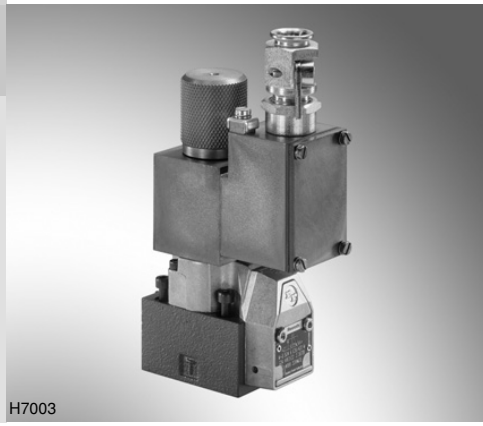
2/2, 3/2 and 4/2 directional seat valves with solenoid actuation

RE 22058-XE-B2/09.13
Replaces: 01.10

Type M-.SEW 6...XE...

Size 6
Component series 3X
Maximum operating pressure 420 bar
Maximum flow 25 l/min



Actual product may differ

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 2G**
- Type of protection of the valve solenoid: Ex e mb IIC T4 Gb according to EN 60079-7: 2007 / EN 60079-18: 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 22058-XE-B2
Part III Product-specific instructions 22058-XE-B3

Operating instructions 22058-XE-B0

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

Table of contents

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
- Subplates available in FE/ZN version (see pages 12/13)
- Blocked port is tight
- Safe switching also with longer standstill periods under pressure
- Air-gap DC and AC solenoids
- Solenoid coil can be rotated by 90°
- Electrical connection as individual connection with cable gland
- With concealed manual override, optional

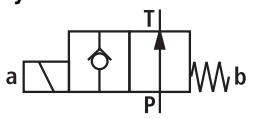
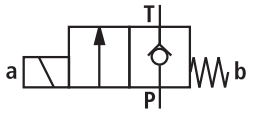
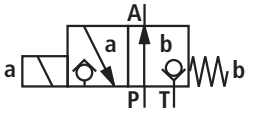
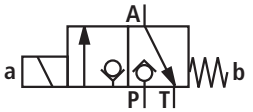
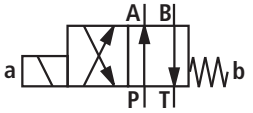
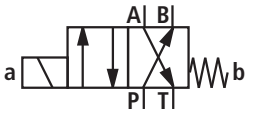
Ordering code and scope of delivery

M–	SEW	6		3X/420	M			XE	Z2/	

2 main ports = **2**
3 main ports = **3**
4 main ports = **4**

Seat valve

Size 6 = **6**

Main ports	2	3	4	
Control spool symbols				
	•	–	–	= **P**
	•	–	–	= **N**
	–	•	–	= **U**
	–	•	–	= **C**
	–	–	•	= **D**
	–	–	•	= **Y**
	• = **available**			

Component series 30 to 39 (30 to 39: Unchanged installation and connection dimensions) = **3X**

Operating pressure up to 420 bar = **420**

Solenoid (air-gap) = **M**

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
B08 = Throttle Ø 0.8 mm
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, For details see chapter Electrical connection

XE = Explosion protection "Increased safety", for details, see information on the explosion protection on page 7

N9 = With concealed manual override
no code = Without manual override

G24 = Direct voltage 24 V
W230 R = AC voltage W 230 V, 50/60 Hz
For further ordering codes for other voltages, see page 9

Included in the scope of delivery:

Valve operating instructions with declaration of conformity in Part III

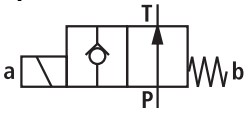
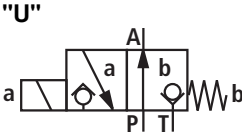
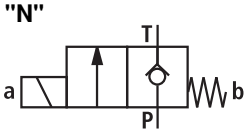
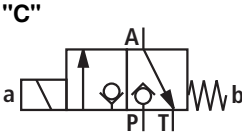
Function, section, control spool symbols: 2/2, 3/2 directional seat valve

General:
The directional valve type M-.SEW...XE... is a directional seat valve with solenoid actuation. It controls the start, stop and direction of flow.
It basically comprises a housing (1), the solenoid (2), the hardened valve system (3) and the control spool (8).

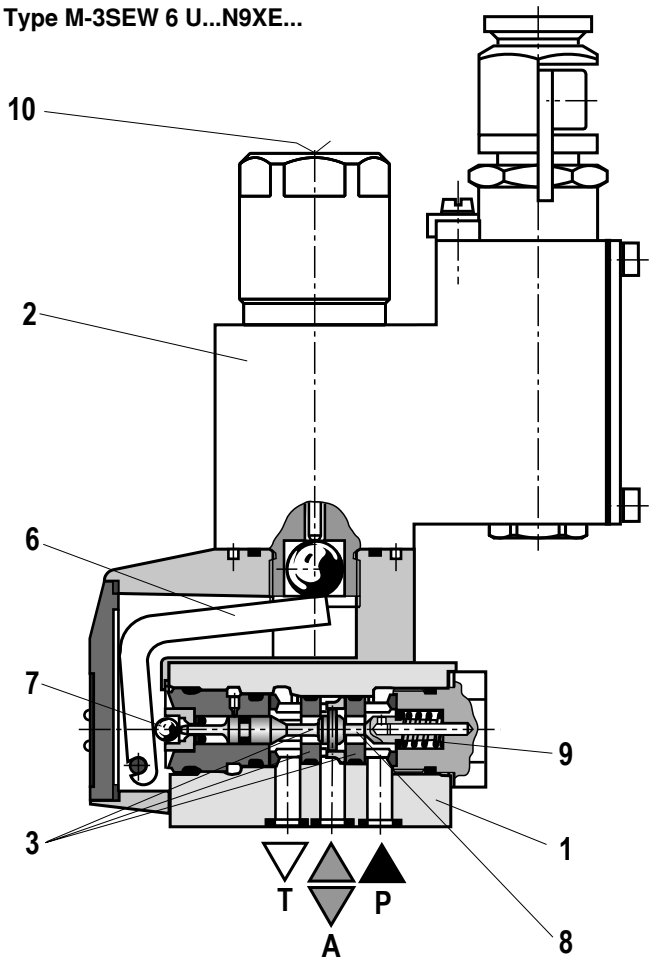
Basic principle:
In the initial position, the control spool (8) is pressed onto the seat by the spring (9) and in spool position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the control spool (8) that is sealed on two sides. The chamber between 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).

Important:
- The 3/2 directional seat valves have a "negative spool overlap". 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).

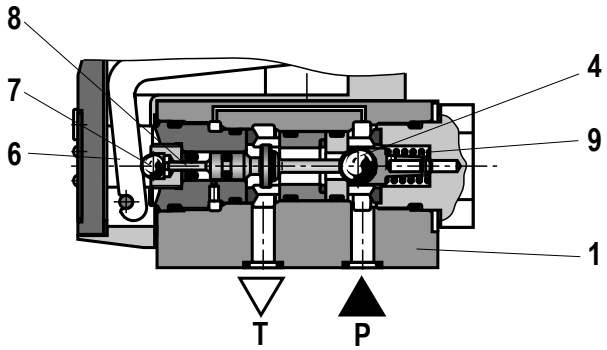
The seat arrangement offers the following options:

	2/2 directional seat valve	**3/2 directional seat valve**
Control spool symbol	**"P"** 	**"U"** 
Initial position	P and T connected	P and A connected, T blocked in a leak-free form
Spool position	P blocked in a leak-free form	P blocked in a leak-free form, A and T connected
Control spool symbol	**"N"** 	**"C"** 
Initial position	P blocked in a leak-free form	P blocked in a leak-free form, A and T connected
Spool position	P and T connected	P and A connected, T blocked in a leak-free form

Type M-3SEW 6 U...N9XE...



Type M-2SEW 6 N...XE...



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 (9) holds the ball (4) on the seat (11). Port P is blocked and A is connected to T. Apart from that, one control 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 control spool (8) is shifted against the spring (9) and pressed onto the seat (15). During this, port T is blocked, P, A, and B are briefly connected to each other.

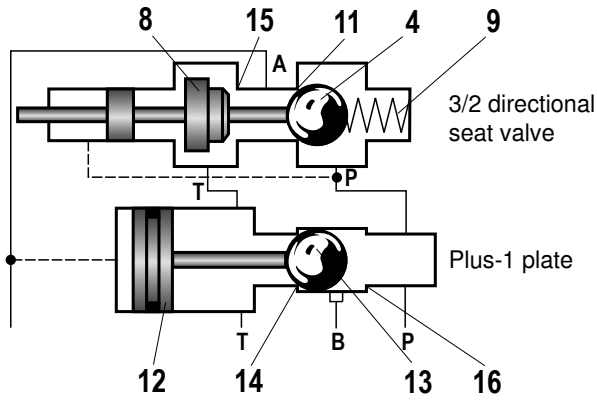
Spool position:

P is connected to A. As the pump pressure acts via A on the large area of the control spool (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 overlap".

Important:

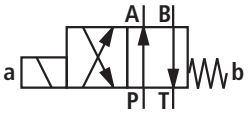
To prevent pressure intensification in conjunction with differential cylinders, the annulus area of the cylinder must be connected to A.

Schematic illustration: Initial position

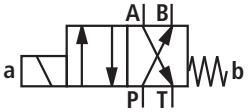


The use of the Plus-1 plate and the seat arrangement offer the following options:

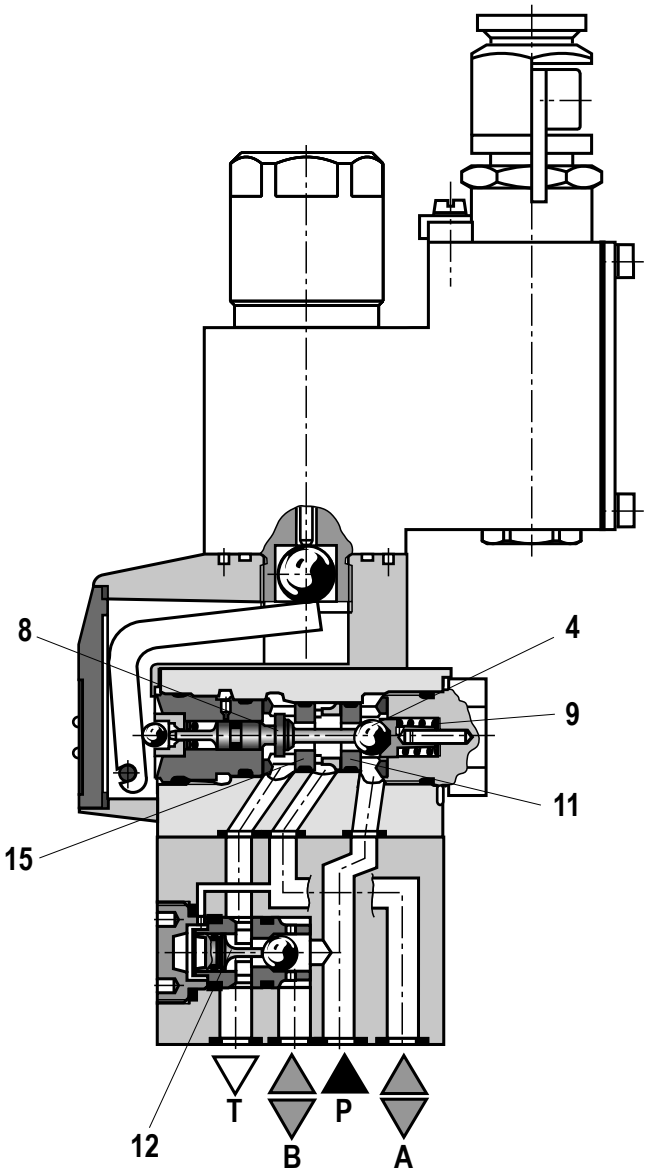
Control spool symbol "D":



Control spool symbol "Y":



Type M-4SEW 6 Y...N9XE...



Function, section: Throttle insert, check valve insert

Throttle insert

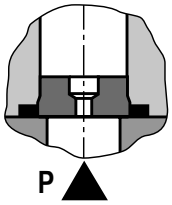
The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

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.

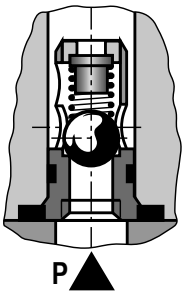


Check valve insert

The check valve insert allows a free flow from P to A and closes A to 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 … +70 [1]
Storage temperature range		°C	–20 … +50
Admissible vibration load			20 … 2000 Hz amplitude 0.05 g^2/Hz (10 g RMS)
Weight	2/2 and 3/2 directional seat valve	kg	3.2
	4/2 directional seat valve	kg	4.1
Surface protection			Galvanic coating

hydraulic

Maximum operating pressure	bar	See table on page 10
Maximum flow	l/min	25
Hydraulic fluid		Mineral oil (HL, HLP) according to DIN 51524 [2]; fast bio-degradable hydraulic fluids according to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [2]; HEPG (polyglycols) [3]; HEES (synthetic esters) [3]; flame-resistant hydraulic fluid HFC according to ISO 12922 [4] Other hydraulic fluids upon request Ignition temperature > 180 °C
Hydraulic fluid temperature range	°C	–20 ... +80 (NBR seals)
		–15 ... +80 (FKM seals)
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 [5]

[1] Observe the "Special conditions for safe use" on page 7.

[2] Suitable for NBR **and** FKM seals

[3] Suitable **only** for FKM seals

[4] Only in connection with NBR seals, max. admissible pressure 210 bar, $\Delta p < 15$ bar, hydraulic fluid temperature max. 60 °C
More information is available from our sales staff.

[5] 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	Alternating voltage 50/60 Hz
Available voltages	V	24, 48, 96, 110	110, 230
Voltage tolerance (nominal voltage)	%	–5 / +10	
Admissible residual ripple	%	< 5	–
Duty cycle/operating mode according to VDE 0580		100 % / S1 (continuous operation)	
Switching time according to ISO 6403		See table below	
Switching frequency	1/h	up to 15000	up to 7200
Nominal power at ambient temperature 20 °C	W	17	
Maximum power with 1.1 x nominal voltage and ambient temperature 20 °C	W	20.6	
Protection class according to EN 60529		IP 66 [1]	

[1] If the electrical connection is correctly installed

Information on the explosion protection

Area of application as per directive 94/9/EC		II 2G
Type of protection Valve		c (EN 13463-5:2011)
Maximum surface temperature [1] Temperature class	°C	135 T4
Type of protection Valve solenoid according to EN 60079-7:2007 / EN 60079-18:2009		Ex e mb IIC T4 Gb
Type examination certificate Solenoid		KEMA 02ATEX2240 X
"IECEx Certificate of Conformity" Solenoid		IECEx DEK 12.0068X
Ambient temperature range	°C	–20 … +70 [2]
Special conditions for safe use		– Maximum ambient temperature: In case of bank assembly, as long as only one solenoid is energized at a time, and in case of individual assembly: +70 °C In case of bank assembly when more than one solenoid is energized at a time: +60 °C – The maximum temperature of the valve casing surface is 120 °C. This has to be considered when selecting the connection cable and contact of the connection cable with the casing surface is to be prevented.

[1] Surface temperature > 50 °C, provide contact protection

[2] Observe the "Special conditions for safe use".

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

Pressure *p* in bar	Flow q_V in l/min	DC solenoid						AC solenoid							
		Control spool symbols U, C, D, Y						Control spool symbols U, C, D, Y							
		t_{on} without tank pressure				t_{off} U	t_{off} D	t_{on} without tank pressure				t_{off}			
		U	C	D	Y	C	Y	U	C	D	Y	U	C	D	Y
70	25	30	40	30	40	15	15	25	40	25	40	45	65	45	65
140	25	30	50	30	50	15	15	25	40	25	40	65	65	65	65
280	25	35	60	35	60	15	15	25	45	25	45	75	65	75	65
320	25	40	70	40	70	15	15	25	45	25	45	80	65	80	65
420	25	45	70	45	70	15	15	30	45	30	45	100	65	100	65

Electrical connection

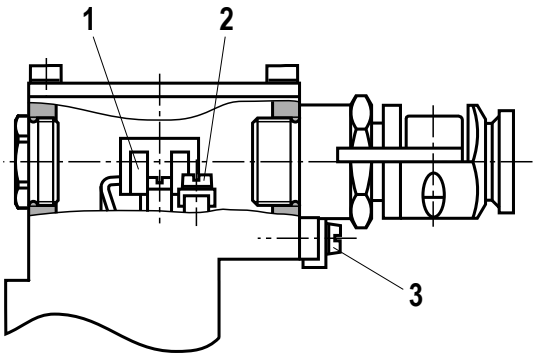
The type-examination tested valve solenoid of the valve is equipped with a terminal box and a type-tested cable gland.

The connection is polarity-independent.

Solenoids to be connected to AC voltage are equipped with an integrated rectifier.

Important

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



Properties of the connection terminals

Position	Function	Connectable line cross-section
1	Operating voltage connection	Single-wire 0.75 … 2.5 mm^2 Finely stranded 0.75 … 1.5 mm^2
2	Connection for protective earthing conductor	Single-wire max. 2.5 mm^2 Finely stranded max. 1.5 mm^2
3	Connection for potential equalization conductor	Single-wire 4 … 6 mm^2 Finely stranded 4 mm^2

Cable gland

Type approval		II 2G Ex e IIC Gb
Threaded connection		M20 x 1.5
Protection class according to EN 60529		IP66 [1]
Line diameter	mm	9 … 11
Sealing		Outer sheath sealing

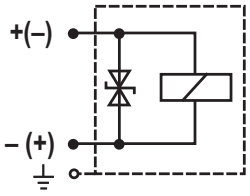
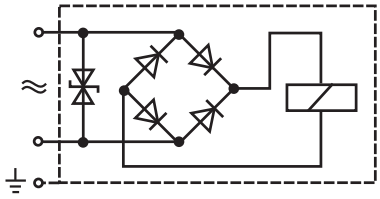
Connection line

Line type		**Non-armored** cables and lines (outer sheath sealing)
Temperature range	°C	–30 … > +110

[1] If installed properly

Electrical connection

Circuit diagrams

Direct voltage, polarity-independent	Alternating voltage
	

Over-current fuse and switch-off voltage peaks

Important:

Corresponding to the rated current, a fuse according to DIN 41571 and EN / IEC 60127 has to be connected ahead of every valve solenoid (max. 3 x I_{rated}).

The shut-off threshold of the fuse has to match the prospective short-circuit current of the supply source.

The prospective short-circuit current of the supply source may amount to a maximum of 1500 A.

This fuse may only be installed outside the explosive area or must be of an explosion-proof design.

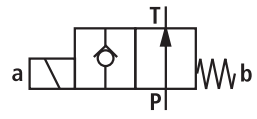
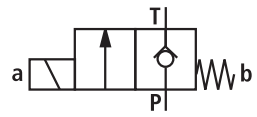
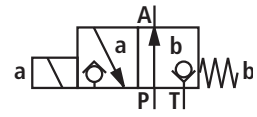
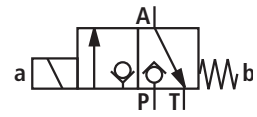
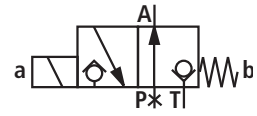
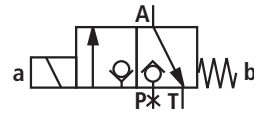
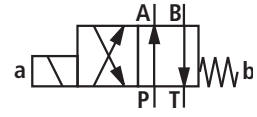
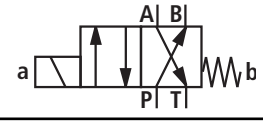
When inductivities are switched off, voltage peaks are the result which may cause faults in the connected control electronics. For this reason, the valve solenoids comprise an interference protection circuit which dampens this voltage peak to the voltage value shown in the table.

Voltage data in the valve type code	Nominal voltage valve solenoid	Rated current valve solenoid	Rated current external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Rated voltage of external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Maximum voltage value upon switch-off	Interference protection circuit
G24	24 V DC	0.708 A DC	800 mA	250 V	–90 V	Suppressor diode bi-directional
G48	48 V DC	0.354 A DC	400 mA	250 V	–200 V	
G96	96 V DC	0.177 A DC	200 mA	250 V	–370 V	
G110	110 V DC	0.155 A DC	200 mA	250 V	–390 V	
W110R	110 V AC	0.163 A AC	200 mA	250 V	–3 V	Bridge rectifier and suppressor diode
W230R	230 V AC	0.078 A AC	80 mA	250 V	–3 V	

General information

- In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: P ≥ A ≥ T (for design reasons).
- The ports P, A and T (3/2 directional seat valve) as well as P, A, B and T (4/2 directional seat valve) are clearly determined according to their tasks. They must not be exchanged or closed. The flow is only permitted in the direction of the arrow.
- When the Plus-1 plate (4/2 directional function) is used, the following minimum operating values have to be observed: p_{min} = 8 bar; q_V > 3 l/min.
- The specified maximum flow must not be exceeded (if necessary, use a throttle insert for flow limitation)!

Performance limits (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

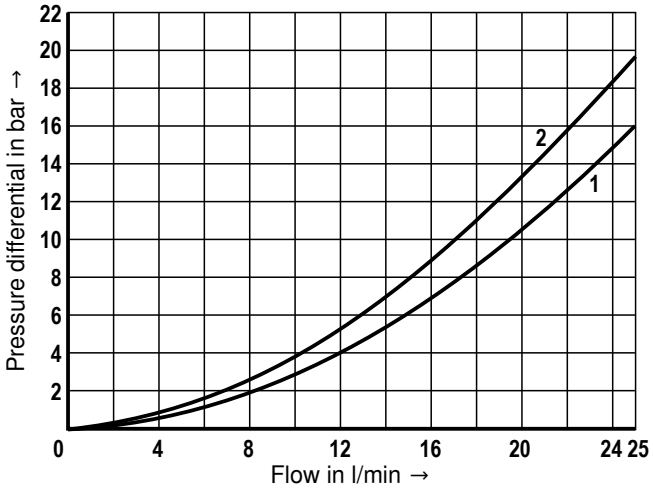
	Control spool symbol	Comment	Operating pressure in bar				Flow in l/min
			P	A	B	T	
2-way circuit	**"P"** 	Pressure at P ≥ T	420			100	25
	"N" 		420			100	25
3-way circuit	**"U"** 	Pressure at P ≥ A ≥ T	420	420		100	25
	"C" 		420	420		100	25
2-way circuit (only for unloading)	**"U"** 	Before switching from the initial position to the spool position, pressure must be applied to port A. Pressure at A ≥ T		420		100	25
	"C" 	Pressure at A ≥ T		420		100	25
4-way circuit (flow only possible in the direction of arrow)	**"D"** 	Valve (symbol "U") in connection with Plus-1 plate P > A ≥ B > T	420	420	420	100	25
	"Y" 	Valve (symbol "C") in connection with Plus-1 plate P > A ≥ B > T	420	420	420	100	25

Important

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

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

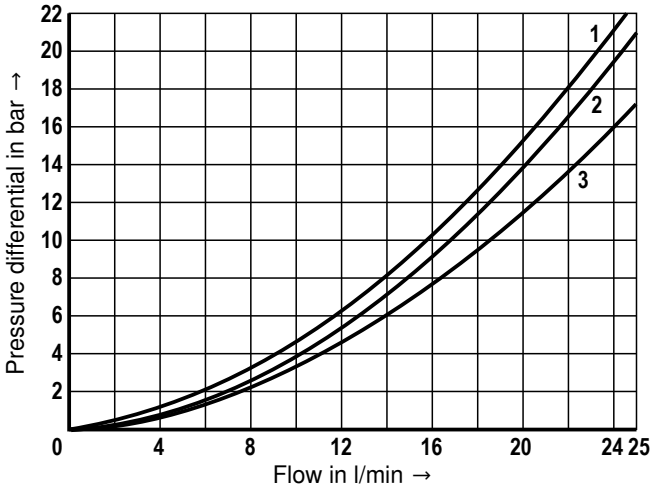
Δp - q_V characteristic curves – 2/2 directional seat valve



1 M-2SEW 6 **N** …, P → T

2 M-2SEW 6 **P** …, P → T

Δp - q_V characteristic curves – 3/2 directional seat valve

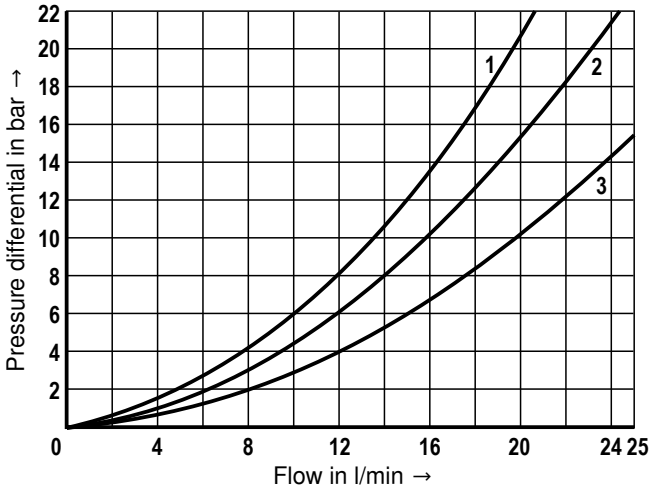


1 M-3SEW 6 **U(C)**…, A → T

2 M-3SEW 6 **U**…, P → A

3 M-3SEW 6 **C**…, P → A

Δp - q_V characteristic curves – 4/2 directional seat valve

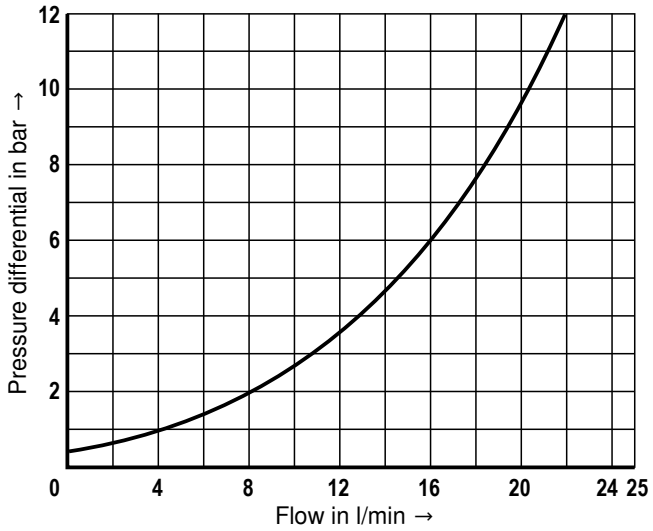


1 M-4SEW 6 **D(Y)**…, A → T

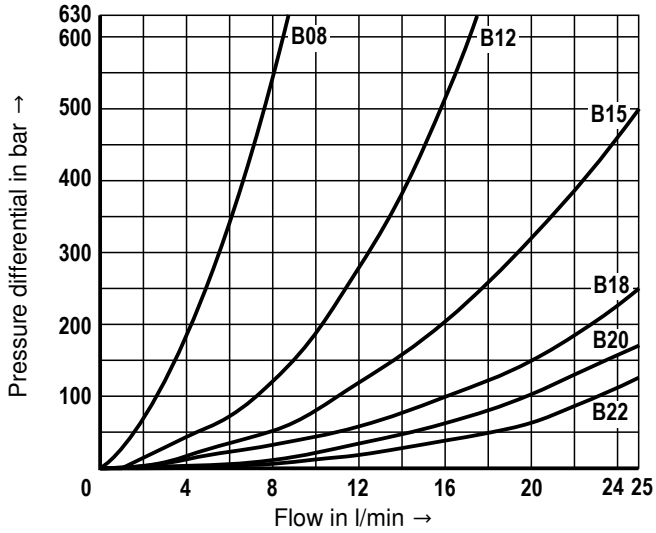
2 M-4SEW 6 **D(Y)**…, P → A

3 M-4SEW 6 **D(Y)**…, P → B, B → T

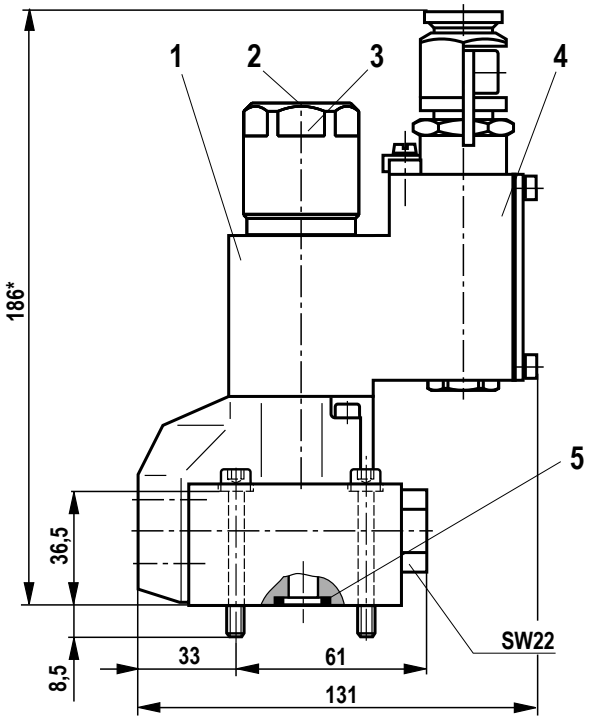
Δp - q_V characteristic curves – check valve insert

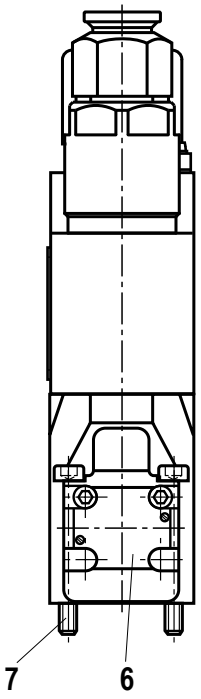


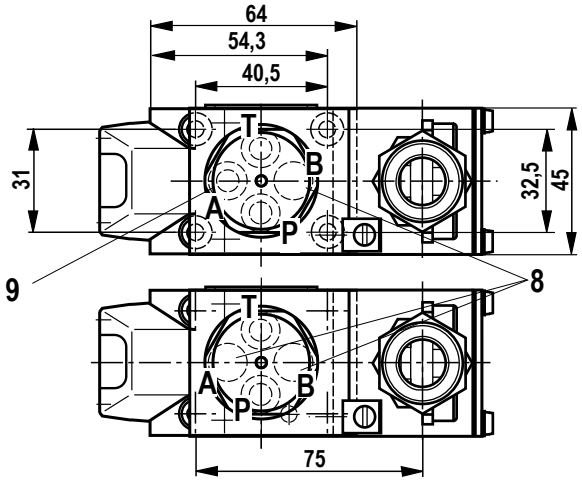
Δp - q_V characteristic curves – throttle insert

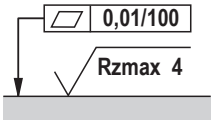


Dimensions: 2/2 and 3/2 directional seat valve (dimensions in mm)









Required surface quality of the valve contact surface

* Plus 80 mm for detaching the solenoid coil

1 Solenoid coil

2 Concealed manual override "N9"

3 Mounting nut with hexagon SW32

4 Terminal box

5 Identical seal rings for ports A, B, and T, seal ring for port P

6 Name plate

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

4 hexagon socket head cap screws
ISO 4762 M5x45-10.9-flZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the scope of delivery)

8 **Important**
With 3/2 directional seat valves, port B is available as blind counterbore.
With 2/2 directional seat valves, ports A and B are available as blind counterbores.

9 Porting pattern according to DIN 24340-A6

Subplates

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

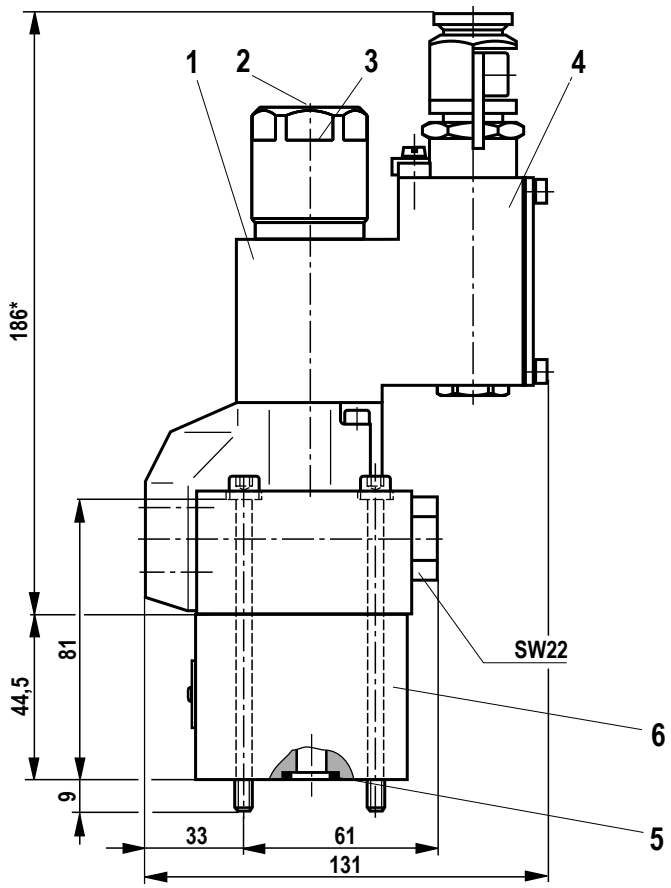
with dimensions as in the data sheet 45052
(must be ordered separately)

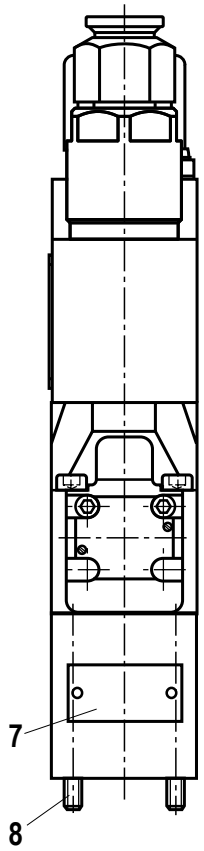
Important:

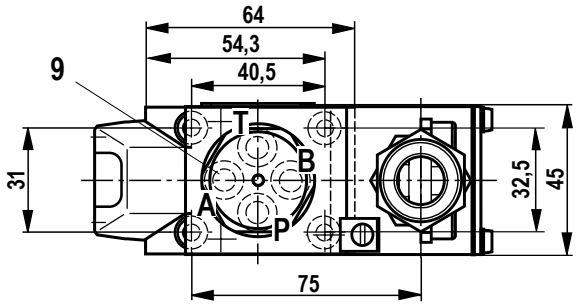
Subplates are no components in the sense of directive 94/9/EC and can be used after the manufacturer of the overall system has assessed the risk of ignition.

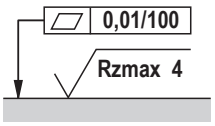
The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Dimensions: 4/2 directional seat valve (dimensions in mm)









Required surface quality of the valve contact surface

* Plus 80 mm for detaching the solenoid coil

1 Solenoid coil
2 Concealed manual override "N9"
3 Mounting nut with hexagon SW32
4 Terminal box
5 Identical seal rings for ports A, B, and T, seal ring for port P
6 Plus-1 plate
7 Name plate
8 **Valve mounting screws**
For reasons of stability, exclusively use the following valve mounting screws:
4 hexagon socket head cap screws
ISO 4762 M5x90-10.9-flZn-240h-L
(friction coefficient 0.09 - 0.14 according to VDA 235-101)
(included in the scope of delivery)
9 Porting pattern according to DIN 24340-A6

Subplates

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

with dimensions as in the data sheet 45052
(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.

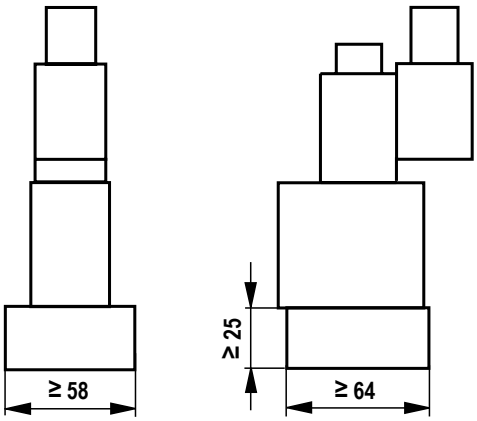
The G...FE/ZN versions are free from aluminum and/or magnesium and galvanized.

Installation conditions (dimensions in mm)

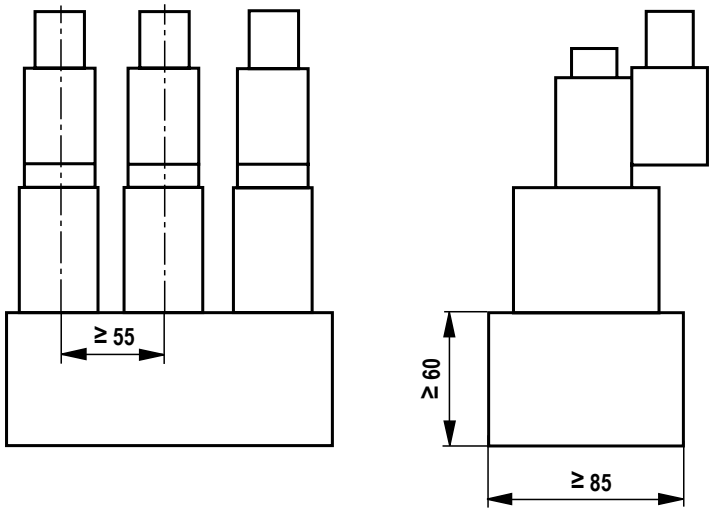
	Individual assembly	Bank assembly
Subplate dimensions	Minimum dimensions Length ≥ 64, width ≥ 58, height ≥ 25	Minimum cross-section Height ≥ 60, width ≥ 85
Thermal conductivity of the subplate	≥ 38 W/mK (EN-GJS-500-7)	
Minimum distance between the longitudinal valve axes	≥ 55 mm	

Schematic diagram

Individual assembly



Bank assembly



Important:

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

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Notes

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