

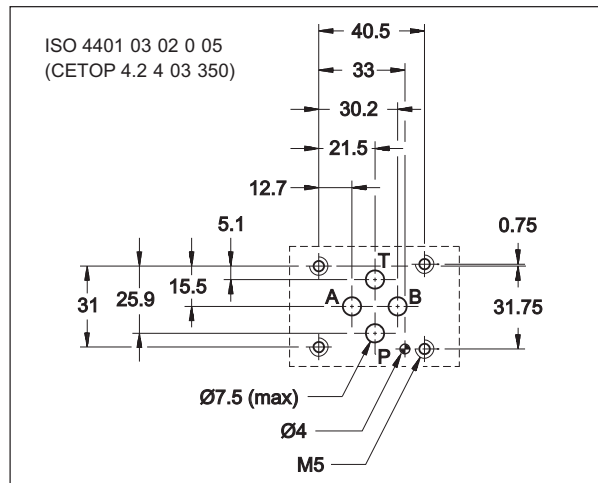
DS3

SOLENOID OPERATED DIRECTIONAL CONTROL VALVE

SUBPLATE MOUNTING ISO 4401-03 (CETOP 03)

p max **350** bar
Q max **100** l/min

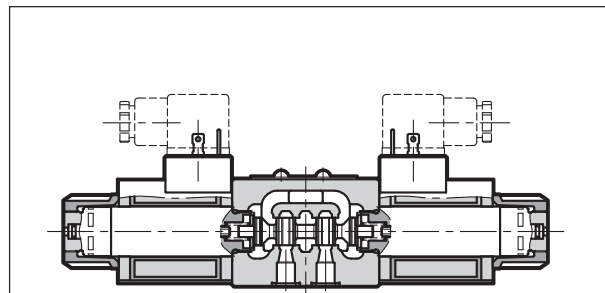
MOUNTING INTERFACE



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

Maximum operating pressure	bar	CC	CA
		Ports P - A - B	350
Port T		210	160
Maximum flow rate	l/min	100	90
Pressure drop $\Delta p-Q$	see paragraph 4		
Operating limits	see paragraph 6		
Electrical features	see paragraph 7		
Electrical connections	see paragraph 14		
Ambient temperature range	°C	20 / +50	
Fluid temperature range	°C	20 / +80	
Fluid viscosity range	cSt	10 ÷ 400	
Recommended viscosity	cSt	25	
Fluid contamination degree	according to ISO 4406:1999 class 20/18/15		
Mass:		kg	
single solenoid valve		1,5	1,35
double solenoid valve		2	1,8

OPERATING PRINCIPLE



Direct acting, subplate mounting directional control valve, with mounting surface according to ISO 4401 (CETOP RP121H) standards.

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 par. 7).

The valve is supplied with 3 or 4 ways designs, with 2 or 3 positions and with several interchangeable spools with different porting arrangements.

The valve is available with DC or AC solenoids. DC solenoids can also be fed with AC power supply, by using connectors with a built in rectifier bridge (see paragraph 7.2).

The DC solenoids DS3 directional valve is also available with connection DUAL DIN 43650.

The DC solenoids DS3 directional valve is also available in the versions with soft shifting (see par. 14) and with lever manual override.



1 - IDENTIFICATION CODE

	D	S	3	-		/	10	-		/		
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Solenoid operated directional control valve

ISO 4401 03 (CETOP 03) size

Spool type (see paragraph 3)

S*	RSA*	TA	RK
SA*	RSB*	TB	
SB*		TA*	
		TB*	

Series: _____
(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 (see **NOTE**)

AC power supply

A24 = 24 V 50 Hz
A48 = 48 V 50 Hz
A110 = 110 V 50 Hz / 120 V 60 Hz
A230 = 230 V 50 Hz / 240 V 60 Hz
A00 = valve without coils (see **NOTE**)

F110 = 110 V 60 Hz
F220 = 220 V 60 Hz

Option: Surface treatment not standard. Omit if not required (see **NOTE 2**)

Manual override: omit for override integrated in the tube (**standard**)

CM = manual override, boot protected
CH = lever manual override (only for DC version)
CP = push manual override (only for DC version)
CPK = push manual override with mechanical retention (only for DC version)

Coil electrical connection:

K1 = plug for connector type DIN 43650 (**standard**)
K7 = plug for connector type DEUTSCH DT04 2P male (available on **D12** and **D24** coils only)
K12 = plug for M12 connector K1 coils and DUAL DIN 43560 connector delivered together

NOTE 1: Coils locking ring and related OR are supplied together with valves.

NOTE 2: The valve is supplied with standard surface treatment of phosphating black. On request we can supply these valves with other surface finishes. Add suffix / **W** * at the end of the code.

W4 = carbonitriding with oxidation process. black colour
W5 = semi gloss epoxy painting black RAL 9005 thickness 80 ÷ 100µ
W6 = gloss polyurethane painting black RAL 9005 thickness 140µ

NOTE: The locking rings of the coils and the relevant O Rings are supplied together with valves

2 - HYDRAULIC FLUIDS

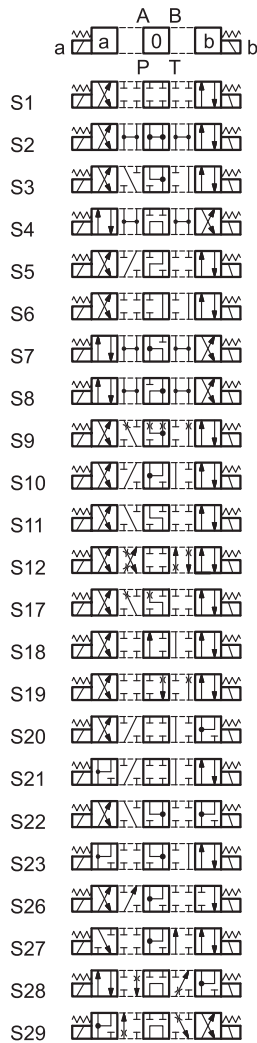
Use mineral oil based hydraulic fluids HL or HM type, according to ISO 6743 4. For these fluids, use NBR seals (code N). For fluids HFDR type (phosphate esters) use FPM seals (code V). For the use of other fluid types such as HFA, HFB, HFC, please consult our technical department. Using fluids at temperatures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

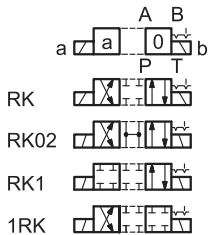
Type **S***:

2 solenoids 3 positions
with spring centering



Type **RK**:

2 solenoids 2 positions
with mechanical retention



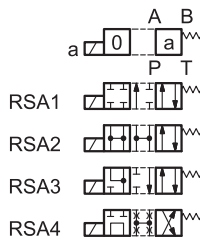
Type **SA***:

1 solenoid side A
2 positions (central + external)
with spring centering



Type **RSA***:

1 solenoid side A
2 positions (external + central)
with return spring



Type **TA**:

1 solenoid side A
2 external positions
with return spring



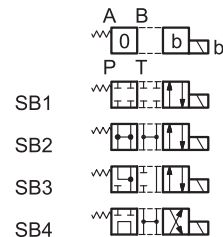
Type **TA***:

1 solenoid side A
2 positions with return spring



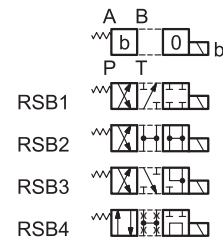
Type **SB***:

1 solenoid side B
2 positions (central + external)
with spring centering



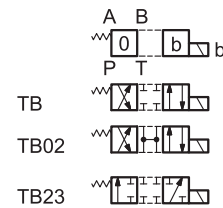
Type **RSB***:

1 solenoid side B
2 positions (external + central)
with return spring



Type **TB**:

1 solenoid side B
2 external positions
with return spring



Type **TB***:

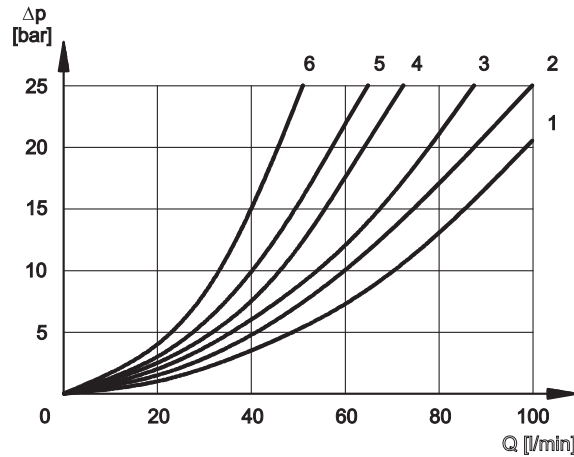
1 solenoid side B
2 positions with return spring



Besides the diagrams shown, which are the most frequently used, other special versions are available: consult our technical department for their identification, feasibility and operating limits.



4 - PRESSURE DROPS $\Delta p-Q$ (obtained with viscosity 36 cSt at 50 °C)



For pressure drops between A and B lines of spools S10, S20, S21, S22 and S23, which are used in the regenerative diagram, refer to curve 5.

PRESSURE DROPS WITH VALVE IN ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION			
	P→A	P→B	A→T	B→T
	CURVES ON GRAPH			
S1, SA1, SB1	2	2	3	3
S2, SA2, SB2	1	1	3	3
S3, SA3, SB3, RSA3, RSB3	3	3	1	1
S4, SA4, SB4, RSA4, RSB4	6	6	6	6
S5	2	1	3	3
S6	2	2	3	1
S7, S8	6	6	6	6
S9	2	2	3	3
S10	1	3	1	3
S11	2	2	1	3
S12	2	2	3	3
S17	2	2	3	3
S18	1	2	3	3
S19	2	2	3	3
S20	1	5	2	
S21	5	1		2
S22	1	5	2	
S23	5	1		2
TA, TB	2	2	2	2
TA02, TB02	2	2	2	2
TA23, TB23	3	3		
RK	2	2	2	2
RK02	2	2	2	2
RK1, 1RK	2	2	2	2

PRESSURE DROPS WITH VALVE IN DE-ENERGIZED POSITION

SPOOL TYPE	FLOW DIRECTION				
	P→A	P→B	A→T	B→T	P→T
	CURVES ON GRAPH				
S2, SA2, SB2					2
S3, SA3, SB3, RSA3, RSB3			3	3	
S4, SA4, SB4, RSA4, RSB4					5
S5		4			
S6				3	
S7, S8					5
S10	3	3			
S11			3		
S18	4				
S22			3	3	
S23			3	3	

5 - SWITCHING TIMES

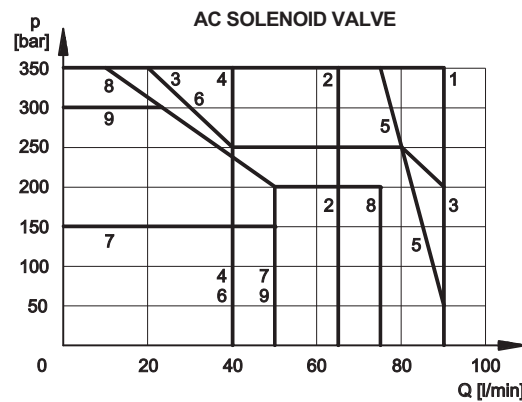
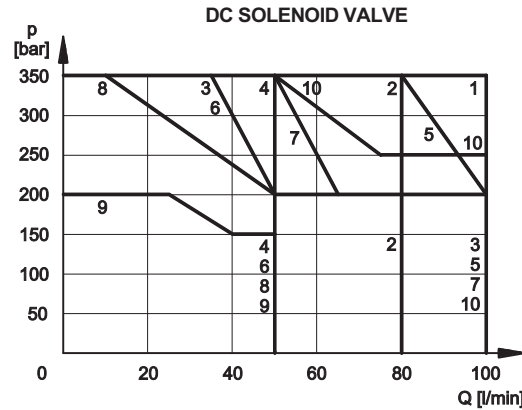
The values indicated are obtained according to ISO 6403 standard, with mineral oil viscosity 36 cSt at 50°C.

SPOOL TYPE	TIMES	
	ENERGIZING	DE-ENERGIZING
DC	25 ÷ 75 ms	15 ÷ 25 ms
AC	10 ÷ 25 ms	15 ÷ 40 ms

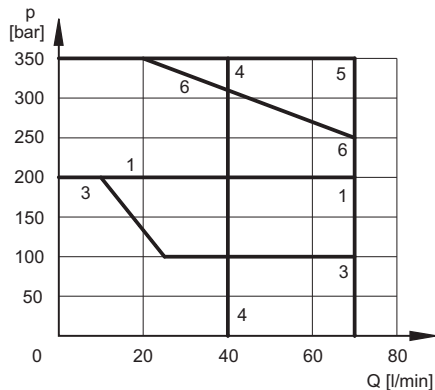


6 - OPERATING LIMITS

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



**AC SOLENOID VALVE with coil A110
fed with 110V - 60 Hz**



DC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3, RSA3, RSB3	3	3
S4, SA4, SB4, RSA4, RSB4	4	4
S5	1	1
S6	6	7
S7	4	4
S8	4	4
S9	10	10
S10	1	1
S11	7	6
S12	1	1
S17		
S18	1	1
S19		
S20	8*	8
S21	8	8*
S22	9*	8
S23	8	9*
TA, TB	5	5
TA02, TB02	1	1
TA23, TB23	2	2
RK	1	1
RK02	1	1
RK1, 1RK	1	1

AC SOLENOID VALVE

SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3, RSA3, RSB3	3	3
S4, SA4, SB4, RSA4, RSB4	4	4
S5	1	1
S6	3	4
S7	4	4
S8	4	4
S9	1	1
S10	1	1
S11	1	3
S12	1	1
S17		
S18	1	1
S19		
S20	9*	8
S21	8	9*
S22	7*	6
S23	6	7*
TA, TB	1	1
TA02, TB02	1	1
TA23, TB23	5	5
RK	1	1
RK02	1	1
RK1, 1RK	1	1

* Performance obtained for a valve with A and B lines connected the one to the piston side chamber and the other to the rod side chamber of a double acting cylinder with area ratio 2:1.

SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	5	5
S3, SA3, SB3, RSA3, RSB3	3	3
S4, SA4, SB4, RSA4, RSB4	4	4

S9	1	1
TA, TB	5	5
RK	6	6

NOTE: The values indicated in the graphs are relevant to the standard solenoid valve. The operating limits can be considerably reduced if a 4-way valve is used with port A or B plugged.

For flow and pressure performances of soft-shifting configuration see paragraph 14. For DC solenoid valves fed with AC by means of connectors with built-in rectifier bridge, see paragraph 7.2



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 360°, to suit the available space.

Protection from atmospheric agents CEI EN 60529

Plug in type	IP 65	IP 67	IP 69 K
K2 AMP JUNIOR	x	x (*)	
K7 DEUTSCH DT04 male	x	x	x (*)
K12 DUAL DIN 43650	x	x (*)	

(*) The protection degree is guaranteed only with the connector correctly connected and installed

SUPPLY VOLTAGE FLUCTUATION	± 10% Vnom
MAX SWITCH ON FREQUENCY	18.000 ins/hr
DUTY CYCLE	100%
ELECTROMAGNETIC COMPATIBILITY (EMC) (NOTE)	In compliance with 2004/108/CE
LOW VOLTAGE	In compliance with 2006/95 CE
CLASS OF PROTECTION : Coil insulation (VDE 0580) Impregnation: (DC valve) (AC valve)	class H class F class H

NOTE: In order to further reduce the emissions, with DC supply, use of type H connectors is recommended. These prevent voltage peaks on opening of the coil supply electrical circuit (see cat. 49 000).

7.2 Current and absorbed power for DC solenoid valve

The table shows current and power consumption values relevant to the different coil types for DC.

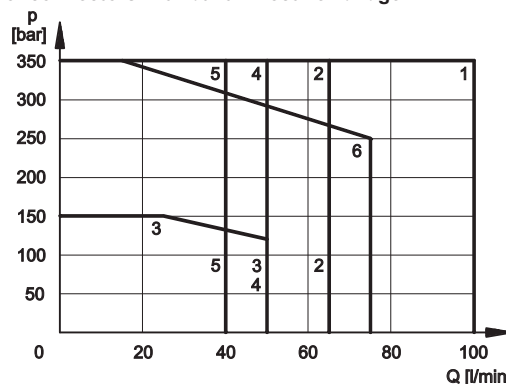
The rectified current supply takes place by fitting the valve (with the exception of D12 coil) with an alternating current source (50 or 60 Hz), rectified by means of a bridge built in to the "D" type connectors (see cat. 49 000), by considering a reduction of the operating limits (see diagram below).

Coils for direct current (values ±5%)

	Nominal voltage [V]	Resistance at 20°C [Ω]	Current consumpt. [A]	Power consumpt [W]	Coil code	
					K1	K7
D12	12	4,4	2,72	32,6	1902860	1902940
D24	24	18,6	1,29	31	1902861	1902941
D28	28	26	1,11	31	1903082	
D48	48	78,6	0,61	29,3	1902863	
D110	110	423	0,26	28,6	1902864	
D220	220	1692	0,13	28,6	1902865	

Operating limits for DC solenoid valves fed with AC by means of connectors with built-in rectifier bridge.

SPOOL	CURVE	
	P→A	P→B
S1, SA1, SB1	1	1
S2, SA2, SB2	2	2
S3, SA3, SB3, RSA3, RSB3	3	3
S4, SA4, SB4, RSA4, RSB4	4	4
S9	6	6
TA, TB	5	5
RK	1	1



7.3 Current and absorbed power for AC solenoid valve

The table shows current and power consumption values at inrush and at holding, relevant to the different coil types for AC current.

Coils for alternating current (values ± 5%)

Suffix	Nominal Voltage [V]	Freq. [Hz]	Resistance at 20°C [Ω] (±1%)	Current consumption at inrush [A] (±5%)	Current consumption at holding [A] (±5%)	Power consumption at inrush (±5%) [VA]	Power consumption at holding (±5%) [VA]	Coil Code	
A24	24	50	1,46	8	2	192	48	1902830	
A48	48		5,84	4,4	1,1	204	51	1902831	
A110	110V 50Hz	50/60	32	1,84	0,46	192	48	1902832	
	120V 60Hz			1,56	0,39	188	47		
A230	230V 50Hz		140	140	0,76	0,19	176	44	1902833
	240V 60Hz				0,6	0,15	144	36	
F110	110	60	26	1,6	0,4	176	44	1902834	
F220	220		106	0,8	0,2	180	45	1902835	

