RA 29 061/06.98

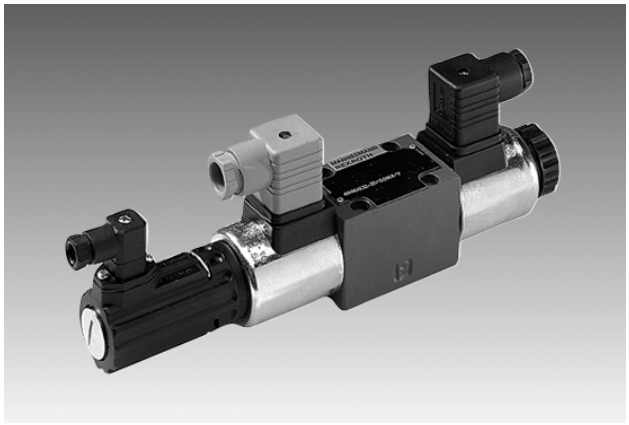
Replaces: 05.97

engineering
mannesmann
Rexroth

4/2 and 4/3 proportional directional valves, directly controlled, with electrical position feedback
Models 4WRE and 4WREE

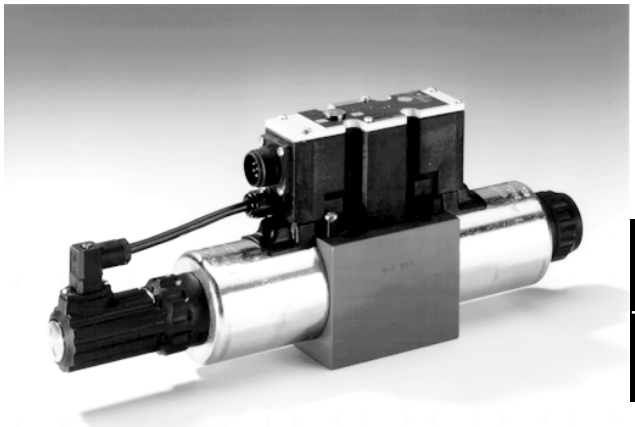
Nominal sizes 6 and 10
Series 2X
Maximum operating pressure 4600 PSI (315 bar)
Maximum flow 63.4 GPM (240 L/min)

H/A/D 5881/97



Model 4WRE 6 ...-2X/G24K4/V with plug-in connectors and associated control electronics (separate order)

H/A/D 5732/97



Model 4WREE 10 ...-2X/G24K31/..V
with integrated control electronics

Contents

Features

- Directly controlled proportional valve for the control of direction and magnitude of a flow
- Actuation is by proportional solenoids with central thread and removable coil
- Electrical position feed-back
- For subplates:
  porting pattern to DIN 24 340 form A, ISO 4401, CETOP-RP 121 H, NFPA T3.5.1M R1, and ANSI B93.7 **D 03, D 05**
  Subplates to catalog sheets RA 45 052 and RA 45 054 (separate order), see pages 15 and 16
- Spring centered control spool
- Model 4WREE, integrated valve electronics with interface A1and F1
- Control electronics for model 4WRE: electronic amplifier VT-VRPA2-1-1X in Eurocard format (separate order)

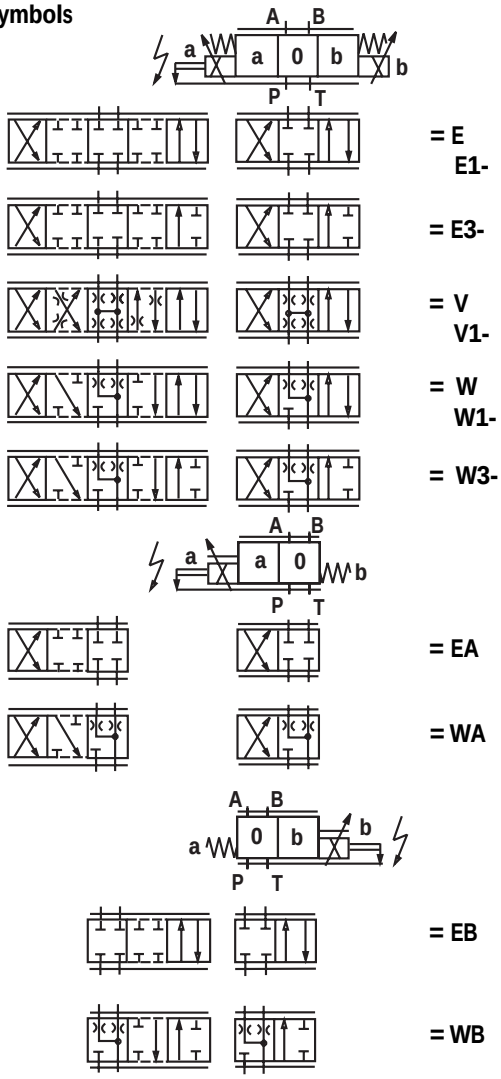
Ordering details

4WRE				– 2X / G24	/	V	*

Without integrated control electronics = **No code**
With integrated control electronics (standard electronics) = **E**

Nominal size 6 = **6**
Nominal size 10 = **10**

Symbols



= E
E1-
= E3-
= V
V1-
= W
W1-
= W3-
= EA
= WA
= EB
= WB

With symbols E1-, V1- and W1-:
P → A: $q_{V\,max}$ B → T: $q_V/2$
P → B: $q_V/2$ A → T: $q_{V\,max}$

With sysmbols E3- and W3-:
P → A: $q_{V\,max}$ B → T: closed
P → B: $q_V/2$ A → T: $q_{V\,max}$

Note:
For spools W, WA and WB there is in the neutral position a connection between A and T and B to T with approx. 3 % of the relevant nominal cross-section.

Further details in clear text

V = FPM rectangular rings, suitable for mineral oil (HL, HLP) to DIN 51 524

For WREE:
A1 = command value input ± 10 VDC
F1 = command value input 4 to 20 mA

Electrical connection for WRE
K4 = with component plug DIN 43 650-AM2
without plug-in connector (solenoid, position transducer)
plug-in connector – separate order
see page 5

Electrical connection for WREE
K31 = with component plug to E DIN 43 563-AM6-3
without plug-in connector
plug-in connector – separate order
see page 6

G24 = Power supply voltage 24 VDC

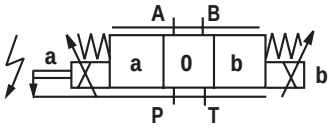
2X = Series 20 to 29
(20 to 29: unchanged installation and connection dimensions)

Nominal flows at a valve pressure differential Dp = 145 PSI (10 bar)

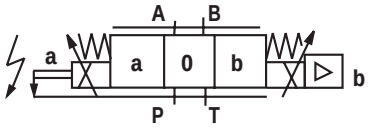
Size 6
08 = 2.11 GPM (8 L/min)
16 = 4.23 GPM (16 L/min)
32 = 8.45 GPM (32 L/min)

Size 10
25 = 6.6 GPM (25 L/min)
50 = 13.21 GPM (50 L/min)
75 = 19.81 GPM (75 L/min)

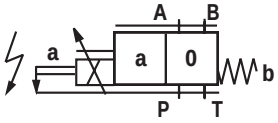
Model 4WRE...



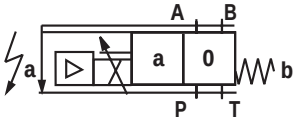
Model 4WREE...



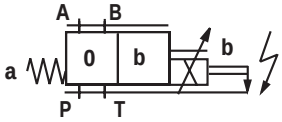
Model 4WRE...**A**...



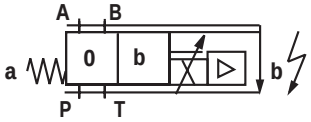
Model 4WREE...**A**...



Model 4WRE...**B**...



Model 4WREE...**B**...



Function, section

The 4/2 and 4/3 proportional directional valves are directly controlled components of subplate mounting design. They are actuated by proportional solenoids with central thread and removable coil. The solenoids are controlled by either external control electronics (model WRE) or by the integrated valve electronics (model WREE).

Design:

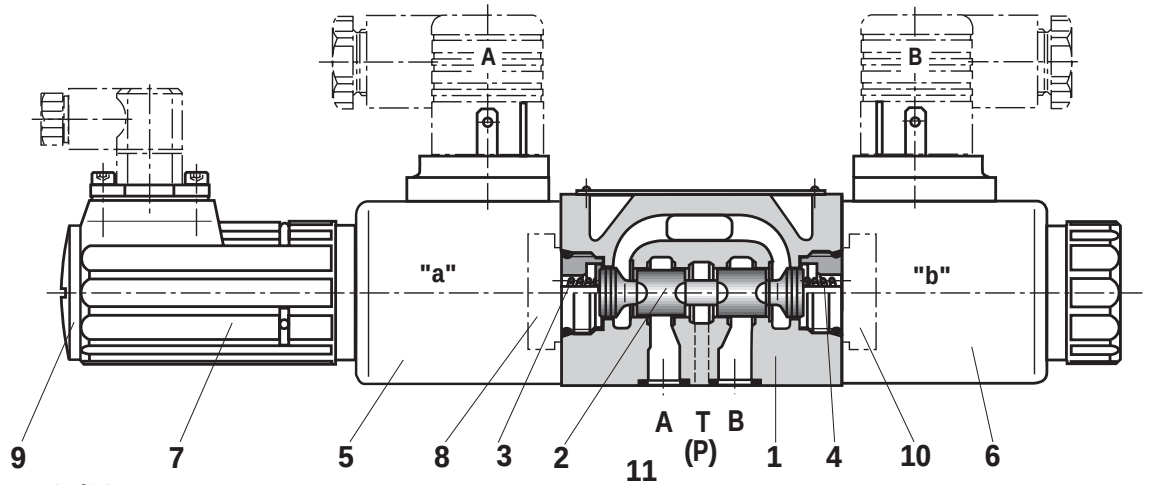
The valve basically consists of:

– Housing (1) with mounting face
– Control spool (2) with compression springs (3 and 4)
– Solenoids (5 and 6) with central thread
– Position transducer (7)
– Integrated valve electronics (8)
– Via the Pg13.5 the mechanical zero point adjustment (9) is accessable and the electrical zero point is accessable via the Pg7(11) (Model 4WREE)

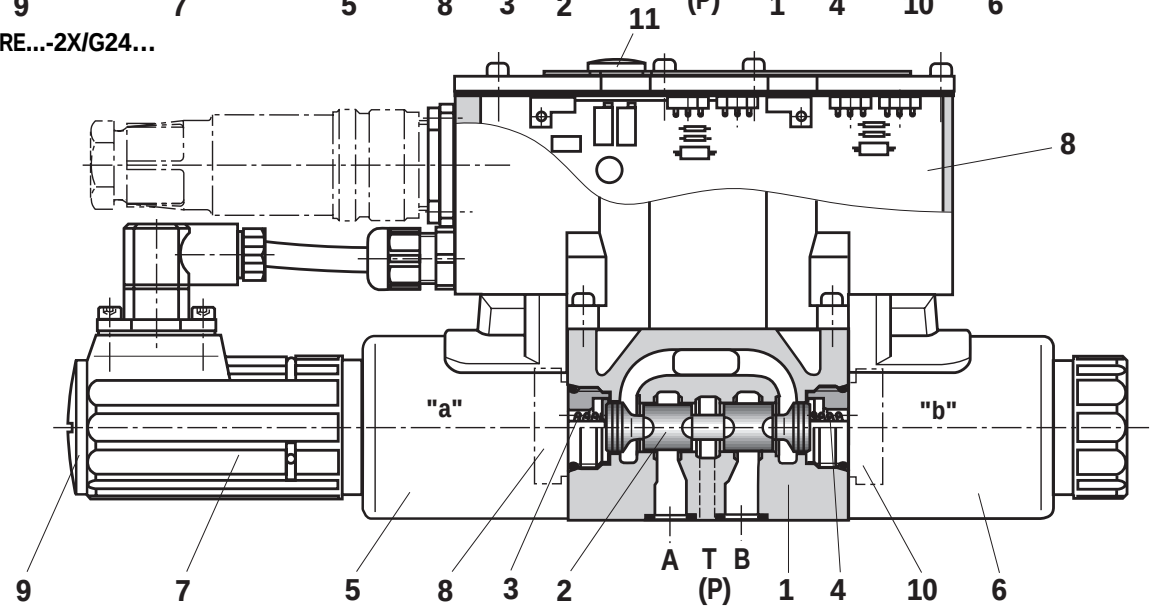
Functional description:

– With de-energized solenoids (5 and 6), the control spool (2) is held in the central position by the compression springs (3 and 4)
– Direct actuation of the control spool (2) by energizing one of the proportional solenoids, e.g. control of solenoid "b" (6)
→ Movement of the control spool (2) to the left in proportion to the electrical input signal
→ Connection from P to A and B to T via orifice like cross-sections with progressive flow characteristics
– De-energizing of solenoids (6)
→ The control spool (2) is returned to the central position via the compression spring (3)

In the de-energized condition the spool (2) is held in a mechanical central position by the solenoid return springs. The spring center position with the V-spool may not correspond to the electrical null.



Model 4WRE...-2X/G24…



Model 4WREE...-2X/G24…

Valve with 2 switching positions:

(models 4WRE…**A**… or 4WRE…**B**…)

The function of this valve version is basically the same as that of the valve with 3 switching positions. The 2 switching position valves are however only fitted with solenoid "a" (5) **or** solenoid"b" (6) . A plug (10) is fitted in place of the 2nd proportional solenoid.

Guideline for model 4WRE…-2X/G24…:

Draining of the tank line is to be prevented. Taking the installation conditions into account a back pressure valve is to be fitted (back pressure approx. 29 PSI (2 bar).

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

General			**Size 6**	**Size 10**
Installation			optional, preferably horizontal	
Ambient	4WRE	°F (°C)	– 4 to + 158 (– 20 to + 70)	
temperature range	4WREE	°F (°C)	– 4 to + 122 (– 20 to + 50)	
Storage temperature range		°F (°C)	– 4 to + 176 (– 20 to + 80)	
Weight	4WRE	lbs (kg)	4.85 (2.2)	13.89 (6.3)
	4WREE	lbs (kg)	5.29 (2.4)	14.33 (6.5)

Hydraulic measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C)

Operating pressure	Ports A, B, P	PSI (bar)	up to 4600 (315)	
	Ports T	PSI (bar)	up to 3046 (210)	
Nominal flow $q_{V\,nom}$ at Δp = 145 PSI (10 bar)		GPM (L/min)	2.11 (8)	6.6 (25)
			4.23 (16)	13.2 (50)
			8.45 (32)	19.8 (75)
Flow, max. permissible		GPM (L/min)	21.1 (80)	47.5 (180)
Pressure fluid			Mineral oil (HL, HLP) to DIN 51 524, further fluids on request	
Degree of contamination			Maximum permissible degree of contamination of the fluid to NAS 1638 – class 9. We, therefore, recommend a filter with a minimum retention rate of $ß_x \geq 75$, x = 10.	
Fluid temperature range		°F (°C)	– 4 to + 176 (– 20 to + 80), preferably + 104 to + 122 (+ 40 to + 50)	
Viscosity range		SUS (mm²/s)	97 to 1760 (20 to 380), preferably 141 to 208 (30 to 46)	
Hysteresis		%	≤ 0.1	
Reversal error		%	≤ 0.05	
Response sensitivity		%	≤ 0.05	

Electrical (solenoid)

Insulation to DIN 40 050			exceeds NEMA class B (IP 65)
Voltage model			DC
Signal model			analog
Command value signal	Voltage input "A1"	V	± 10
	Current input "F1"	mA	4 to 20
Max. current per solenoid		A	2.5
Solenoid coil	Cold value at 20 °C	Ω	2
resistance	Max. warm value	Ω	3
Duty		%	100
Coil temeprature		°F (°C)	up to 302 (150)

Electrical (inductive position transducer)

Electrcial measuring system	inductive
Electrical connection	plug-in connector 4-pin + Pg7-G4W1F
Protection to DIN 40 050	IP 65

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

Electrical (integrated electronics)

Supply voltage	Nominal voltage	VDC	24
4WREE	Lower limiting value	V	19
	Upper limiting value	V	35
Amplifier power	I_{max}	A	1.8
consumption	Impulse current	A	3
Input impedance	Voltage input “A1”	Ω	30K or higher
	Current input “F1”	Ω	100
Zero displacement		%/10 K	0.15
		%/1450 PSI (100 bar)	0.1

Electrical (control electronics)

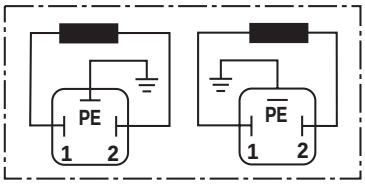
4WRE Amplifier in Eurocard format (separate order)	model VT-VRPA2-1-1X see pages 17 and 18 or catalog sheet RA 30 125
4WREE	integrated into the valve, see pages 6 and 7

Note: For details regarding **the environmental simulation test** covering EMV (electro-magnetic compatability), climate and mechanical loading see RA 29 061-U (declaration regrading environmental compatibility).

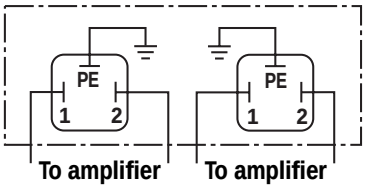
Electrical connection, plug-in connector

For model 4WRE (without integrated electronics)

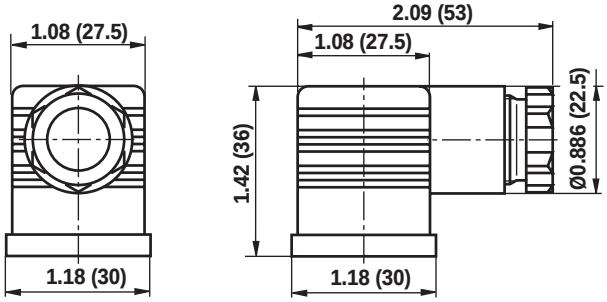
Connections on the component plug



Connections on the plug-in connector

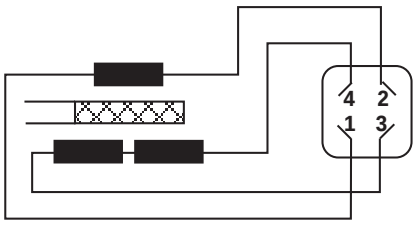


Plug-in connector to DIN 43 650-AF2
Solenoid **a**, grey, Pg11 (Z4)
part no. **RR00 074 683**
Solenoid **b**, black, Pg11 (Z4)
part no. **RR00 074 684**
Solenoid **b**, red-brown, 1/2“ NPT (Z45)
part no. **RR00 004 823**
Solenoid **b**, black, 1/2“ NPT (Z45)
part no. **RR00 011 039**

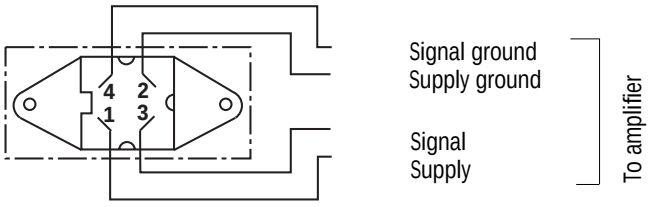


Inductive position transducer

Coil connections



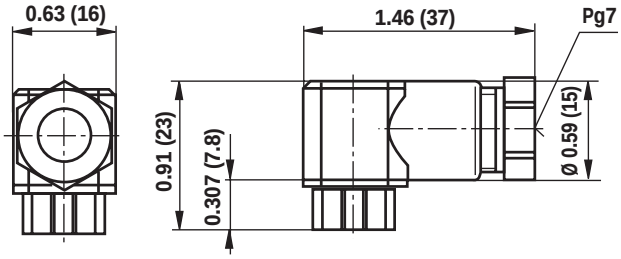
Connections on the plug connector



Plug-in connector 4-pin Pg7-G4W1F
part no. **RR00 023 126**

Connection cable:

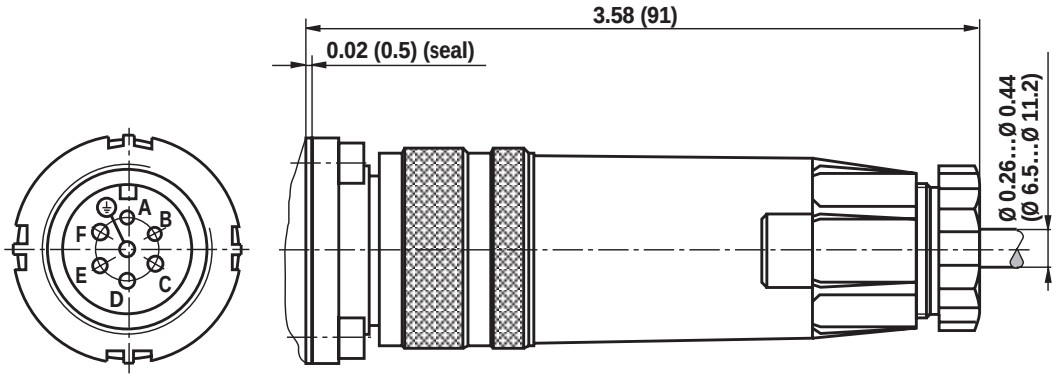
Recommendation: up to 160 ft (50 m) cable length
stranded 24 AWG (LiYCY 4 x 0.25 mm^2) with shield.
Only connect shield to earth ground PE on the supply side.
Outside diameter 0.16 to 0.29 in (4.0 to 7.5 mm)



Integrated valve electronics for model 4WREE

Plug-in connector

Plug-in connector to E DIN 43 563-BF6-3/Pg11
Separate order under part no. **RR00 021 267**
(plastic)
For pin allocation see block circuit diagram on page 7



Component plug allocation

	Contact	Signal
Supply voltage	A	24 VDC = (19.4 V to 35 V); I_{max} = 2 A
	B	0 V
Ref. potential actual value	C	0 V reference contact F
Differential amplifier input	D E	± 10 V, R_e > 50 kΩ; or 4...20 mA, R_e > 100 Ω; command value 0 V reference
Meas. output (actual value)	F	± 10 V (limiting load 5 mA); or 4...20 mA, max. load impedance 300 Ω; actual value
PE	⏚	connected with heat sink and valve housing

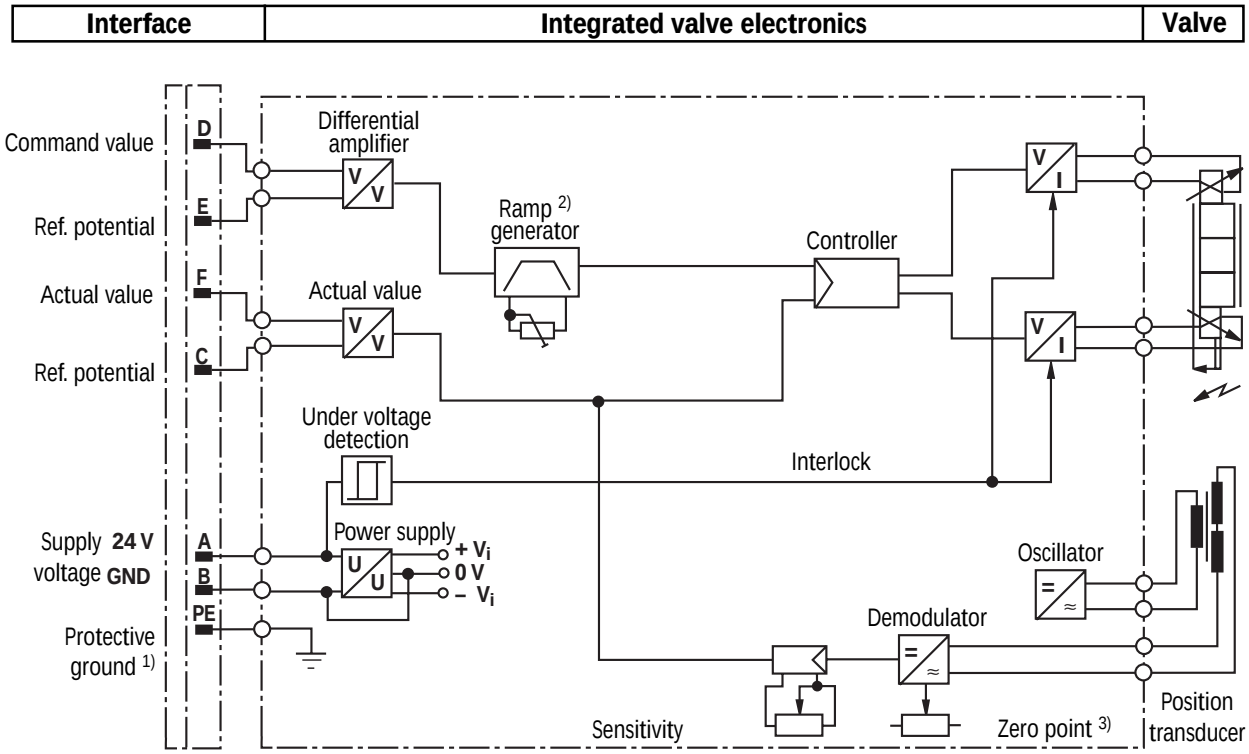
Actual value: Positive actual value (or 12 to 20 mA) at F and reference potential at C results in a flow from P to A.

Command value: Positive command value (or 12 to 20 mA) at D and reference potential at E results in a flow from P to A and B to T.
Negative command value (or 4 to 12 mA) at D and reference potential at E results in a flow from P to B and A to T.
For a value with 1 solenoid on side a (e.g. spool variant **EA** and **WA**) a positive command value (or 4 … 20 mA) at D and reference potential at E results in a flow from P to B and A to T.

Connection cable: Recommendation: – up to 80 ft (25 m) cable length stranded 18 AWG (LiYCY 7 x 0.75 mm^2)
– up to 160 ft (50 m) cable length stranded 16 AWG (LiYCY 7 x 1.0 mm^2)
outside diameter 0.26 to 0.44 inches (6.5 to 11.2 mm)
Only connect shield to earth ground PE on the supply side.

Integrated valve electronics for model 4WREE

Block circuit diagram/connection allocation for the integrated valve electronics

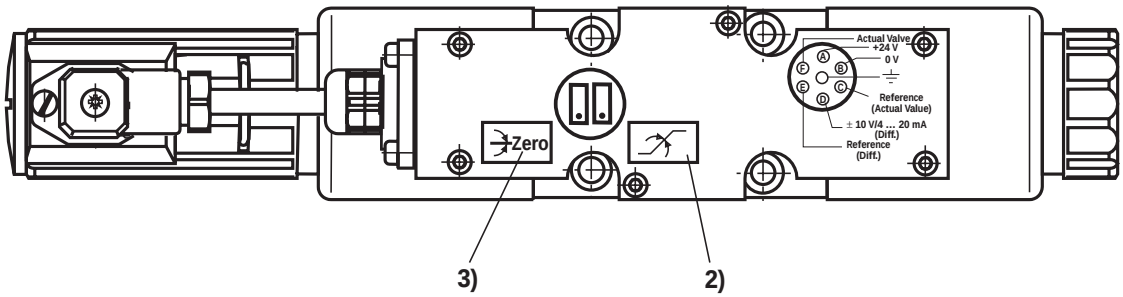


Note: Electrical signals processed by valve electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions!
(See also European Standard "Safety requirements of fluid power systems and components – Hydraulics", draft per EN 982!)

1) Connection PE is connected to the heat sink and the valve housing

2) Ramp is externally adjustable from 0 to 5 s ($T_{up} \triangleq T_{down}$)

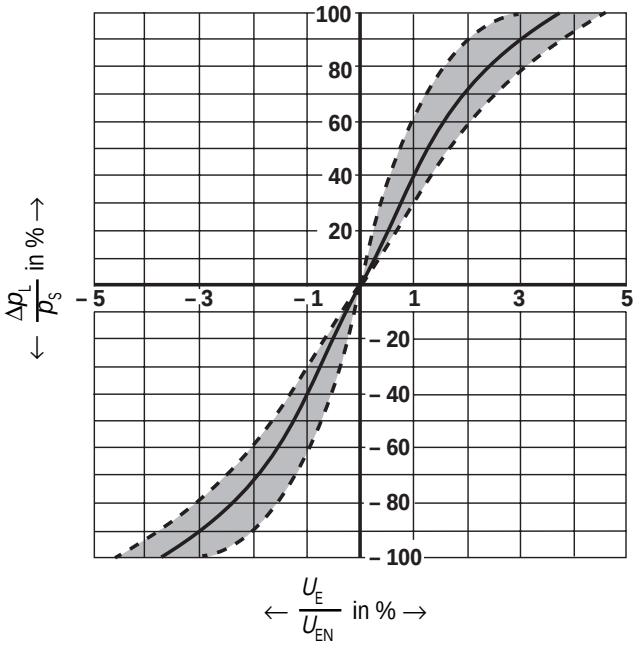
3) Zero point is externally adjustable



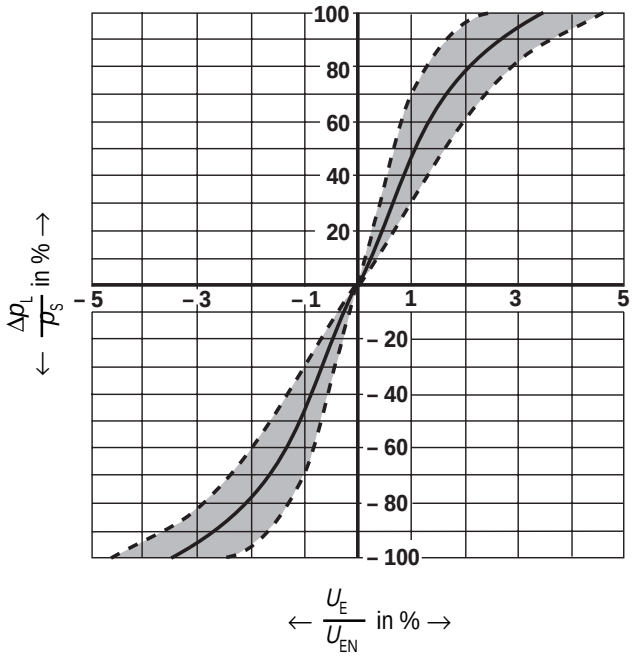
Characteristic curves: measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C) **Sizes 6 and 10**

Pressure-signal-characteristic curves (V-spool), p_s = 1450 PSI (100 bar)

Size 6

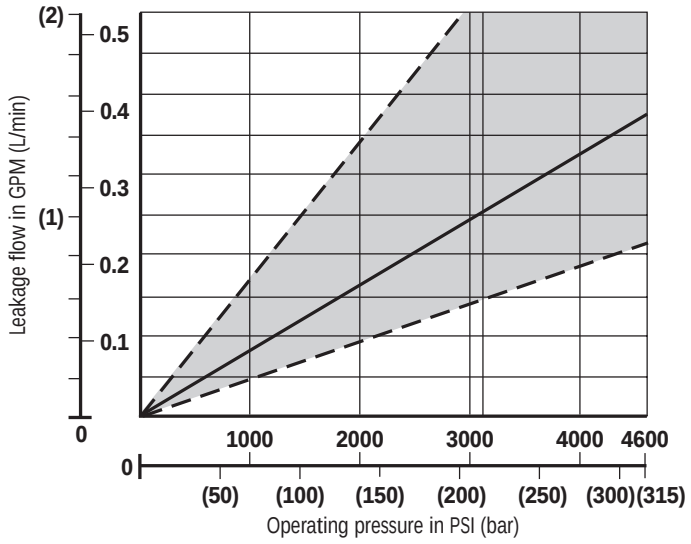


Size 10

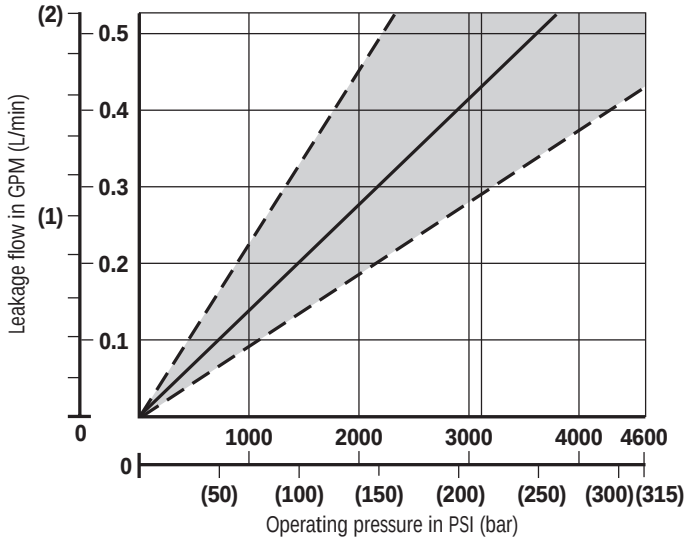


Leakage flow (for spool in the center position)

Model 4WREE 6 V32

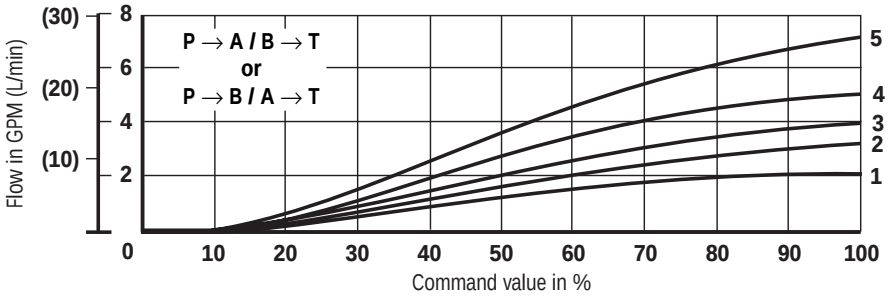


Model 4WREE 10 V75



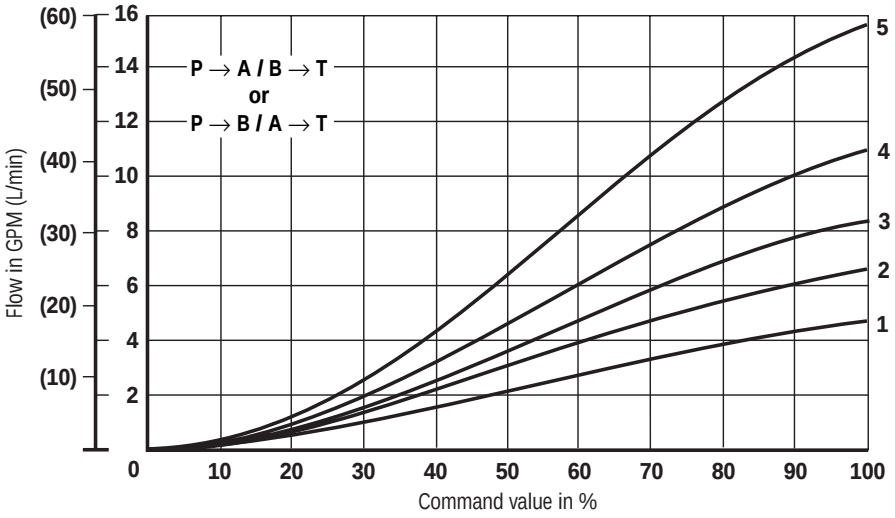
Characteristic curves: measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C) **Size 6**

2.11 GPM (8 L/min) nominal flow at a 145 PSI (10 bar) valve pressure differential



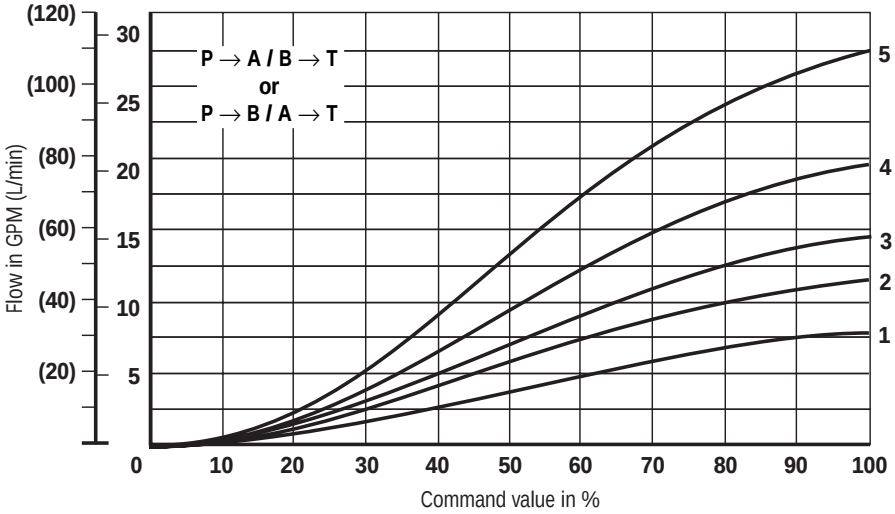
1 Δp = 145 PSI (10 bar) constant
2 Δp = 290 PSI (20 bar) constant
3 Δp = 435 PSI (30 bar) constant
4 Δp = 725 PSI (50 bar) constant
5 Δp = 1450 PSI (100 bar) constant

4.23 GPM (16 L/min) nominal flow at a 145 PSI (10 bar) valve pressure differential



1 Δp = 145 PSI (10 bar) constant
2 Δp = 290 PSI (20 bar) constant
3 Δp = 435 PSI (30 bar) constant
4 Δp = 725 PSI (50 bar) constant
5 Δp = 1450 PSI (100 bar) constant

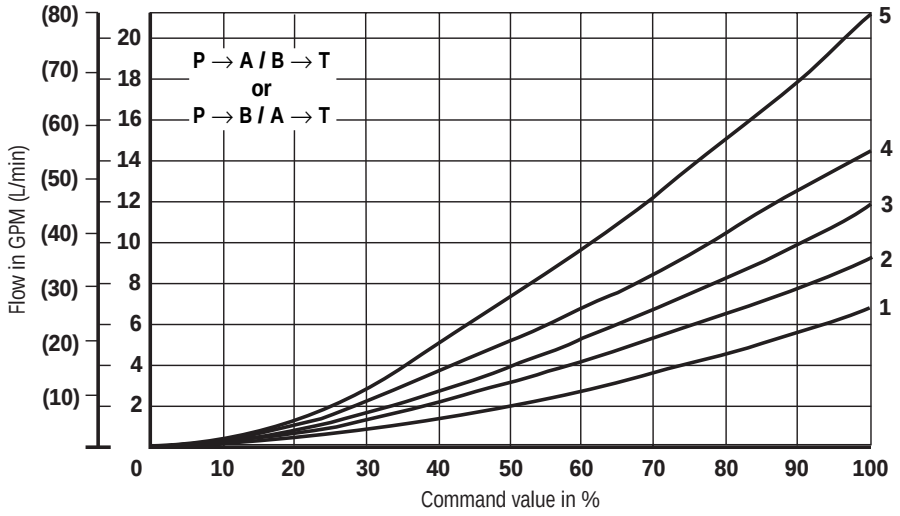
8.45 GPM (32 L/min) nominal flow at a 145 PSI (10 bar) valve pressure differential



1 Δp = 145 PSI (10 bar) constant
2 Δp = 290 PSI (20 bar) constant
3 Δp = 435 PSI (30 bar) constant
4 Δp = 725 PSI (50 bar) constant
5 Δp = 1450 PSI (100 bar) constant

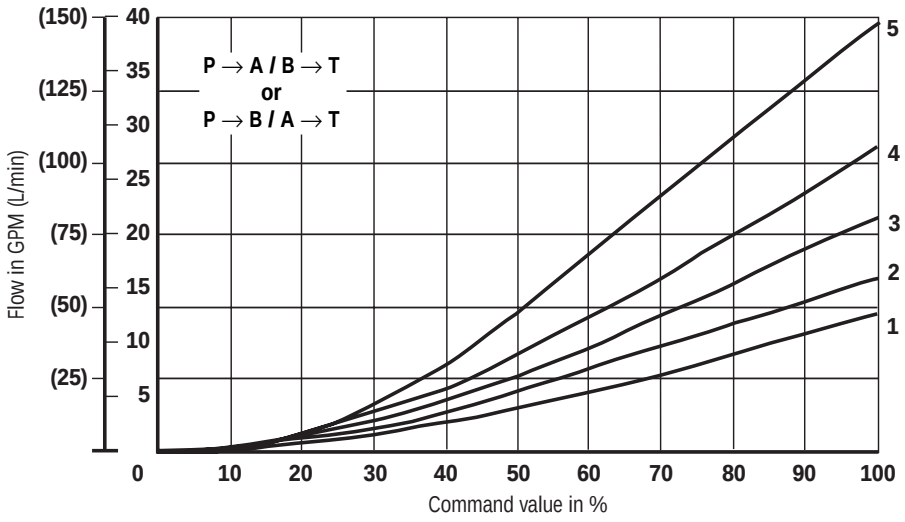
Characteristic curves: measured at v = 208 SUS (46 mm²/s) and t = 104 °F (40 °C) **Size 10**

6.6 GPM (25 L/min) nominal flow at a 145 PSI (10 bar) valve pressure differential



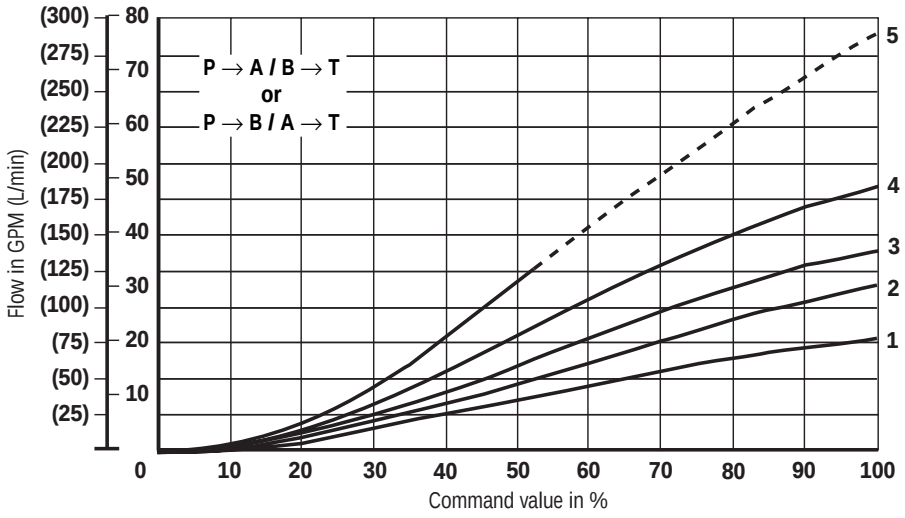
1 Δp = 145 PSI (10 bar) constant
2 Δp = 290 PSI (20 bar) constant
3 Δp = 435 PSI (30 bar) constant
4 Δp = 725 PSI (50 bar) constant
5 Δp =1450 PSI (100 bar) constant

13.2 GPM (50 L/min) nominal flow at a 145 PSI (10 bar) valve pressure differential



1 Δp = 145 PSI (10 bar) constant
2 Δp = 290 PSI (20 bar) constant
3 Δp = 435 PSI (30 bar) constant
4 Δp = 725 PSI (50 bar) constant
5 Δp =1450 PSI (100 bar) constant

19.81 GPM (75 L/min) nominal flow at a 145 PSI (10 bar) valve pressure differential



1 Δp = 145 PSI (10 bar) constant
2 Δp = 290 PSI (20 bar) constant
3 Δp = 435 PSI (30 bar) constant
4 Δp = 725 PSI (50 bar) constant
5 Δp =1450 PSI (100 bar) constant

Note:

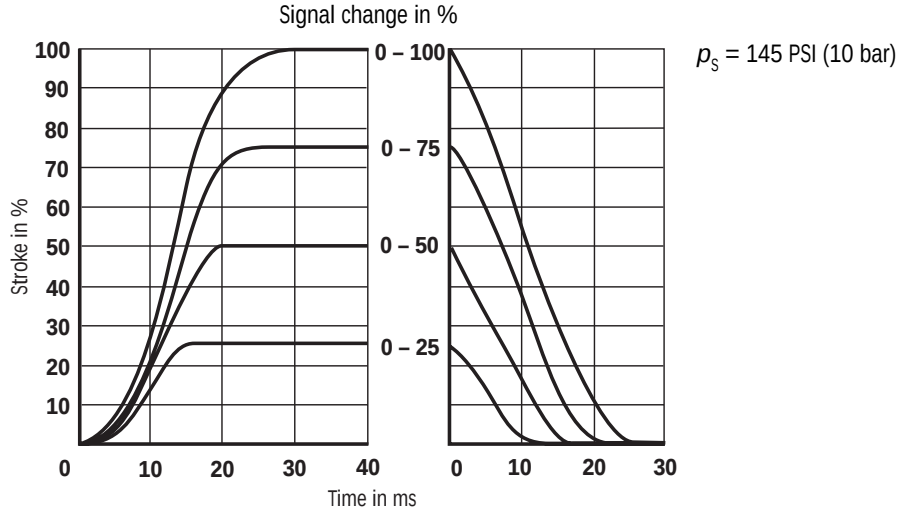
Power limitations on page 14 are to taken into account!

Δp = valve pressure differential (inlet pressure p_P minus load pressure p_L minus return pressure p_T)

Transient function with a stepped form of electrical input signal

Size 6

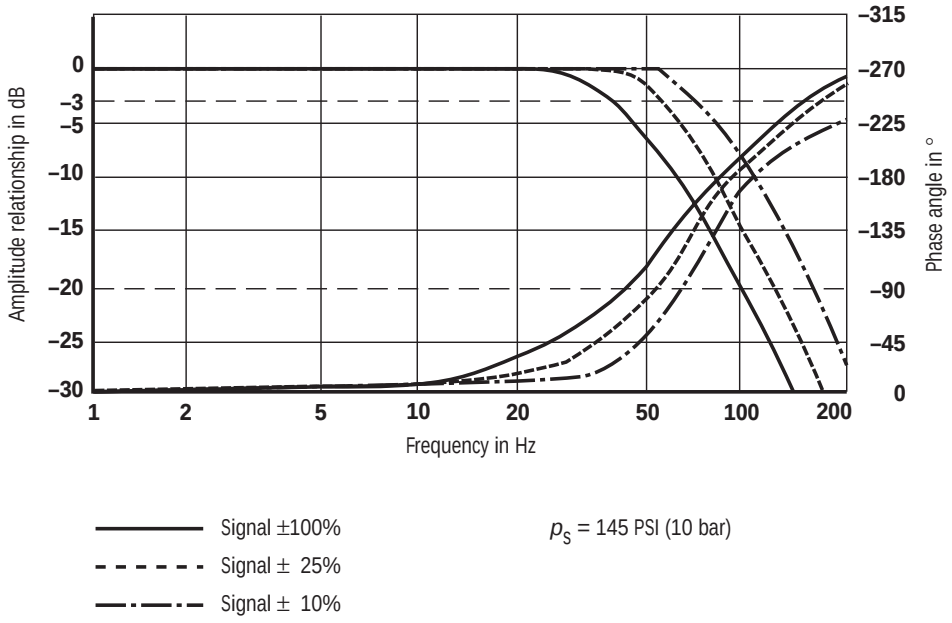
measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C)



Frequency response characteristic curves

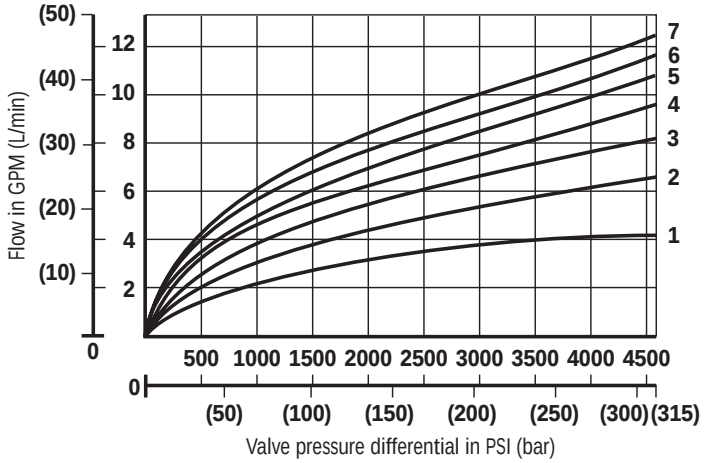
Size 6

(measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C)



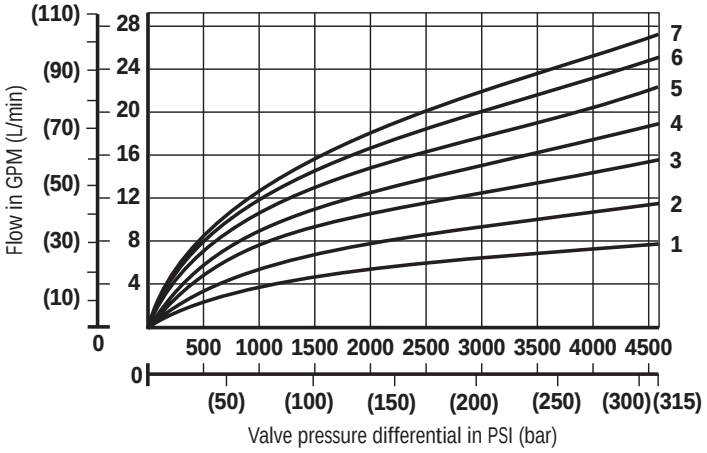
Characteristic curves: measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C) **Size 6**

Nominal flow 2.11 GPM (8 L/min)



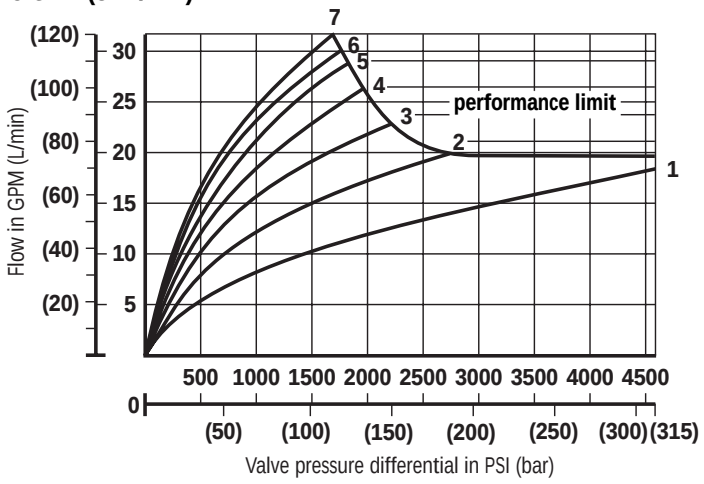
P → A / B → T
or
P → B / A → T

Nominal flow 4.23 GPM (16 L/min)



P → A / B → T
or
P → B / A → T

Nominal flow 8.45 GPM (32 L/min)

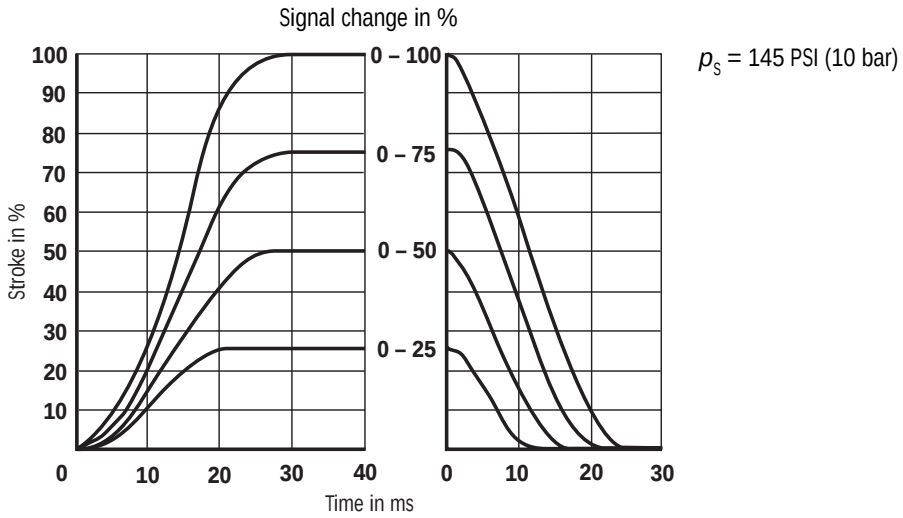


P → A / B → T
or
P → B / A → T

1 Command value = 40 %
2 Command value = 50 %
3 Command value = 60 %
4 Command value = 70 %
5 Command value = 80 %
6 Command value = 90 %
7 Command value = 100 %

Transient function with a stepped form of electrical input signal — Size 10

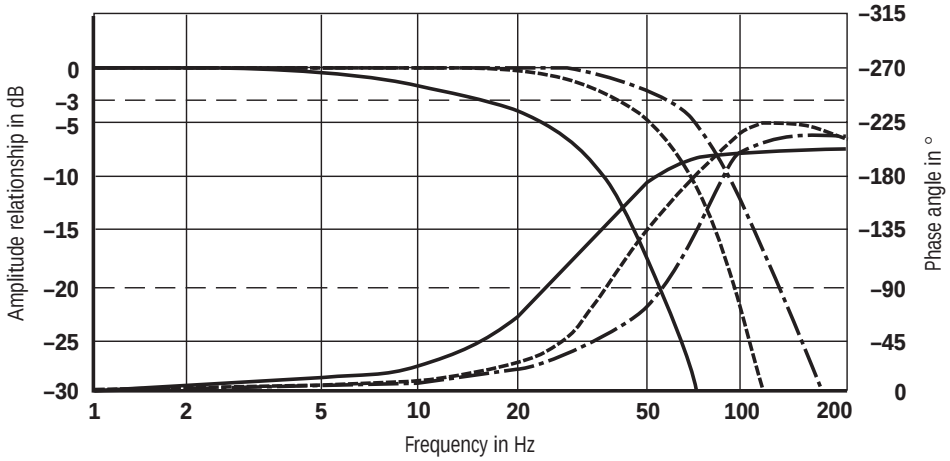
measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C)



p_S = 145 PSI (10 bar)

Frequency response characteristic curves — Size 10

measured at ν = 208 SUS (46 mm²/s) and t = 104 °F (40 °C)

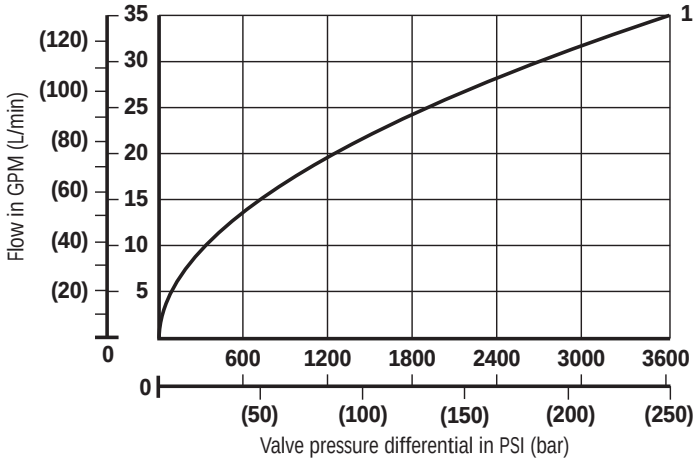


Signal ±100%
Signal ± 25%
Signal ± 10%

p_S = 145 PSI (10 bar)

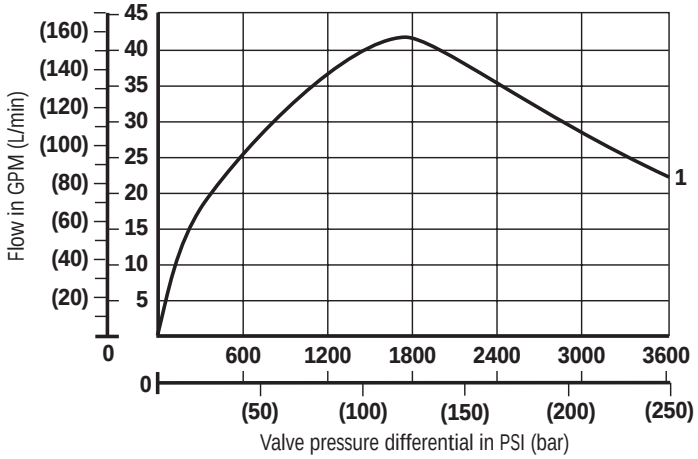
Performance limits: measured at v = 208 SUS (46 mm²/s) and t = 104 °F (40 °C) **Size 10**

Nominal flow 6.604 GPM (25 L/min)



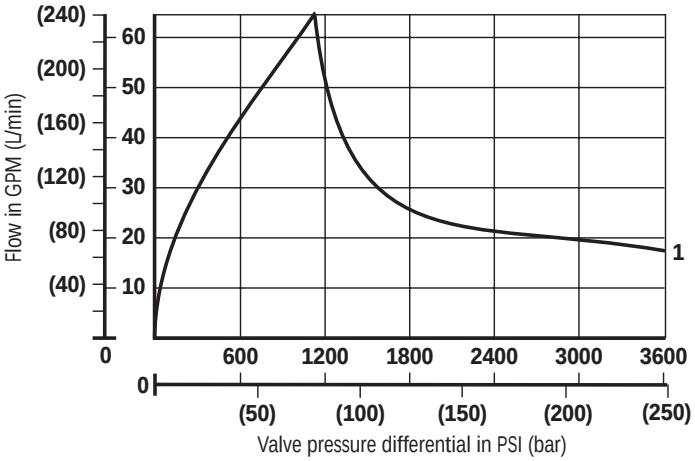
P → A / B → T
or
P → B / A → T

Nominal flow 13.21 GPM (50 L/min)



P → A / B → T
or
P → B / A → T

Nominal flow 19.81 GPM (75 L/min)

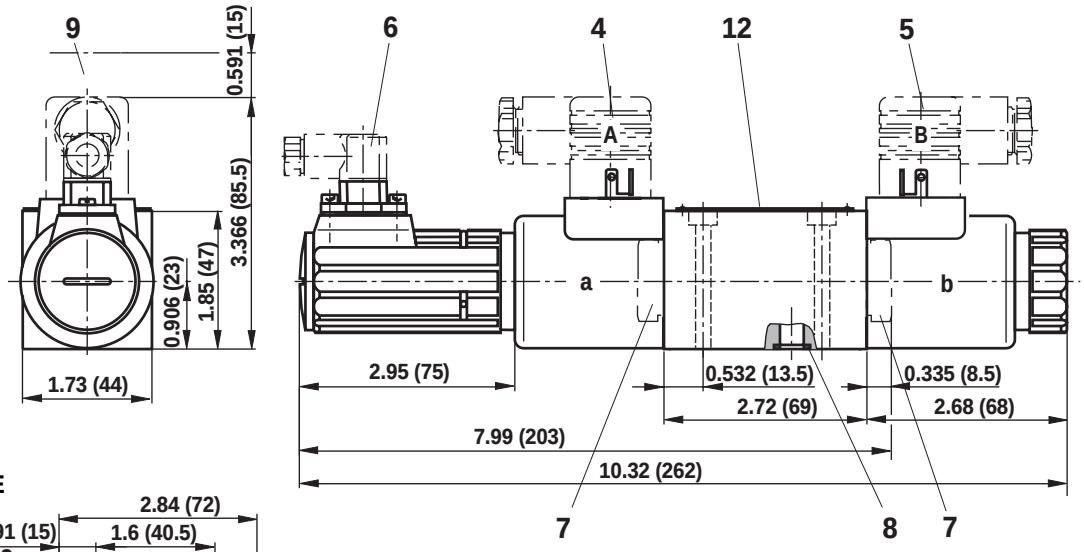


P → A / B → T
or
P → B / A → T

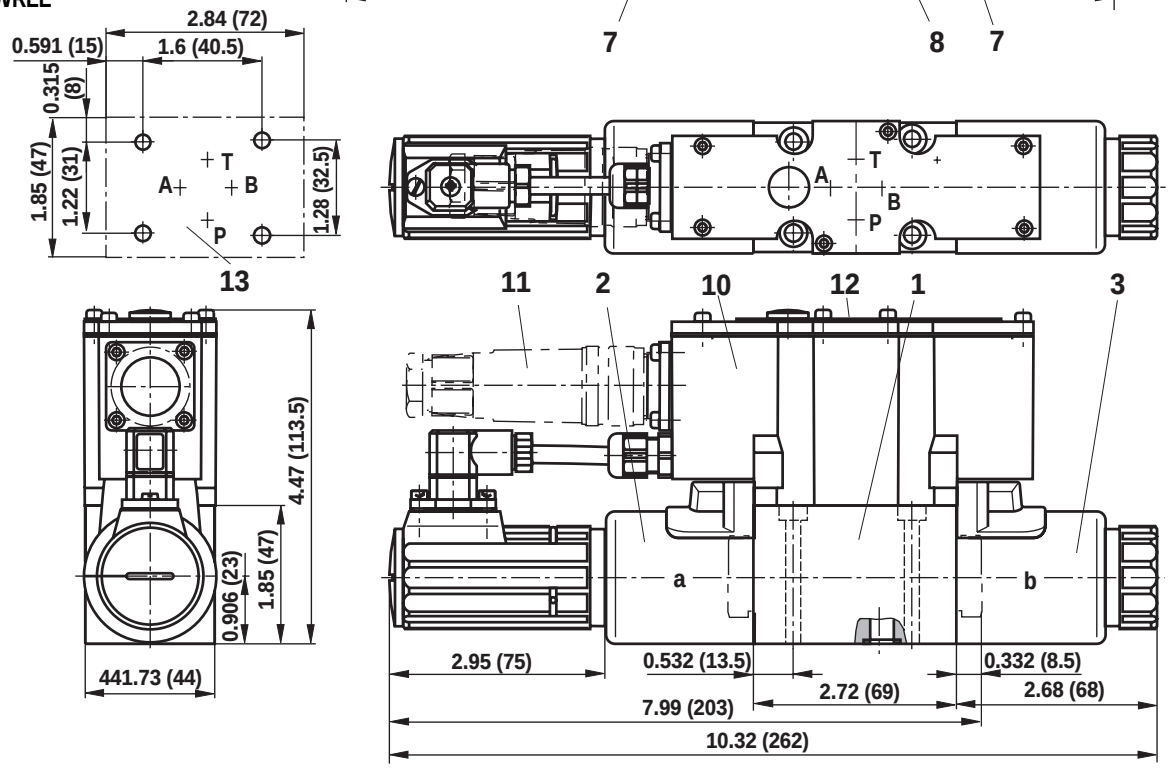
1 Command value = 100 %

Unit dimensions: dimensions in inches (millimeters) **Size 6**

Model 4WRE



Model 4WREE



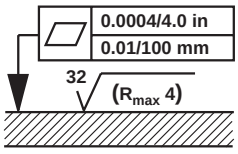
Subplates and valve mounting bolts must be ordered separately, see RA 45 052

Sub-plates:

G341/05 (1/4“ NPT)	G341/12 (SAE 4; 7/16-20)
G342/05 (3/8“ NPT)	G341/12 (SAE 4; 7/16-20)
G502/05 (1/2“ NPT)	G341/12 (SAE 4; 7/16-20)

Valve mounting bolts:

4) 10-24 UNC x 2“ (M5 x 50), SAE grade 8 or better; DIN 912-10.9; Torque M_A = 6.56 lb-ft (8.9 Nm)

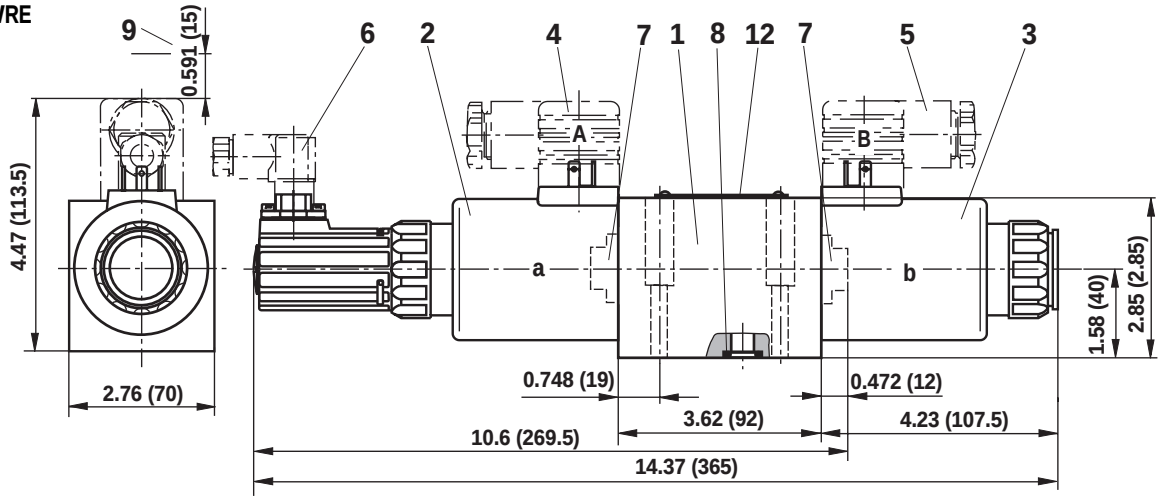


Required surface finish of mating piece

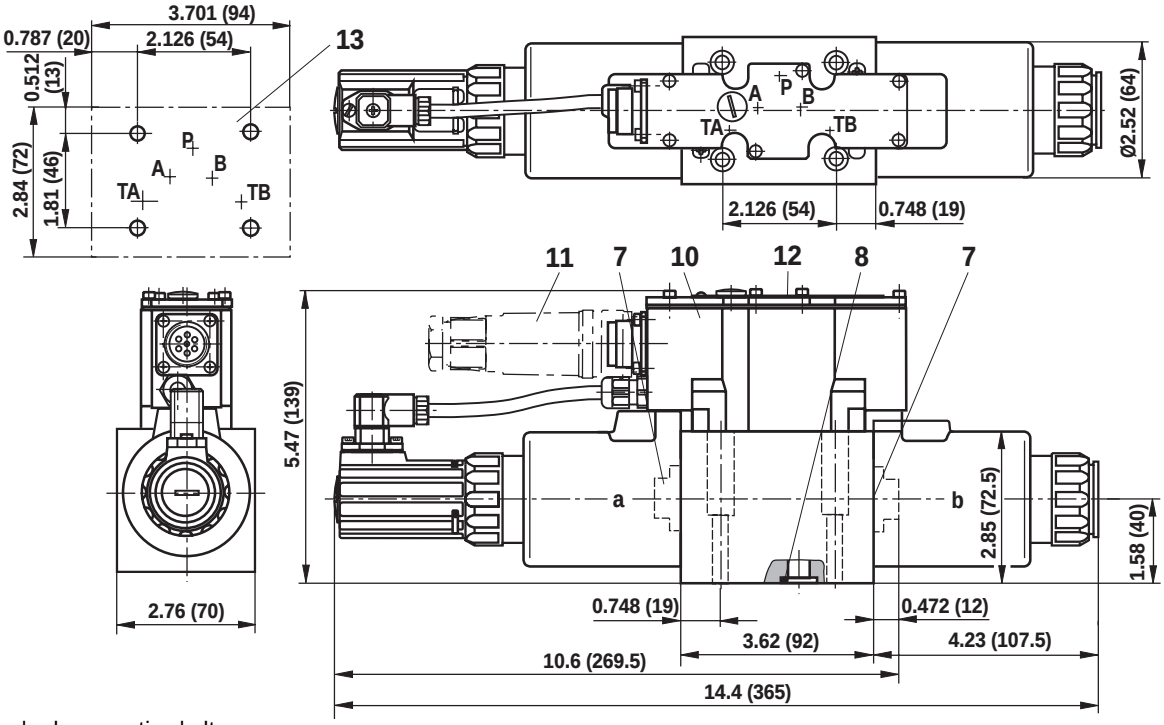
1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
4 Plug-in connector "A", color grey; separate order, see pages 2 and 5
5 Plug-in connector "B", color black; separate order, see pages 2 and 5
6 Plug-in connector for position transducer; separate order, see pages 2 and 5
7 Plug for valves with one solenoid (2-switching positions), versions **EA**, **WA**, **EB** or **WB**
8 R-ring 9.81 mm x 1.5 mm x 1.78 mm (Ports A, B, P, T)
9 Space required to remove plug-in connector
10 Integrated electronics
11 Plug-in connector to E DIN 43 563-BF6-3/Pg11 (separate order, see pages 2 and 6)
12 Name plate
13 Machined valve mounting surface, and location of the connections to DIN 24 340 form A, ISO 4401,CETOP-RP121H, NFPA/ANSI **D 03**

Unit dimensions: dimensions in inches (millimeters) **Size 10**

Model 4WRE



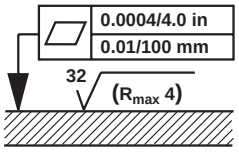
Model 4WREE



Subplates and valve mounting bolts must be ordered separately, see RA 45 054.

Subplates:

G66/05 (3/8“ NPT)	G66/12 (SAE 6; 9/16-18)
G67/05 (1/2“ NPT)	G67/12 (SAE 8; 3/4-16)
G534/05 (3/4“ NPT)	G534/12 (SAE 12; 1-1/16-12)



Required surface finish of mating piece

Valve mounting bolts:

4) 1/4-20 UNC x 1-1/2“ (M6 x 40); socket head cap screws (SAE grade 8 or better); Torque M_A = 11.4 lb-ft (15.5 Nm)

1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
4 Plug-in connector "A", color grey; separate order, see pages 2 and 5
5 Plug-in connector "B", color black; separate order, see pages 2 and 5
6 Plug-in connector for position transducer; separate order, see pages 2 and 5
7 Plug for valves with one solenoid (2-switching positions), versions **EA**, **WA**, **EB** or **WB**
8 R-ring 13.0 mm x 1.6 mm x 2.0 mm (Ports A, B, P, TA, TB)
9 Space required to remove plug-in connector
10 Integrated electronics
11 Plug-in connector to E DIN 43 563-BF6-3/Pg11; separate oreder, see pages 2 and 6
12 Name plate
13 Machined valve mounting surface, and location of the connections to DIN 24 340 form A, ISO 4401, CETOP-RP121H, and NFPA/ANSI **D 05**

Notes

Notes

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