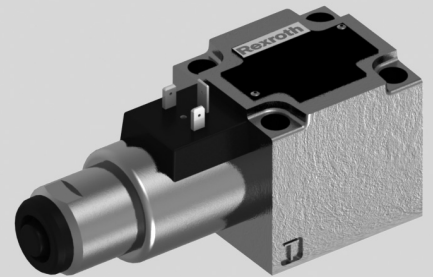


3/2 and 4/2 directional seat valves with solenoid actuation

RE 22045-XN-B2/08.12
Replaces: 07.10

Type M-.SED 10...XN...

Size 10
Component series 1X
Maximum operating pressure 350 bar
Maximum flow 40 l/min



ATEX units
For explosive areas

Part II Data sheet



Information on the explosion protection:

- Area of application in accordance with the Explosion Protection Directive 94/9/EC: **II 3G; II 3D**
- Type of protection of the valve solenoid
Ex nA IIC T3 Gc according to EN 60079-15:2010 and
Ex tc IIIC T140°C Dc IP65 according to EN 60079-31:2009

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 07010-X-B1

Part II Data sheet 22045-XN-B2

Part III Product-specific instructions 22045-XN-B3

Operating instructions 22045-XN-B0

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

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Technical data, information on the explosion protection	7
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General information	9
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Features

- Direct operated directional seat valve with solenoid actuation for proper use in explosive atmospheres
- Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-D05
- Subplates available in FE/ZN version (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
- Solenoid coil rotatable by 90 °
- Electrical connection as individual connection with connector according to EN 175301-803, design A
- With manual override, optional

Ordering code and scope of delivery

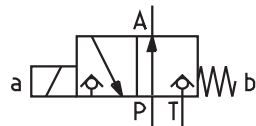
M	SED	10	1X	/350	C	G24	XN	K4	/	
---	-----	----	----	------	---	-----	----	----	---	--

3 main ports = 3
 4 main ports = 4

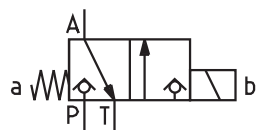
Size = 10

Main ports 3 4

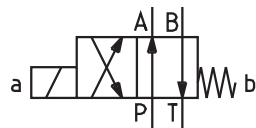
Control spool symbols



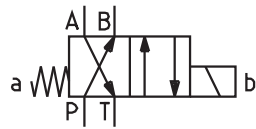
• - = UK



• - = CK



- • = D



- • = Y

• = Available

Component series 10 to 19 = 1X
 (10 to 19: Unchanged installation and connection dimensions)

Operating pressure up to 350 bar = 350

Solenoid, wet-pin = C

Seal material

no code = NBR seals

V = FKM seals

Important:

Observe compatibility of seals with hydraulic fluid 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

K4 = Solenoid without mating connector
 For details see chapter Electrical connection

XN = Explosion protection "Non-sparking",
 Details see information on the explosion protection page 7

N9 = With manual override
 no code = Without manual override

G24 = Direct voltage 24 V

Included in the scope of delivery:

Valve operating instructions with declaration of conformity in part III

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

General:

The directional valve type M-SED is a direct operated directional seat valve with solenoid actuation. It controls the start, stop and direction of flow and basically comprises a housing (1), the solenoid (2), the valve seats (7) and (11) and the control spool (4).

The manual override (6) allows for the switching of the valve without solenoid energization.

Basic principle:

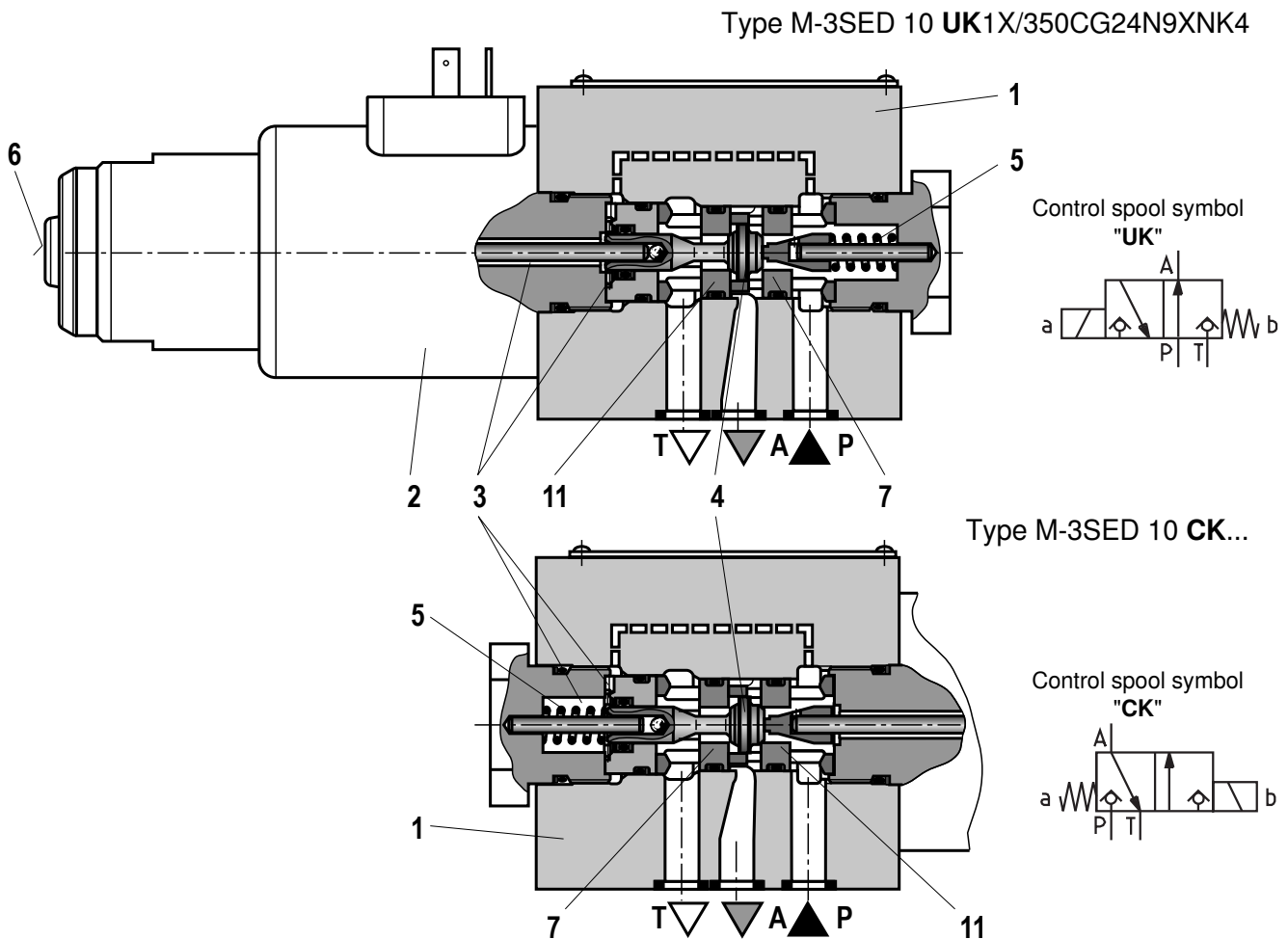
The initial position of the valve (normally open "UK" or normally closed "CK") is determined by the arrangement of the spring (5). The chamber (3) behind the control spool (4) is connected to port P and sealed against port T. Thus, the

valve is pressure-compensated in relation to the actuating forces (solenoid and spring).

By means of the control spool (4), the ports P, A and T can be loaded with the maximum operating pressure (350 bar) and the flow can be directed in both directions (see control spool symbols).

In the initial position, the control spool (4) is pressed onto the seat (11) by the spring (5), in spool position, it is pressed onto the seat (7) by the solenoid (2). The flow is blocked in a leak-free manner.

Seat valves can be used according to the control spool symbols and the related operating pressures and flows (see performance limits page 9).



Function, section, control 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 (5) holds the control spool (4) on the seat (11). Port P is blocked and A connected to T. Apart from that, one control line is connected from A to the large area of the control spool (8), which is thus unloaded to the tank. The pressure applied via P now pushes the ball (9) onto the seat (10). Now, P is connected to B, and A to T.

Transition position:

When the main valve is operated, the control spool (4) is shifted against the spring (5) and pressed onto the seat (7). During this, port T is blocked, P, A, and B are briefly connected to each other.

Spool position:

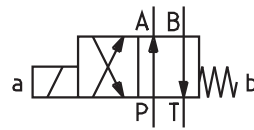
P is connected to A. As the pump pressure acts via A on the large area of the control spool (8), the ball (9) is pressed onto the seat (12). Thus, B is connected to T, and P to A. The ball (9) in the Plus-1 plate has a "positive spool overlap".

Important:

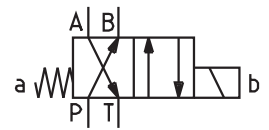
To prevent pressure intensification in conjunction with differential cylinders, the annulus area of the cylinder must be connected to A.

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

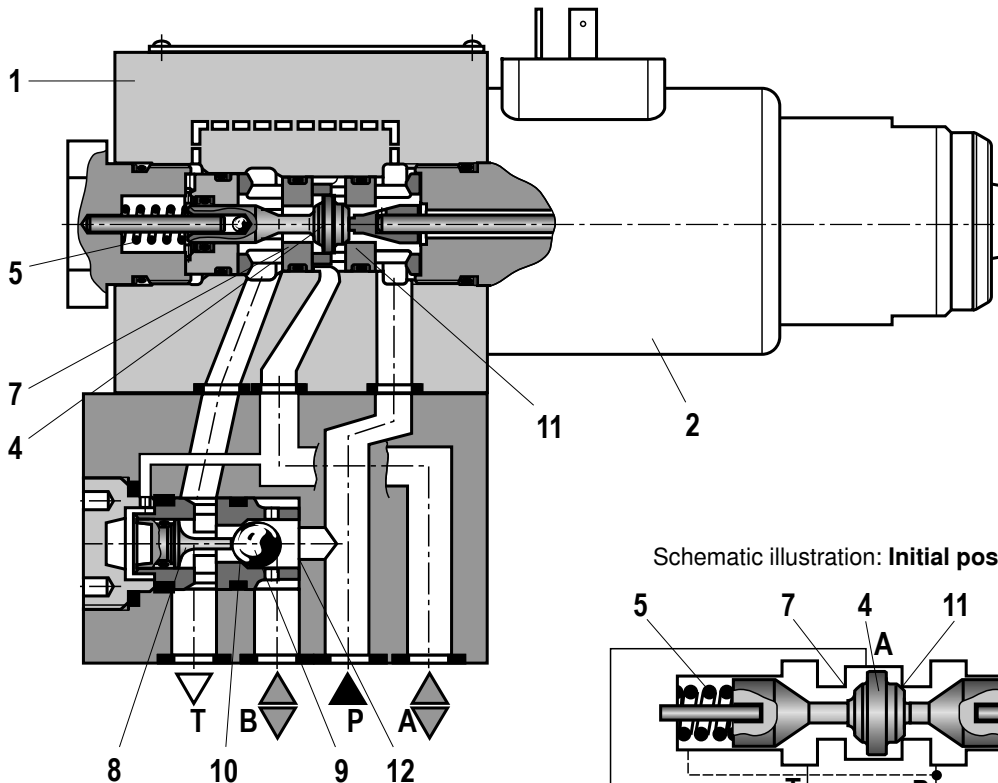
Control spool symbol "D"



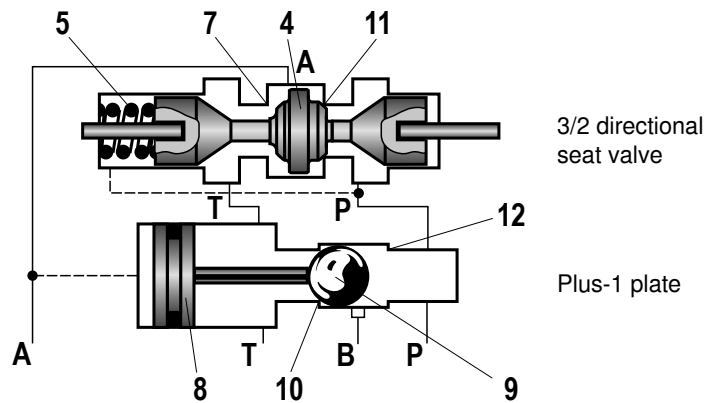
Control spool symbol "Y"



Type M-4SED 10 Y1X/350CG24N9XNK4



Schematic illustration: Initial position



Function, section: Throttle insert, check valve insert

Throttle insert

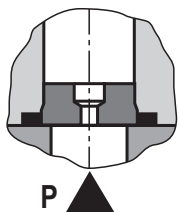
The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

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.

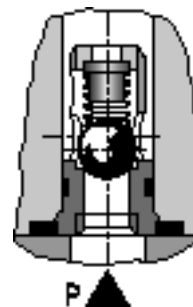


Check valve insert

The check valve insert allows 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	+15 ... +30
Admissible vibration load		20 ... 2000 Hz amplitude 0.05 g ² /Hz (10 g RMS)
Weight	3/2 directional seat valve	kg 3.3
	4/2 directional seat valve	kg 4.7
Surface protection		Galvanically coated

hydraulic

Maximum operating pressure	bar	See table on page 9
Maximum flow	l/min	40
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 ¹⁾ ; fast biodegradable hydraulic fluids according to VDMA 24568 (see also data sheet 90221); HETG (rape seed oil) ¹⁾ ; HEPG (polyglycols) ²⁾ ; HEES (synthetic esters) ²⁾ ; other hydraulic fluids on request, ignition temperature > 190 °C
Hydraulic fluid temperature range	°C	-20 ... +80 (for NBR seals) ³⁾
		-15 ... +80 (for FKM seals) ³⁾
Viscosity range	mm ² /s	2.8 ... 500
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)		Class 20/18/15 ⁴⁾

¹⁾ Suitable for NBR **and** FKM seals

²⁾ Suitable **only** for FKM seals

³⁾ Observe the "Special conditions for safe use" on page 7.

⁴⁾ 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 life cycle of the components. For the selection of the filters see www.boschrexroth.com/filter

Technical data

electric

Voltage type	Direct voltage (DC)		
Nominal voltage	V	24	
Voltage tolerance	%	±10	
Admissible residual ripple	%	< 5	
Duty cycle / operating mode according to VDE 0580	100 % / S1 (continuous operation)		
Switching times according to ISO 6403	On	ms	40 ... 80
	Off	ms	10 ... 25
Switching frequency	Hz	Max. 1	
Nominal power at ambient temperature 20 °C	W	23	
Maximum power with 1.1 x nominal voltage and ambient temperature 20 °C	W	28.8	
Protection class according to EN 60529	IP 65 ¹⁾		

¹⁾ If suitable mating connectors are used (protection class at least IP 65) and in case of appropriate assembly.

Information on the explosion protection

Area of application as per directive 94/9/EC	II 3G		II 3 D
Type of protection of the valve solenoid according to EN 60079-15: 2010 / EN 60079-31: 2009	Ex nA IIC T3 Gc		Ex tc IIIC T140°C Dc IP65
Maximum surface temperature ¹⁾	°C	140	140
Type examination certificate Solenoid	BVS 12 ATEX E 062 X		
Type of protection Valve	c (EN 13463-5: 2011)		
Special conditions for safe use	<ul style="list-style-type: none"> - Connection lines must be passed in a pull-relieved way. - The valve is to be installed so that no impact stresses > 4 J can take effect. - In order to avoid dangers caused by static charging, the base and/or subplate on which the valve is to be fitted must be electrically conductive and included in the equipotential bonding. - The valve solenoid must not be installed close to charge-generating processes. - Dust layers with a thickness > 50 mm are not admissible. - Maximum hydraulic fluid temperature: In case of bank assembly, as long as only one solenoid is energized at a time, and in case of individual assembly: +80 °C In case of bank assembly when more than one solenoid is energized at a time: +65 °C - The maximum temperature of the valve casing surface is 110 °C. This has to be considered when selecting the connection cable and/or contact of the connection cable with the casing surface is to be prevented. 		
Ambient temperature range	°C	-20 ... +50	

Requirements on the mating connector

Temperature at the connector of the valve solenoid	°C	≥ 100
Area of application as per directive 94/9/EC	II 3G; II 3D	
Protection class in plugged condition	IP 65	

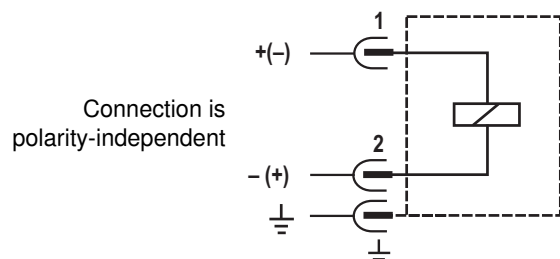
¹⁾ Surface temperature > 50 °C, provide contact protection

Electrical connection

The valves are equipped with a plug-in connector according to EN 175301-803, design A.

Information on the suitability of mating connectors is available on page 7.

Circuit diagram



For protection of the valve solenoids, suitable measures are to be taken which limit the switch-off overvoltages to a maximum of 500 V.

Over-current fuse and switch-off voltage peak

Important:

A fuse appropriate for the solenoid's rated current (max. $3 \times I_{\text{rated}}$ according to DIN 41571 and/or IEC 60127) or a protective motor switch with short-circuit and thermal instantaneous tripping must be connected to each valve solenoid as short-circuit protection. The cut-off capacity of the fuse must match or exceed the short-circuit current of the supply source.

This fuse or protective motor switch may only be fitted outside the explosive area or must be of an explosion-proof design. When an inductivity is switched off, a voltage peak results which may cause failures or damage in the connected control electronics.

Voltage data in the valve type code	Nominal voltage Valve solenoid	Rated current Valve solenoid	Recommended pre-fuse characteristics medium time-lag according to DIN EN 60127-1: 2011
G24	24 V DC	0.95 A DC	1 A

General information

Seat valves can be used according to the control spool symbols and the related operating pressures and flows (see performance limits below).

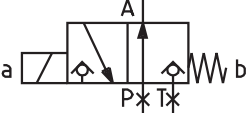
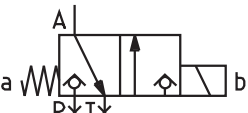
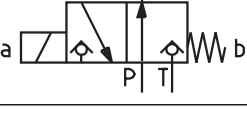
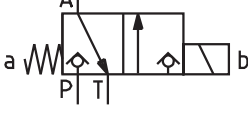
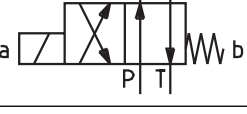
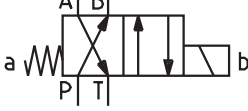
In order to guarantee safe functioning, the following points must imperatively be observed:

- Seat valves have negative spool overlap, i.e. leakage oil occurs during the switching process. This process takes, however, place within such a short time that it is irrelevant in nearly all applications.
- The specified maximum flow must not be exceeded (if necessary, use a throttle insert for the flow limitation)!

Plus-1 plate:

- When the Plus-1 plate (4/2 directional function) is used, the following lower operating values are to be observed:
 $p_{\min} = 8 \text{ bar}$, $q_v > 3 \text{ l/min}$.
- The ports P, A, B and T are clearly determined according to the tasks. They must not be exchanged or closed!
- Port T must always be connected.
- Pressure level and pressure distribution are to be observed!
- The flow is only permitted in the direction of arrow!

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

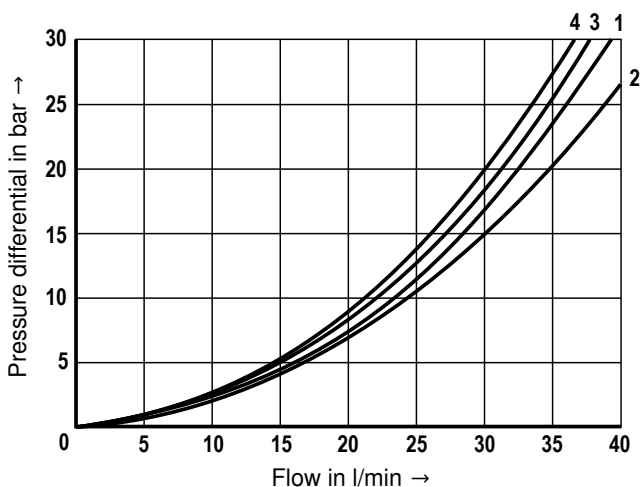
	Control spool symbol	Comment	Operating pressure in bar				Flow in l/min
			P	A	B	T	
2-way circuit	"UK" 	With 2/2 way circuits, port P or T must be closed by the customer!	350	350		350	40
	"CK" 		350	350		350	40
3-way circuit	"UK" 		350	350		350	40
	"CK" 		350	350		350	40
4-way circuit (flow only possible in the direction of arrow)	"D" 	3/2 directional valve (symbol "UK") in connection with Plus-1 plate: $p_p \geq p_A \geq p_B \geq p_T$	350	350	350	P/A/B -40	40
	"Y" 	3/2 directional valve (symbol "CK") in connection with Plus-1 plate: $p_p \geq p_A \geq p_B \geq p_T$	350	350	350	P/A/B -40	40

Important

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

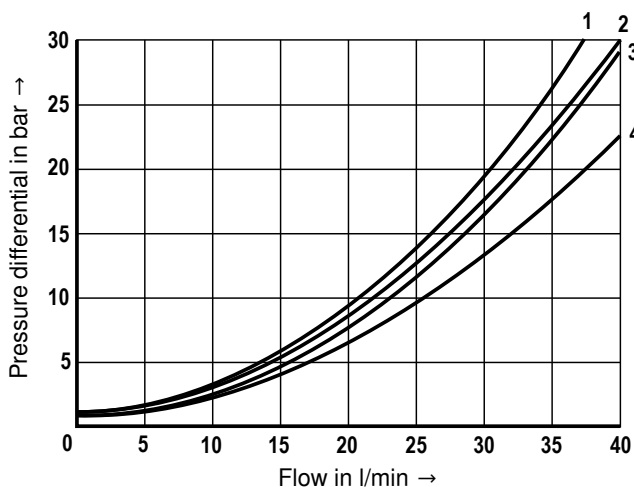
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$)

$\Delta p - q_v$ characteristic curves
3/2 directional seat valve



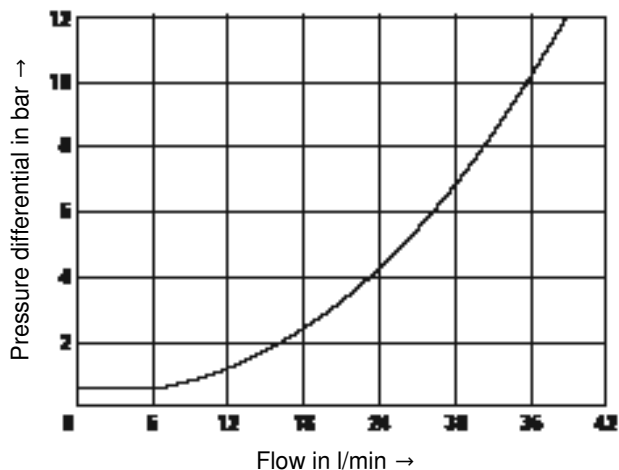
- 1 M-3SED 10 CK..., P → A
- 2 M-3SED 10 CK..., A → T
- 3 M-3SED 10 UK..., P → A
- 4 M-3SED 10 UK..., A → T

$\Delta p - q_v$ characteristic curves
4/2 directional seat valve

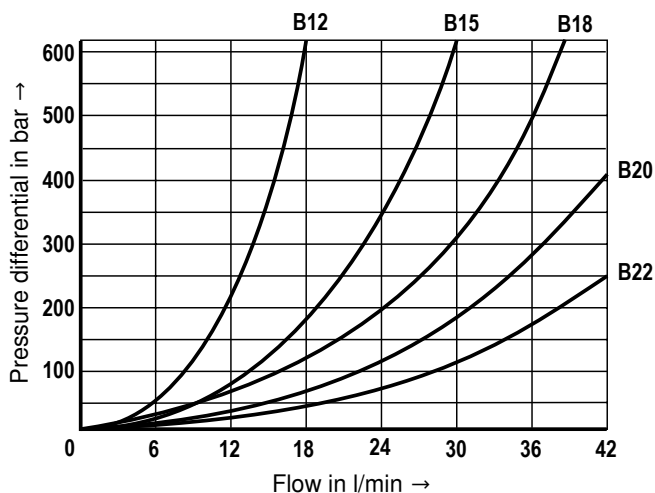


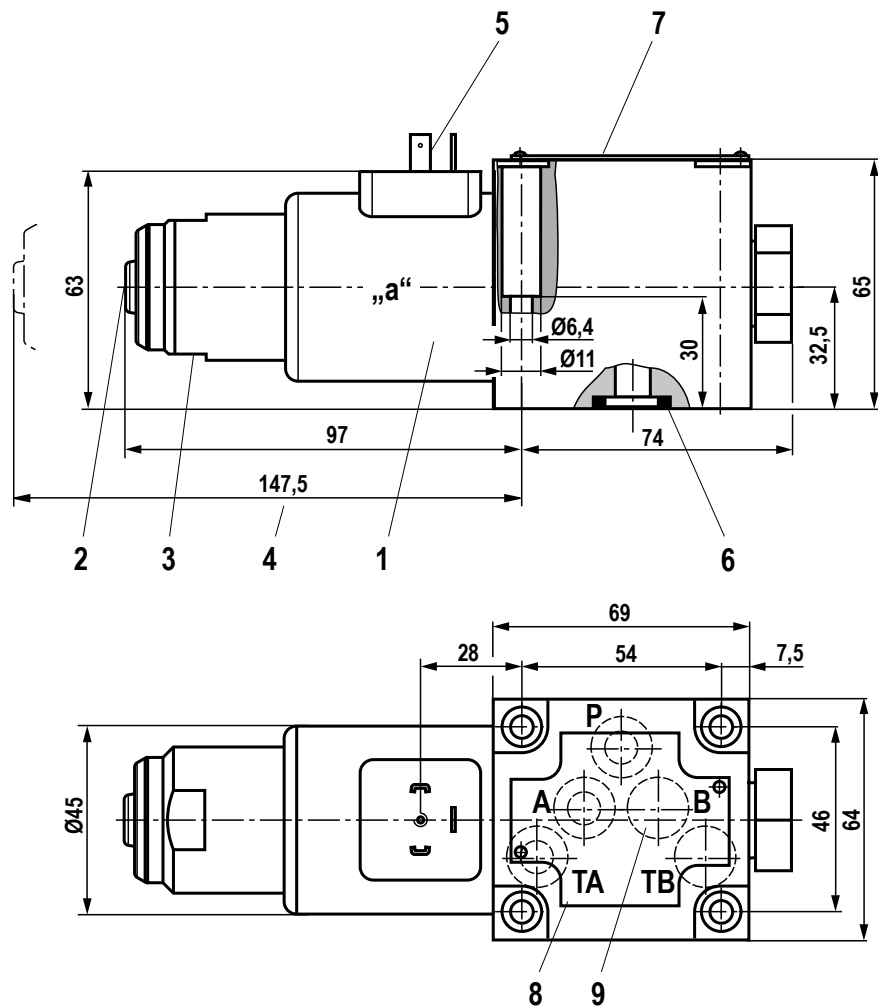
- 1 M-4SED 10 D/Y..., A → T
- 2 M-4SED 10 D/Y..., P → A
- 3 M-4SED 10 D/Y..., P → B
- 4 M-4SED 10 D/Y..., B → T

$\Delta p - q_v$ characteristic curve
Check valve insert



$\Delta p - q_v$ characteristic curves
Throttle insert



Device dimensions: 3/2 directional seat valve – design "UK" (dimensions in mm)


- 1 Solenoid coil
- 2 Manual override "N9"
- 3 Mounting nut with double edge SW32
- 4 Space required to remove the solenoid coil
- 5 Plug-in connector according to EN 175301-803, design A
- 6 Identical seal rings for ports A, B, T
Seal ring for port P
- 7 Name plate
- 8 Porting pattern according to ISO 4401-05-04-0-05
and NFPA T3.5.1 R2-D05
- 9 **Important**
With 3/2 directional seat valves, ports B and TB are
designed as blind counterbore

Valve mounting screws

For reasons of stability, exclusively use the following valve mounting screws:

4 hexagon socket head cap screws
ISO 4762-M6x40-10.9-fIZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
 (must be ordered separately)

Subplates

G 66/01 FE/ZN (G3/8)

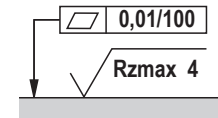
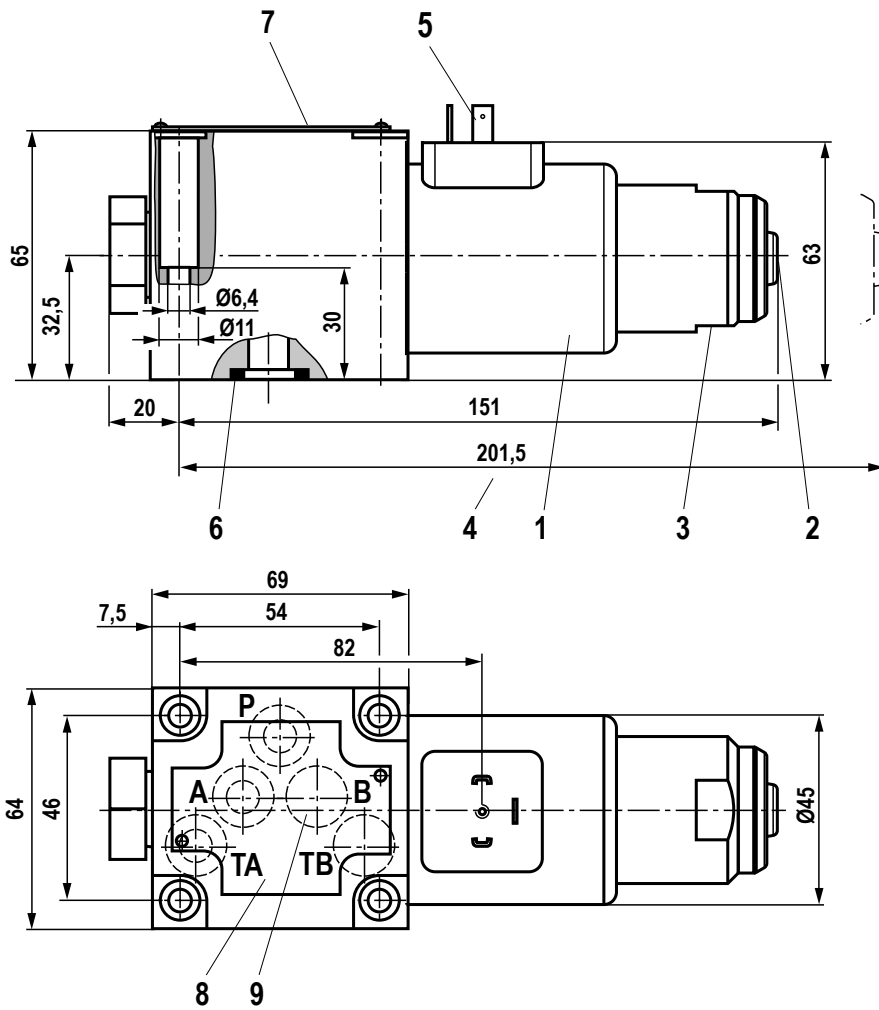
G 67/01 FE/ZN (G1/2)

with dimensions as in the data sheet 45054
 (must be ordered separately)

Important:

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.

Device dimensions: 3/2 directional seat valve – design "CK" (dimensions in mm)

Required surface quality of the valve contact surface

- 1 Solenoid coil
- 2 Manual override "N9"
- 3 Mounting nut with double edge SW32
- 4 Space required to remove the solenoid coil
- 5 Plug-in connector according to EN 175301-803, design A
- 6 Identical seal rings for ports A, B, T
Seal ring for port P
- 7 Name plate
- 8 Porting pattern according to ISO 4401-05-04-0-05
and NFPA T3.5.1 R2-D05
- 9 **Important**
With 3/2 directional seat valves, ports B and TB are
designed as blind counterbore

Valve mounting screws

For reasons of stability, exclusively use the following valve mounting screws:

4 hexagon socket head cap screws

ISO 4762-M6x40-10.9-fIZn-240h-L

(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(must be ordered separately)

Subplates

G 66/01 FE/ZN (G3/8)

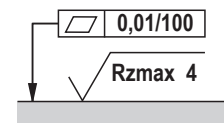
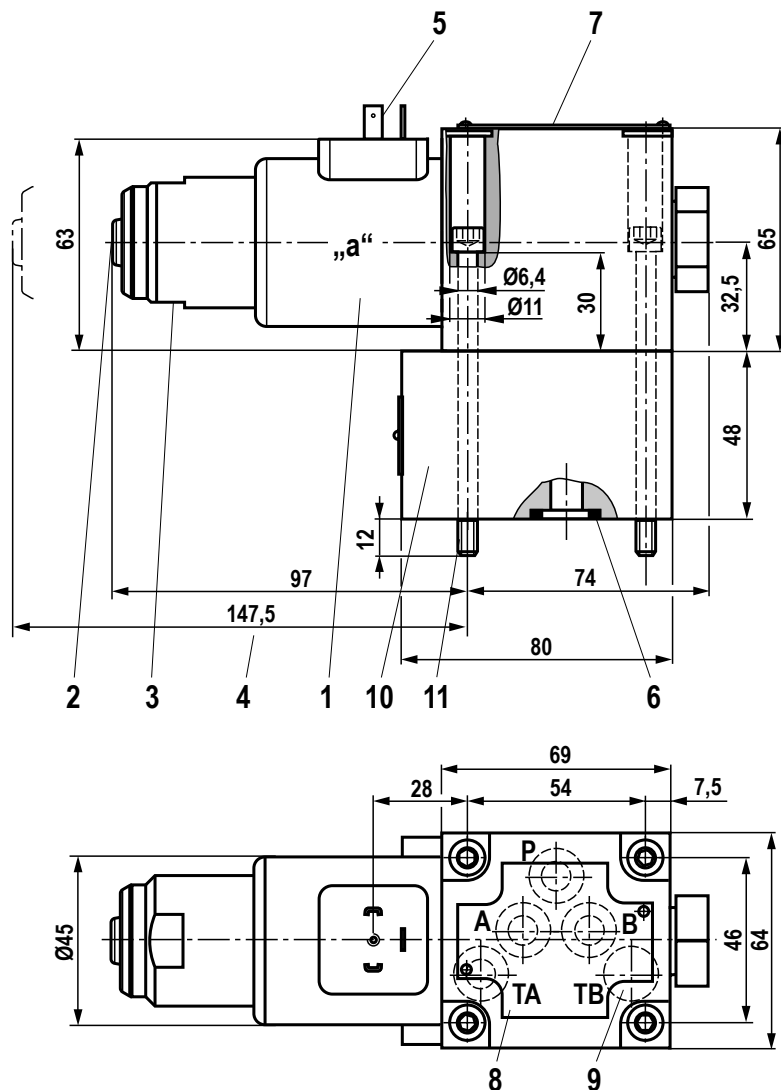
G 67/01 FE/ZN (G1/2)

with dimensions as in the data sheet 45054
(must be ordered separately)

Important:

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.

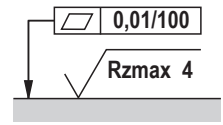
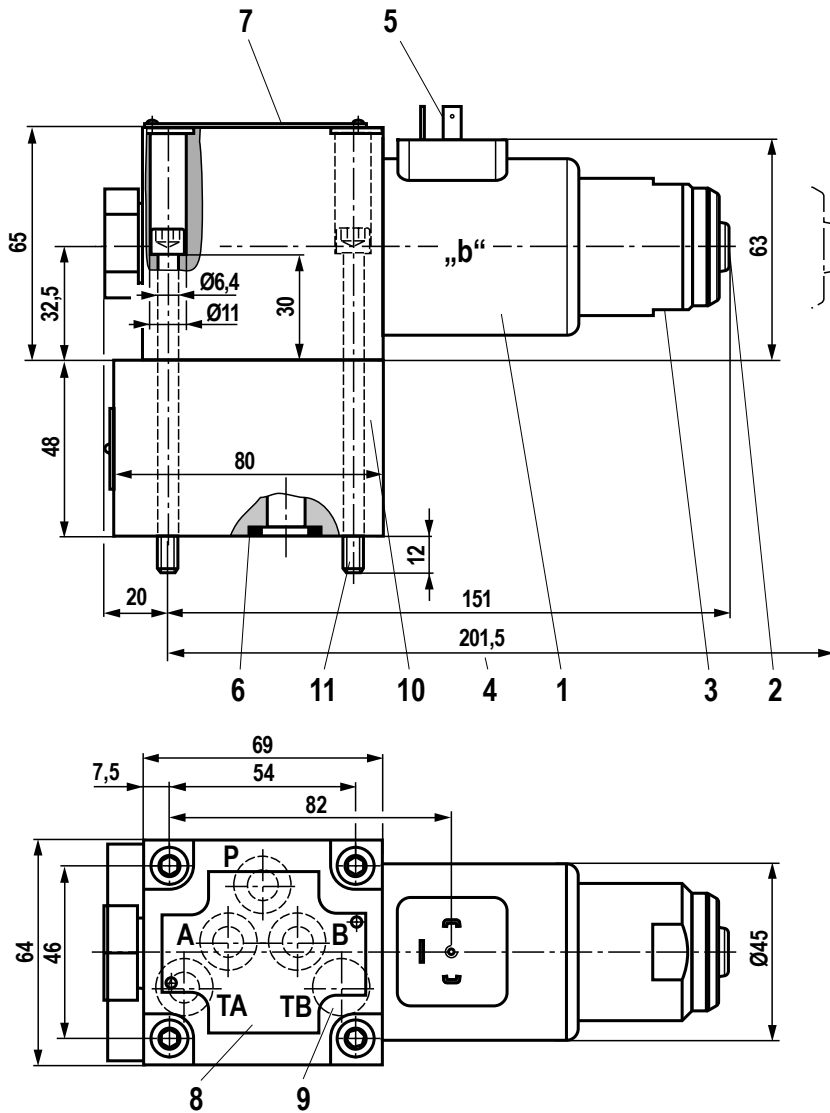
The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Device dimensions: 4/2 directional seat valve – design "D" (dimensions in mm)


Required surface quality of the valve contact surface

- | | |
|--|--|
| <p>1 Solenoid coil</p> <p>2 Manual override "N9"</p> <p>3 Mounting nut with double edge SW32</p> <p>4 Space required to remove the solenoid coil</p> <p>5 Plug-in connector according to EN 175301-803, design A</p> <p>6 Identical seal rings for ports A, B, T
Seal ring for port P</p> <p>7 Name plate</p> <p>8 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-D05</p> <p>9 Important
With 4/2 directional seat valves, port TB is designed as blind counterbore</p> <p>10 Plus-1 plate</p> | <p>11 Valve mounting screws
For reasons of stability, exclusively use the following valve mounting screws:
4 hexagon socket head cap screws
ISO 4762-M6x90-10.9-fZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the scope of delivery)</p> <p>Subplates
G 66/01 FE/ZN (G3/8)
G 67/01 FE/ZN (G1/2)
with dimensions as in the data sheet 45054
(must be ordered separately)</p> <p>Important:
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.</p> |
|--|--|

Device dimensions: 4/2 directional seat valve – design "Y" (dimensions in mm)



Required surface quality of the valve contact surface

- 1 Solenoid coil
- 2 Manual override "N9"
- 3 Mounting nut with double edge SW32
- 4 Space required to remove the solenoid coil
- 5 Plug-in connector according to EN 175301-803, design A
- 6 Identical seal rings for ports A, B, T
Seal ring for port P
- 7 Name plate
- 8 Porting pattern according to ISO 4401-05-04-0-05 and NFPA T3.5.1 R2-D05
- 9 **Important**
With 4/2 directional seat valves, port TB is designed as blind counterbore
- 10 Plus-1 plate

- 11 Valve mounting screws
For reasons of stability, exclusively use the following valve mounting screws:
4 hexagon socket head cap screws
ISO 4762-M6x90-10.9-fZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the scope of delivery)

Subplates

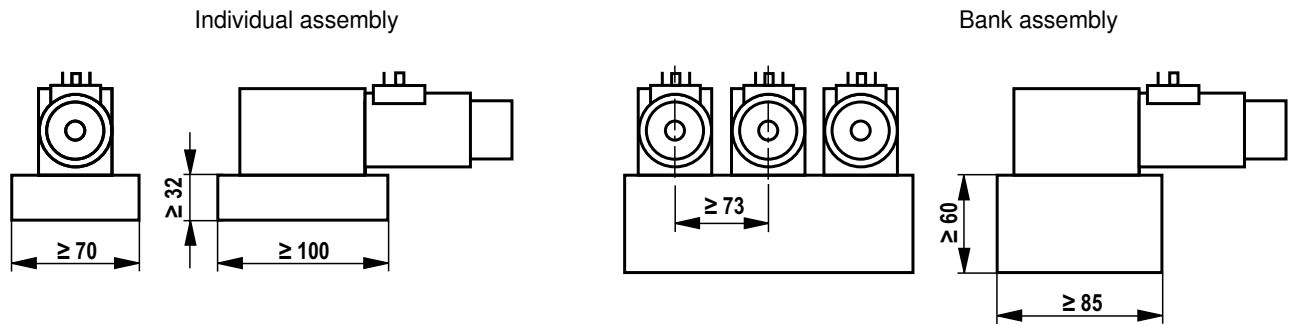
G 66/01 FE/ZN (G3/8)
G 67/01 FE/ZN (G1/2)
with dimensions as in the data sheet 45054
(must be ordered separately)

Important:

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 ≥ 100 , width ≥ 70 , height ≥ 32	Minimum cross-section Height ≥ 60 , width ≥ 85
Thermal conductivity of the subplate	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	≥ 73 mm	

Schematic diagram**Important:**

With regard to the hydraulic fluid temperature, observe the "Special conditions for safe use" on page 7.

Notes
