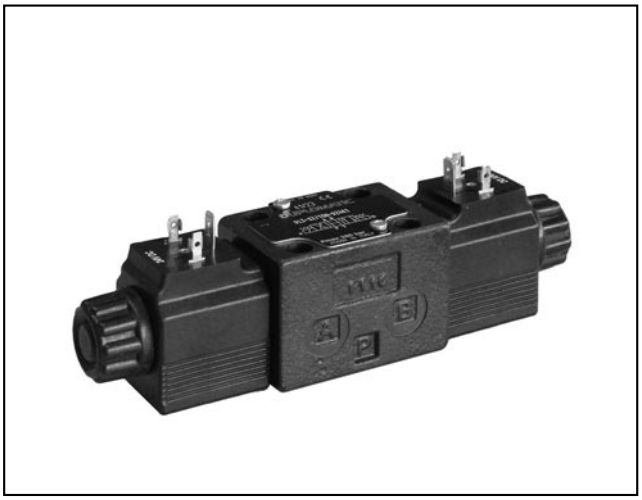


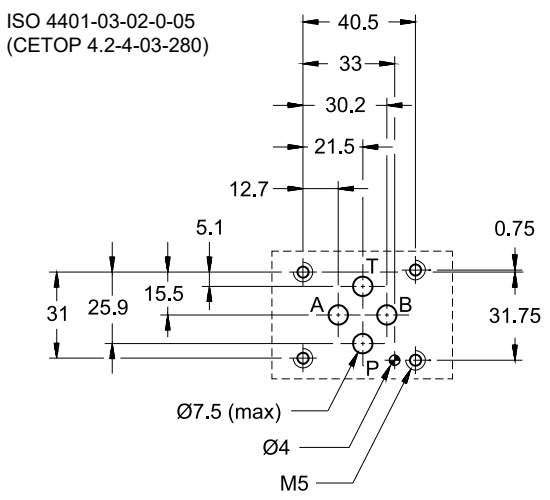
DL3

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE COMPACT VERSION

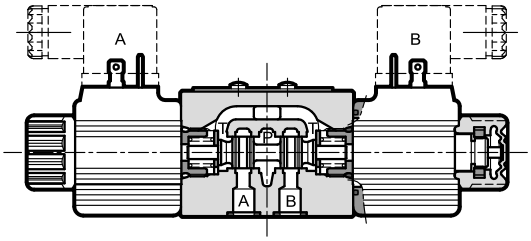
SUBPLATE MOUNTING ISO 4401-03

p max **280** bar
Q max **50** l/min

MOUNTING SURFACE



OPERATING PRINCIPLE



— Solenoid actuated directional control valve, direct operated, with mounting surface according to ISO 4401-03 standards.

— It is available in 3 and 4-ports versions, with 2 or 3 positions, in a wide range of spools.

— Compact design with reduced solenoid dimensions, suitable for mini-power packs and mobile and agricultural applications.

— The valve body is made with high strength iron castings provided with wide internal passages in order to minimize the flow pressure drop. Wet armature solenoids with interchangeable coils are used (for further information on solenoids see point 7).

— The valve is available with DC or AC current solenoids and with several types of electrical connections to cover various installation requirements (see points 7 and 11).

— Versions with UL/CSA Recognized DC coils are available for the North American market.

— The DC valve comes with boot protected manual override which ensures a protection degree IP69K for connections types K7 and K8.

— It is available also with zinc-nickel surface treatment, that ensures a salt spray resistance up to 600 hours.

PERFORMANCES

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

		CC	CA
Maximum operating pressure: - ports P - A - B - port T	bar	280 250	 160
Maximum flow rate	l/min	50	
Pressure drop Δp-Q	see point 4		
Operating limits	see point 5		
Electrical features	see point 7		
Electrical connections	see point 11		
Ambient temperature range	°C	-20 / +50	
Fluid temperature range	°C	-20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Recommended viscosity	cSt	25	
Masse: single solenoid valve double solenoid valve	kg	1,1 1,4	

1 - IDENTIFICATION CODE

Solenoid operated directional valve

Compact version

ISO 4401-03 size

Spool type (see point 3):

S*	**TA**
SA*	**TB**
SB*	**RK**

Series no.:
10 = for direct current valves
11 = for alternate current valves
(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

DC power supply
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V
D00 = valve without coils

AC power supply
A24 = 24 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz
A00 = valve without coils

Option:
/ W7 = Zinc-nickel surface treatment (see **NOTE**)
Not available for AC valves.
Omit if not required.
(Standard treatment: black phosphating)

Manual override (see point 13)
for **DC** version:
omit for boot manual override integrated in the coil locking ring
CK1 = knob manual override
for **AC** version:
omit for manual override integrated in the tube
CM = manual override boot protected

Coil electrical connection:
(see point 11)
K1 = plug for connector type EN 175301-803 (ex DIN 43650)
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
K8 = plug for connector type AMP SUPERSEAL

Coil version (see availability table):
Omit for standard version
UL = UL Recognized (point 7.2)

AVAILABILITY

Voltage	electrical conn.	coil version std	UL
D12, D24	K1	■	■
	K2	■	-
	K4	■	-
	K7	■	■
	K8	■	-
D28	K1	■	-
D48, D110, D220	K1	-	■
A*	K1	■	-

NOTE: The zinc-nickel finishing provides salt spray resistance of up to **600** hours (test operated according to UNI EN ISO 9227 standard and test evaluation operated according to UNI EN ISO 10289 standard)

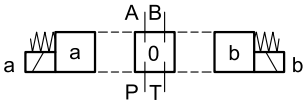
2 - HYDRAULIC FLUIDS

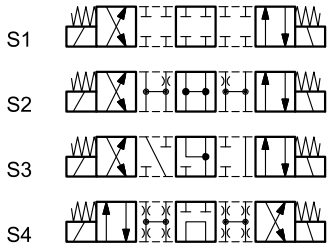
Use mineral oil-based hydraulic fluids HL or HM type, according to ISO 6743-4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department.

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.

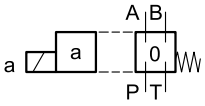
3 - SPOOL TYPE

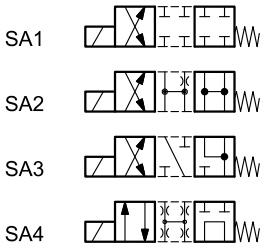
Type **S***:
2 solenoids - 3 positions
with spring centering



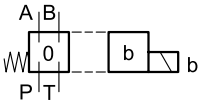


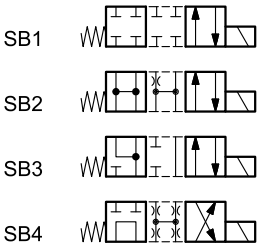
Type **SA***:
1 solenoid side A
2 positions (central + external)
with spring centering



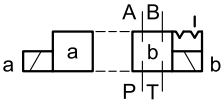


Type **SB***:
1 solenoid side B
2 positions (central + external)
with spring centering

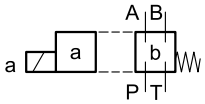


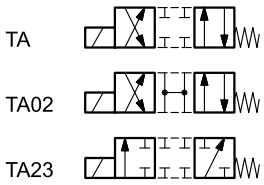


Type **RK**:
2 solenoids - 2 positions
with mechanical retention

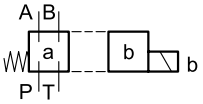


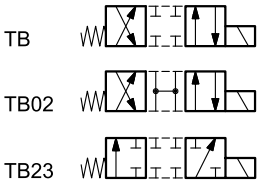
Type **TA**:
1 solenoid side A
2 external positions
with return spring





Type **TB**:
1 solenoid side B
2 external positions
with return spring

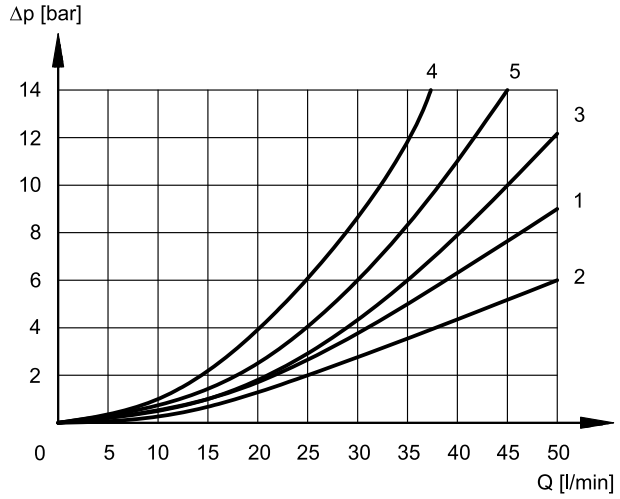




NOTE: Others spools available on request only.

4 - PRESSURE DROPS Δp-Q

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



ACTUATED POSITION

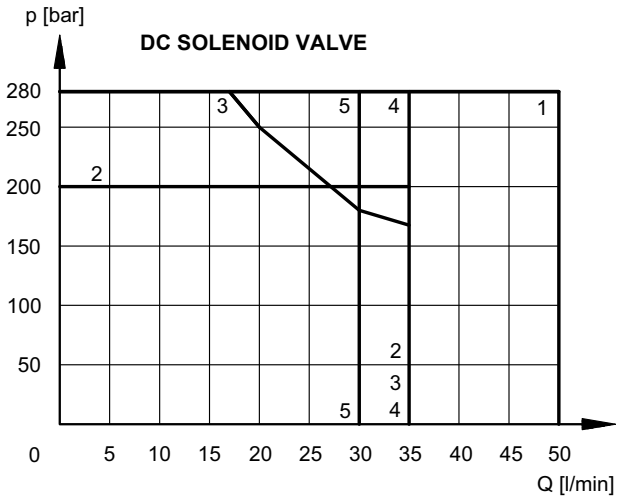
SPOOL	FLOW DIRECTIONS				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPHS				
S1	1	1	1	1	-
S2	1	1	2	2	3
S3	3	3	2	2	-
S4	4	4	4	4	5
RK	1	1	1	1	-
TA, TB	3	3	3	3	-
TB23	3	5	-	-	-
TA23	5	3	-	-	-

5 - OPERATING LIMITS

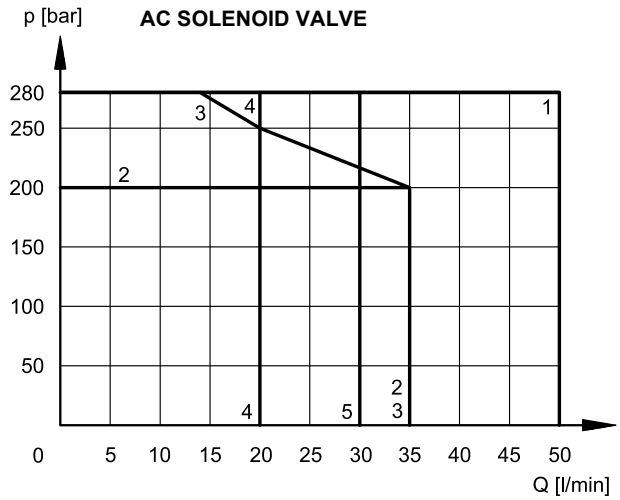
The curves define the flow rate operating fields according to the valve pressure of the different versions.

The values have been obtained according to ISO 6403, with the solenoids at the rated temperature and supplied with 90% of the nominal voltage. The values have been obtained using mineral oil with a viscosity of 36 cSt at 50 °C and filtration according to ISO 4406:1999 class 18/16/13.

The limits have been tested with a standard valve, with 4-port configuration. They may be considerably reduced if a 4-port valve is used as a 3-port valve with port A or B plugged or with no flow through port A or B.



SPOOL	CURVE
S1, TA	1
S2	2
S3	3
S4	4
RK	5
TA23, TB23	1



SPOOL	CURVE
S1, TA	1
S2	2
S3	3
S4	4
RK	5
TA23, TB23	1

6 - SWITCHING TIMES

The values indicated are obtained with spool S1, according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SUPPLY	TIMES (±10%) [ms]	
	ENERGIZING	DE-ENERGIZING
DC	25 ÷ 75	15 ÷ 25
AC	10 ÷ 25	15 ÷ 30

7 - ELECTRICAL FEATURES

7.1 - Solenoids

These are essentially made up of two parts: tube and coil. The tube is threaded into the valve body and includes the armature that moves immersed in oil, without wear. The inner part, in contact with the oil in the return line, ensures heat dissipation.

The coil is fastened to the tube by a threaded ring, and can be rotated freely, to suit the available space.

The interchangeability of coils of different voltages is allowed within the same type of supply current, alternating or direct.

7.2 - UL Recognized coils

UL type coils are UL Recognized Components (cUR®us marking) intended for installation within end-use equipment that is subject to evaluation in accordance with the applicable UL and CSA standards.

7.3 - IP degree of protection

The IP degree of protection is defined according to IEC 60529 and indicates the level of protection against the ingress of solid objects and liquids.

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

electrical connection	IP65	IP66	IP67	IP68	IP69 IP69K (*)
K1	x	x (#)			
K2	x		x		
K4	x				
K7	x		x	x	x
K8	x	x	x	x	x

(#) valid for DC valves only

(*) The IP69K degree of protection is not covered by IEC 60529 but is defined in ISO 20653.

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	10.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC)	In compliance with 2014/30/EU
LOW VOLTAGE	In compliance with 2014/35/EU
CLASS OF PROTECTION Coil insulation (VDE 0580) Impregnation	 class H class H

NOTE: To further reduce emissions, when using a DC power supply, type H connectors are recommended. These prevent overvoltage peaks when the coil supply circuit is opened (see catalogue 49 000).

IP Ratings: Selection Guide

The IP rating indicates protection against solid objects (first digit) and liquids (second digit). For solid objects, rating 6 is the highest level and provides complete dust protection. Our solenoid valves fall into this category.

For liquids, three types are distinguished:

- degree 1 to 6: protection against water jets;
- degree 7 and 8: protection against immersion;
- degree 9: protection against high-pressure, high-temperature water jets.

IP ratings are neither equivalent nor cumulative: IP66 covers lower ratings; IP68 covers IP67 only, not IP66, IP65 or lower ratings; IP69 does not cover any other rating.

Where a component complies with more than one type of protection, all applicable IP ratings shall be stated.

Example: equipment protected against powerful water jets and continuous immersion is marked IP66/IP68.

7.4 - DC solenoid valve - Current and absorbed power

The table shows current and power consumption values of the DC coils.

Using connectors type "D" or “D1” (see cat. 49 000) with embedded bridge rectifier it is possible to feed DC coils with alternating current (50 or 60 Hz), considering a reduction of the operating limits.

(values ± 5%)

	Resistance at 20°C [Ω]	Current consumption [A]	Power consumption [W]
D12	5,4	2,20	26,5
D24	20,7	1,16	27,8
D28	27,5	1,02	28,5
D48	82	0,58	28
D110	424	0,26	28,5
D220	1856	0,12	26,1

7.3 - AC solenoid valve - Current and power consumption

In alternating current energizing, an initial phase (maximum movement) is seen, during which the solenoid consumes elevated value currents (inrush current); the current values diminish during the plunger stroke until it reaches the minimum values (holding current) when the plunger reaches the stroke end. The table shows the values of absorption at the inrush and at holding.

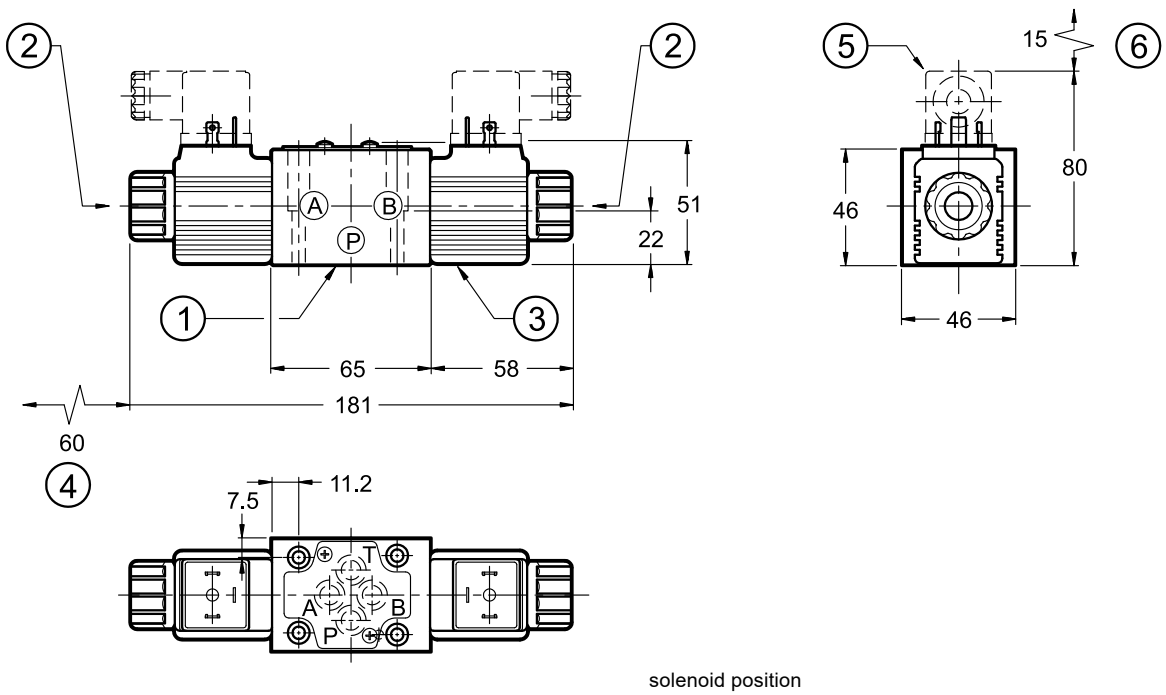
(values ±10%)

	Nominal voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω]	Current consumption at inrush [A]	Current consumption at holding [A]	Power consumption at inrush [VA]	Power consumption at holding [VA]
A24	24	50	2,7	4,5	1,47	109,2	35,3
A110	110		73,4	1,0	0,31	107,8	34,1
A230	230		320	0,5	0,16	112,7	36,8

8 - DL3 DC OVERALL AND MOUNTING DIMENSIONS

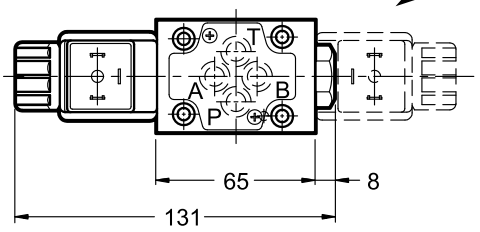
dimensions in mm

DL3 - S*



solenoid position for execution type TB* - SB*

DL3 - TA, DL3-SA*



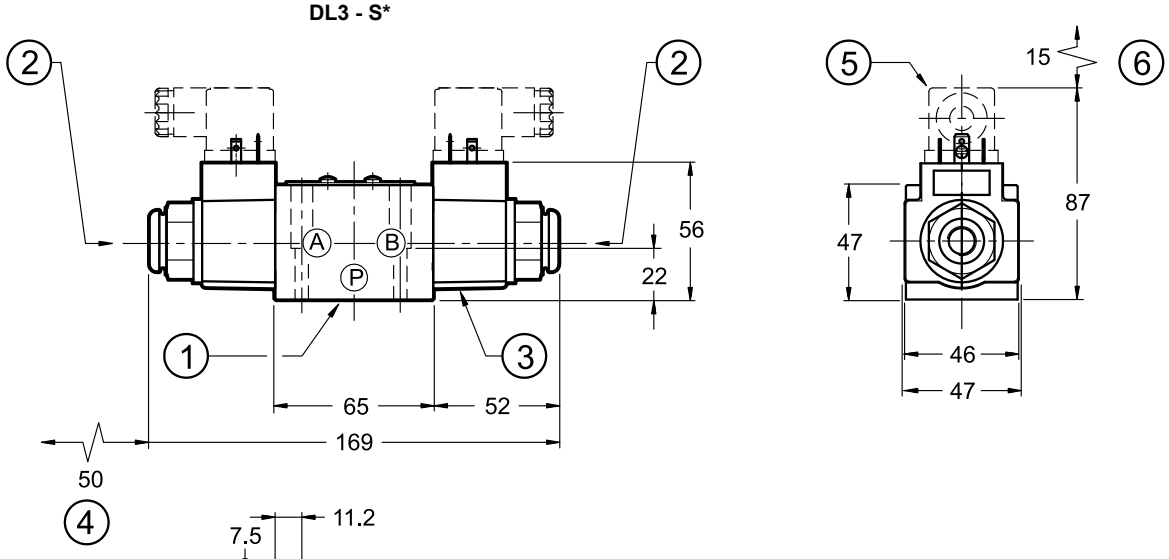
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Locking ring with boot protected manual override
3	Coil
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector (representation with K1 standard connection - see point 11 for other connection types)
6	Connector removal space

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

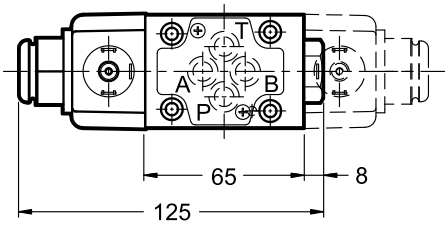
9 - DL3 AC OVERALL AND MOUNTING DIMENSIONS

dimensions in mm

DL3 - S*



DL3 - TA, DL3-SA*



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

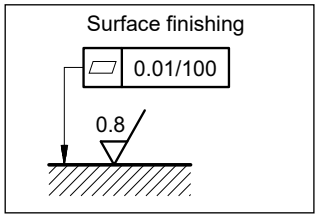
1	Mounting surface with sealing rings: 4 OR type 2037 (9.25x1.78) - 90 shore
2	Locking ring with boot protected manual override
3	Coil
4	Coil removal space
5	EN 175301-803 (ex DIN 43650) electrical connector
6	Connector removal space

10 - INSTALLATION

Configurations with centering and return springs can be mounted in any position; type RK valves - without springs and with mechanical detent - must be mounted with the longitudinal axis horizontal.

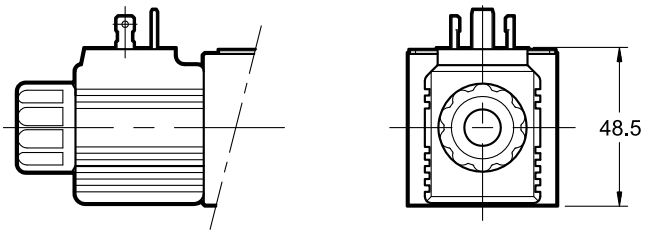
Valve fitting takes place by means of screws or tie rods, fixing the valve on a lapped surface, with values of planarity and smoothness that are equal to or better than those indicated in the drawing.

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

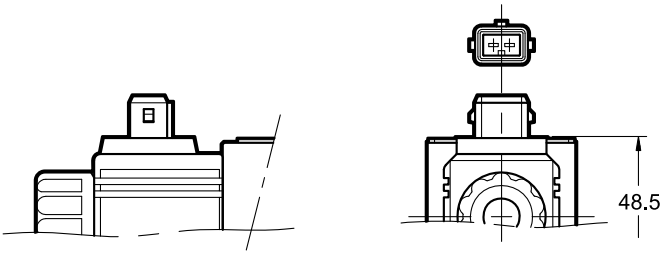


11 - ELECTRICAL CONNECTIONS

connection for EN 175301-803
(ex DIN 43650) connector
code **K1**
code **ULK1**

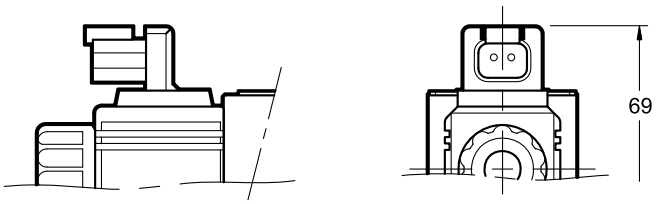


connection for AMP JUNIOR
connector type
code **K2**

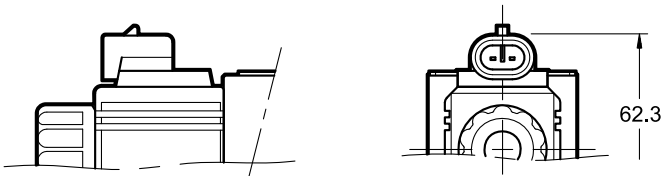


outgoing cable connections
cable length = 100 cm
code **K4**

connection for DEUTSCH DT04-2P
for male connector type DEUTSCH DT06
code **K7**
code **ULK7**



connection for AMP SUPERSEAL
(two contacts) connector type
code **K8**



12 - ELECTRICAL CONNECTORS

Solenoid operated valves are delivered without connectors. Connectors type EN 175301-803 (ex DIN 43650) for K1 connections can be ordered separately. See catalogue 49 000.

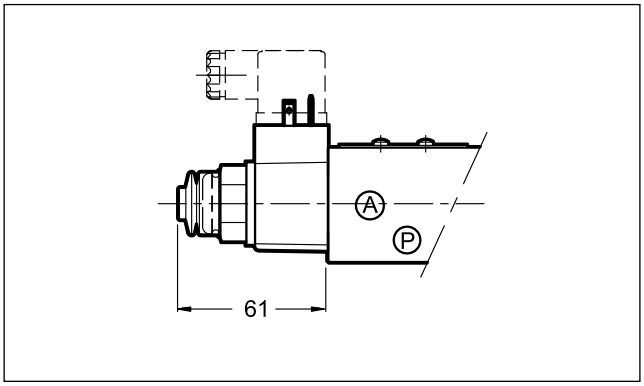
13 - OPTIONAL MANUAL OVERRIDES

13.1 - Boot protected manual override

On the DC version the boot override is integrated in the coil locking ring, as standard.

On the AC version, however, the boot override can be ordered by entering the code **CM** in the identification code at point 1, or is available as option to be ordered separately.

code **3401210001**

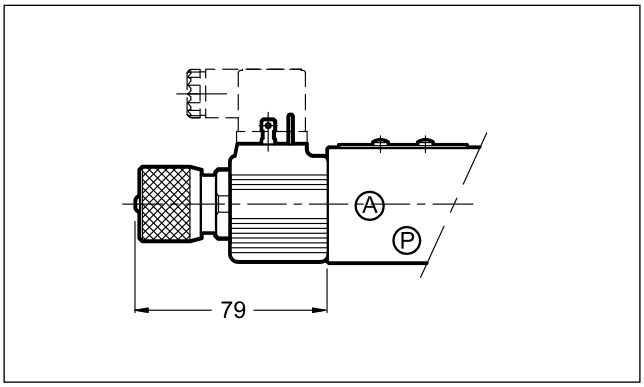


13.2 - Knob manual override

Available only for DC version.

The knob override can be ordered by entering the code **CK1** in the identification code at point 1, or is available as option to be ordered separately.

code **3404100046**



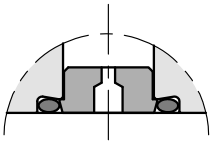
14 - PORT RESTRICTORS

The use of port restrictors is recommended when flow rate variations exceed the valve performance limits or when excessive vibrations are present.

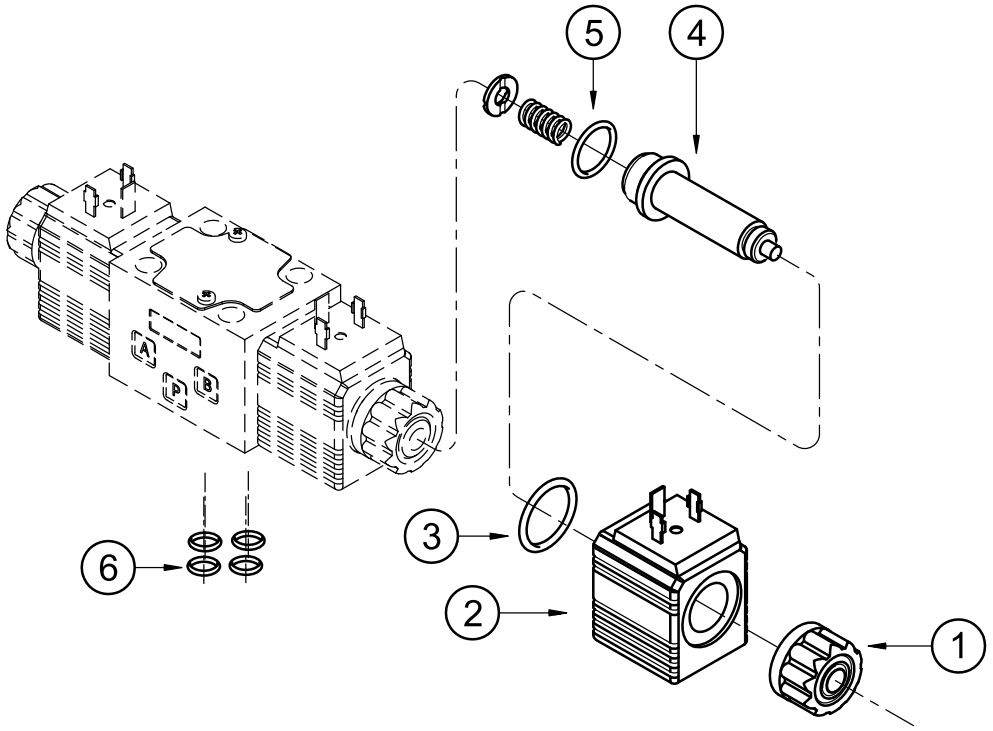
Port restrictor can be ordered separately using the part numbers shown alongside.

Ø (mm)	part number
blank	**0144162**
0.6	**0144163**
0.8	**0144033**
1	**0144034**

Ø (mm)	part number
1.2	**0144035**
1.5	**0144036**
1.8	**0144164**
2	**0144165**



15 - SPARE PARTS FOR DC SOLENOID VALVE



IDENTIFICATION CODE FOR DC COILS

C	14	L3	-				/	11	

Supply voltage
D12 = 12 V
D24 = 24 V
D28 = 28 V
D48 = 48 V
D110 = 110 V
D220 = 220 V

Coil version
(see availability table at page 2):
Omit for standard version
UL = UL Recognized

Coil electrical connection
(see point 11):
K1 = plug for connector type EN 175301-803 (ex DIN 43650)
K2 = plug for connector type AMP JUNIOR
K4 = outgoing cables
K7 = plug DEUTSCH DT04-2P for male connector type DEUTSCH DT06-2S
K8 = plug for connector type AMP SUPERSEAL

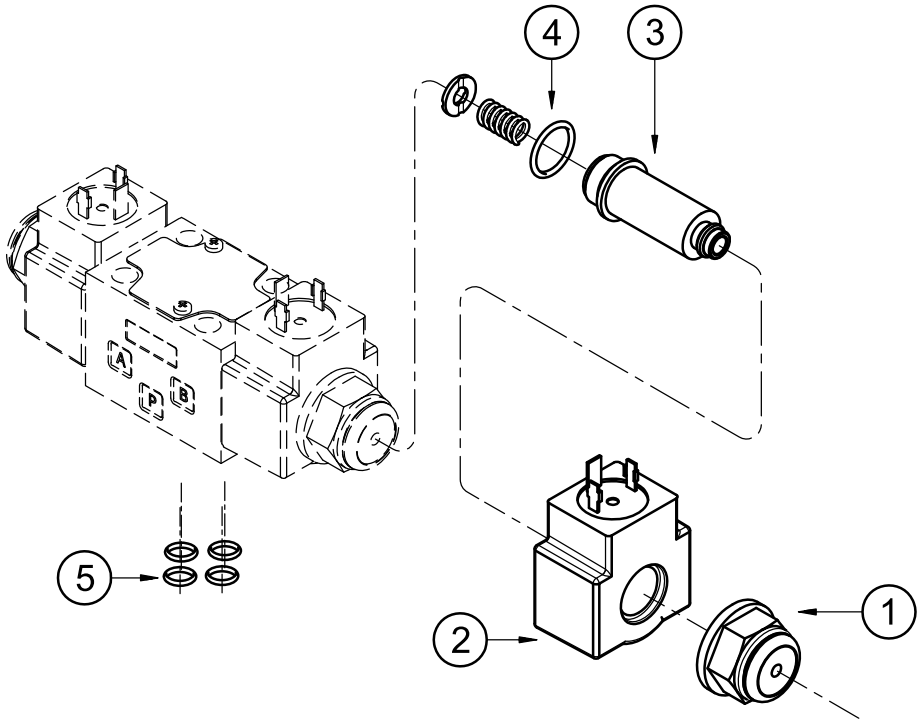
Series no.:

For UL coils only:
A = internal code

1	Coil locking ring - code 0119382 tightening torque: 3 ÷ 3.4 Nm
2	Coil (see identification code)
3	OR type 2112 (28.3x1.78) Supplied together with the coil
4	Solenoid tube: TD14-M18/11N (NBR seals) TD14-M18/11V (FPM seals) (OR n° 5 included)
5	OR type 2062 (15.6x1.78) - 70 Shore
6	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEAL KIT
The codes included the OR n° 5 and 6.
Cod. 1984435 NBR seals
Cod. 1984436 FPM seals

16 - SPARE PARTS FOR AC SOLENOID VALVE



IDENTIFICATION CODE FOR AC COILS

C	18	L3	-		K1	/	11

Supply voltage
A24 = 24 V - 50 Hz
A110 = 110 V - 50 Hz
A230 = 230 V - 50 Hz

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

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

1	Coil locking ring - code. 0119469 tightening torque: 3 ÷ 3.4 Nm
2	Coil (see identification code)
3	Solenoid tube: TA18-M18/11N (NBR seals) TA18-M18/11V (FPM seals) (OR n° 4 included)
4	OR type 2062 (15.6x1.78) - 70 Shore
5	N. 4 OR type 2037 (9.25x1.78) - 90 Shore

SEAL KIT
The codes included the OR n° 4 and 5.
Cod. 1984435 NBR seals
Cod. 1984436 FPM seals

17 - SUBPLATES
(see catalogue 51 000)

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

DUPLOMATIC MOTION SOLUTIONS
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