Directional spool valves, direct operated, with solenoid actuation

Type WE

RE 23327
Edition: 2013-05
Replaces: 08.08

H5958

- Size 10
- Component series 3X; 4X
- Maximum operating pressure 315 bar *[4569 psi]*
- Maximum flow 120 l/min *[31.7 US gpm]*

Features

- 4/3, 4/2 or 3/2 directional design
- High-power solenoid
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05
- Wet-pin AC solenoids with detachable coil
- Solenoid coil can be rotated by 90°
- The coil can be changed without having to open the pressure-tight chamber
- Electrical connection as individual or central connection
- Manual override, optional

Contents

Ordering codes

01	02	03	04	05		06	07	08	09	10	11		12	13	14	15	16
	WE	**10**			**/**		**C**					**/**					*****

01	3 main ports	**3**
	4 main ports	**4**
02	Directional valve	**WE**
03	Size 10	**10**
04	Symbols e.g. C, E, EA, EB, etc; for the possible version, see page 3	
05	Component series 30 ... 39 (30 ... 39: Unchanged installation and mounting dimensions)	**3X**
	Component series 40 ... 49 (40 ... 49: Unchanged installation and mounting dimensions)	**4X**
06	**With** spring return	**no code**
	Without spring return	**O**
	Without spring return with detent	**OF**
07	High performance wet-pin solenoid with detachable coil	**C**
08	AC voltage 230 V 50/60 Hz	**W230**
	For further ordering codes for other voltages and frequencies, see page 7; for direct voltage, see data sheet 23340	
09	**With** concealed manual override (standard)	**N9**
	With manual override	**N**
	Without manual override	**no code**

Electrical connection

10	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K4** [1]
	Central connection	
	Cable entry at the cover, with indicator light	**DL**
	Central plug-in connection at the cover, with indicator light (without mating connector)	**DK6L**
	For further electrical connections, see data sheet 08010	

Spool position monitoring

11	**Without** position switch	**no code**
	– Inductive position switch type QM	
	Monitored spool position "a"	**QMAG24**
	Monitored spool position "b"	**QMBG24**
	Monitored rest position	**QM0G24**
	For further information, see data sheet 24830	
12	**Without** throttle insert	**no code**
	Throttle Ø 0.8 mm *[0.031 inch]*	**B08**
	Throttle Ø 1.0 mm *[0.039 inch]*	**B10**
	Throttle Ø 1.2 mm *[0.047 inch]*	**B12**
	Use with flows which exceed the performance limit of the valve (see page 4).	

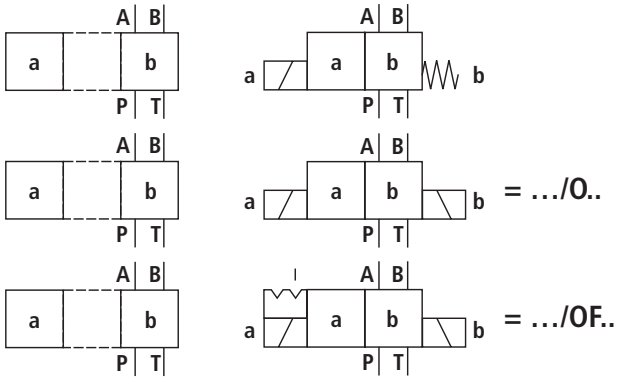
Seal material

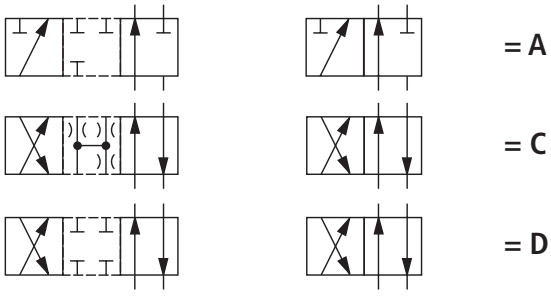
13	NBR seals	**no code**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
14	Further details in the plain text	

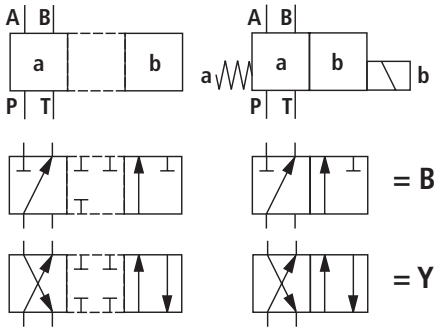
[1] Mating connectors, separate order, see page 14 and data sheet 08006.

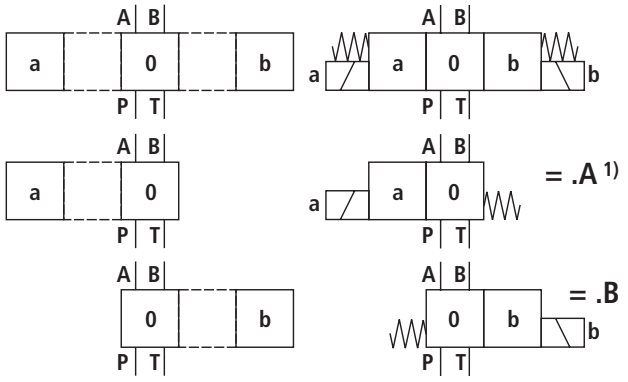
☞ **Notice!** Preferred types and standard units are contained in the EPS (standard price list).

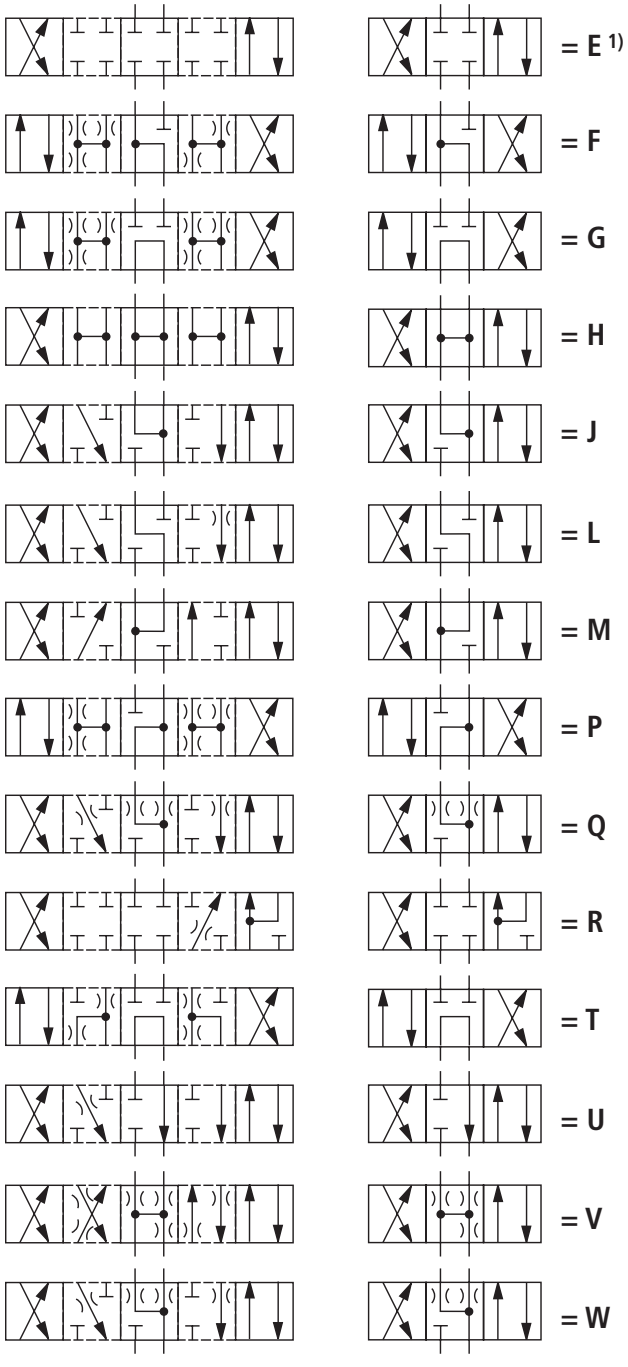
Symbols











1) **Example:**
Symbol E with spool position "a", ordering code ..**EA**..

Notices!
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

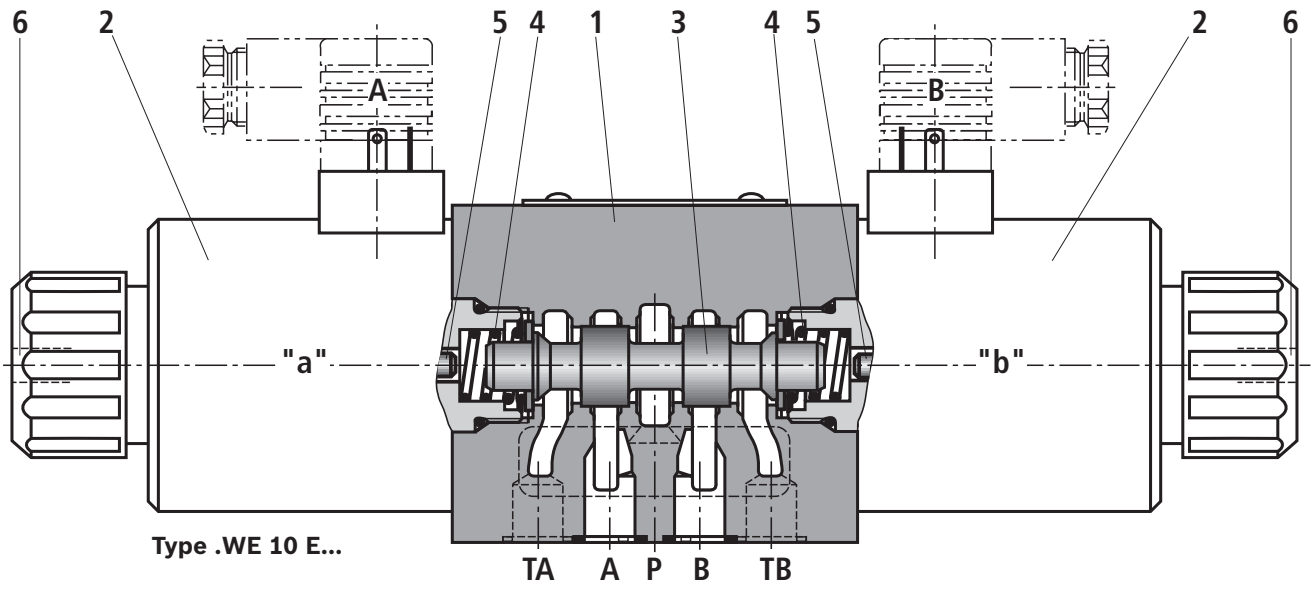
Function, section

The directional valve type WE is a solenoid actuated directional spool valve. It controls the start, stop and direction of a flow.
The directional valve basically consists of the housing (1), one or two electronic solenoids (2), the control spool (3), and the return springs (4).
In the de-energized condition, the control spool (3) is held in the central position or in the initial position by the return springs (4) (except for version "O"). The control spool (3) is actuated by wet-pin electronic solenoids (2). The force of electronic solenoid (2) acts via the plunger (5) on the control spool (3) and pushes the latter from its rest position to the required end position. This enables the necessary direction of flow from P to A and B to T or P to B and A to T.

When the electronic solenoid (2) is de-energized, the return spring (4) pushes the control spool (3) back to its rest position.
A manual override (6) allows for the manual switching of the valve without solenoid energization.

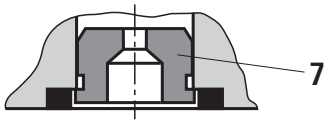
To ensure proper functioning, make sure that the pressure chamber of the solenoid is filled with oil.

For additional functions, see page 5.



Type .WE 10 E...

Throttle insert "B.."
Using a throttle insert (7) in channels P, A, B or T increases the flow resistance at the valve. Its use is required when due to prevailing operating conditions, flows occur during the switching processes, which exceed the performance limit of the valve.

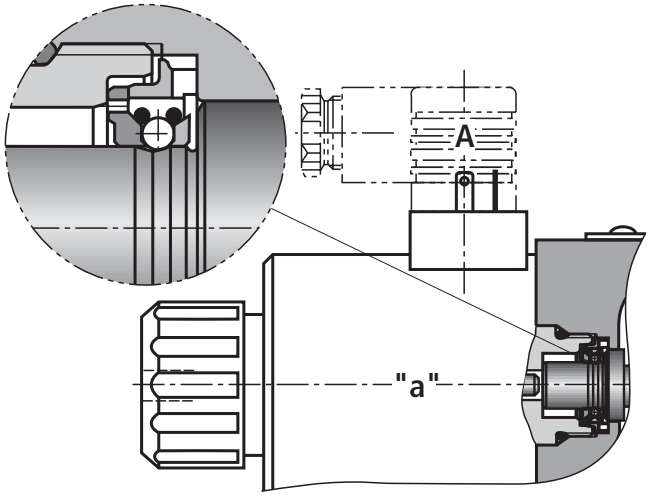


Function, section

Without spring return "O" (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **without** detent. The valve without spring return at the control spool (3) has no defined basic position in the de-energized condition.

Without spring return with "OF" detent (only possible with symbols A, C and D)
This version is a directional valve with 2 spool positions and 2 electronic solenoids **with** detent. The detents are used to fix the control spool (3) in the relevant spool position. During operation, continuous application of current to the electronic solenoid can therefore be omitted which contributes to energy-efficient operation.

☞ **Notice!**
Pressure peaks in the tank line to two or several valves can result in unwanted control spool movements in the case of valves with detent! We therefore recommend that separate return lines be provided or a check valve installed in the tank line.



Type .WE 10 ../OF...

Technical data
(for applications outside these parameters, please consult us!)

general				
Weight			Individual connection	Central connection
	– Valve with one solenoid	kg *[lbs]*	3.6 *[7.9]*	3.5 *[7.7]*
	– Valve with two solenoids	kg *[lbs]*	4.4 *[9.7]*	4.3 *[9.5]*
Installation position			Any	
Ambient temperature range		°C *[°F]*	–30 ... +50 *[–22 ... +122]* (NBR seals) –20 ... +50 *[–4 ... +122]* (FKM seals)	
$MTTF_d$ values according to EN ISO 13849		Years	150 (for further details see data sheet 08012)	

hydraulic			
Maximum operating pressure	– Port A, B, P	bar *[psi]*	315 *[4569]*
	– Port T	bar *[psi]*	160 *[2320]* With symbols A and B, port T has to be used as leakage oil connection if the operating pressure exceeds the tank pressure.
Maximum flow		l/min *[US gpm]*	120 *[31.7]*
Flow cross-section (spool position 0)	– Symbol V	mm² *[inch²]*	11 *[0.017]* (A/B to T); 10.3 *[0.016]* (P to A/B)
	– Symbol W	mm² *[inch²]*	2.5 *[0.004]* (A/B to T)
	– Symbol Q	mm² *[inch²]*	5.5 *[0.009]* (A/B to T)
Hydraulic fluid			See table below
Hydraulic fluid temperature range (at the valve operating ports)		°C *[°F]*	–30 ... +80 *[–22 ... +176]* (NBR seals) –20 ... +80 *[–4 ... +176]* (FKM seals)
Viscosity range		mm²/s *[SUS]*	2.8 ... 500 *[35 ... 2320]*
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524
Bio-degradable	– insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– water-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure difference per control edge 50 bar
  - Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

Technical data
(for applications outside these parameters, please consult us!)

electric			
Voltage type			Alternating voltage 50/60 Hz
Available voltages [2] (For ordering codes for AC voltage solenoids, see below)		V	42, 110, 230
Voltage tolerance (nominal voltage)		%	±10
Power consumption		W	–
Holding power		VA	90
Switch-on power		VA	550
Duty cycle (ED)		%	100
Switching time according to ISO 6403	– ON	ms	15 ... 25
	– OFF	ms	20 ... 30
Maximum switching frequency		1/h	7200
Maximum surface temperatures of the coil [3]		°C *[°F]*	180 *[356]*
Protection class according to DIN EN 60529			IP 65 with mating connector mounted and locked
Insulation class VDE 0580			H
Electrical protection			Every solenoid must be protected individually, using a suitable fuse with tripping characteristic K (inductive loads).
Behavior in case of an error (solenoid does not switch though)			The solenoid surface temperature may be exceeded.

[2] Special voltages on request

[3] Possible surface temperature > 50 °C, provide contact protection!

Notice!
- The solenoid coils must not be painted.
- Actuation of the manual override is only possible up to a tank pressure of approx. 50 bar *[725 psi]*. Avoid damage to the bore of the manual override! (Special tool for the operation, separate order, material no. **R900024943**). When the manual override is blocked, actuation of the opposite solenoid must be ruled out!
- The simultaneous actuation of 2 solenoids of one valve must be ruled out!
- Use cables that are approved for an operation temperature above 105 °C *[221 °F]*.
- When solenoid coils are switched off, voltage peaks result which may cause failures or damage in the connected control electronics. The user has to provide for a suitable circuit for limiting the voltage peaks. It must be noted that a diode switched in an anti-parallel form extends the switching off time.
- Valves with individual connection and supply voltage 12 V or 24 V can be operated with twice the voltage for reducing the switching time. For this purpose, the voltage has to be reduced to the nominal valve voltage after 100 ms by means of pulse width modulation. The maximum admissible switching frequency is 5 1/s.
- Due to possible overloads of the printed-circuit board, valves with central connection must not be operated with twice the voltage.

Notice!
AC solenoids can be used for 2 or 3 mains; e.g. solenoid type **W110** for: 110 V, 50 Hz; 110 V, 60 Hz; 120 V, 60 Hz

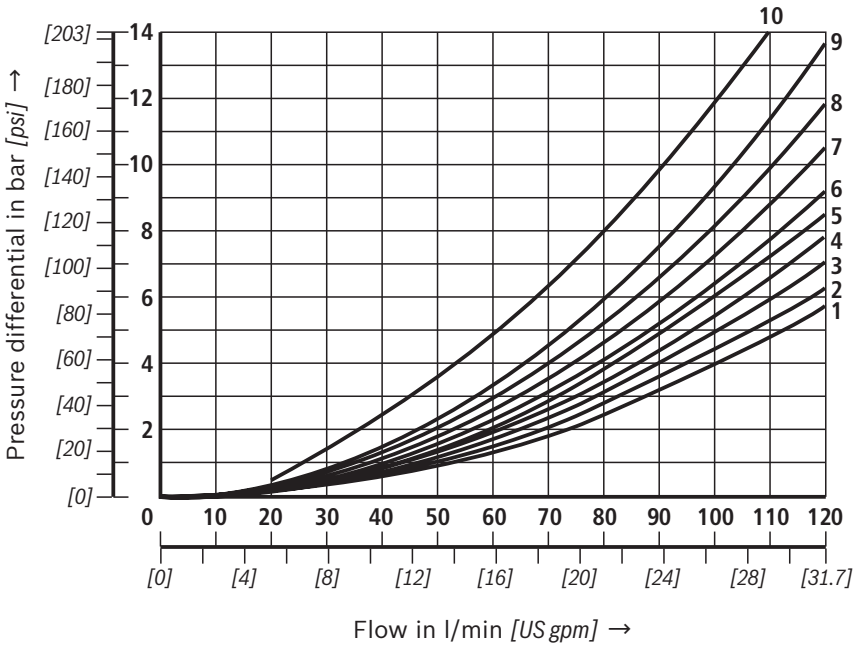
Ordering code	Mains
W42	42 V, 50 Hz 42 V, 60 Hz
W110	110 V, 50 Hz 110 V, 60 Hz 120 V, 60 Hz
W230	230 V, 50 Hz 230 V, 60 Hz

When establishing the electrical connection, the protective earthing conductor (PE ⏚) has to be connected correctly.

Characteristic curves

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

***Δp-q*$_V$ characteristic curves**



Symbol	Direction of flow			
	P – A	P – B	A – T	B – T
A; B	3	3	–	–
C	3	3	4	5
D; Y	5	5	6	6
E	1	1	4	4
F	2	3	7	4
G	3	3	6	7
H	1	1	6	7
J	1	1	3	3
L	2	2	3	5
M	1	1	4	5
P	4	2	5	7
Q	1	2	1	3
R	3	6	4	–
T	3	3	6	7
U; V	2	2	3	3
W	2	2	4	5

Central position:

Symbol	Direction of flow				
	P – A	P – B	B – T	A – T	P – T
F	4	–	–	9	9
P	–	5	8	–	10
G, T	–	–	–	–	9
H	–	–	–	–	3

Spool position:

Symbol	Direction of flow			
	P – A	B – A	A – T	P – T
R	–	9	–	–

Performance limits

(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

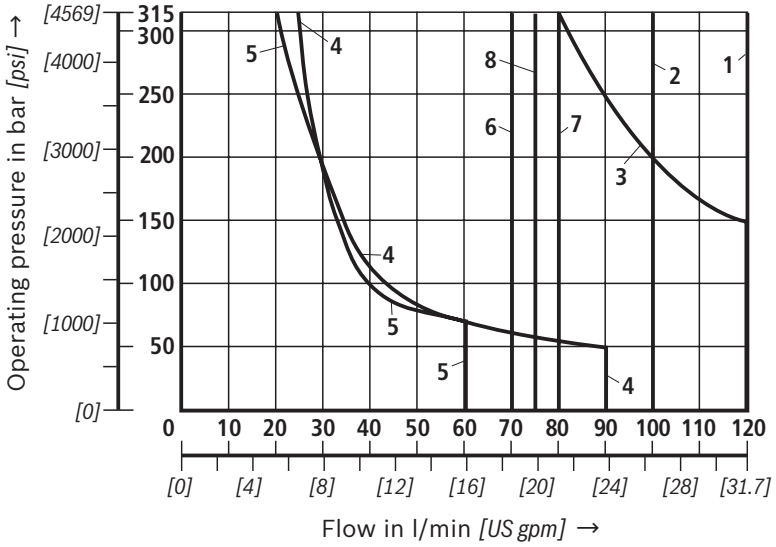
☞ **Notice!**

The specified performance limits are valid for operation with two directions of flow (e.g. from P to A and simultaneous return flow from B to T).

Due to the flow forces acting within the valves, the permissible performance limit may be considerably lower with only one direction of flow (e.g. from P to A while port B is blocked).

In such cases, please consult us.

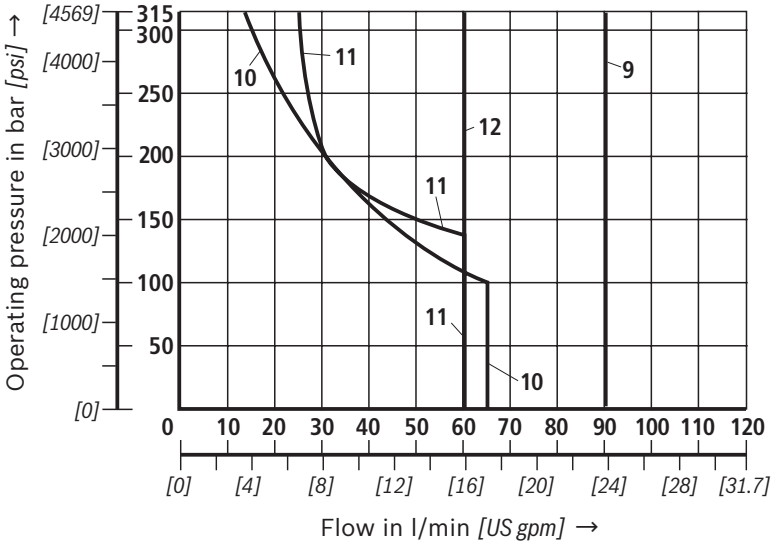
The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank pre-loading.



Characteristic curve	Symbol
1	C; C/O; C/OF; D; D/O; D/OF; Y
2	E; L; U; Q; W
3	A/O; A/OF; J
4	F; P
5	T
6	H
7	R
8 [2)]	L; U

[2)] Central position only

42 V, 50 Hz; 110 V, 50 Hz; 120 V, 60 Hz;
127 V, 50 Hz; 220 V, 50 Hz; 240 V, 60 Hz



Characteristic curve	Symbol
9	M
10	A, B
11	G
12	V

42 V, 50 Hz; 110 V, 50 Hz; 120 V, 60 Hz;
127 V, 50 Hz; 220 V, 50 Hz; 240 V, 60 Hz

Performance limits
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C *[104 ± 9 °F]*)

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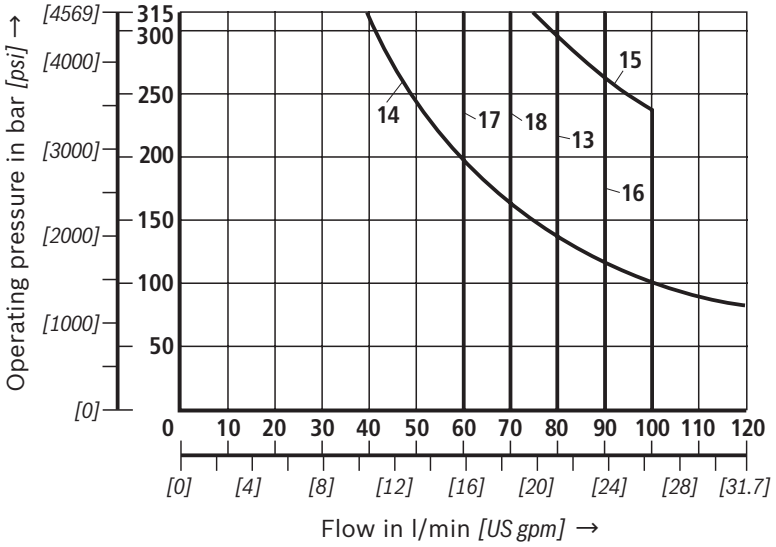
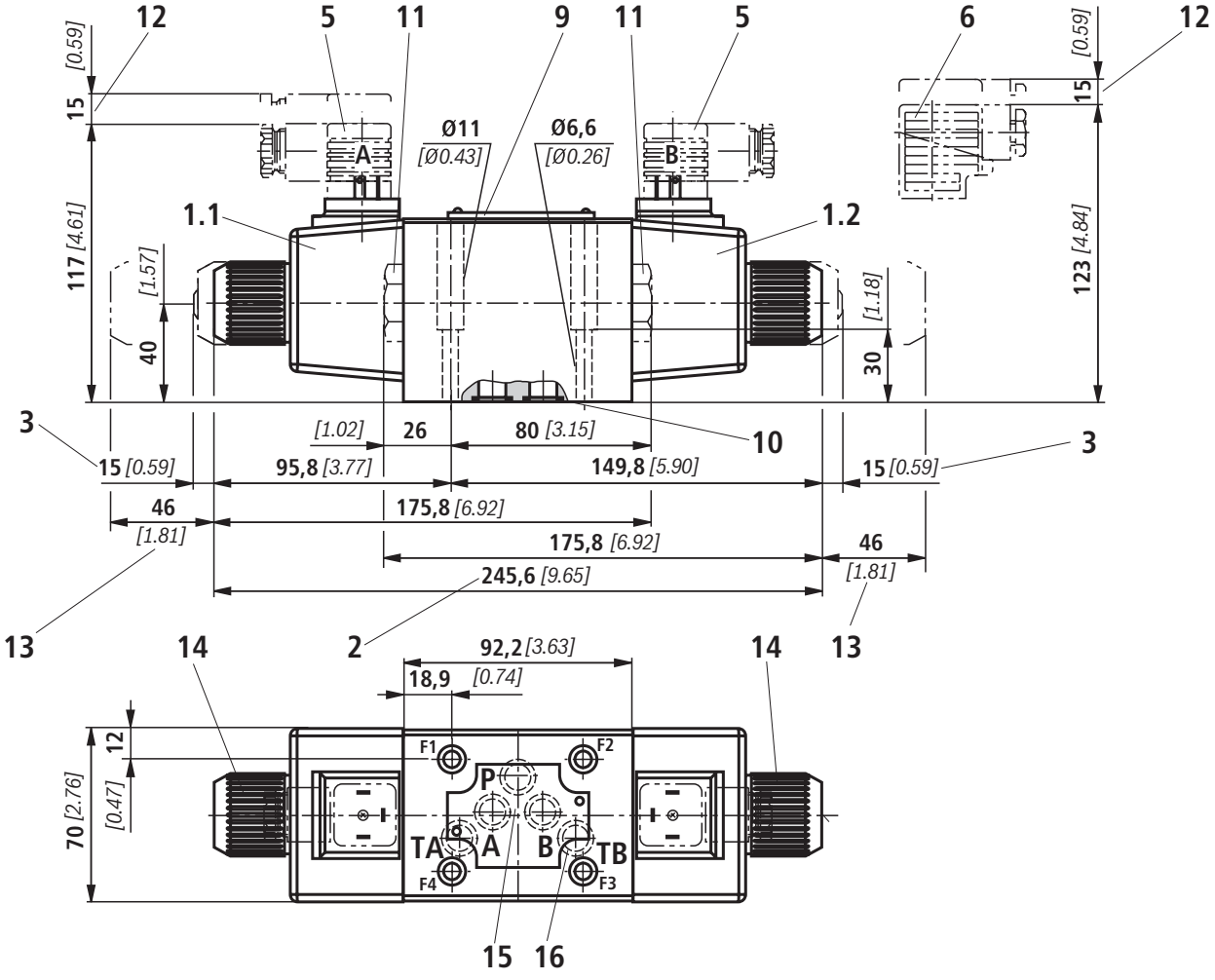
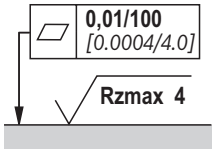


Characteristic curve	Symbol
13	C; C/O; C/OF; D; D/O; D/OF; Y
14	A/O; A/OF
15	E
16	M
17	V
18	H

42 V, 60 Hz; 110 V, 60 Hz;
127 V, 60 Hz; 220 V, 60 Hz
Please consult us regarding the performance limits for other symbols.

Dimensions: Individual connection
(dimensions in mm *[inch]*)





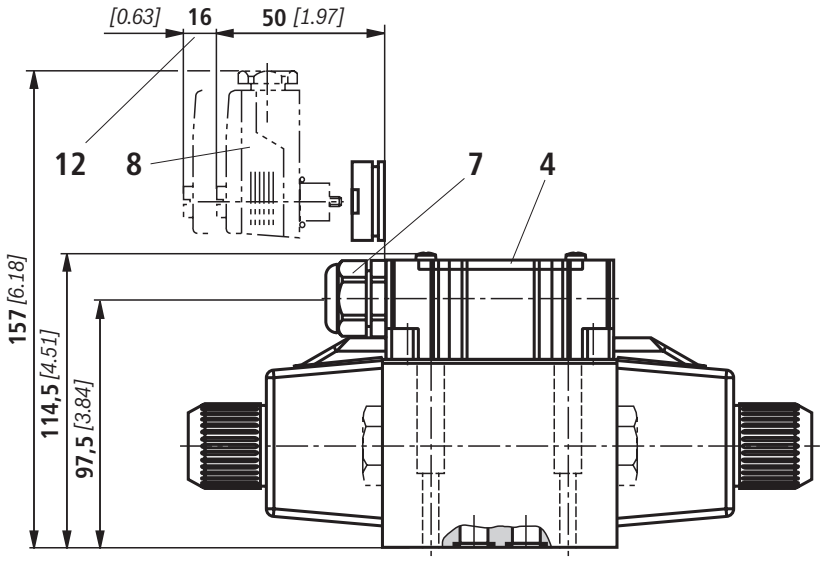
Required surface quality of the valve contact surface

☞ **Notice!**

- Deviating from ISO 4401, in this data sheet port T is called TA, port T1 is called TB.
- The dimensions are nominal dimensions which are subject to tolerances.

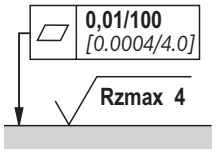
For item explanations, valve mounting screws and **sub-plates,** see page 13.

Dimensions: Central connection (dimensions in mm *[inch]*)



Terminal assignment with central connection:

- **1 solenoid:**
  Always connect the solenoid to terminals 1 and 2,
  the protective grounding conductor to terminal ⏚ PE
- **2 solenoids:**
  Always connect solenoid "a" to terminals 1 and 2,
  solenoid "b" to terminals 3 and 4,
  the protective grounding conductor to terminal ⏚ PE



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For item explanations, valve mounting screws and **sub-plates,** see page 13.

Dimensions

1.1 Solenoid "a"

1.2 Solenoid "b"

2 Dimension for solenoid **without** and **with concealed** manual override "**N9**" (standard)

3 Dimension for solenoid **with** manual override "**N**"

4 Cover
Attention!
The valve may only be operated with properly mounted cover.

5 Mating connector **without** circuitry (separate order, see page 14 and data sheet 08006)

6 Mating connector **with** circuitry (separate order, see page 14 and data sheet 08006)

7 Cable gland Pg 16 *[1/2" NPT]* "DL"

8 Angled socket (red, separate order)
(material no. **R900005538**)

9 Name plate

10 Identical seal rings for ports A, B, P, TA, TB (for valves with throttle insert: O ring in channel P)

11 Plug screw for valves with one solenoid

12 Space required to remove the mating connector/ angled socket

13 Space required to remove the coil

14 Mounting nut, tightening torque $\boldsymbol{M}_A = 6^{+2}$ Nm *[4.43$^{+1.48}$ ft-lbs]*

15 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-2002 D05

16 Connection TB can only be used in connection with separately produced bore.

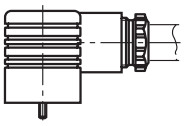
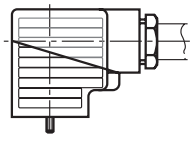
Subplates according to data sheet 45054 (separate order)
G 66/01 (G3/8)
G 67/01 (G1/2)
G 534/01 (G3/4)
G 66/12 (SAE-6; 9/16-18) [1)]
G 67/12 (SAE-8; 3/4-16) [1)]
G 534/12 (SAE-12; 1-1/16-12) [1)]
[1)] On request

Valve mounting screws (separate order)
4 metric hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 ... 0.14);
tightening torque $\boldsymbol{M}_A$ = 12.5 Nm *[9.2 ft-lbs]* ± 10%,
material no. **R913000058**
or
4 hexagon socket head cap screws
ISO 4762 - M6 x 40 - 10.9 (self procurement)
(friction coefficient μ_{total} = 0.12 ... 0.17);
tightening torque $\boldsymbol{M}_A$ = 15.5 Nm *[11.4 ft-lbs]* ± 10%

4 UNC hexagon socket head cap screws
1/4-20 UNC x 1-1/2" ASTM-A574
(friction coefficient μ_{total} = 0.19 ... 0.24);
tightening torque $\boldsymbol{M}_A$ = 20 Nm *[14.7 ft-lbs]* ± 15%,
(friction coefficient μ_{total} = 0.12 ... 0.17);
tightening torque $\boldsymbol{M}_A$ = 14 Nm *[10.3 ft-lbs]* ± 10%,
material no. **R978800710**

With different friction coefficients, the tightening torques are to be adjusted accordingly!

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006					
			Material number		
Port	**Valve side**	**Color**	Without circuitry	With indicator light 12 ... 240 V	With indicator light and Zener diodes-protection circuit 24 V
M16 x 1.5	a	Gray	**R901017010**	**–**	**–**
	b	Black	**R901017011**	**–**	**–**
	a/b	Black	**–**	**R901017022**	**R901017026**
1/2" NPT (Pg 16)	a	Red/brown	**R900004823**	**–**	**–**
	b	Black	**R900011039**	**–**	**–**
	a/b	Black	**–**	**R900057453**	**–**