

3/2 and 4/2 directional seat valves with solenoid actuation

RE 22047-XH-B2/01.10
Replaces: 09.07

Type E-.SE 6 ...XH
Type W-.SE 6 ...XH

Size 6
Component series 6X
Maximum operating pressure 420 bar
Maximum flow 4 l/min



ATEX units
For explosive areas

Part II Technical data sheet



Information on explosion protection:

Range of application in accordance with the Explosion Protection Directive and type of protection

- Range of application as per Directive 94/9/EC **IM2; II2G**
- Type of protection of valve solenoid **Ex ib II CT6 / Ex ib I** according to EN 60079-0:2006 / EN 60079-11:2007

What you need to know about these operating instructions

These operating instructions apply to the explosion-proof version of Rexroth valves and consist of the following three parts:

- | | | | |
|----------|--|---|-----------------------|
| Part I | General information RE 07010-X-B1 | } | RE 22047-XH-B0 |
| Part II | Technical data sheet RE 22047-XH-B2 | | |
| Part III | Product-specific instructions RE 22047-XH-B3 | | |

You can find further information on the correct handling of Rexroth hydraulic products in our publication "General product information on hydraulic products" RE 07008.

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Features

- Direct operated directional seat valve with solenoid actuation for proper use in explosive atmospheres
- Porting pattern according to DIN 24340-A6, **without** locating hole (standard)
- Subplates available in FE/ZN design (see pages 11 to 14)
- Blocked connection tight in a leak-free form
- Safe switching also with longer standstill periods under pressure
- Wet-pin DC solenoids in hydraulic fluid
- Electrical connection with:
 - Individual connection with cable gland
 - ConnectorDepending on the valve type
- With manual override

Ordering code and scope of delivery

—		SE	6	6X/420	B	N	XH	/	
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Oil-in-water emulsion = E

Water = W

3 main ports = 3

4 main ports = 4

Seat valve

Size 6 = 6

no code = NBR seals

V = FKM seals

Note:

Observe compatibility of seals with the hydraulic fluids used!

no code = without check valve insert without throttle insert

P = with check valve insert

B12 = Throttle Ø 1.2 mm

B15 = Throttle Ø 1.5 mm

B18 = Throttle Ø 1.8 mm

B20 = Throttle Ø 2.0 mm

B22 = Throttle Ø 2.2 mm

Electrical connection

Z2 = Solenoid with terminal box and cable gland, (only with type E-.SE 6..)

K20ZL = Solenoid with connector facing the valve housing (only with type W-.SE 6..) for details see chapter Electrical connection

XH = Explosion protection “Eigensicher (intrinsically safe)” for details see information on the explosion protection, page 8

N = with manual override (standard)

DC voltage 12 V

Nominal power supply 120 mA = G12-12 (only with type E-.SE 6..)

Nominal power supply 190 mA = G12-19 (only with type W-.SE 6..)

Main ports	3	4	
Spool symbols			
	•	—	= U
	•	—	= C
	—	•	= D
	—	•	= Y
	• = Available		

Component series 60 to 69 = 6X (60 to 69: unchanged installation and connection dimensions)

Operating pressure up to 420 bar = 420

High-power solenoid, (high-power solenoid in hydraulic fluid) = B

Included in the delivery:

- Valve mounting screws
- Valve operating instructions with declaration of conformity in part III

Function, section, spool symbols: 3/2 directional seat valve

General:

The directional valve type -SE.. is a directional seat valve with solenoid actuation. It controls start, stop and direction of the flow. It basically comprises a housing (1), the solenoid (2), the hardened valve system (3) and the balls (4.1 and 4.2) as closing element.

Basic principle:

In the initial position, the ball (4.1) is pressed onto the seat by the spring (7), in spool position, the ball (4.2) is pressed onto the seat by the solenoid (2). The force of solenoid (2) acts via the ball (5) on the actuating plunger (6) that is sealed on two sides. The chamber between the two sealing elements is connected to port P. Thus, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring). Thus, the valves can be used up to 420 bar.

Notes

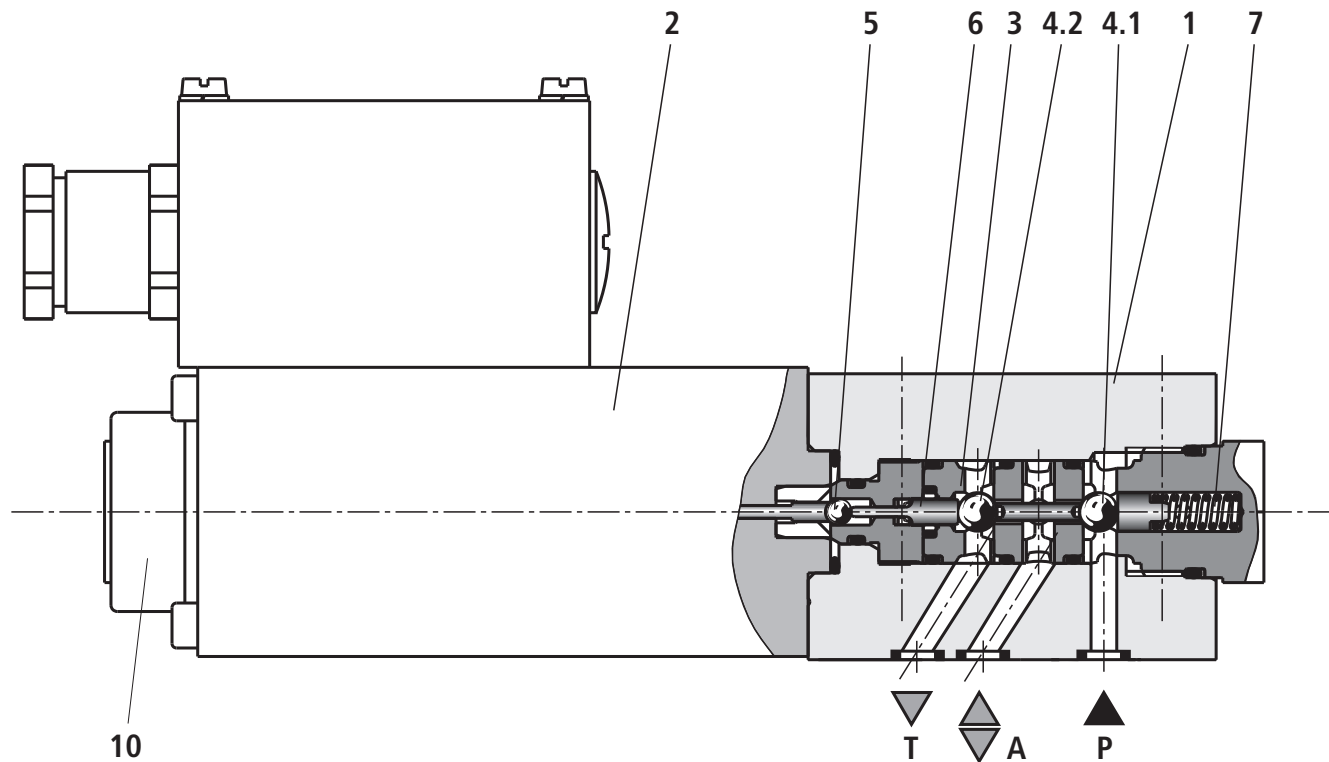
- The 3/2 directional seat valves have a “negative spool underlap”. Therefore, port T must always be connected. That means that during the switching process – from the starting of the opening of one valve seat to the closing of the other valve seat – ports P–A–T are connected with each other. This process takes, however, place within such a short time that it is irrelevant in nearly all applications.

- The manual override (10) allows for the switching of the valve without solenoid energization.
- It has to be made sure that the specified maximum flow is not exceeded! A throttle insert must be used for limiting the flow, if necessary (see page 6).
- In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: $P \geq A \geq T$ (for design reasons).
- The ports P, A and T (3/2 directional seat valve) are clearly determined according to the tasks. They must not be exchanged or closed. The flow is only permitted in the direction of arrow.

The seat arrangement offers the following options:

Spool symbol	U	C
Initial position	P and A connected, T blocked in a leak-free form	P blocked in a leak-free form, A and T connected
Spool position	P blocked in a leak-free form, A and T connected	P and A connected, T blocked in a leak-free form

Example: Type E-3SE 6 C6X/420BG12-12NXHZ2/V



Function, section, spool symbols: 4/2 directional seat valve

With a sandwich plate, the **Plus-1 plate**, under the 3/2 directional seat valve, the function of a 4/2 directional seat valve is achieved.

Function of the Plus-1 plate:

Initial position:

The main valve is not operated. The spring (7) holds the ball (4.1) on the seat (11). Port P is blocked and A connected to T. Apart from that, one pilot line is connected from A to the large area of the control spool (12), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (13) onto the seat (14). Now, P is connected to B, and A to T.

Transition position:

When the main valve is operated, the spool (8) is shifted against the spring (7) and the ball (4.2) is pressed onto the seat (15). During this, port T is closed, P, A, and B are briefly connected to each other.

Spool position:

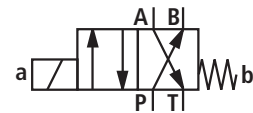
P is connected to A. As the pump pressure acts via A on the large area of the control spool (12), the ball (13) is pressed onto the seat (16). Thus, B is connected to T, and P to A. The ball (13) in the Plus-1 plate has a "positive spool underlap".

The use of the Plus-1 plate and the seat arrangement offer the following options:

Spool symbol **D**:

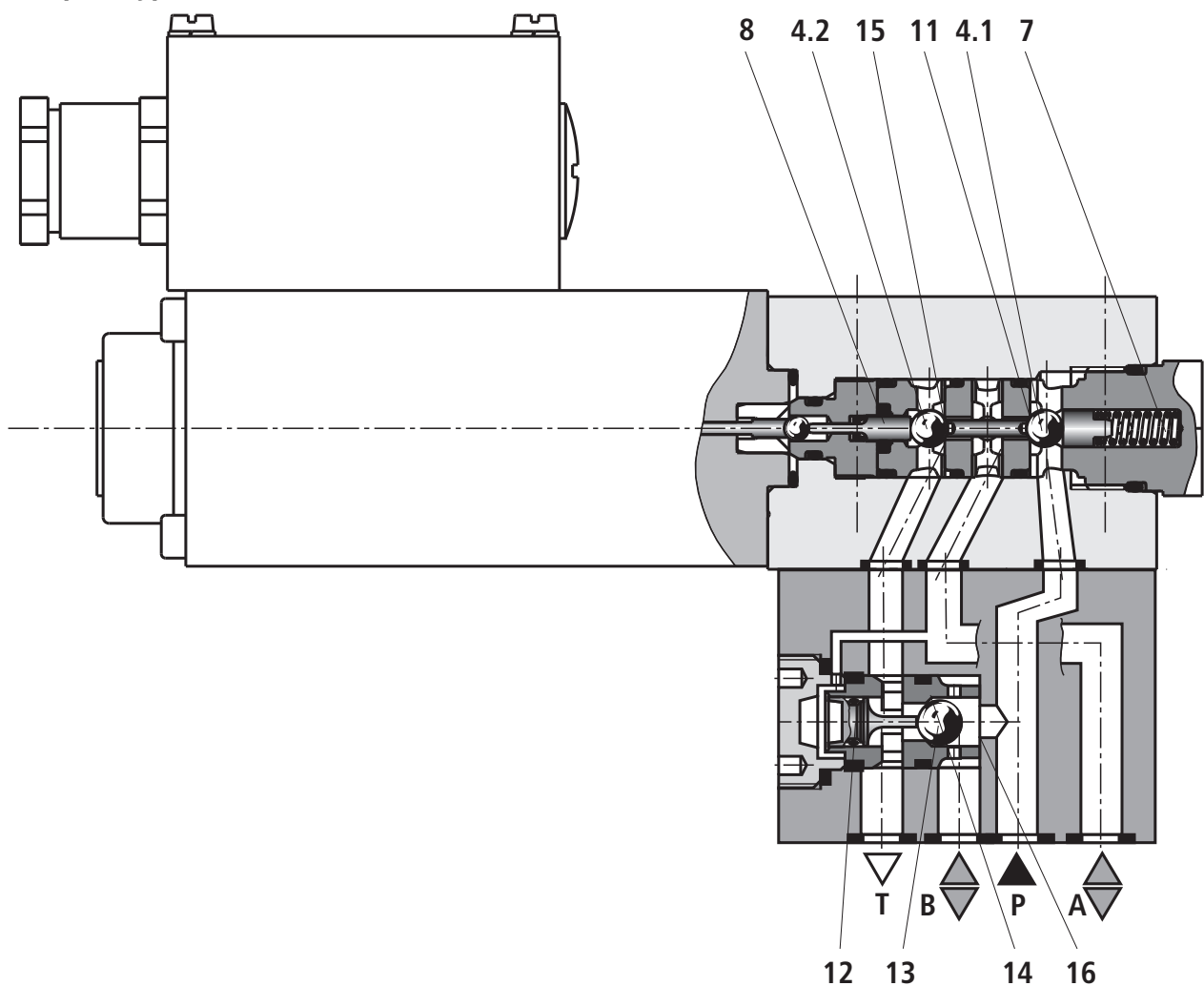


Spool symbol **Y**:



To prevent pressure intensification in conjunction with single-rod cylinders, the annulus area of the cylinder must be connected to A.

Example: Type E-4SE 6 Y6X/420BG12-12NXHZ2/V



Function, section: Throttle insert, check valve insert

Throttle insert

The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

Examples:

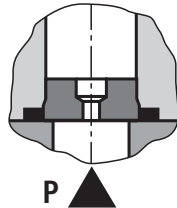
- Accumulator operation,
- Use as pilot control valve with internal pilot fluid tapping.

3/2 directional seat valve (see page 4)

The throttle insert is inserted in port P of the seat valve.

4/2 directional seat valve (see page 5)

The throttle insert is inserted in port P of the Plus-1 plate.



Check valve insert

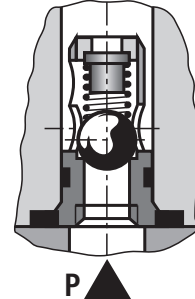
The check valve insert allows a free flow from P → A and closes A → P in a leak-free form.

3/2 directional seat valve (see page 4)

The check valve insert is inserted in port P of the seat valve.

4/2 directional seat valve (see page 5)

The check valve insert is inserted in port P of the Plus-1 plate.



Technical data

general

Installation position		Any
Ambient temperature range	°C	-20 ... +50
Storage temperature range	°C	-20 ... +70
Admissible vibration load		20 ... 2000 Hz amplitude 0.05 g ² /Hz (10 g RMS)
Weight	3/2 directional seat valve	kg 2.6
	4/2 directional seat valve	kg 3.4
Surface protection	Valve body	Valve type E Coating, layer thickness max. 100 µm
		Valve type W Stainless steel
	Solenoid	Galvanized and passivated olive-green (FeZn8D)

hydraulic

Maximum surface temperature	°C	See information on the explosion protection on page 8
Maximum operating pressure	Port P, A, B	bar 420
	Port T	bar 40
Maximum flow	l/min	4
Hydraulic fluid	Valve type E	HFA, HFB, HFD ¹⁾ ; flame-resistant hydraulic fluid HFC according to ISO 12922 ²⁾
	Valve type W	Water ¹⁾
Hydraulic fluid temperature range	°C	+5 ... +50 (NBR seals)
		+5 ... +50 (FKM seals)
Viscosity range	mm ² /s	1 ... 380
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 ³⁾ For water-containing liquids, a comparable cleanliness is to be ensured.

electrical

Nominal voltage	V	12
Voltage type		Direct voltage (DC)
Admissible residual ripple	%	< 5
Voltage tolerance	%	±10
Duty cycle/operating mode according to VDE 0580		100 % / S1 (DB)
Information on the rated current in the type key		G12-12
Rated current	mA	120
Coil resistance with solenoid temperature 20 °C	Ω	91
Minimum current for achieving the hydraulic switching power	mA	88
Switching times according to ISO 6403	ms	See table page 8
Switch-off voltage peak Solenoid	V	max. -3
Protection class according to EN 60529:1991+A1:2000 ⁴⁾		IP 65

¹⁾ Only in connection with FKM seals, check compatibility in connection with the hydraulic fluid used

²⁾ Only in connection with NBR seals, $p_{\max} = 210$ bar for more information, please ask our sales staff.

³⁾ The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of filters, see technical data sheets RE 50070, RE 50076 and RE 50081.

⁴⁾ With correctly installed electrical connection

Technical data

Information on explosion protection

Information in the type key		G12-12	G12-19
Range of application as per directive 94/9/EC		IM2; II2G	IM2
Type of protection valve solenoid according to EN 60079-0:2006 / EN 60079-11:2007		EEx ib I EEx ib II CT6	EEx ib I
Maximum surface temperature ¹⁾	°C	70	70
Temperature class		T6	–
Type examination certificate solenoid		DMT 99 ATEX E 089	
Type of protection valve		c (EN 13463-5:2004)	
Special conditions for safe use		–	
Ambient temperature range		–20 ... +50	
Safety maximum values for solenoids	Maximum voltage U_i	V(DC)	15
	Maximum current I_i	A	2
	Effective internal inductivity L_i	H	Neglectable
	Effective internal capacity C_i	F	Neglectable

¹⁾ Due to the temperatures occurring at the surfaces of the valve solenoid, the standards ISO 13732-1 and EN 982 need to be adhered to! (contact protection)

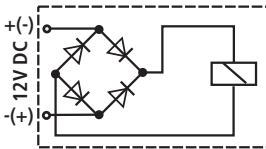
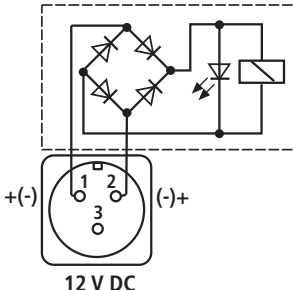
Switching times t in ms (Installation position: Solenoid horizontal)

Type -3SE 6 **C** 6X/... and type -3SE 6 **U** 6X/...

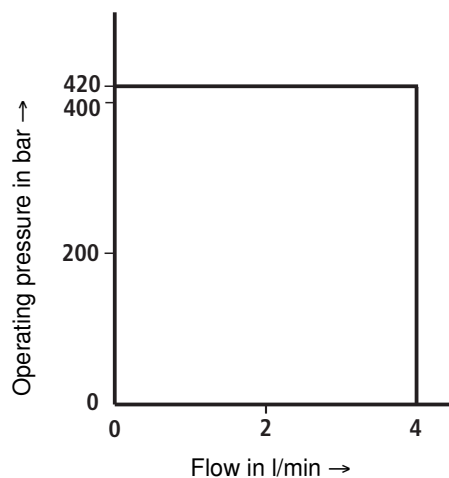
Pressure p in bar	Flow q_v in l/min	with solenoid G12-12								with solenoid G12-19							
		t_{on} without tank pressure				t_{off}				t_{on} without tank pressure				t_{off}			
		C	U	Y	D	C	U	Y	D	C	U	Y	D	C	U	Y	D
70	4	220	265	230	275	95	85	105	95	140	160	150	170	110	100	120	110
140	4	260	265	270	275	100	90	110	100	150	165	160	175	120	110	130	120
280	4	320	260	330	270	115	110	125	120	170	170	180	180	125	135	135	145
320	4	350	260	360	270	120	115	130	125	175	170	185	180	130	140	140	150
420	4	360	260	370	270	120	130	130	140	185	170	195	180	135	145	145	155

Electrical connection

The type-tested valve solenoid of the valve is equipped with an electrical connection according to the following table. The electrical connection of the solenoid is insensitive to polarity.

Information on the electrical connection in the type key	Type of connection Description	Circuit diagram	Availability for rated current (see information on the rated current in the type key)
Z2	– Electrical connection via 2-pole terminal in terminal box – with cable gland – without operating display		G12-12 (120 mA)
	Cable gland		
	Threaded connection	Pg 13.5	
	Thread length	mm 5 ... 14	
	Temperature range	°C –20 ... > +80	
	Line diameter	mm 7 ... 13	
	Seal	Outer sheath sealing	
	Tightening torque of the plug screw	Nm 1.8 ... 2.0	
	Connection terminal Solenoid		
	For line cross-section	mm ² 0.75 ... 1.5	
Tightening torque for the clamping screws	Nm 0.4 ... 0.5		
Tightening torque of the screws for the cover	Nm 1.0 ... 1.1		
K20ZL	– Electrical connection via connector, 3-pole with pin contacts, type 845-11-1125-001, FCI/Souriau – Connector facing the valve housing – Operating display via light emitting diode (LED), red – Suitable mating connector, type 845-11-8522-001, FCI/Souriau, must be ordered separately.		G12-19 (190 mA)

Performance limits (measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)



Note:

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

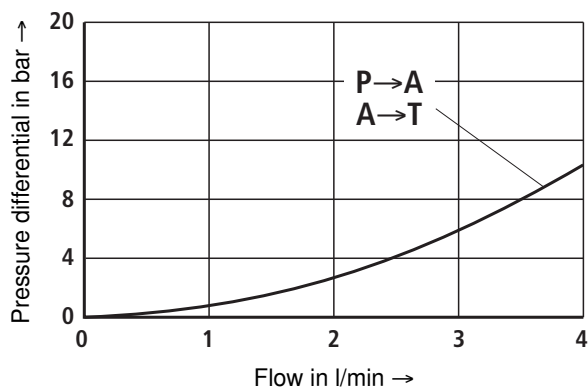
Due to the flow forces acting within the valves, the permissible switching power limits may be considerably lower with only one direction of flow (e.g. from P → A while port B is blocked)!

(In such cases, please consult us.)

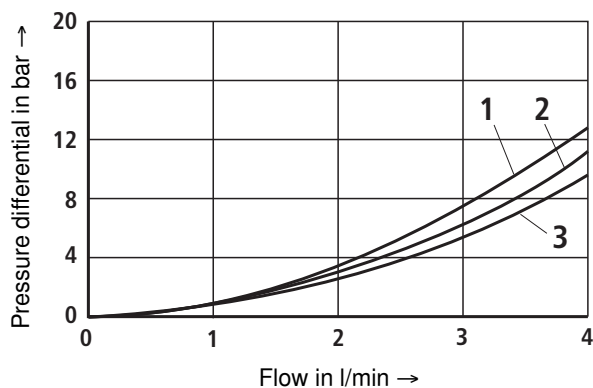
The switching power limit was established while the solenoids were at operating temperature, at 10 % undervoltage and without tank pre-loading.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ and $p = 100\text{ bar}$)

Type -3SE 6...

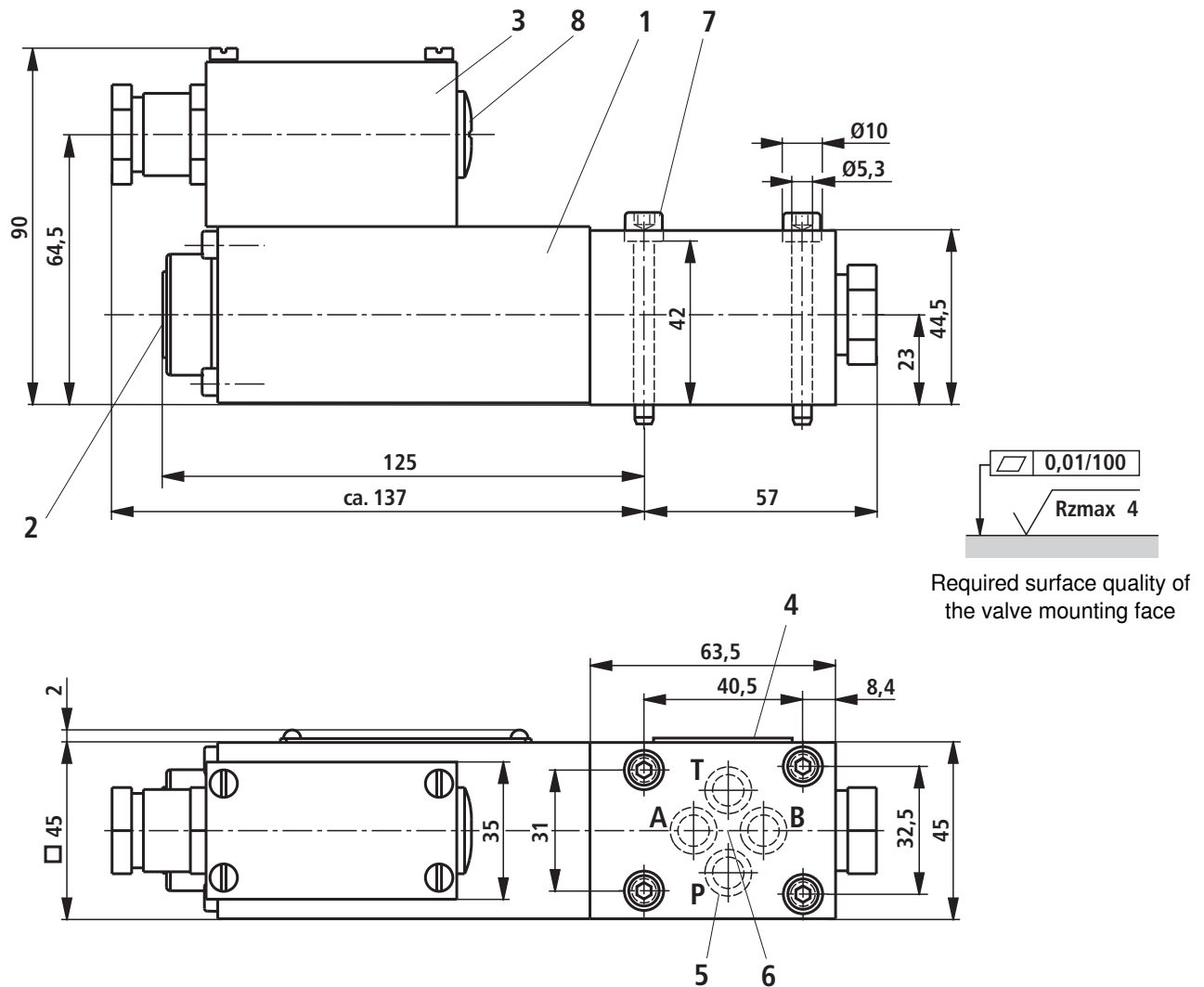


Type -4SE 6...



- 1 = A → T
- 2 = P → A
- 3 = B → T, P → B

Unit dimensions type E-3SE 6 ...BG12-12XHZ2/... (dimensions in mm)



- 1 Valve solenoid
- 2 Manual override
- 3 Terminal box
- 4 Nameplate
- 5 Identical seal rings for ports P, A, B, T
- 6 Porting pattern according to DIN 24340-A6, **without** locating hole
- 7 Valve mounting screws
For reasons of stability, exclusively the following valve mounting screws may be used:
4 hexagon socket head cap screws
ISO 4762-M5x50-10.9-fIZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the delivery)
- 8 Plug screw

Subplates (without locating hole)

G 341/01 FE/ZN (G1/4)
G 342/01 FE/ZN (G3/8)
G 502/01 FE/ZN (G1/2)

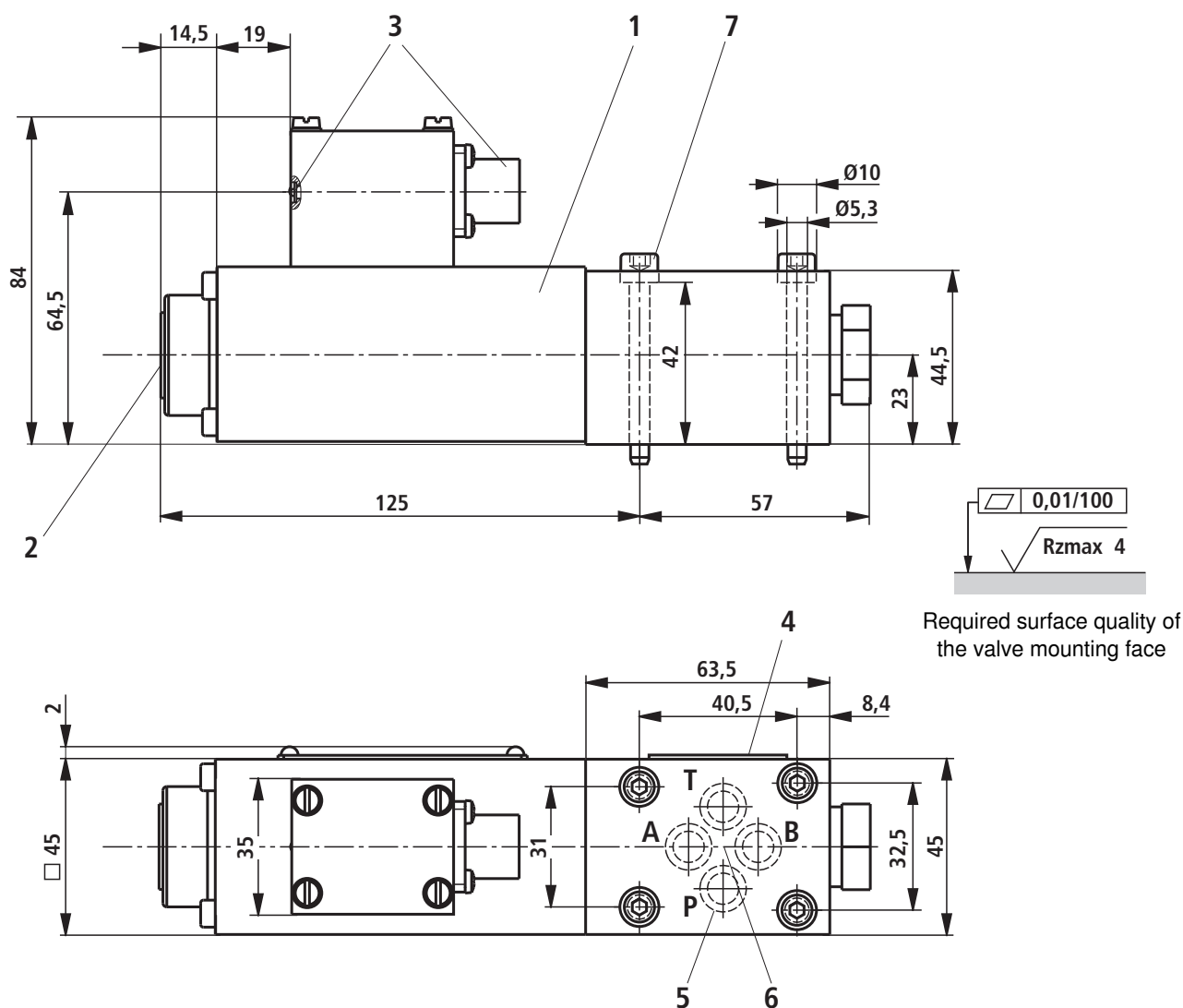
according to technical data sheet RE 59052 must be ordered separately.

Note:

Subplates are no components in the sense of directive 94/9/EC and can be used after the manufacturer of the overall system has assessed the risk of ignition.

The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Unit dimensions type W-3SE 6 ...BG12-19XHK20ZL/...(dimensions in mm)



- 1 Valve solenoid
- 2 Manual override
- 3 Operating display and connector
- 4 Nameplate
- 5 Identical seal rings for ports P, A, B, T
- 6 Porting pattern according to DIN 24340-A6, **without** locating hole
- 7 Valve mounting screws
For reasons of stability, exclusively the following valve mounting screws may be used:
4 hexagon socket head cap screws
ISO 4762-M5x50-10.9-fIZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the delivery)

Subplates (without locating hole)

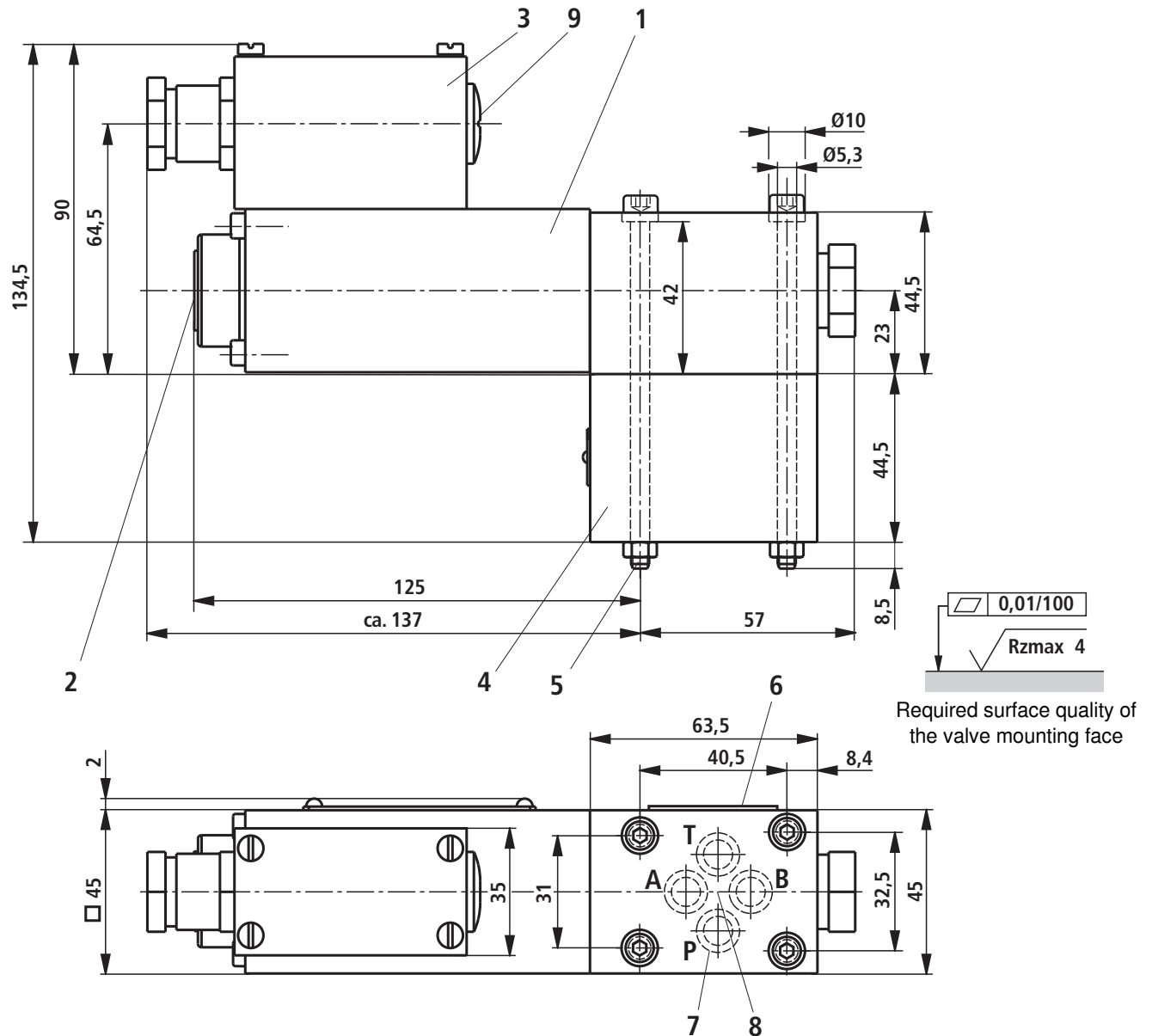
with dimensions as in the technical data sheet RE 45052
(upon request)

Note:

Subplates are no components in the sense of directive 94/9/EC and can be used after the manufacturer of the over-all system has assessed the risk of ignition.

The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Unit dimensions type E-4SE 6 ...BG12-12XHZ2/... (dimensions in mm)



- 1 Valve solenoid
- 2 Manual override
- 3 Terminal box
- 4 Plus-1 plate
- 5 Valve mounting screws
For reasons of stability, exclusively the following valve mounting screws may be used:
4 hexagon socket head cap screws
ISO 4762-M5x95-10.9-fIZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the delivery)
- 6 Nameplate
- 7 Identical seal rings for ports P, A, B, T
- 8 Porting pattern according to DIN 24340-A6,
without locating hole
- 9 Plug screw

Subplates (without locating hole)

G 341/01 FE/Zn (G1/4)
G 342/01 FE/Zn (G3/8)
G 502/01 FE/Zn (G1/2)

according to technical data sheet RE 59052 must be ordered separately.

Note:

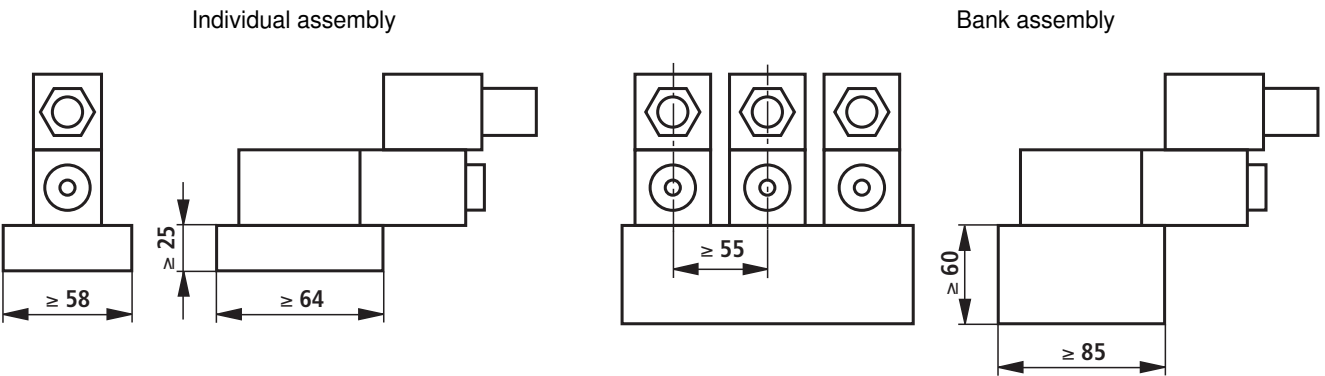
Subplates are no components in the sense of directive 94/9/EC and can be used after the manufacturer of the overall system has assessed the risk of ignition.

The G...FE/Zn versions are free from aluminum and/or magnesium and galvanized.

Installation conditions (dimensions in mm)

	Individual assembly	Bank assembly
Subplate dimensions	Minimum dimensions Length ≥ 64, width ≥ 58, height ≥ 25	Minimum cross-section Height ≥ 60, width ≥ 85
Heat conductivity of the subplate	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	≥ 55 mm	

Schematic diagram



Notes
