2/2 and 3/2 directional seat valve with manual or fluid logics actuation

RE 22340-B1/11.12

English

Operating instructions

Size 6
Component series 3X
Maximum operating pressure 350 bar
Maximum flow 25 l/min

Similar figure

Applies to:

2/2 and 3/2 directional seat valve with manual or fluid logics actuation

Type **M-2SMM6...SO711**
M-3SMM6...SO711
M-3SH6...SO712

You can find further information on the correct handling of Bosch Rexroth hydraulic products in our publication "Hydraulic valves for industrial applications", RE 07600-B/08.2012

The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. Data available in catalogs are no guaranteed properties. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

The original operating instructions were prepared in German.

Contents

Contents

1 About this documentation

1.1 Validity of the documentation

This documentation applies to the 2/2 and 3/2 directional seat valve with manual or fluid logics actuation:

- M-2SMM6...SO711
- M-3SMM6...SO711
- M-3SH6...SO712

This documentation is intended for machine manufacturers, assemblers and system end-users.

This documentation contains important information on the safe and proper transport, assembly, commissioning, operation, use, maintenance, simple troubleshooting, disassembly and disposal of the directional seat valve.

► You should read this documentation thoroughly, and in particular the chap. 2 "Safety instructions" before working with the directional seat valve.

1.2 Required and amending documentation

► The product must not be commissioned until you have been provided with the documentation marked with the book symbol 🕮 and you have understood and observed it.

Table 1: Required and amending documentation

	Title	Document number	Document type
🕮	Hydraulic valves for industrial applications	RE 07600-B/08.2012	Operating instructions

1.3 Representation of information

Consistent safety instructions, symbols, terms and abbreviations are used so that you can quickly and safely work with your directional seat valve using this documentation. For a better understanding, they are explained in the following sections.

1.3.1 Safety instructions

In this documentation, safety instructions are indicated in section 2.6 "Product- and technology-dependent safety instructions" and whenever sequences of actions are explained which bear the danger of personal injury or damage to property. The measures described for the hazard avoidance must be observed in any case. The safety instructions describe measures for the avoidance of possible hazards for persons and objects.

Safety instructions are set out as follows:

> **⚠ SIGNAL WORD**
>
> **Type and source of danger**
>
> Consequences in case of non-compliance
>
> ▶ Measures for the hazard avoidance

- **Warning sign:** Draws attention to the danger
- **Signal word:** Identifies the degree of danger
- **Type and source of danger:** Specifies the type and source of danger
- **Consequences:** Describes the consequences in case of non-compliance
- **Precaution:** Specifies how the danger can be prevented

Table 2: Risk classes according to ANSI Z535.6-2006

Warning sign, signal word	Meaning
⚠ DANGER	Indicates a dangerous situation which will cause death or severe personal injuries if not avoided.
⚠ WARNING	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided.
⚠ CAUTION	Indicates a dangerous situation which may cause minor or medium personal injuries if not avoided.
NOTICE	Damage to property: The directional seat valve or the environment could be damaged.

1.3.2 Symbols

The following symbols indicate notices which are not safety-relevant but ensure performance of the directional seat valve and allow you to use the directional seat valve perfectly.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the directional seat valve cannot be used and/or operated optimally.
▶	Individual, self-dependent action.
1. 2. 3.	Numbered instruction: The numbers indicate that the actions must be carried out one after the other.

2 Safety instructions

2.1 General information on this chapter

The directional seat valve was designed and manufactured according to the generally accepted code of practice. However, there is still the danger of personal injury and damage to property if you do not observe this chapter and the safety instructions in this documentation.

- ▶ Read this documentation completely and thoroughly before working with the directional seat valve.
- ▶ Keep this documentation in a location where it is accessible to all users at all times.
- ▶ Always include the required documentation when you pass the directional seat valve on to third parties.

2.2 Intended use

The directional seat valve is a hydraulic component.

You may use the directional seat valve as follows:

- Compliance with the application and environmental conditions according to the technical data.
- Compliance with the specified performance limits.
- Use in the original condition, without damage.
- Repair by customers is not admissible.

The directional seat valve is exclusively intended for the professional use and not for private use.

Intended use includes having read and understood this documentation completely, especially the chapter 2 "Safety instructions".

2.3 Improper use

Any use deviating from the intended use is improper and thus not admissible.

Improper use of the directional seat valve includes:

- Incorrect storage.
- Incorrect transport.
- Lack of cleanliness during storage and assembly.
- Incorrect installation.
- Use of inappropriate/non-admissible hydraulic fluids.
- Exceedance of the specified maximum pressures.
- Operation outside the approved temperature range.

Bosch Rexroth AG does not assume any liability for damage caused by improper use. The user assumes all risks involved with improper use.

2.4 Qualification of personnel

Handling the directional seat valve requires basic knowledge of mechanics, hydraulics and electrics as well as knowledge of the appropriate technical terms. In order to ensure safe use, the activities described in the documentation may only be carried out by corresponding experts or instructed persons under the direction and supervision of an expert.

Experts are those who can recognize potential dangers and apply the appropriate safety measures due to their technical training, knowledge and experience, as well as their understanding of the relevant provisions pertaining to the work to be undertaken. An expert must observe the relevant specific professional rules.

Bosch Rexroth offers measures supporting the training in specific fields. You can find an overview of the training contents on the Internet at: www.boschrexroth.de/didactic.

2.5 General safety instructions

- Observe the valid regulations on accident prevention and for environmental protection.
- Observe all other safety regulations and provisions of the country where the directional seat valve is implemented/used.
- Do not commission the directional seat valve until you can be sure that the end product (for example a machine or system) where the Rexroth directional seat valve is installed complies with the country-specific provisions, safety regulations and standards of the application.
- Observe all notices on the directional seat valve.
- Comply with the technical data and environmental conditions specified in the operating instructions.
- Exclusively use Rexroth directional seat valves in good technical order and condition.
- Only use accessories and spare parts authorized by Bosch Rexroth.
- Persons who assemble, operate, disassemble or maintain Rexroth directional seat valves must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to react.

2.6 Product- and technology-dependant safety instructions

⚠ WARNING

Pressurized system parts and leaking hydraulic fluid!

When working at hydraulic systems with stored pressure energy (accumulator or cylinders working under gravity), valves may even be pressurized after the pressure supply has been switched off. During assembly and disassembly works, the directional seat valves or parts may fly around and cause personal injuries and/or damage to property. There is moreover the danger of serious injury caused by a powerful leaking hydraulic fluid jet.

- Ensure before working at the directional seat valve that the hydraulic system is depressurized.
- Completely unload the pressure at machines and systems before working at the valve.

Non-compliance with functional safety!

Directional seat valves control movements in machines or systems. In case of faults, persons may be caught by the system, kicked away or bruised.

- When setting up your circuit, observe functional safety e.g.: EN ISO 13849.

Incorrect fastening!

Mounting of the valves with valve mounting screws of reduced stability, insufficient mounting or fastening at blocks and plates with insufficient stability may lead to the directional seat valve becoming loose and falling down. Consequently, hydraulic fluid may leak and lead to personal injuries and/or damage to property. Special care must be taken with directional seat valves with suspended installation.

- Completely assemble the directional seat valve according to the assembly specifications by means of suitable assembly aids.
- Only assemble the valves at blocks or plates suitable for the weight of the valve.
- Comply with tightening torques and screw stabilities.

Missing equipotential bonding!

Electrostatic processes, an incorrect earthing concept or missing equipotential bonding may lead to malfunction or uncontrolled movements of the machine!

- Provide for correct earthing and provide for proper equipotential bonding.
- The subplate to which the directional seat valve is attached must be electrically conductive and included in the equipotential bonding according to EN 60079-14 and IEC 60364-4-41.

⚠ CAUTION

Contaminated hydraulic fluid!

Contamination in the hydraulic fluid may cause functional failures e.g. jamming or blocking of nozzles of the directional seat valve. In the worst case, this may result in unexpected system movements and thus constitute a risk of injury for persons.

- Ensure adequate hydraulic fluid cleanliness according to the cleanliness classes of the directional seat valve over the entire operating range.

Hot surfaces!

Directional seat valves may heat up considerably during operation. This may lead to burns in case of skin contact.

- Avoid contact with the directional seat valve during operation.
- Allow the valve to cool down sufficiently before touching it or wear protective gloves.
- If necessary, attach protective covers.

Exceedance of the maximum temperatures!

Use of the directional seat valves outside the approved temperature ranges may lead to functional failures. Due to uncontrolled behavior of the directional seat valve persons may thus be caught by the system, kicked away or bruised.

- Only use the directional seat valve within the intended environmental and hydraulic fluid temperature range.

Leakage in case of incorrect working temperatures!

Use of the directional seat valves outside the approved temperature ranges may lead to permanent leakage at the directional seat valves. Thus, hydraulic fluid in the form of a leaking hydraulic fluid jet may injure persons, lead to damage to property and endanger the environment.

- Only use the directional seat valve within the intended environmental and hydraulic fluid temperature range.
- In case of leakage, immediately exchange damaged seal rings or the directional seat valve.

Corrosion!

If the valve is used in humid environments or water, the directional seat valves and valve mounting screws may corrode. Thus, the valve mounting screws and the directional seat valves loose their stability and may become loose and thus constitute a risk of injury.

- Insert valve mounting screws with adequate corrosion protection and exchange the valve mounting screws with serious corrosion damage.
- Provide for adequate corrosion protection and exchange directional seat valves with serious corrosion damage at an early stage.

Contact with salt water leads to increased corrosion at the directional seat valve. Thus, valve mounting and plug screws as well as moveable components like hand levers may be chemically corroded and damaged.
You should thus take suitable corrosion protection measures.

3 General information on damage to property and damage to the product

The warranty only applies to the supplied configuration.

- The claim to warranty expires if the product is incorrectly assembled, commissioned and operated, not used as intended and/or handled improperly.

NOTICE

Inadmissible mechanical load!

Impact or shock forces on the directional seat valve may damage or even destroy it.

- ▶ Never use the directional seat valve as handle or step. Do not place/put any objects on top of it.

Dirt and foreign particles in the hydraulic valve!

Penetrating dirt and foreign particles in the directional seat valve lead to wear and malfunctions. So safe function of the directional seat valve is no longer ensured.

- ▶ During assembly, ensure utmost cleanliness in order to prevent foreign particles such as welding beads or metal chips from getting into the hydraulic lines.
- ▶ Do not use linting fabric for cleaning.
- ▶ Ensure that no cleaning agents are able to penetrate the hydraulic system.

Hydraulic fluid harmful to the environment!

Leaking hydraulic fluid leads to environmental pollution.

- ▶ Immediately remedy possible leakage.
- ▶ Dispose of the hydraulic fluid in accordance with the currently applicable national regulations in your country.

Damage to property due to frost in the hydraulic valve (SH variant)!

In order to prevent freezing of the control spool in the SH valve, condensation in the spring chamber caused by condensed water must be avoided.

- ▶ Connect air-tight piping at **one of the two** ports for dry air (see fig. 6) (connection thread G1/8, Ma = 12 Nm ± 1.2 Nm) supplying the spring chamber with dry air.
- ▶ In the spring chamber, no overpressure or underpressure is admissible. It must be noted in this connection that due to the ambient temperature range from –43 °C to +60 °C, the contracting and expanding air in the spring chamber creates a pressure drop and increase of ±0.6 bar. Apart from that, the actuation of the valve results in a pressure increase of 0.3 bar.
- ▶ The customer may also select different piping; the conditions specified above must, however, be completely satisfied.

4 Scope of delivery

The scope of delivery includes:

- 2/2 and 3/2 directional seat valve with manual or fluid logics actuation
  Type M-2SMM6...SO711
  M-3SMM6...SO711
  M-3SH6...SO712

▶ Check the scope of delivery for completeness.
▶ Check the scope of delivery for possible transport damage, see section 6 "Transport and storage".

Accessories such as valve mounting screws are not included in the scope of delivery and must be ordered separately. See chapter 13.1 "Available accessories".

In case of complaints, please contact Bosch Rexroth AG, see section 15.2 "List of addresses".

5 Information on this product

5.1 Performance description

- Direct operated directional seat valve with manual or fluid logics actuation.
- Porting pattern according to DIN 24340 form A (**without** locating hole).
- Safe switching also with longer standstill periods under pressure.
- Types of actuation:
  – Manual (hand lever)
  – Hydraulic
- Blocked connection tight.

5.2 Ordering code

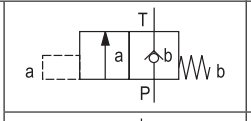
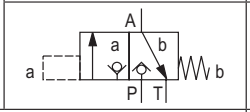
Table 4: Type code

M–		6		3X/	350		

2 main ports (only size 6) **= 2**
3 main ports **= 3**

Seat valve, direct operated
hydraulically operated **= SH**
manually operated (hand lever) **= SMM**

Size 6 **= 6**

Main ports	2	3	4	
Symbols 	●	–	–	**= N**
	–	●	–	**= C**
● = available				

SO 711 [1]
SO 712 [2]

no code = without check valve insert, without throttle insert
B08 = Throttle Ø 0.8 mm
B12 = Throttle Ø 1.2 mm
Other orifices upon request

350 = Operating pressure 350 bar

no code = without detent
F = with detent (only type SMM)

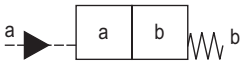
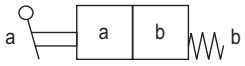
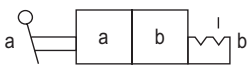
3X = Component series 30 to 39
(30 to 39: Unchanged installation and connection dimensions)

[1] For the directional seat valve, an assessment of the risk of ignition is available for the purpose of qualification and certification.
Ambient temperature: See section 5.3.4 "Technical data"
Operating pressure: See section 5.3.4 "Technical data"
Seals for special medium silicone oil (PMS-20)

[2] For the directional seat valve, an assessment of the risk of ignition is available for the purpose of qualification and certification.
Ambient temperature: See section 5.3.4 "Technical data"
Operating pressure: See section 5.3.4 "Technical data"
Seals for special medium silicone oil (PMS-20)
More connections at the housing flange (actuation) for attachment of piping
Control pressure increased

5.2.1 Types of actuation

Table 5: Listing of the types of actuation

Hydraulic "SH"	Hand lever "SMM"
	
	"SMM...F" 

5.3 Product description

5.3.1 Function

The directional seat valve type M-2SMM6...SO711 / M-3SMM6...SO711 / M-3SH6...SO712 is a directional seat valve with manual or fluid logics actuation. It controls start, stop and direction of flow and basically comprises of the housing (1), actuation (2), the hardened valve system (3) as well as the ball/the spool (4) as closing element.

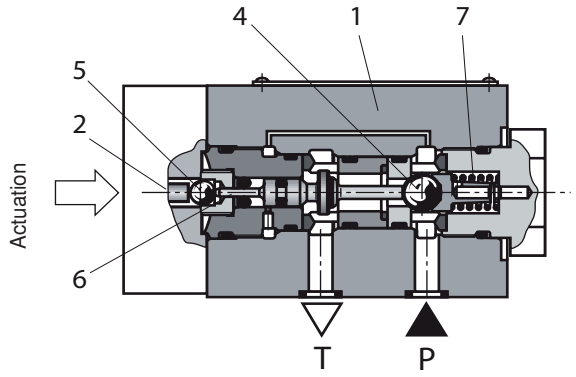
Basic principle

In the initial position, the ball/the spool (4) is pressed onto the seat by the spring (7), in spool position by the relevant type of actuation (2). The actuation force 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 (actuation or return spring).

The directional seat valves have a "negative spool overlap". Therefore, port T must always be connected. That means that during the switching process - before 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.

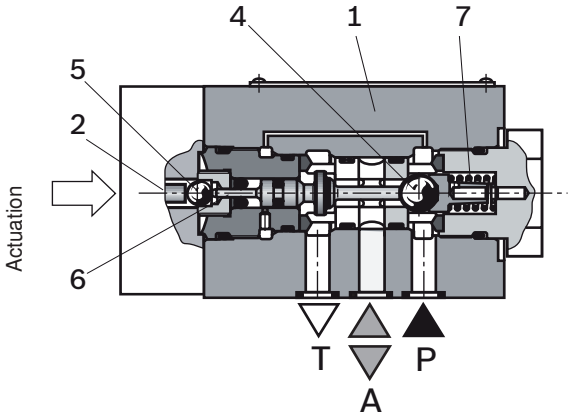
In order to switch the valve safely or maintain it in its spool position, the pressure situation must be as follows: $p_P \geq p_A \geq p_T$.

5.3.2 Section



Types of actuation see page 13

Fig. 1: Section type M-2S..6N...



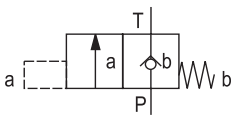
Types of actuation see page 13

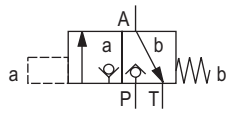
Fig. 2: Section type M-3S...6C...

5.3.3 Spool symbols

The seat arrangement offers the following options:

Table 6: Spool symbols

2/2 directional seat valve	
Symbol **"N"**	
Initial position	P blocked
Spool position	P and T connected

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

Information on this product

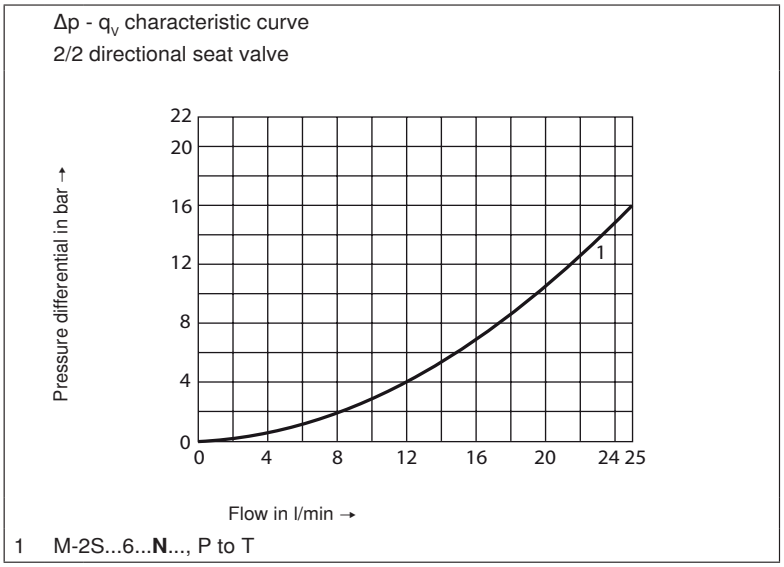
5.3.4 Technical data

Table 7: Technical data

general				
Size		Size	6	
Type			SH	SMM
Weight	-2/2 directional seat valve	kg	1.5	1.5
	-3/2 directional seat valve	kg	1.5	1.5
Pilot pressure	-Maximum	bar	275	-
	-Switch-on pressure	bar	≥ 40	-
	-Switch-off pressure	bar	≤ 15	-
Actuating force	-Maximum	N	–	50
Installation position			Any	
Ambient temperature range		°C	–30 °C to +60 °C –43 °C to –30 °C (max. 50 switching cycles per life cycle)	
Storage temperature range		°C	–60 °C to +70 °C	
Surface temperature		°C	+85 °C with a max. ambient temperature of +60 °C	
Surface protection			Coating, layer thickness max. 100 µm	
hydraulic				
Maximum operating pressure		bar	350	
Maximum flow		l/min	25	
Hydraulic fluid [1]			Mineral oil (HL, HLP) according to DIN 51524, PMS-20KG/PK, viscosity 8-12 cSt at 20 °C, > 180 cSt at –50 °C, > 470 cSt at –60 °C, max. 500 cSt (ignition temperature) ignition point > 180 °C	
Hydraulic fluid temperature range		°C	As ambient temperature range, see above	
Viscosity range		mm²/s	2.8 … 500	
Maximum permitted degree of contamination of the hydraulic fluid Cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]	

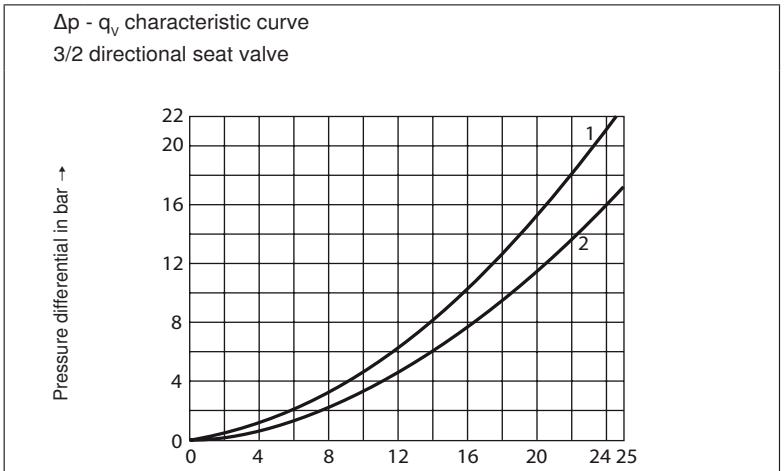
[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

5.3.5 Characteristic curve size 6 (measured with HLP46, ϑoil = 40 °C ± 5 °C)



1 M-2S...6...**N**..., P to T

Fig. 3: Characteristic curve 2/2 directional seat valve



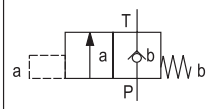
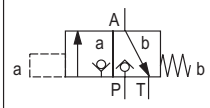
1 M-3S...6...**C**..., A to T
2 M-3S...6...**C**..., P to A

Fig. 4: Characteristic curve 3/2 directional seat valve

Information on this product

5.3.6 Performance limit (measured with HLP46, ϑoil = 40 °C ± 5 °C)

Table 8: Performance limit

	Symbol		Comment	Maximum operating pressure in bar				Flow in l/min
				P	A	B	T	Size 6
2-way circuit (2/2 directional seat valve)	**N**		$p_P \geq p_T$	350			100	25
3-way circuit	**C**		$p_P \geq p_A \geq p_T$	350	350		100	25

Please observe chapter 5.3.1 "Function"!

5.3.7 Unit dimensions type M-.SMM... (dimensions in mm)

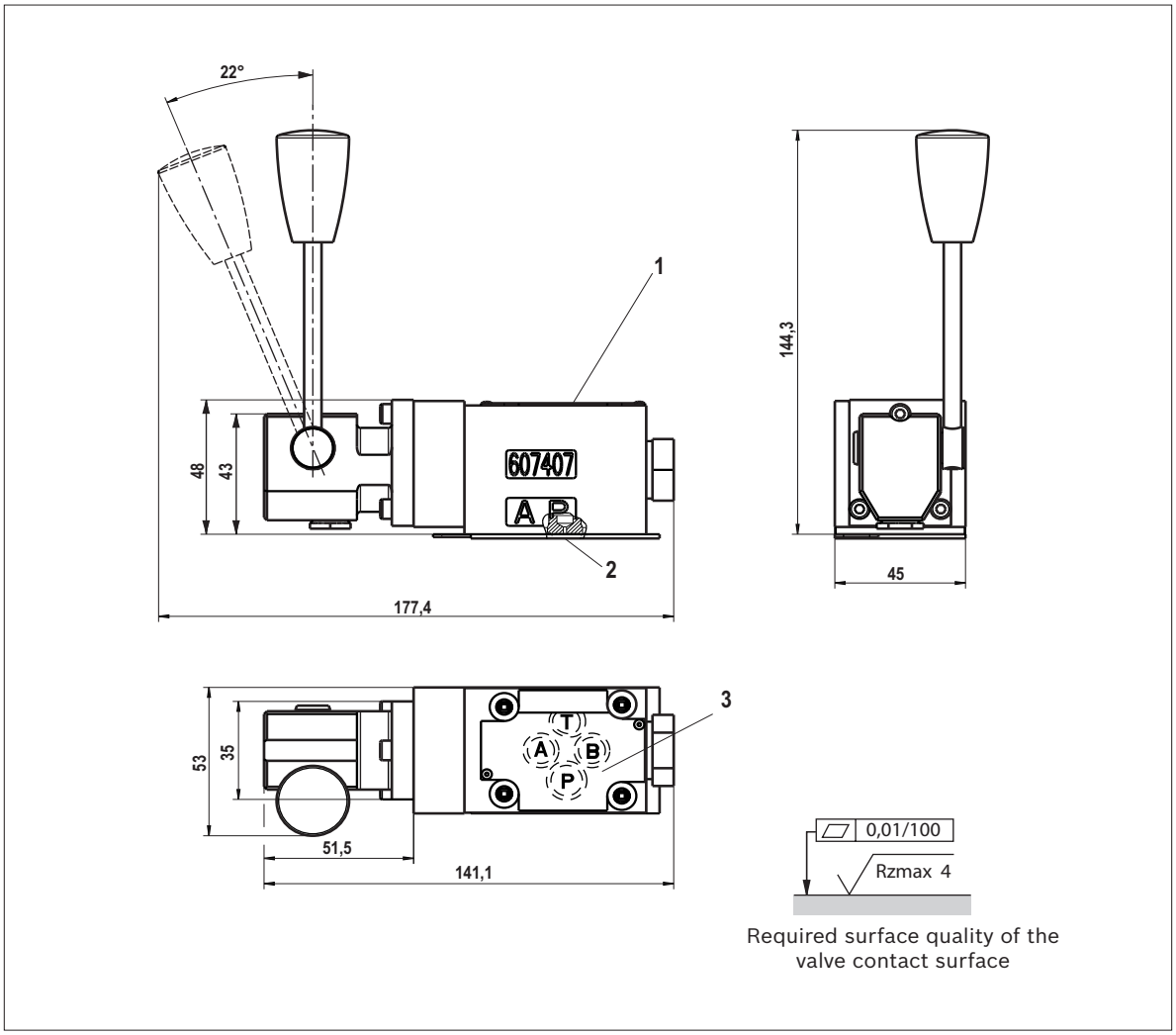


Fig. 5: Type M-.SMM... (dimensions are nominal dimensions)

1 Name plate
2 Throttle insert (it is installed in port P of the seat valve)
3 Porting pattern according to DIN 24340 form A

Valve mounting screws (separate order)
For reasons of stability, use of the following valve mounting screws is recommended:
4 hexagon socket head cap screws
ISO 4762 M5 x 50 - 10.9-flZn-240h-L
(friction coefficient μ = 0.09 to 0.14)
Material no. **R913000064**

5.3.8 Unit dimensions type M-.SH... (dimensions in mm)

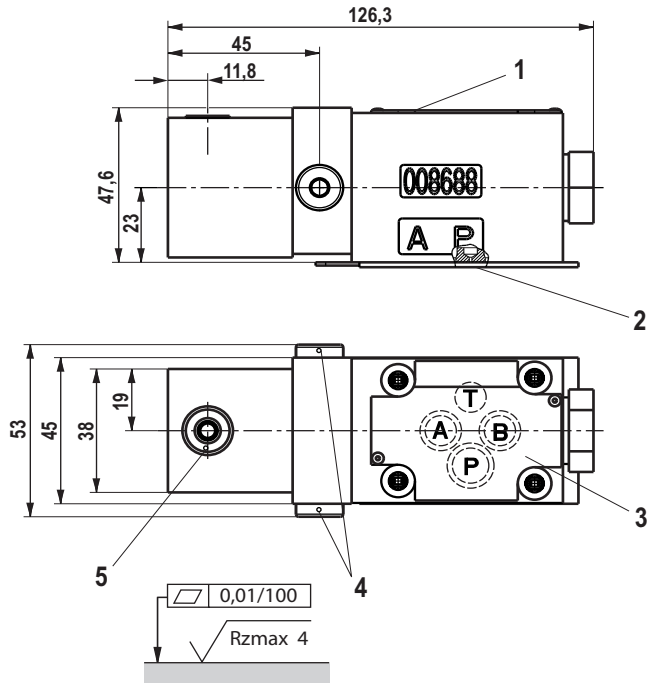


Fig. 6: Unit dimensions type M-.SMM... (dimensions are nominal dimensions)

1 Name plate
2 Throttle insert (it is installed in port P of the seat valve)
3 Porting pattern according to DIN 24340 form A
4 Connection for dry air supply
5 Connection for control line (connection thread G1/8)

Valve mounting screws (separate order)
For reasons of stability, use of the following valve mounting screws is recommended:
4 hexagon socket head cap screws
ISO 4762 M5 x 50 - 10.9-flZn-240h-L
(friction coefficient μ = 0.09 to 0.14)
Material no. **R913000064**

5.3.9 Throttle insert

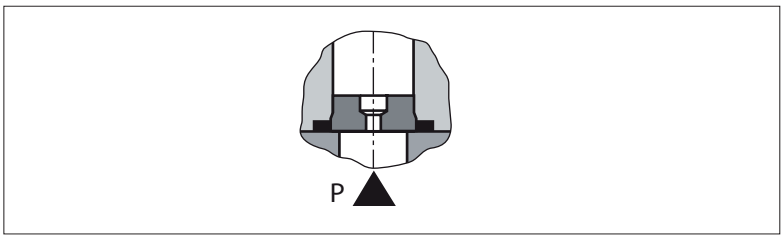


Fig. 7: Section throttle insert

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.

2/2 and 3/2 directional seat valve (see chapter 5.3.1 "Function")

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

5.4 Product identification

Information on the name plate

The name plate comprises the following information:

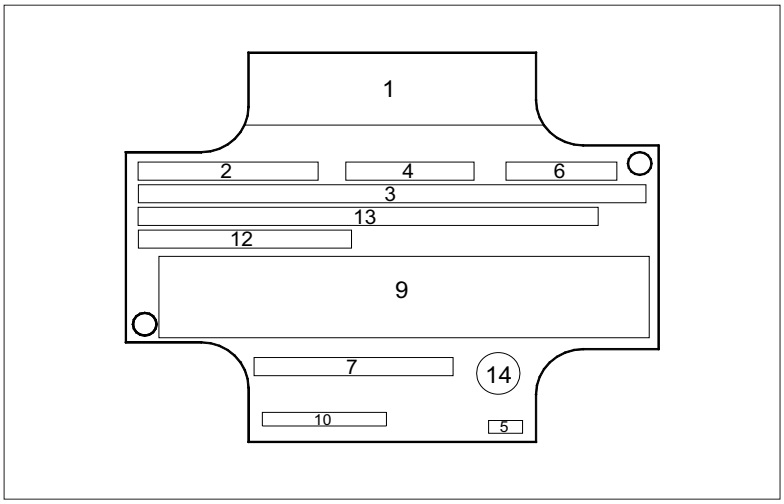


Fig. 8: Name plate

Table 9: Information on the name plate

No.	Type of information	Information or example
1	Manufacturer's logo	Rexroth
2	Material no. of the directional seat valve	e.g.: R901332659
3	Material short text	e.g.: M-2SH6C3X/350/B08SO712
5	Area / works number	708F
6	Date of production	e.g.: FD: 03W01
10	Designation of origin	Made in Germany
12	Customer's or production order number	e.g.: 123456789012345

6 Transport and storage

For transporting and storing the product always observe the environmental conditions specified in the technical data.

6.1 Transporting the product

Directional seat valves from Bosch-Rexroth are high-quality products. In order to prevent damage at the directional seat valve, transport the directional seat valves in the original packaging or with equivalent transport protection.

For information on the transport of the product please refer to chapter 6 of RE 07600-B.

6.2 Storing the directional seat valve

The directional seat valve is supplied in good order and condition.

For transporting and storing the product always observe the environmental conditions specified in the technical data. Improper storage may damage the directional seat valve.

The directional seat valve is suitable for storage for up to 6 months under the following conditions:

- Do not store the directional seat valve outdoors but in a well-ventilated room.
- Protect the directional seat valve against humidity, particularly ground humidity. Store the directional seat valve in the shelf or on a pallet.
- Store the directional seat valve in the original packaging or comparable packaging in order to protect it from dust and dirt.
- All connections at the directional seat valve must be covered with closing elements.
- After opening the transport packaging, it must be closed properly again for the storage. Use the original packaging for storage.
- Remove the covers at the hydraulic connections of the directional seat valve only before the assembly.

In case of storage of more than six months or in case sea transport is necessary, please consult Bosch Rexroth.

7 Assembly

7.1 Unpacking

Dispose of the packaging in accordance with the national conditions of your country.

7.2 Changes at the surface protection of the directional seat valve

⚠ WARNING

Electrostatic charging due to inadmissible surface protection!

Painting the directional seat valve with non-conductive surface coating leads to electric charging.

- ▶ Additional painting of the valve housing is not admissible.

7.3 Before the assembly

- ▶ Before assembling the directional seat valve check compliance of the type designation on the name plate with your order or job number.
- ▶ Observe the information on the maximum operating pressure on the name plate.

7.4 Necessary tools

In order to assemble the directional seat valve, you need standard tools only.

7.5 Assembling the directional seat valve

⚠ WARNING

Incorrect assembly of plug screws and lines!

Improperly fastened plug screws and lines may become loose during subsequent operation and fly around due to the pressure and thus cause serious injuries.

- Only pressurize your system after all plug screws and lines have been completely and properly mounted according to the specifications.

⚠ CAUTION

Insufficient installation space!

Insufficient installation space may lead to jamming or abrasions in case of actuation and adjustment works at the directional seat valve.

- Provide for sufficient installation space.
- Ensure that actuation and adjustment elements are easily accessible.

Leaking hydraulic fluid!

Hydraulic fluid may leak during assembly and disassembly of the valve. Consequently, persons may slip or fall.

- Only remove the protective caps of the valve directly before the assembly.
- After the disassembly, provide the bores containing the hydraulic fluid with suitable closing elements.
- Immediately remove leaked hydraulic fluid.

Sharp edges!

Directional seat valves may have sharp edges at the valve openings. During transport or assembly/disassembly, cutting or abrasive injuries may result.

- Wear corresponding protective clothing during transport.
- Do not reach into valve openings!

NOTICE

Damage to property due to frost in the hydraulic valve (SH variant)!

In order to prevent freezing of the control spool in the SH valve, condensation in the spring chamber caused by condensed water must be avoided.

- Connect air-tight piping at **one of the two** ports for dry air (see fig. 6) (connection thread G1/8, Ma = 12 Nm ± 1.2 Nm) supplying the spring chamber with dry air.
- In the spring chamber, no overpressure or underpressure is admissible. It must be noted in this connection that due to the ambient temperature range from –43 °C to +60 °C, the contracting and expanding air in the spring chamber creates a pressure drop and increase of ±0.6 bar. Apart from that, the actuation of the valve results in a pressure increase of 0.3 bar.
- The customer may also select different piping; the conditions specified above must, however, be completely satisfied.

Have sufficiently dimensioned collecting containers, non-linting fabric and medium-binding materials ready in order to collect or bind leaking medium.

Assembly steps of the directional seat valve:

The mounting surfaces of the directional seat valve and the subplate must be clean and free of hydraulic fluid.

- ▶ Use non-linting cleaning cloth to clean the subplate.

1. Remove the protective cover at the directional seat valve.
2. Ensure correct orientation of the directional seat valve. Observe the porting pattern according to the symbol and connection labeling at the directional seat valve.
3. Check whether all seal rings are available and intact.
4. Carefully put the directional seat valve onto the mounting surface.
5. Screw the directional seat valve onto the subplate. Only use valve mounting screws that are specified in section 5.3.7 "Unit dimensions (dimensions in mm)". The valve mounting screws are to be tightened using a torque power screwdriver (tolerance ≤ ±10 %) and a tightening torque of 7 Nm. This tightening torque refers to the maximum admissible operating pressure.
6. Please note that the tightening torques may change if other screw types are used.

Hydraulically connecting the directional seat valve

1. Depressurize the relevant part of the system.
2. Establish all connections; in this connection, observe the operating instructions of the system.
3. Make sure that pipes and/or hoses are connected to all ports and/or that the ports are sealed with plug screws.
4. Carry out a special check to make sure that the cap nuts and flanges are correctly tightened at the pipe fittings and flanges.
5. Make sure that all pipes and hose lines and every combination of connection pieces, couplings or connection points with hoses or pipes are checked for their operational safety by a person with appropriate knowledge and experience.

8 Commissioning

⚠ WARNING

Incorrect assembly, leaking hydraulic fluid!

Carelessly or incorrectly fastened directional seat valves may become loose during operation and fall down and cause serious injuries. A powerful fluid jet may leak at incompletely mounted hydraulic connections and connection lines and cause injuries.

- ▶ Only commission your system after all hydraulic connections of the directional seat valve have been completely and properly mounted according to the specifications.
- ▶ Look out for defective sealing points and exchange defective seal rings immediately.

Inadmissibly high operating pressure!

In hydraulic applications with different area ratio, the hydraulic pressure is fortified and may - in case of incorrect design - lead to exceedance of the maximum admissible operating pressure. Thus, directional seat valves may burst or the closing elements may fly around and cause serious injuries.

- ▶ Ensure before the commissioning of the hydraulic system that the maximum admissible pressure of the directional seat valve in the system is not exceeded by no means.
- ▶ Ensure that in your system, the maximum admissible operating pressure is secured by means of a pressure relief element.

Excessive pressure!

Incorrectly set pressure relief valves or valves not unloaded to the tank may lead to exceedance of the maximum admissible operating pressure.
Thus, the directional seat valves may burst or the closing elements may fly around and cause personal injuries and/or damage to property.

- ▶ Before commissioning the hydraulic system, ensure correct setting and safe unloading of the these pressure relief valves.

- ▶ Make sure that all hydraulic connections are covered.
- ▶ Commission the directional seat valve only if it is completely installed.

If hydraulic fluid still leaks after proper assembly:

- ▶ Immediately depressurize the system and continue with chapter 14 "Troubleshooting".

Information on the hydraulic fluid

- The released hydraulic fluids and limitations of operation for your directional seat valve are contained in section 5.3.4 "Technical data".

Bleeding the hydraulic system

Bleeding of the directional seat valve is usually not necessary. However Bosch Rexroth recommends bleeding the entire hydraulic system; while doing so, the following points are to be observed:

- ▶ Before the actual operation, switch the directional seat valve several times with reduced pressure (50 % operating pressure). This will press out any

remaining air from the directional seat valve. Mechanical damage due to inadmissibly high acceleration of the hydraulic fluid and the valve spool is thus avoided and the directional seat valve's life cycle is increased.

Do not switch the directional seat valve under operating pressure during bleeding as this may cause damage.

9 Operation

See operating instructions of the hydraulic system into which the directional seat valve has been installed.

⚠ CAUTION

Danger of hearing damage!

In case of an unfavorable arrangement of directional seat valves, resonance or fluid noises e.g. whistling may result. In continuous operation, these noises may cause hearing damage in persons or damage at the directional seat valves.

- In this case, contact a service engineer.

If faults occur, refer to chapter 14 "Troubleshooting".

10 Maintenance and repair

The following inspection, testing and maintenance works are to be carried out regularly. The intervals for the same have to be selected in a way - also depending on the operating conditions - that deficiencies that have to be anticipated are identified timely. The check must, however, at least be carried out every **three years** from the date of manufacture of the valve. The date of manufacture of the valve can be found on the name plate, see 5.4 "Product identification".

The check is also to be carried out if the valve is only stored, however not used!

- Regularly check the product and connection surfaces for leak-tightness!
- As a precaution, exchange seals at reasonable time intervals.

Preventative maintenance (e.g. hydraulic fluid care) as well as compliance with the pressure and temperature specifications extend the life cycle of the system and/or the directional seat valve.

10.1 Cleaning and care (maintenance)

NOTICE

Solvents and aggressive cleaning agents!

Aggressive cleaning agents may damage the seals and the surface of the valve and let them age faster.

- Do not use solvents or aggressive cleaning agents.

Water jet!

A high-pressure washer's water pressure could damage the hydraulic system and the seals of the valve.

- Do not use a high-pressure washer for cleaning.

- Cover all openings with appropriate protective caps.
- Only clean the directional seat valve using a damp, lint-free cloth. Only use water and a mild cleaning agent, if necessary, to do so.
- Remove dust accumulations on the directional seat valve at regular intervals.

10.2 Inspection and maintenance

NOTICE

Dirt and foreign particles in the directional seat valve!

Penetrating dirt and foreign particles in the directional seat valve lead to wear and malfunctions. So safe function of the directional seat valve is no longer ensured.

- During all works at the directional seat valve, provide for absolute cleanliness in order to prevent foreign particles like e.g. welding beads or metal chips from getting into the hydraulic lines.
- Do not use linting fabric for cleaning.
- Ensure that no cleaning agents are able to penetrate the hydraulic system.
- Flush the hydraulic system if necessary. Replace the fluid filter or the hydraulic fluid.

1. Remove coarse dirt from the exterior.
2. Check all external fittings for completeness and tight seat.
3. Check valve for external leakage, replace the seals if necessary, see "Rectifying leakages".
4. Check the directional seat valve for corrosion. Corrosion is an indication of leaks. Remove the valve and have it repaired if there is any visible corrosion.
5. Check all screws and connections for a tight seat.

10.3 Repair

Bosch Rexroth offers a wide range of repair services for the directional seat valve.

- Only use original spare parts from Bosch Rexroth for repairing the directional seat valve.

10.3.1 Rectifying leakages

- Remove the directional seat valve, see chapter 11 "Disassembly and replacement".
- Check the seal ring recesses on the valve connection surface for cleanliness and damage.
- Dry the valve connection surface and the valve contact surface using suitable cleaning materials.
- Fit the new seals.
- Re-install the directional seat valve at the valve contact surface, see chap. 7 "Assembly".

10.3.2 Spare parts

CAUTION

Damage to persons and property due to faulty spare parts!

Spare parts that do not meet the technical requirements specified by Bosch Rexroth may cause personal injuries and damage to property.

- Only use original spare parts from Bosch Rexroth.

The available spare parts and seal kits are specified in chapter 10.3.2 "Spare parts list". The spare parts are available from the address specified in chapter 15.2 "List of addresses".

11 Disassembly and replacement

WARNING

Pressurized system parts.

When working at pressurized system parts, there is the risk of injury by leaking hydraulic fluid.

- Ensure before the disassembly that the hydraulic system is depressurized.

CAUTION

Incompletely mounted valve components falling down!

Incompletely disassembled valve components may fall down and cause injuries.

- During the disassembly, secure the directional seat valves against falling down.

Have sufficiently dimensioned collecting containers, non-linting fabric and medium-binding materials ready in order to collect or bind leaking hydraulic fluid.

1. De-energize and depressurize your system.
2. Unload the hydraulic accumulators, if available.
3. Provide for a clean environment during the disassembly.
4. Prepare a container or tray for collecting the escaping hydraulic fluid.
5. Only loosen the valve mounting screws of the directional seat valve using a suitable tool.
6. Remove the valve mounting screws and take off the directional seat valve from the valve contact surface.
7. Collect the escaping hydraulic fluid in the provided container and dispose of it properly.
8. If the directional seat valve is to be returned to the manufacturer for repair, close the valve connection surface using the protective plate supplied or protect it using equivalent packaging in order to avoid contamination and damage.
9. Seal the subplate in order to avoid contamination of your system.

In case of new installation and/or exchange of the directional seat valve, the following steps are analog to chapter 7 "Assembly".

12 Disposal

12.1 Environmental protection

Careless disposal of the directional seat valve and the hydraulic fluid could lead to environmental pollution.

- Dispose of the directional seat valve and the hydraulic fluid in accordance with the currently applicable national regulations in your country.
- Dispose of hydraulic fluid residues according to the applicable safety data sheets for hydraulic fluids.
- Please observe the following supplied notes for the environmentally-friendly disposal of the directional seat valve.

12.2 Return to Bosch Rexroth AG

The directional seat valves manufactured by us can be returned to us for disposal purposes at no costs. However, the precondition is that there are no spurious adherences or any other contamination. The directional seat valve is to be drained before the return. Furthermore, there must be no inappropriate foreign substance or third-party components when products are returned.

The directional seat valves have to be sent free to the door to the following address:

Bosch Rexroth AG

Service Industriehydraulik [Industrial hydraulics]

Bürgermeister-Dr.-Nebel-Straße 8

97816 Lohr am Main

Germany

12.3 Packaging

Upon request, reusable systems can be used for regular deliveries.

The materials for disposable packaging are mostly cardboard, wood, and styrofoam. They can be recycled without any problems. Due to ecological reasons, disposable packaging should not be used for returning products to Bosch Rexroth AG.

12.4 Materials used

Directional seat valves from Bosch Rexroth do not contain any hazardous materials that could be released during intended use. Normally, no adverse effects on human beings and on the environment have to be expected.

The directional seat valve basically consists of:

- Cast iron
- Steel
- Plastic materials
- Elastomers

12.5 Recycling

Due to the high share of metal, the directional seat valve can mostly be recycled. In order to achieve an ideal metal recovery, disassembly into individual assemblies is required.

13 Extension and modification

Do not modify the directional seat valve.

13.1 Available accessories

Optional accessories

Table 10: Valve mounting screws

Type	Friction coefficient according to VDA 235-101	Material no.
ISO 4762 M5 x 50 - 10.9-flZn-240h-L	0.09-0.14	R913000064

14 Troubleshooting

14.1 How to proceed with troubleshooting:

- Always work systematically and targeted, even when under time pressure. Random and imprudent disassembly and readjustment of settings might result in the inability to restore the original cause of fault.
- First get a general idea of how your directional seat valve works in conjunction with the overall system.
- Try to establish whether the directional seat valve was working properly in conjunction with the overall system before the fault first occurred.
- Try to determine any changes of the overall system in which the directional seat valve is integrated, e.g.:
  - Changes in the application conditions or the area of application?
  - Were there any changes (e.g. retrofitting) or repair works at the overall system (machine/system, electrics, control) or at the directional seat valve? If so: What were they?
  - Was the directional seat valve or machine used as intended?
  - How did the fault become apparent?
- Try to get a clear idea of the cause of fault.

Fault table

The directional seat valve is usually not sensitive to faults if the prescribed application conditions and hydraulic fluid quality are complied with.

Table 11: Fault table

Fault	Possible causes	Remedy
Directional seat valve does not switch	Missing pilot pressure	Check and/or reapply pressure at the ports.
	Spool is jammed due to contamination	Loosen the jamming by switching the valve several times. In case the actuation is stiff, disassemble the directional seat vale and replace it by a new directional seat valve.
External leak	Seals at valve connection surface damaged	Remove the directional seat valve and replace the seals, see 10 "Maintenance and repair".
	Other leakage	Replace the directional seat valve.

Following faults due to contamination, it is - in addition to the repair - essential to check the hydraulic fluid quality and improve it, if necessary, by suitable measures such as flushing or the additional installation of filters.

If you could not remedy the occurred error, please contact one of the addresses specified in section 15.2 "List of addresses".