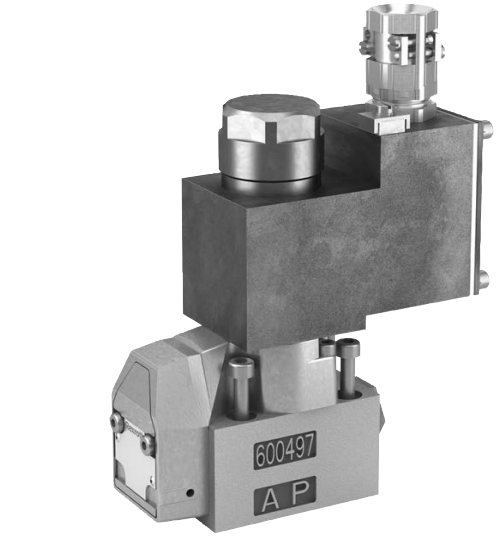
RE 22058-XE
Edition: 2021-01
Replaces: 2019-09
RA78491033_AB

rexroth
A Bosch Company

Directional seat valves, direct operated, with solenoid actuation

Type SEW ...XE



H8094

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

CE

ATEX units
For potentially explosive atmospheres

Information on explosion protection:
- Area of application in accordance with the Explosion Protection Directive 2014/34/EU: **II 2G; II 2D**
- Type of protection valve:
  - Ex h IIC T4 Gb X according to EN 80079-36
  - Ex h IIIC T115°C Db X according to EN 80079-36
- Type of protection, solenoid coil:
  - Ex eb mb IIC T4 Gb according to EN 60079-7 / EN 60079-18
  - Ex tb IIIC T115°C Db according to EN 60079-31
- Solenoid coil certified according to IECEx

Features

- 2/2, 3/2 or 4/2-way version
- For intended use in potentially explosive atmosphere
- Porting pattern according to ISO 4401-03-02-0-05 (however, **without** locating hole)
- Safe switching also with longer standstill periods under pressure
- Air-gap DC and AC solenoids
- Solenoid coil is rotatable by 90°
- Electrical connection with individual connection and cable gland
- With concealed manual override, optional

Contents

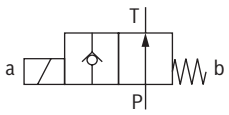
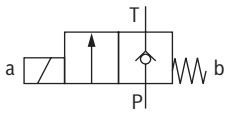
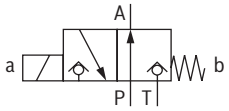
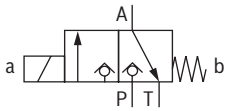
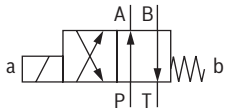
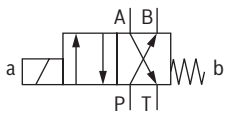
☞ **Notice:** The documentation version with which the product was supplied is valid.

Ordering code

01	02	03	04	05	06		07	08	09	10	11	12		13	14
M	**–**		**SEW**	**6**		**3X**	**/**	**420**	**M**			**XE**	**Z2**	**/**		

01	Mineral oil	**M**
02	2 main ports	**2**
	3 main ports	**3**
	4 main ports	**4**
03	Seat valve	**SEW**
04	Size 6	**6**

Symbols

05	Main ports	2	3	4	
		✓	–	–	**P**
		✓	–	–	**N**
		–	✓	–	**U**
		–	✓	–	**C**
		–	–	✓	**D**
		–	–	✓	**Y**

06	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**
07	Operating pressure 420 bar	**420**
08	Solenoid (air-gap)	**M**
09	Direct voltage 24 V	**G24**
	Direct voltage 110 V	**G110**
	AC voltage 110 V, 50/60 Hz	**W110R**
	AC voltage 230 V, 50/60 Hz	**W230R**

Bosch Rexroth AG, RE 22058-XE, edition: 2021-01

Ordering code

01		02	03	04	05	06		07	08	09	10	11	12		13	14
M	**–**		**SEW**	**6**		**3X**	**/**	**420**	**M**			**XE**	**Z2**	**/**		

10	**With** concealed manual override	**N9**
	Without manual override	**no code**

Explosion protection

11	"Increased safety"	**XE**
	For details, see information on explosion protection, page 7	

Electrical connection

12	Solenoid with terminal box and cable gland	**Z2**
	For details of electrical connections, see page 15	

13	**Without** check valve insert, **without** throttle insert	**no code**
	With check valve insert	**P**
	Throttle Ø 0.8 mm	**B08**
	Throttle Ø 1.2 mm	**B12**
	Throttle Ø 1.5 mm	**B15**
	Throttle Ø 1.8 mm	**B18**
	Throttle Ø 2.0 mm	**B20**
	Throttle Ø 2.2 mm	**B22**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 6)

14	NBR seals	**no code**
	FKM seals	**V**

☞ **Notice:**
Representation of the symbols according to DIN ISO 1219-1.

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

General information

Directional valves of the type SEW are directional seat valves with solenoid actuation. They control start, stop and direction of flow.

The directional valves basically comprise a housing (1), the solenoid (2), the hardened valve system (3) and the control spool (8).

For unobjectionable functioning, the hydraulic system has to be bled properly.

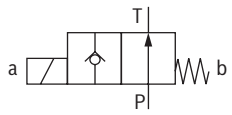
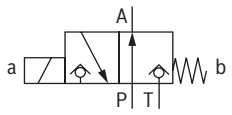
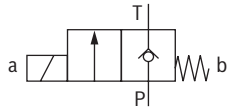
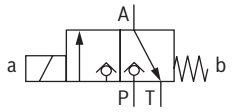
Basic principle

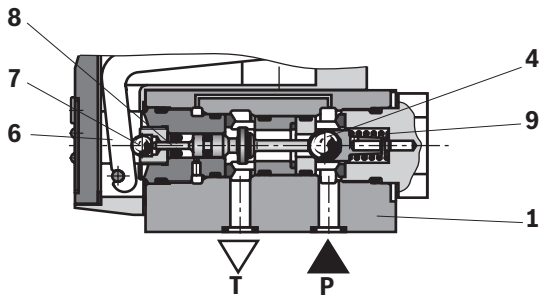
In the initial position, the control spool (8) is pressed onto the seat by the spring (9) and in spool position by the solenoid (2). The force of the solenoid (2) acts via the angled lever (6) and the ball (7) on the control spool (8) that is sealed on two sides. The chamber between the two sealing elements is connected to port P. Thus, the valve system (3) is pressure-compensated in relation to the actuating forces (solenoid or return spring).

☞ **Notices:**

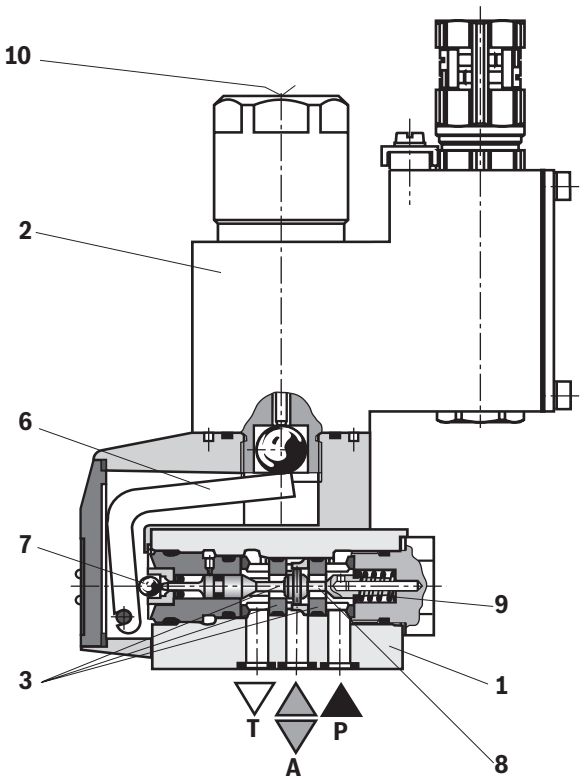
- The 3/2 directional seat valves have a "negative spool overlap". Therefore, port T must always be connected. That means that during the switching process – from the starting of the opening of one valve seat to the closing of the other valve seat – ports P–A–T are connected with each other. However, this process takes 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.
- Make sure that the specified maximum flow is not exceeded. A throttle insert must be used for flow limitation, if necessary (see page 14).

The seat arrangement offers the following options:

	2/2 directional seat valve	3/2 directional seat valve
Symbol	**P** 	**U** 
Initial position	P and T connected	P and A connected, T blocked
Spool position	P blocked	P blocked, A and T connected
Symbol	**N** 	**C** 
Initial position	P blocked	P blocked, A and T connected
Spool position	P and T connected	P and A connected, T blocked



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



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

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

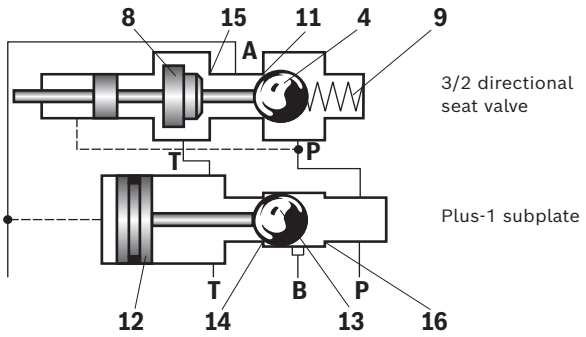
With a sandwich plate, the **Plus-1 subplate,** under the 3/2 directional seat valve, the function of a 4/2 directional seat valve is achieved.

Function of the Plus-1 subplate

- Initial position
  The main valve is not actuated. 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 actuated, 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 subplate has a "positive spool overlap".

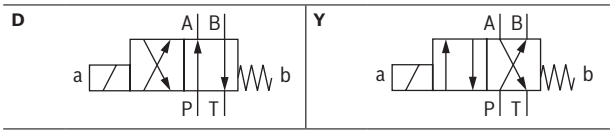
☞ **Notices:**
When operating 4/2 directional seat valves to control differential cylinders, the annulus area of the cylinder must only be connected with connection A of the valve. Otherwise, pressure peaks can be created while switching, which will exceed the maximum operating pressure.

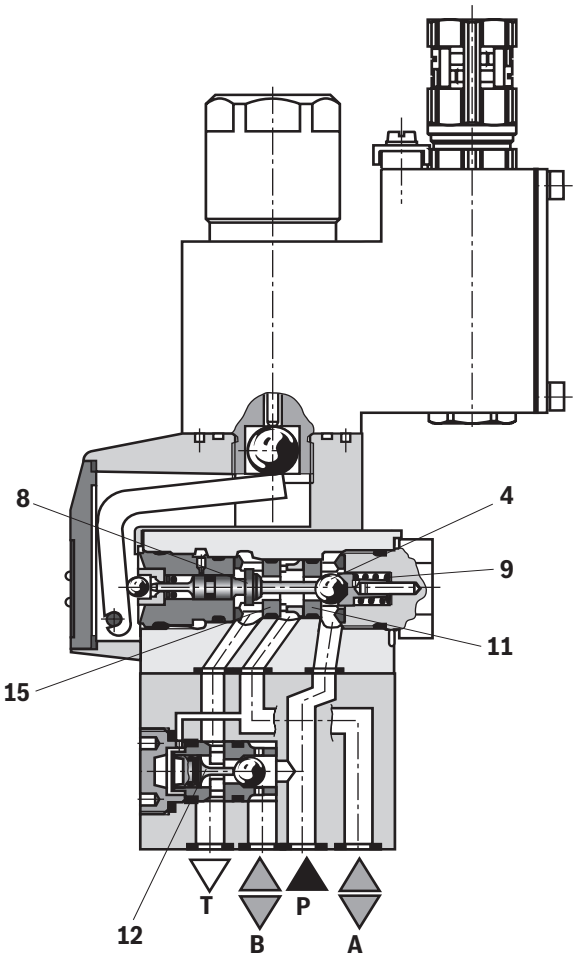
Schematic illustration: Initial position



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

Symbols





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

RE 22058-XE, edition: 2021-01, **Bosch Rexroth AG**

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

General			
Installation position			any
Ambient temperature range		°C	–20 ... +70 [1]
Storage temperature range		°C	+5 ... +40
Maximum storage time		Years	1
Maximum admissible acceleration a_{max}		g	10
Weight	▶ 2/2 and 3/2 directional seat valve	kg	3.2
	▶ 4/2 directional seat valve	kg	4.1
Surface protection			Galvanized
Maximum surface temperature		°C	See information on explosion protection, page 7

Hydraulic		
Maximum operating pressure	bar	See table page 9
Maximum flow	l/min	25
Hydraulic fluid		See table below
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 [2]

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP, HLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**
- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:** If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.
- **Flame-resistant – containing water:**
  - Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended – if possible specific to the installation – to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
  - Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, a maximum duty cycle of 50% in continuous operation has to be set for on/off valves (measuring period 300 s). If this is not possible due to the function, an energy-reducing control of these components is recommended, e.g. via a PWM plug-in amplifier.

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

[2] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.
Available filters can be found at www.boschrexroth.com/filter.

Bosch Rexroth AG, RE 22058-XE, edition: 2021-01

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

Electric			
Voltage type		Direct voltage	Alternating voltage
Available voltages	V	24, 110	110, 230
Voltage tolerance (nominal voltage)	%	–5 / +10	
Admissible residual ripple	%	< 5	–
Duty cycle / operating mode according to VDE 0580		S1 (continuous operation)	
Switching times according to ISO 6403	ms	See table page 8	
Maximum switching frequency	1/h	15000	7200
Nominal power at ambient temperature of 20 °C	W	17	
Maximum power with 1.1 x nominal voltage and an ambient temperature of 20 °C	W	20.6	
Protection class according to EN 60529		IP66 (With correctly installed electrical connection)	

Information on explosion protection			
Area of application according to Directive 2014/34/EU		II 2G	II 2D
Type of protection of valve according to EN 80079-36 [3]		Ex h IIC T4 Gb X	Ex h IIIC T115°C Db X
Maximum surface temperature [4]	°C	115	
Temperature class		T4	–
Type of protection, solenoid coil according to EN 60079-7 / EN 60079-18 / EN 60079-31		Ex eb mb IIC T4 Gb	Ex tb IIIC T115°C Db
Type examination certificate, solenoid coil		BVS 20 ATEX E 009 X	
"IECEx Certificate of Conformity" for solenoid coil		IECEx BVS 20.0007 X	

[3] Ex h: structural safety c according to EN 80079-37.
[4] Surface temperature > 50 °C, provide contact protection.

Special application conditions for safe application:
- Connection lines must be passed in a strain-relieved way. The first mounting point must be within 150 mm of the cable and line entry.
- 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 several solenoids are energized simultaneously +60 °C
- The maximum temperature of the surface of the valve jacket is 115 °C. This has to be considered when selecting the connection cable and/or contact of the connection cable with the surface of the jacket is to be prevented.

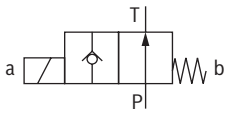
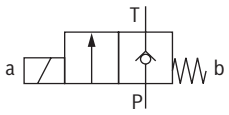
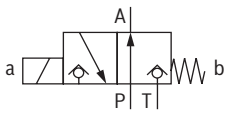
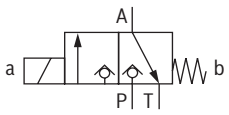
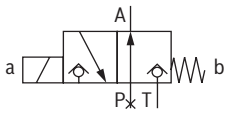
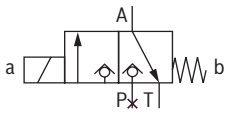
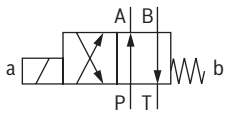
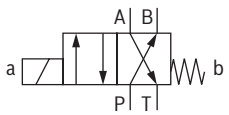
Switching times (installation position: solenoid horizontal)

Pressure ***p*** in bar	**Flow** q_V in l/min	**Switching times** ***t*** in ms													
		Direct voltage						Alternating voltage							
		t_{ON} (without tank pressure)				t_{OFF}		t_{ON} (without tank pressure)				t_{OFF}			
		U	**C**	**D**	**Y**	**U, C**	**D, 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

☞ **Notice:**
The switching times were determined at a hydraulic fluid temperature of 40 °C and a viscosity of 46 cSt. Deviating hydraulic fluid temperatures can result in different switching times! Switching times change dependent on operating time and application conditions.

Performance limits

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

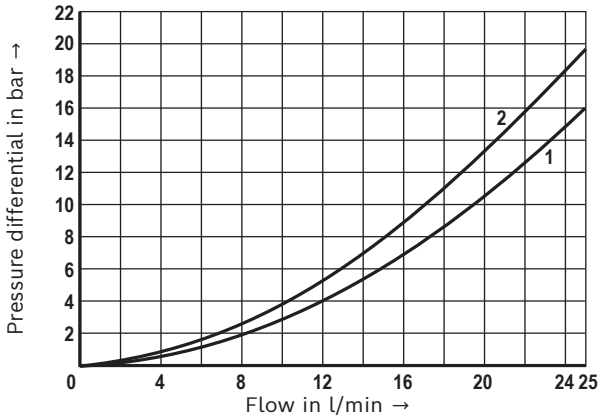
	Symbol	Comment	Operating pressure in bar P	A	B	T	Flow in l/min
2-way circuit	**P** 	Pressure at P ≥ T	420			100	25
	N 		420			100	25
3-way circuit	**U** 	Pressure at P ≥ A ≥ T	420	420		100	25
	C 		420	420		100	25
2-way circuit (as unloading function only)	**U** 	Before switching from the initial position 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 subplate P > A ≥ B > T	420	420	420	100	25
	Y 	Valve (symbol "C") in connection with Plus-1 subplate P > A ≥ B > T	420	420	420	100	25

Notices:

- Please observe the general information, page 11.
- The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.

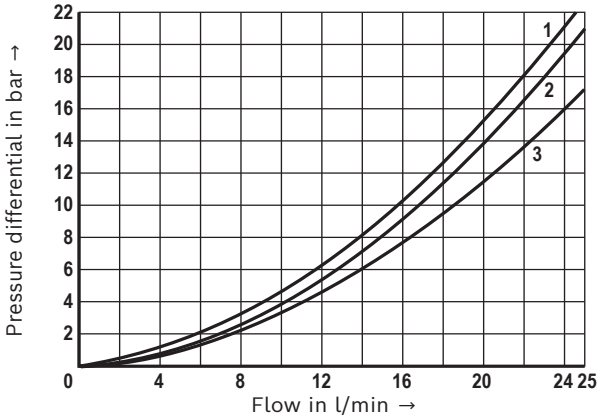
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

***Δp-q*V characteristic curves**
2/2 directional seat valve



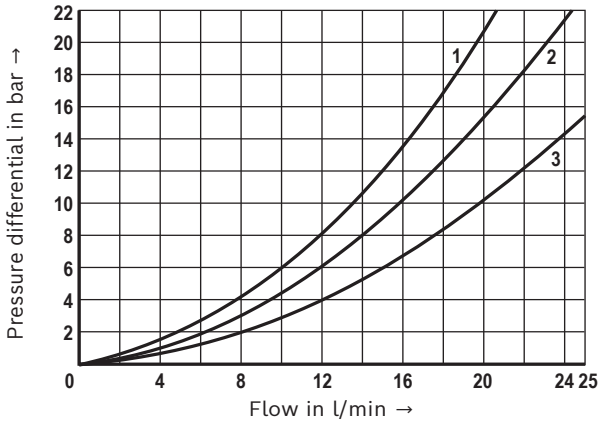
1 Symbol **N**, P → T
2 Symbol **P**, P → T

***Δp-q*V characteristic curves**
3/2 directional seat valve



1 Symbol **U** and **C**, A → T
2 Symbol **U**, P → A
3 Symbol **C**, P → A

***Δp-q*V characteristic curves**
4/2 directional seat valve

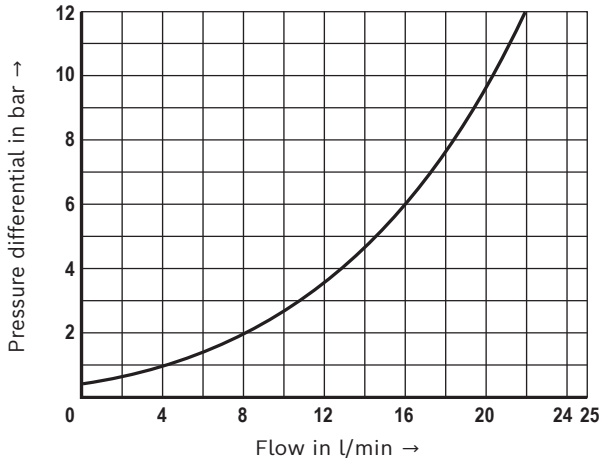


1 Symbol **D** and **Y**, A → T
2 Symbol **D** and **Y**, P → A
3 Symbol **D** and **Y**, P → B, B → T

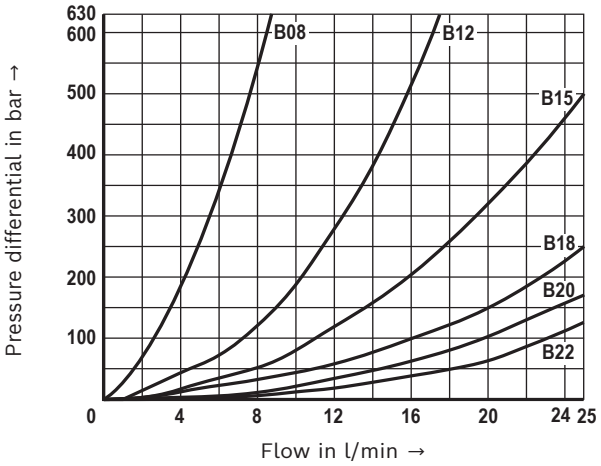
Characteristic curves

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

***Δp-q*V characteristic curves**
Check valve insert



***Δp-q*V characteristic curves**
Throttle insert



General information

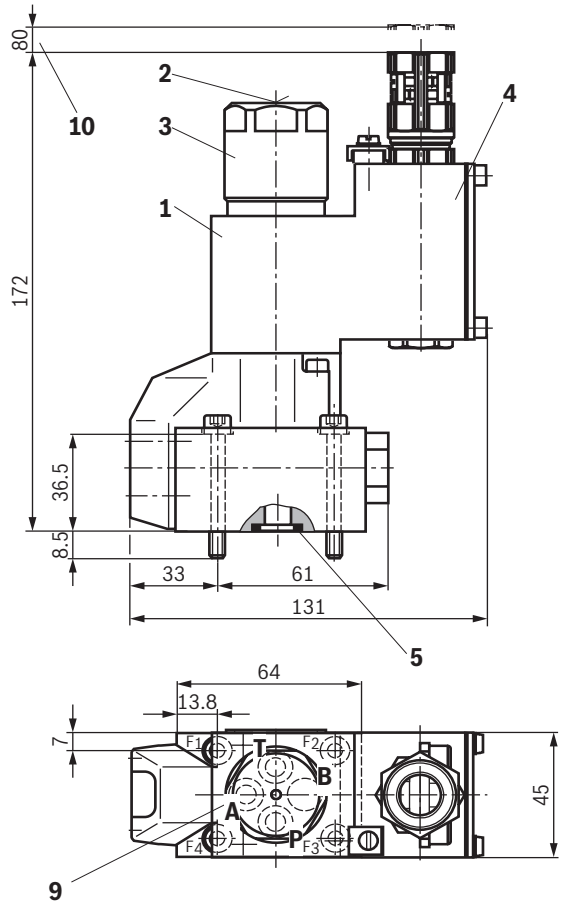
Seat valves can be used according to the spool symbols as well as the assigned operating pressures and flows (see performance limits, page 9).
In order to ensure safe functioning, it is absolutely necessary to observe the following:

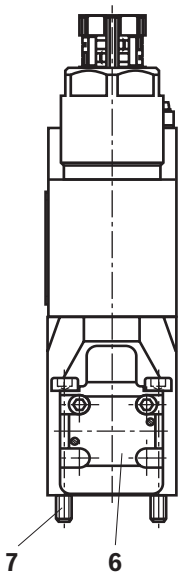
- In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: P ≥ A ≥ T (for design reasons).
- The ports P, A and T (3/2 directional seat valve) as well as P, A, B and T (4/2 directional seat valve) are clearly determined according to their tasks. They must not be exchanged or closed. The flow is only admissible in the direction of arrow.
- Seat valves have a negative spool overlap, i.e. during the switching process, there is leakage oil. However, this process takes place within such a short time that it is irrelevant in nearly all applications.
- The specified maximum flow must not be exceeded (use a throttle insert for flow limitation, if necessary).

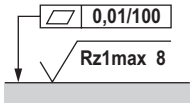
Plus-1 subplate:

- If the Plus-1 subplate (4/2 directional function) is used, the following lower operating values have to be observed:
  p_{min} = 8 bar, q_V > 3 l/min.
- Port T must always be connected.
- Observe the pressure level and pressure distribution.
- The flow is only admissible in the direction of arrow.

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







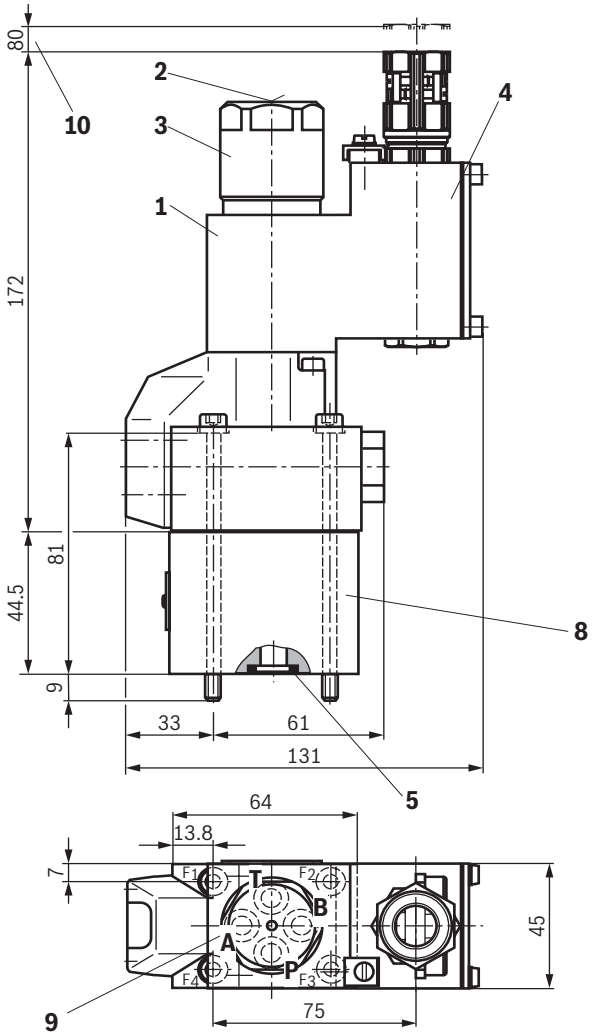
Required surface quality of the valve contact surface

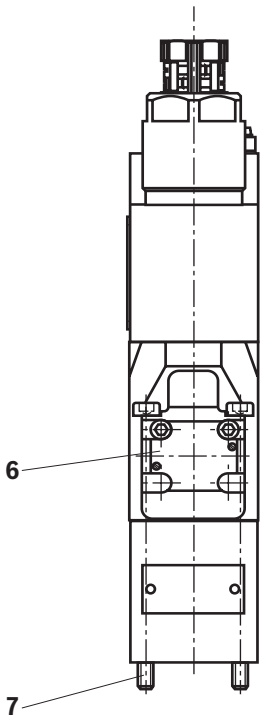
1 Solenoid coil
2 Concealed manual override "N9"
3 Mounting nut with hexagon SW32
4 Terminal box
5 Identical seal rings for ports A, B, and T, seal ring for port P
6 Name plate
7 **Valve mounting screws** (included in the scope of delivery)
4 hexagon socket head cap screws
ISO 4762 M5 x 45-10.9
(friction coefficient μ_{total} = 0.09 ... 0.14);
Tightening torque M_A = 7 Nm ±10%
Material no. **R913048087**
9 Porting pattern according to ISO 4401-03-02-0-05 (however, without locating hole)
Notice: With 3/2 directional seat valves, port B is designed as blind counterbore.
10 Space required to remove the solenoid coil

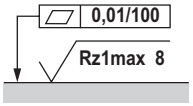
Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05, see data sheet 45100.

Notices:
- Subplates are no components in the sense of Directive 2014/34/EU and can be used after the manufacturer of the overall system has conducted an assessment of the risk of ignition. The "G...J3" versions are free from aluminum and/or free from magnesium and galvanized.
- The dimensions are nominal dimensions which are subject to tolerances.

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







Required surface quality of the valve contact surface

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** (included in the scope of delivery)
4 hexagon socket head cap screws
ISO 4762 M5 x 90-10.9
(Friction coefficient μ_{total} = 0.09 ... 0.14)
Tightening torque M_A = 7 Nm ±10%
Material no. **R913051578**
8 Plus-1 subplate
9 Porting pattern according to ISO 4401-03-02-0-05 (however, without locating hole)
10 Space required to remove the solenoid coil

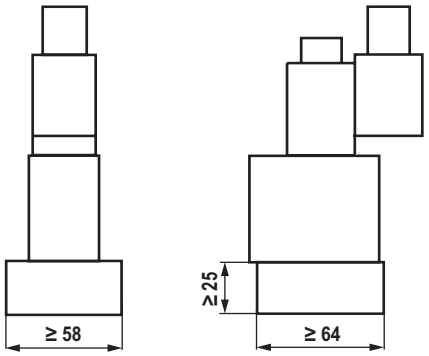
Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05, see data sheet 45100.

Notices:
- Subplates are no components in the sense of Directive 2014/34/EU and can be used after the manufacturer of the overall system has conducted an assessment of the risk of ignition. The "G...J3" versions are free from aluminum and/or free from magnesium and galvanized.
- The dimensions are nominal dimensions which are subject to tolerances.

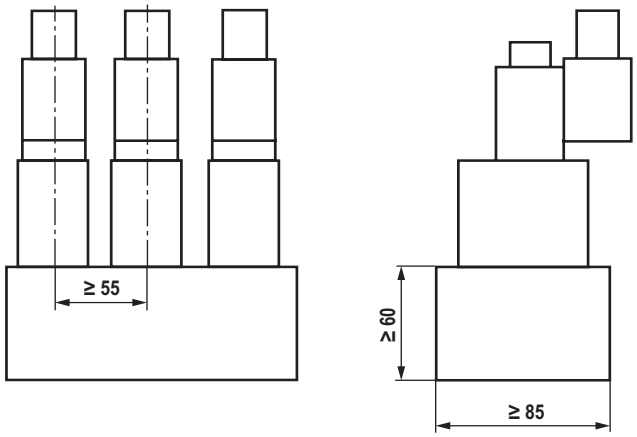
Installation conditions
(dimensions in mm)

	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	≥ 36.2 W/mK	
Minimum distance between the longitudinal valve axes	≥ 55	

Individual assembly



Bank assembly

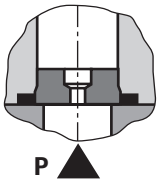


Notice:
Observe the "Special application conditions for safe application" on page 7 with regard to the hydraulic fluid temperature.

Throttle insert

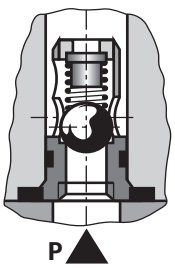
The use of a throttle insert is required when due to prevailing operating conditions, flows can occur during the switching processes, which exceed the performance limit of the valve.

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



Check valve insert

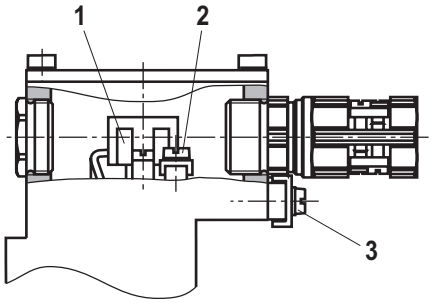
The check valve insert allows a free flow from P to A and closes A to P.



Electrical connection

The type-examination tested solenoid coil of the valve is equipped with a terminal box, a type-examination tested cable entry and a type-examination tested blind plug.
The connection is polarity-independent.
Solenoid coils to be connected to AC voltage are equipped with an integrated rectifier.

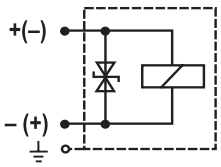
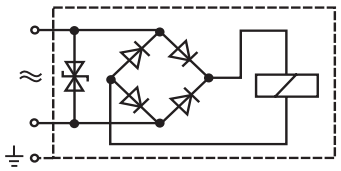
Notice:
When establishing the electrical connection, the protective grounding conductor (PE ⏚) has to be connected properly.



Properties of the connection terminals and mounting elements

Position	Function	Connectable line cross-section
1	Operating voltage connection	single-wire 0.75 ... 2.5 mm² finely stranded 0.75 ... 1.5 mm²
2	Connection for protective grounding conductor	single-wire max. 2.5 mm² finely stranded max. 1.5 mm²
3	Connection for potential equalization conductor	single-wire max. 6 mm² finely stranded max. 4 mm²

Connection line		
Line type		non-armored and non-shielded connection lines
Temperature rating	°C	≤–20 ... ≥+110
Line diameter	mm	7 ... 10.5

Direct voltage, polarity-independent	Alternating voltage
	

Notice:
Only use finely stranded conductors if they have pressed-on wire end ferrules.

Over-current fuse and switch-off voltage peaks

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, external miniature fuse: Medium time-lag (M) according to DIN 41571 and EN/IEC 60127	Maximum voltage value when switching off	Interference protection circuit
G24	24 VDC	0.708 ADC	800 mA	250 V	–90 V	Suppressor diode bi-directional
G110	110 VDC	0.155 ADC	200 mA	250 V	-390 V	
W110R	110 VAC	0.163 AAC	200 mA	250 V	-3 V	Bridge rectifier and suppressor diode
W230R	230 VAC	0.078 AAC	80 mA	250 V	-3 V	

☞ **Notice:**
A fuse which corresponds to the rated current according to DIN 41571 and EN / IEC 60127 has to be connected upstream 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 potentially explosive atmospheres or must be of an explosion-proof design.
When inductivities are switched off, voltage peaks result which may cause faults in the connected control electronics.

Further information

▶ Subplates	Data sheet 45100
▶ Use of non-electrical hydraulic components in an explosive environment (ATEX)	Data sheet 07011
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
▶ Directional seat valves, direct operated, with solenoid actuation	Operating instructions 22058-XE-B
▶ Selection of filters	
▶ Information on available spare parts	

Bosch Rexroth AG, RE 22058-XE, edition: 2021-01