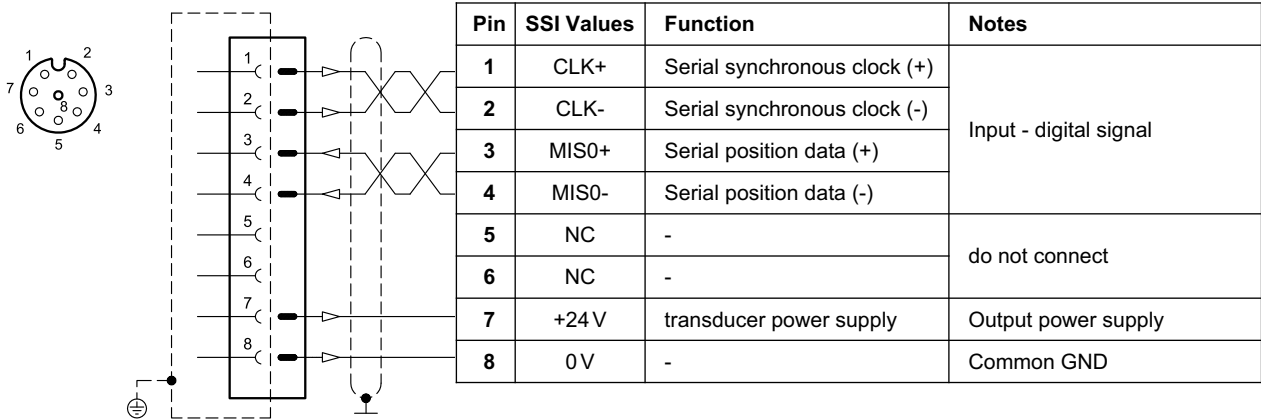
**NOTE:** Shield connection on connector housing is recommended.



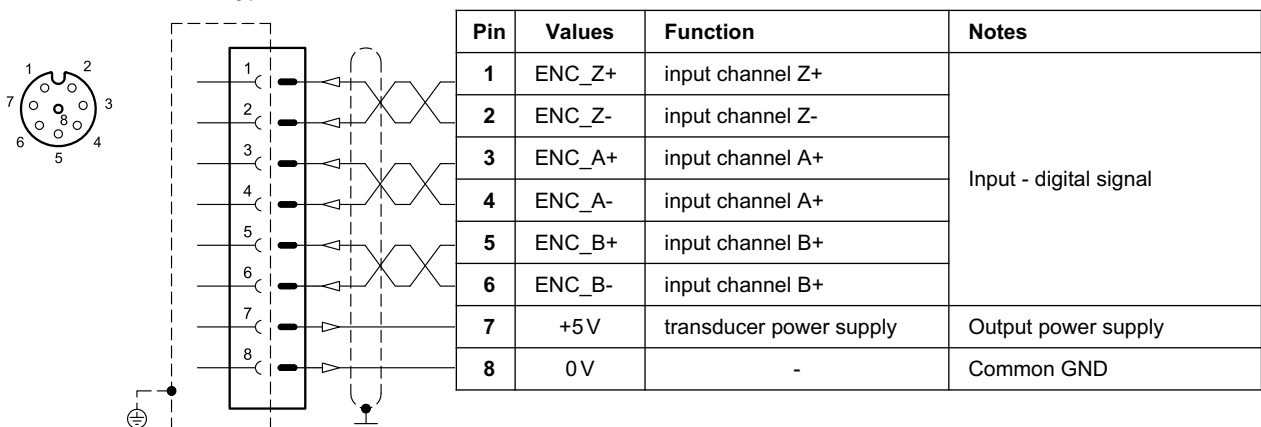
## 5.4 - Digital transducer connection

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

### VERSION 1: SSI type



### VERSION 2: ENCODER type

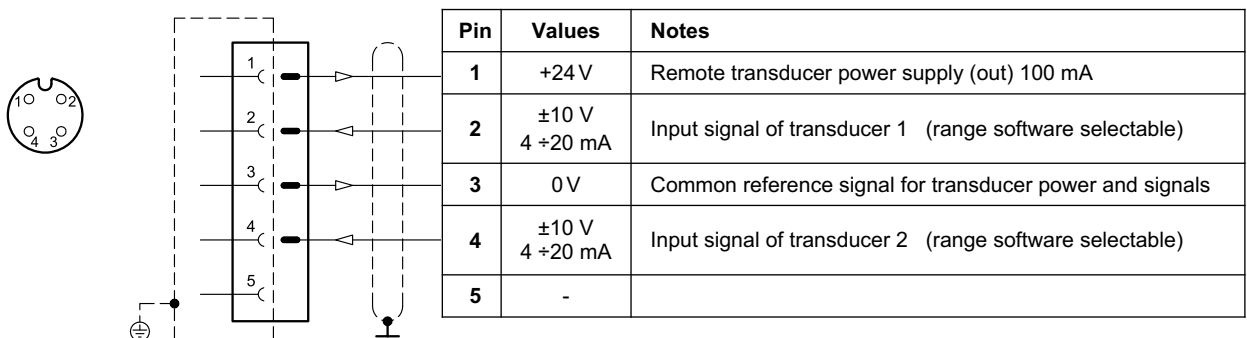


## 5.5 - Analogue transducer connection

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

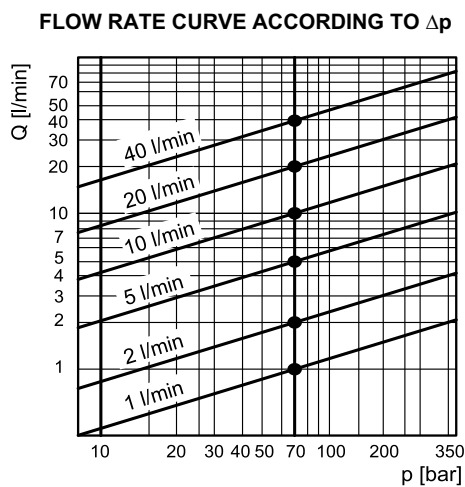
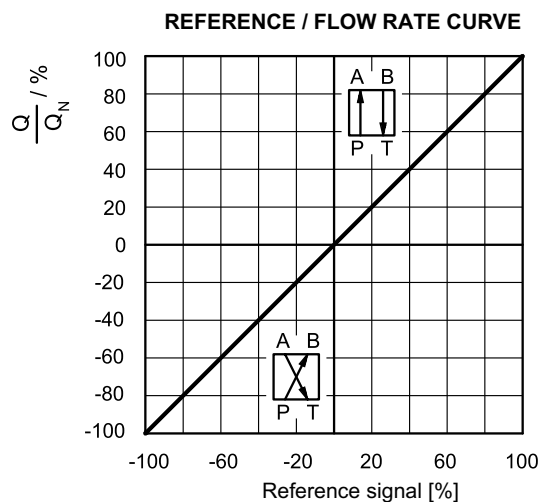
### VERSION 1: single / double transducer

(single or double is a software-selectable option)



## 6 - CHARACTERISTIC CURVES

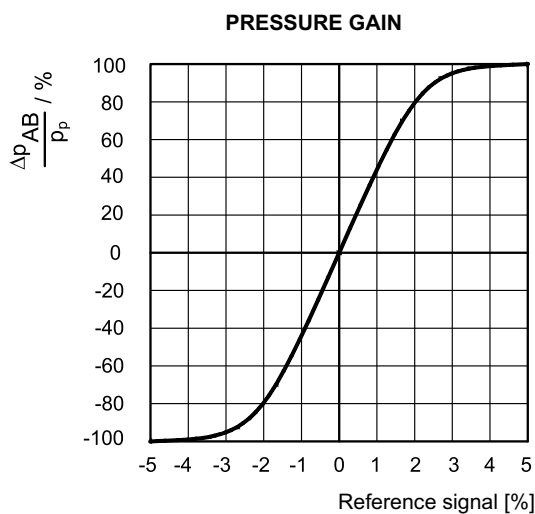
(measured with viscosity of 36 cSt at 50°C)



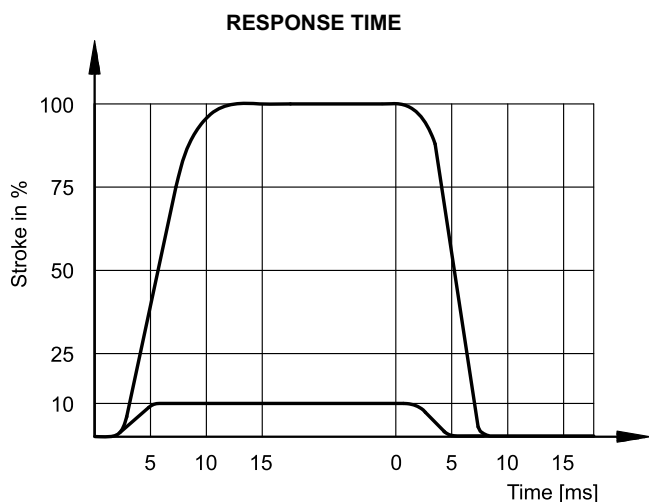
Typical flow rate curves at constant  $\Delta p = 70$  bar P-T according to the reference signal.

**NOTE:** with positive reference signal connected to pin D the valve regulates P - A / B - T.

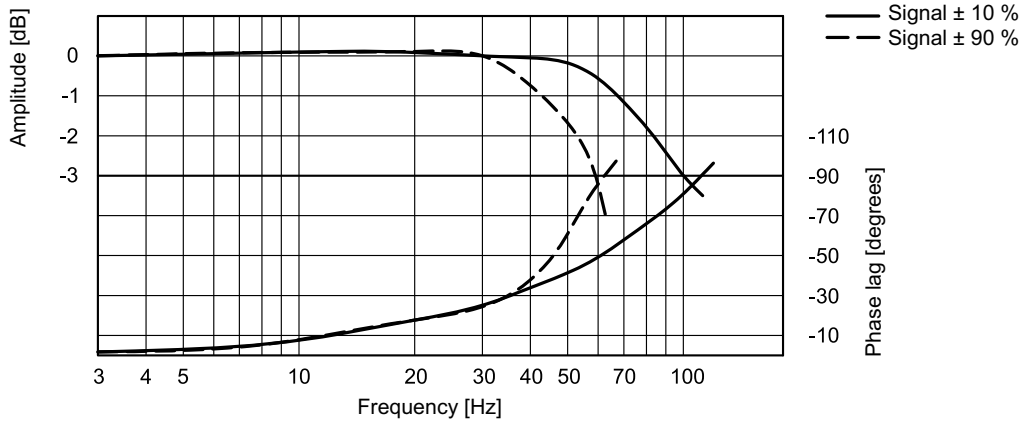
The diagram states the maximum valve controlled flow rate according to the pressure drop between the P and T ports.



The diagram shows the valve pressure gain, expressed as % of the ratio between the port pressure variation in A or B ( $\Delta p_{AB}$ ) 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.

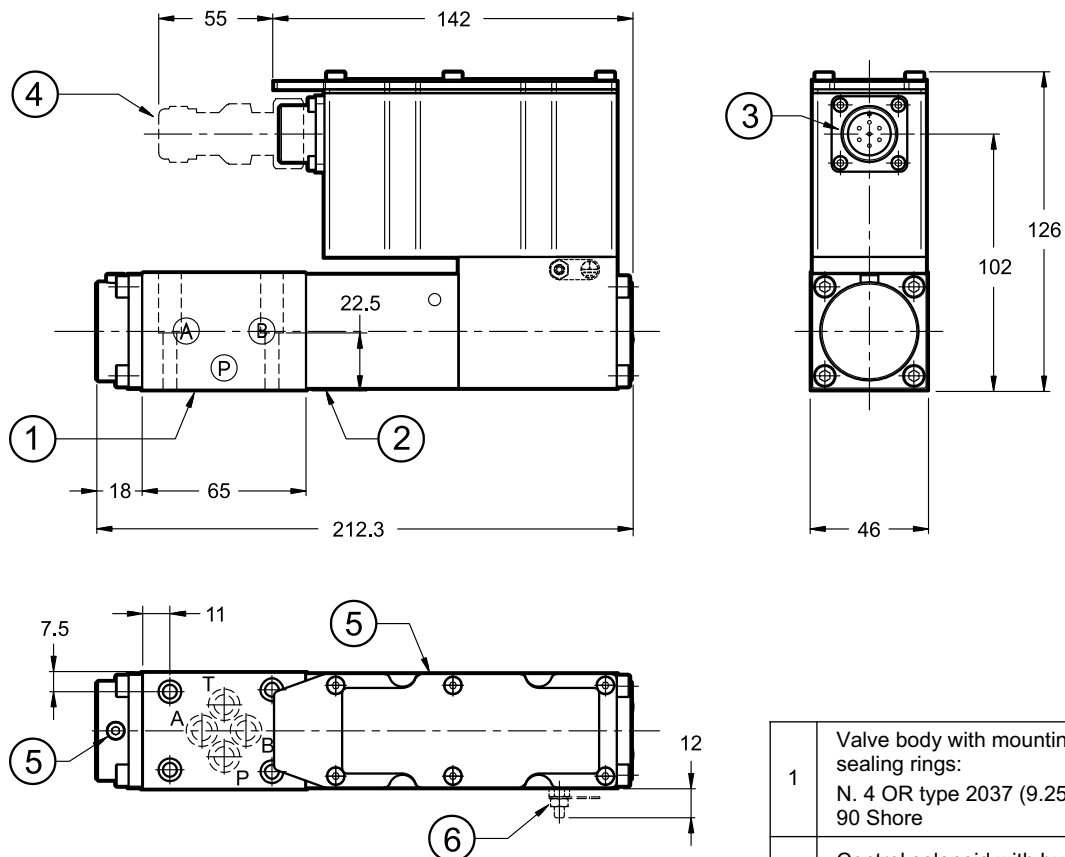


## FREQUENCY RESPONSE



## 7 - DXE3J - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



Fastening bolts: 4 SHC screws M5x30

Torque: 5 Nm  $\pm 10\%$  (A8.8)

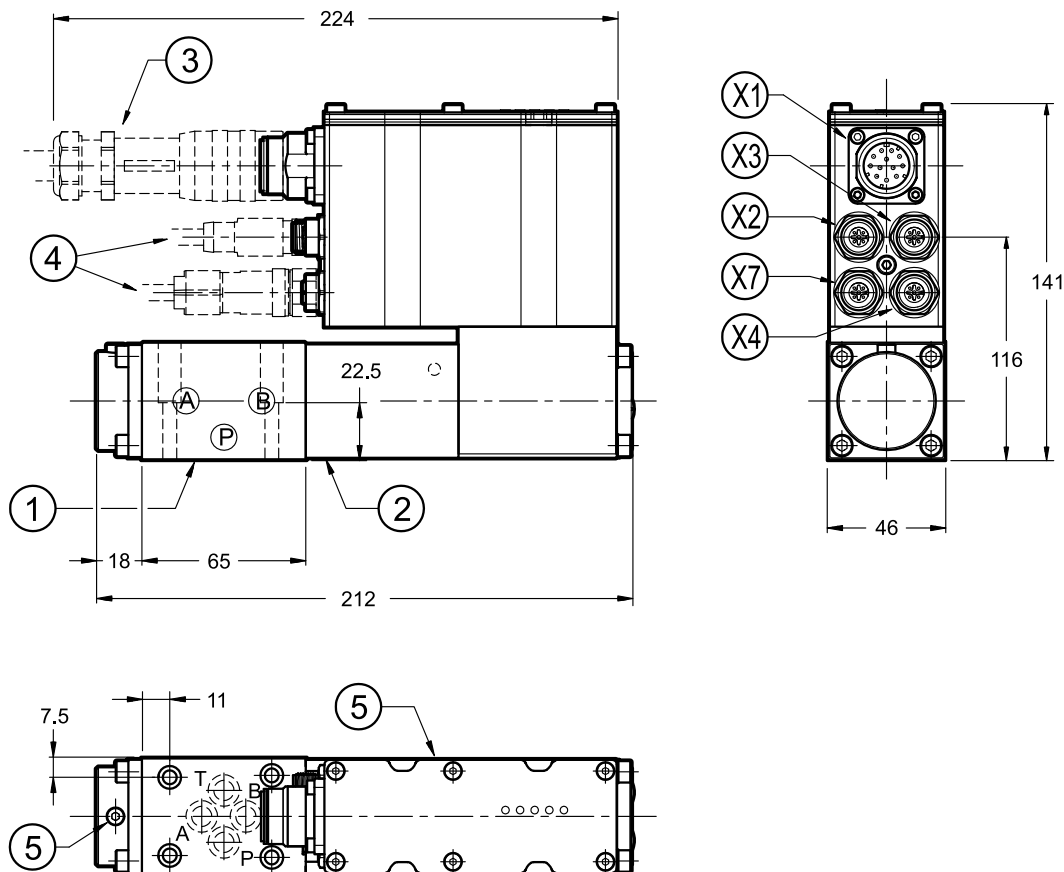
Threads of mounting holes: M5x10

**NOTE:** The valve is filled with mineral oil during testing, therefore the breather should not be used without specific authorization. Breaking the seals can cause the loss of the guarantee.

1	Valve body with mounting surface sealing rings: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Control solenoid with built-in position transducer
3	Main connection
4	Mating connector 6 poles + PE, female type MIL-5015-G <b>To be ordered separately.</b> See catalogue 89 000
5	Air breather. Sealed at the factory <b>(NOTE)</b>
6	DXE3JK3 only: grounding point

## 8 - DXE3JH - OVERALL AND MOUNTING DIMENSIONS

dimensions in mm



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: N. 4 OR type 2037 (9.25x1.78) 90 Shore
2	Control solenoid with built-in position transducer
3	Mating connector 11 poles + PE <b>To be ordered separately.</b> See catalogue 89 000
4	Mating connectors for fieldbus communication and signals <b>To be ordered separately.</b> See catalogue 89 000
5	Air breather. Sealed at the factory (NOTE 2)

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

**NOTE 2:** The valve is filled with mineral oil during testing, therefore the breather should not be used without specific authorization. Breaking the seals can cause the loss of the guarantee.

Fastening bolts: 4 SHC screws M5x30

Torque: 5 Nm  $\pm$  10% (A8.8)

Threads of mounting holes: M5x10

## 9 - HYDRAULIC FLUIDS

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

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

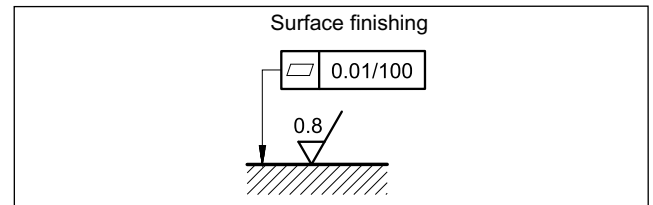
The fluid must be preserved in its physical and chemical characteristics.

## 10 - INSTALLATION

The valves can be installed in any position without impairing correct operation. Valves are fixed by means of screws or tie rods on a flat surface with planarity and roughness equal to or better than those indicated in the relative symbols.

If minimum values are not observed, fluid can easily leaks between the valve and support surface.

Take care to the cleanliness of the mounting surfaces and surrounding environment upon installation.



## 11 - ACCESSORIES

(to be ordered separately)

### 11.1 - Mating connectors

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



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.

### 11.2 - 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.

### 11.3 - 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<sup>2</sup>
- up to 40 m cable length : 1,5 mm<sup>2</sup>

Cross section for signals (command, monitor):

- 0,50 mm<sup>2</sup>

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

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

## 12 - SUBPLATES

(see catalogue 51 000)

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



# DXE3J

SERIES 31



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