

Piezo-pneumatic switch valve Type P20

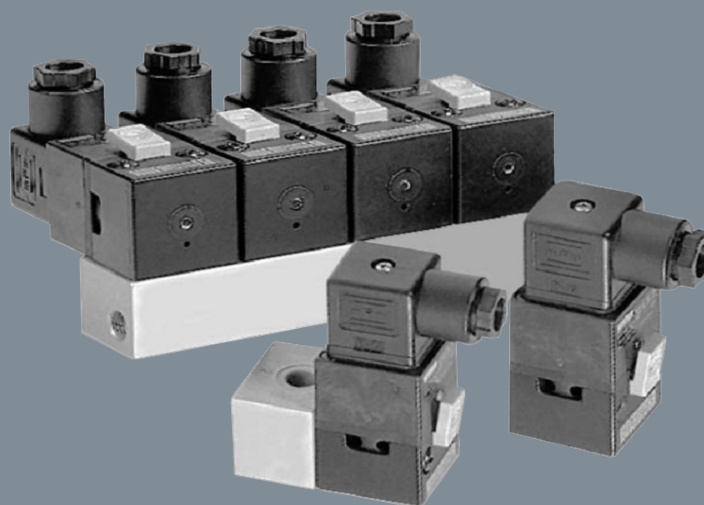
Intrinsically safe according to ATEX

Operating instructions

Version 01

ID no.: PS09552A


HOERBIGER
because performance counts



Version: 01
Date: 2018

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1 Notes about using the operating instructions

1.1 About these instructions

These operating instructions describe how to work, operate, and maintain the product Pneumatic valve P20. They provide important notes for safe and efficient use of the product.

1. The operating instructions are part of the product. Keep the operating instructions carefully.
2. Transfer the operating instructions to any subsequent owner or user.

For additional information, contact the manufacturer at the following address:

HOERBIGER Flow Control GmbH
Südliche Römerstraße 15
86972 Altenstadt
Germany

Information on the Internet: www.hoerbiger.com

1.2 Warnings used

Warnings warn about dangers that can occur when handling the product. There are four danger levels with the following signal words:

Signal word	Meaning
DANGER	Identifies a danger with high risk that can cause death or severe injury.
WARNING	Identifies a danger with a medium risk that can cause death or severe injury.
CAUTION	Identifies a danger with a low risk that can cause slight or moderate injury.
NOTICE	Identifies a danger that can cause property damage.

1.3 Symbols



This symbol indicates useful and important information.

- ✓ This symbol stands for a prerequisite that must be fulfilled before performing an action.
- ⇒ This symbol stands for an individual action to be performed.
 1. Numbers indicate several steps to be performed in an action instruction: Step 1
 2. Step 2
 - ↳ This symbol stands for the intermediate result of an action.
 - ↳ This symbol stands for the result of an entire action instruction.

1.4 Abbreviations

Term / Abbreviation	Explanation
Ex area	Area subject to explosion
GSD	Device socket
LED	Light Emitting Diode
NG	Normally closed
NO	Normally open
RF	Reset with spring

2 Basic safety instructions

2.1 General notes

The product was constructed, manufactured, and tested according to the standards and safety regulations listed in the current declaration of conformity.

The current declaration of conformity of HOERBIGER Automatisierungstechnik GmbH and the EU-type examination certificates apply. The CE mark is on the piezo valves' type plate.

2.2 Intended use

The piezoelectrically-activated Pneumatic valve P20 serves to control compressed air activated by the actuators in the standard pneumatic range.

The product is used especially in areas subject to explosion (Ex area according to EN 1127-1) as well as in non-Ex areas.

Typical areas of application are process technology (turning and positioning drives) and pneumatic process flow controllers.

1. To ensure perfect, risk-free function and a long life span of the device, follow the notes in these operating instructions and adhere to the usage conditions and permissible data according to the data sheet and type plate.
2. The usage planning and operation of the device must be done according to the recognized rules of technology.
3. Prevent unintentional activations or impermissible interference by taking suitable measures.



⚠ WARNING

Personal injury and property damage possible

- Only have settings on the valve made by authorized specialized personnel trained by the manufacturer with suitable tools.
- Only operate valve in the pressure range specified on the data sheet.
- Only use valve according to the protection type.
- Heed the maximum switch-on duration according to the data sheet.



WARNING

Use is forbidden in case of:

- Use of aggressive gases that can damage the valve.
- Use of pneumatic variables that lie outside the area of application (see *Technical data, page 15*).
- Use of flammable gases that can also explode due to a lack of oxygen.
- Use as safety valve.
- Higher pressures than 1.1 bar if the medium is subject to explosion.
- Use in acid rain or other corrosive atmospheres. Use only after consultation with the manufacturer.



- ⇒ If the device should be operated below the freezing point, dried compressed air must absolutely be used (pressure dew point 10 K below ambient temperature).

2.3 Personnel qualification

Unqualified personnel cannot detect risks and is therefore subject to greater dangers.

1. Only commission qualified personnel with the activities described in these instructions.
2. Make sure that the personnel adheres to the locally valid regulations and rules for safe and danger-conscious work.

The following target groups are addressed in these instructions:

Trained person: A trained person is somebody who has been trained extensively by the operator in his tasks in connection with the safe operation of the valves.

Training is conducted by specialized personnel.

Electrically-qualified person: An electrically-qualified person is somebody who, based on his specialized training, knowledge, and experience, as well as knowledge of the applicable regulations, can judge and perform the work with which he is commissioned and detect possible hazards independently.

Pneumatically-qualified person: A pneumatically-qualified person is somebody who, based on his specialized training, knowledge, and experience with respect to pneumatic components and systems as well as knowledge of the applicable regulations, can judge and perform the work with which he is commissioned and detect possible hazards – especially with respect to interactions between pneumatic, mechanical, electrical, and control-technical components – independently.

Activity	Authorization
<ul style="list-style-type: none">■ Assembly	<ul style="list-style-type: none">■ Pneumatically-qualified person■ Trained person
<ul style="list-style-type: none">■ Installation incl. electrical connection■ Initial start-up■ Troubleshooting■ Elimination of faults■ Taking out of service	<ul style="list-style-type: none">■ Electrically-qualified person■ Trained person with training in the area of explosion hazards

2.4 Dangers



Here you will find information about various types of dangers and damage that can occur in connection with operation of the product.

Electricity

1. Only have the device connected to the power supply and control lines by an electrically-qualified person.
2. Only perform installation and maintenance work when the power is disconnected.

Pressure

1. Only have the device assembled by a pneumatically-qualified person.
2. Only install pneumatic components when the compressed air system is depressurized.
3. During assembly and dismantling, adhere to the recognized rules of technology.
4. During work on pneumatic systems, heed the special safety regulations.

Explosion

1. Do not make any changes to devices that are operated in connection with areas subject to explosion.
2. Avoid electrostatic charges (danger of explosion with use in Ex areas). These can arise with friction processes, for example.
3. Use in Ex areas is only permitted with GSD according to DIN EN 175301-803-B. Use of a GSD with LED in Ex areas is not permitted.

Operation

1. Settings on the valve only by authorized personnel trained by the manufacturer with suitable tools.
2. Only use the device in industrial applications for compressed air and permissible gases. Adhere to the working pressure according to the data sheet.
3. The device is only approved for proper or intended use.
4. Do not open the device.
5. Do not remove type designations or seals that do not serve transport protection.
6. Heed the prescribed air purity.

Repair and maintenance

1. Only have repair work on the valve performed by the manufacturer since only the manufacturer has the equipment for optimal adjustment after repair and can therefore guarantee perfect function.
2. Do NOT maintain the inner parts of the device.
3. Send the complete valve to the manufacturer for maintenance and service.

2.5 Responsibility of the operator

The assumed duties of the operator are:

1. Adherence to operational safety regulations.
2. Adherence to the valid national regulations for occupational safety and explosion protection.
3. Adherence to the intended use of the valve.

3 Product description

3.1 Function

This product is a piezoelectrically-activated 3/2-way pneumatic valve. Within the valve, a pneumatically-controlled 3/2-way valve with a piezoelectric pilot valve (piezo chip) is installed upstream.

With the normally closed version (NG), the flow path from connection 2 to connection 3 is enabled (OFF state) when de-energized. With application of the supply voltage, the path from connection 1 to connection 2 is enabled (ON state).

Upstream from the piezo valve is a pressure controller with fine filter.

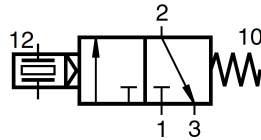
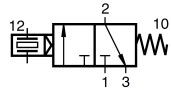
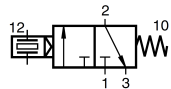


Fig. 1: Schematic circuit diagram

3.2 Type overview

3/2-way poppet valves/pilot and individual valves with HOERBIGER own connection.

Type / Order details	Valve symbol	Activation	Note
P20 381RF-NG-C.		Pilot valve Normally closed	With device outlet, without connection plate
P20 381RF-NG-C.-01		Individual valve G $\frac{1}{8}$ Normally closed	With device outlet and with connection plate G $\frac{1}{8}$

Accessories: Device outlet type GSD-30; 1, 2 or 4 connection plates and blind plate; available complete or separately.

3.3 Connections

The connections shown for the single connection plate are repeated on the connection plates 2 and 4 times for the battery mounting.



With manual operation, the valve can be activated manually and without electrical activation.

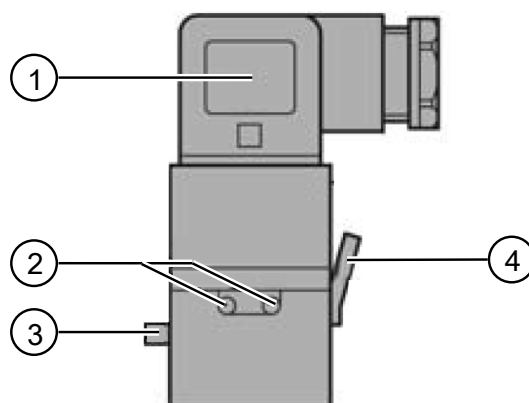


Fig. 2: Side view

1	Device outlet GSD-30	3	Fastening screw M4
2	Ventilation	4	Manual operation

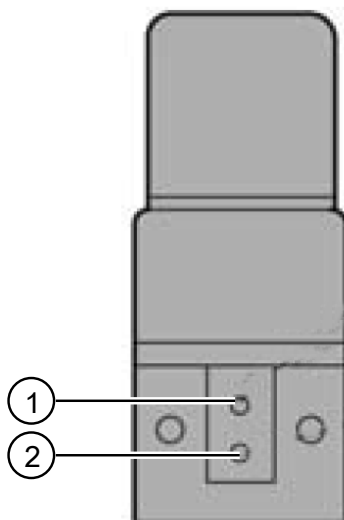


Fig. 3: Side view

1	Working connection	2	Supply
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Fig. 4: P20 battery mounting on a connection plate, 4x

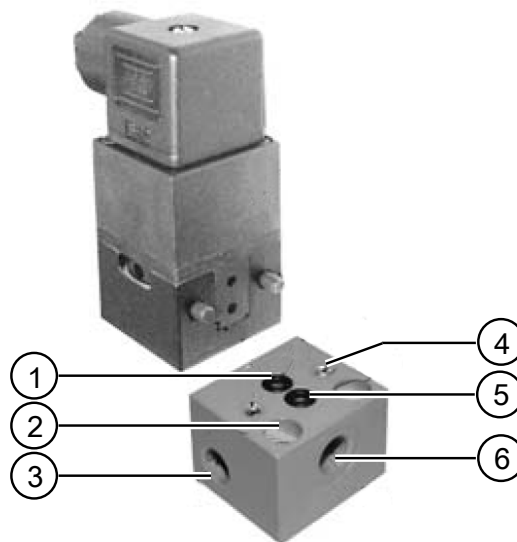


Fig. 5: P20 valve can be mounted on connection plate, 1x

1	Air supply with O-ring	4	Screw fastening M4 thread
2	Fastening holes for M4 screw connections	5	Working connection with O-ring
3	Supply	6	Working connection

3.4 Technical data

General technical data

Designation	Pneumatic valve P20
Actuation type	Piezoelectric pilot valve-controlled
Design	Piezo seat valve, not overlap-free
Fastening type	Flange according to CNOMO
Line connection	Flange/threads
Threads	G $\frac{1}{8}$ – with connection plate
Installation position	Any (preferred position: plug on top); possible compromising of emergency manual operation depending on installation position
Medium	Compressed air and nitrogen According to ISO 8573-1:2010 (7:3:4)
Flow direction	<ul style="list-style-type: none"> ■ ON: from 1 to 2 ■ OFF: from 2 to 3
Storage temperature	-40 to +80 °C
Ambient temperature ¹⁾	-10 to +60 °C
Medium temperature ¹⁾	-10 to +60 °C

¹⁾ Use below the freezing point requires dried air (pressure dew point 10 K below ambient or medium temperature)

Subject to change without notice

Pneumatic characteristics ¹⁾

Nominal pressure (p ₁)	6 bar
Min. working pressure (p _{2_min})	1.5 bar
Max. working pressure (p _{2_max})	8 bar
Nominal flow rate (Q _N)	> 110 l/min

¹⁾ Pressure specifications in overpressure

Piezoelectric activation

Approval	EU design type certificate		
Category, ignition protection type	II 2G Ex ia IIC T4/T5/T6 Gb II 2D Ex ia III B T125°C Db		
HOERBIGER code	PT(63)	PM(64)	PN(61)
Voltage type	DC voltage	DC voltage	DC voltage
Switching voltage (U“on”)	5.5 to 9 V DC	6 to 16 V DC	7 to 30 V DC
Switching voltage (U“off” _{max}) ¹⁾	1 V DC	1 V DC	1 V DC
Holding current (I“on”)	1 to 19 mA	1.7 to 23 mA	2 to 19 mA
Max. current switched off (I“off” _{max}) ¹⁾	0.05 mA	0.1 mA	0.22 mA
Nominal power (P _n)	5.5 to 171 mW	10 to 368 mW	14 to 571 mW
On-time (ED)	100 % ED with maximum 6000 hours constant operation		
Protection type (IP)	IP54 according to DIN EN 60529/A1:2000		
Connection	Device outlet according to DIN EN175301-803A		

¹⁾ For use with cable break detection, check characteristic values for compatibility. U“off”_{max} and I“off”_{max} must be ≤ than the values specified above.

Subject to change without notice

Safety technical data according to EU design type certificate

HOERBIGER code	PT(63)	PM(64)	PN(61)
Voltage (U _i)	9 V	16 V	30 V
Current (I _i)	Not relevant		
External capacity (C _i)	12 nF	12 nF	12 nF
External inductance (L _i)	Negligible		



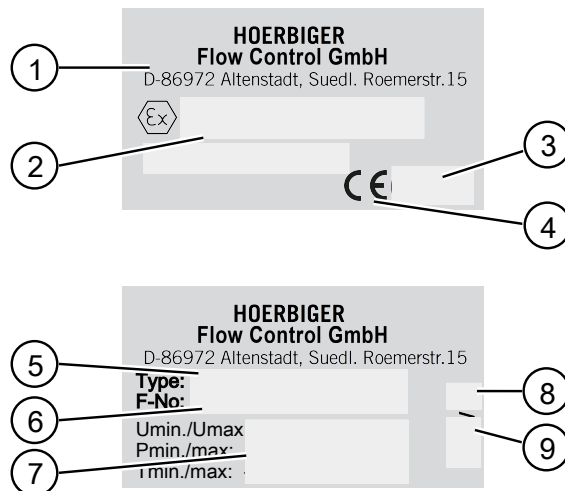
Compromising of the valve function possible

- With mounting outdoors, protect all connections against penetration of humidity.



If necessary, request the current table of compatible, intrinsically safe tools for valves from HOERBIGER Flow Control GmbH.

3.5 Type plate



1	Address	6	Item number
2	Ex protection identification	7	Technical data
3	Number of the test center	8	Technical state
4	CE mark	9	Production date (format WW/YY)
5	Type designation		

4 Assembly and installation

4.1 Assembly



⚠ DANGER

Mortal danger due to electrical voltage!

- Switch off current before assembling and dismantling the valve.



⚠ WARNING

Danger of crushing due to uncontrolled movement of the machines

Personal injury and/or property damage possible.

- Before restarting the system, take measures to prevent uncontrolled movement of the machines.
- Make sure that nobody is in the danger zone.



⚠ WARNING

Personal injury or property damage due to overpressure

Improperly connected or defective pneumatic connections can loosen under pressure and cause extremely severe injuries.

- Before assembly and dismantling of valves, switch off compressed air.
- Make sure that there is neither input nor output pressure on the valves.
- Only use components that are suitable for the permissible pressure ranges (see *Technical data, page 15*).
- Proceed according to the special country-specific safety regulations.



During installation of the valves in a system/machine in Ex areas, adhere to standards EN1127-1 and relevant standards.



⚠ WARNING

Personal injury and property damage due to explosion

- Only install devices within the categories specified on the data sheet.
- Undertake installation of the intrinsically safe circuits according to the applicable building regulations (demonstrate knowledge of the builder, protected laying of the intrinsically safe circuits).
- Maintain a safety distance of at least 50 mm between intrinsically safe and non intrinsically safe conductive connection parts.
- For the interconnection of the devices with the intrinsically safe circuits of the associated tools, heed the respective maximum values of the field device (valves) and the associated device in the interest of explosion protection (proof of intrinsic safety).
- In adverse ambient conditions, protect devices against spray water or dirt according to the protection type in the current data sheet.
- For the special conditions of the EU design test certificate, see *EU design type certificate, page 27*.

✓ The pipelines and flange surfaces are free of contamination.

✓ The input pressure is at least 1 bar greater than the maximum required output pressure.

1. Make sure that the appropriate O-rings or seals are inserted on the valve and the connection plate.
2. Optionally mount the valve on a connection plate for the direct connection of lines or on another pneumatic amplifier stage. **NOTICE! Tightening torque:** 120 ±5 Ncm



Compromising of the valve function possible

- Make sure that the ventilation openings are not covered.
- Protect valve against excessive heat radiation.
- Protect valve against adverse ambient conditions such as spray water or dirt, in order to guarantee the protection type according to the data sheet.

4.2 Electrical installation



⚠ DANGER

Mortal danger due to electrical voltage!

- Only have the device connected to the power supply and control lines by a specialist.
- Installation may only be done when the device is de-energized.
- Secure against unintentional switching on.
- Check electric cables for damage before connecting.



For electrical connections in Ex areas, heed the applicable standards.



⚠ DANGER

Mortal danger due to explosion

- In Ex areas, only use with device outlet according to chapter *Device socket*, page 20.
- Only use the device in areas subject to explosion together with appropriately approved voltage sources and safety equipment (e.g. separator modules or similar).
- Have the interconnection assessed by a specialized electrician with knowledge of the set-up of electrical systems in areas subject to explosion.
- Lay intrinsically safe lines protected.
- For the electrical connection, heed the prescribed switching voltage and the protection type of the cable.

4.3 Device socket

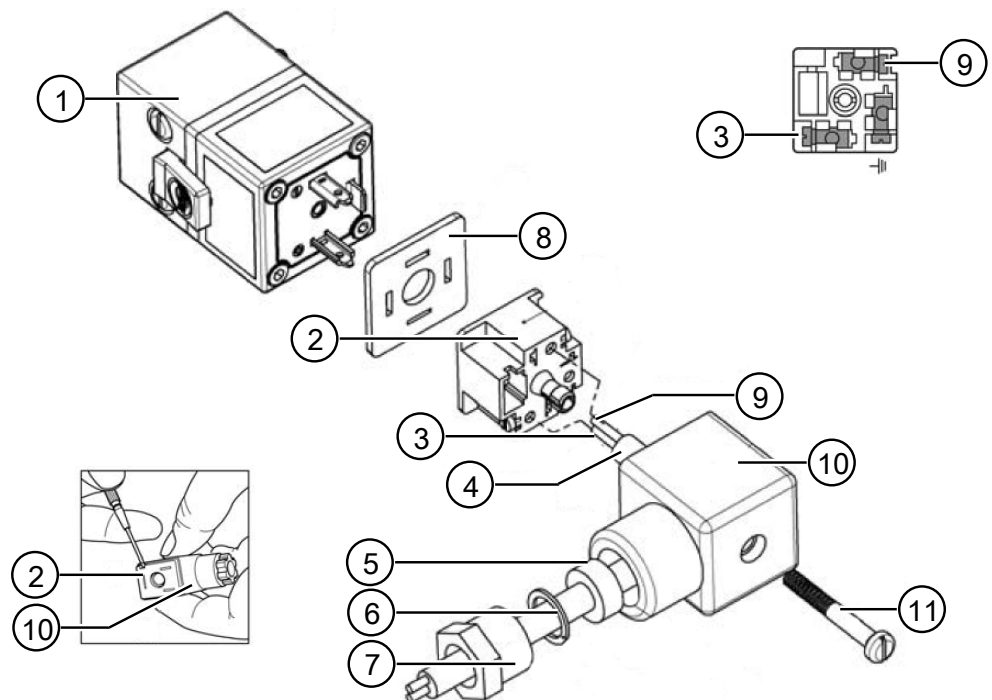
The device outlet corresponds to design A according to industry standard according to DIN EN 175301-803-A (= type GSD-30).



Use in Ex areas is only permitted with GSD-30 design A according to DIN EN 175301-803-A.

Use of a GSD with LED in Ex areas is not permitted.

4.4 Connect control cable to device outlet





The terminal assignments are depicted at the top right of the figure.

1. Loosen the connection locking screw (11).
2. Remove device outlet (10) from the blade contacts of the valve (1). **NOTICE! Heed the installation position of the plug seal (8). The seal must lie correctly and flat.**
3. Pull the plug locking screw completely out of the device outlet (10).
4. Pull the connection block (2) completely out of the device outlet with a screwdriver.
5. Turn the screw connection (7) out of the device outlet.
6. Remove the washer (6) and seal (5) from the device outlet.
7. Feed the control cable (4) through the screw connection (7), washer (6), seal (5) into the device outlet.
8. Adjust the control cable of the seal in diameter so that the cable is tight in the seal.
9. Remove insulation at the end of the control cable. **NOTICE! Do not damage the two wires.**
10. Strip the wires with a cable stripper. **NOTICE! For the installation, a two-line cable is sufficient.**
11. Clamp both wires of the cable to the screw terminals of the connection block: Wire "0 Volt" to terminal 1 (3), wire "control voltage" to terminal 2 (9). **NOTICE! The ground clamp is not used. The terminal numbering is engraved in both sides of the connection block.**
12. Place the seal (5), washer (6), and the screw connection (7) to the control cable.
13. Turn screw connection in the device outlet.
14. Place device outlet with connected cable on the contacts of the valve.
15. Tighten with plug locking screw. **NOTICE! Make sure that the plug seal (8) is placed on the valve over the blade contacts and there is no strain on the cables.**

5 Start-up

5.1 Start-up



With use in environments with flammable gases, heed the Ex directive and other applicable regulations and the respectively valid local regulations (e.g. flush with inert gas, avoid adiabatic processes, etc.).



⚠ WARNING

Personal injury and property damage possible

- Only have the start-up done by people who have sufficient knowledge and experience with respect to compressed air systems and the machine/system to be started up.
- Before operation with combustible gases, consult the manufacturer.
- Heed additional measures according to the local set-up provisions (e.g. incorporation into the repeated pressure test).
- For start-up of the valves, adhere to the following sequence of steps.

- ✓ The power supply is switched off.
- ✓ There is neither input nor output pressure present.

1. Check proper mounting.
2. Open compressed air supply.



⚠ WARNING

Danger of crushing due to uncontrolled movement of the machines

Personal injury and/or property damage possible.

- Before restarting the system, take measures to prevent uncontrolled movement of the machines.
- Make sure that nobody is in the danger zone.

3. Switch on electric signal control.

5.2 Manual operation

With manual operation, the spool valve can be operated without electrical activation. It functions both by pressing a button and by locking.

- By pressing a button:
 - On: by pressing the activation button.
 - Off: by releasing the activation button.

6 Service

The transmission behavior of the devices is also stable across long time periods. Regular adjustment or similar is thus not required. There should also not be any maintenance work required.



Compromising of the valve function due to incorrect cleaning

- Do not use cleansers that contain solvents for cleaning work.
- No solvents or solids may penetrate the openings for ventilation and manual activation.



⚠ WARNING

Personal injury and property damage due to improper servicing

Malfunctions can result.

- In case of fault, do NOT service the device.
- In case of fault, shut the device down immediately.
- Remove the complete valve and send it to the manufacturer's local agent for servicing.

6.1 Inspection and maintenance plan

Work to be performed	ir	d	w	¼ y	y	oh
■ Check pneumatic connections for leaks				X		
■ Check electrical cable for cracks, kinks, and damage to the cable insulation. ■ Replaced damaged lines.				X		
■ Check type plates to ensure they are present, visible, legible, and complete; replace if necessary					1	
■ Check fastening screws to ensure they are tight, tighten if necessary				X		
Legend: ir= if required, d = daily, w = weekly , ¼ = quarterly, y = annually, oh = operating hours						

7 Transport and storage

1. Store the product in level, dry rooms that are free of dust and vibrations.
2. In case of longer unpackaged storage, seal all pneumatic connections of the valve with tape that can be removed without leaving residues.

For more information, see *Technical data, page 15*.

8 Troubleshooting

1. Customers and third parties should not make any changes to or perform any troubleshooting on the device.
2. Send the defective product to the manufacturer or its local representative for servicing.

9 Decommissioning and disposal

9.1 Decommissioning/dismantling



⚠ WARNING

Risk of injury due to pressure

- Do not perform any work on the valve when it is pressurized.
-
- ✓ The power supply is switched off.
 - ✓ There is no input or output pressure.
 - ✓ The machines/systems (e.g. actuators) have been moved into a safe switch state (control positions).
- ⇒ Dismantle.

9.2 Disposal

The disposal of the packaging and used parts is the customer's responsibility.

- ⇒ Dispose of the product according to the local regulations at approved collection points or have removed by approved disposal companies.

10 Appendix

10.1 EU design type certificate

We will be glad to send the customer the EU design type certificate on request.

The EU design type certificate applies only for the electrical examination of the basic P20 valve devices.

The approval according to EU design type certificate is only provided with device outlet according to DIN EN 175301-803, design A.

10.2 Product observation

Our goal is continuous enhancement of our products and close cooperation with the customer. Please tell us about faults or problems with the valve.

10.3 Material defects and defects of title

These operating instructions and technical details with respect to the specifications and figures in these operating instructions are subject to change without notice.

The company HOERBIGER Flow Control GmbH makes no quality or durability guarantees, and also no guarantees about suitability for a particular purpose. These must be agreed upon expressly in writing. Public statements, promotions, and advertising do not constitute quality specifications for the product.

The operator's claims relating to material defects and defects of title assume that he presses this claim in writing immediately, at the latest within two working days. HOERBIGER Flow Control GmbH is in no case responsible for damage to the product itself or consequential damages caused by the product that are caused by improper handling of the product.

Insofar as HOERBIGER Flow Control GmbH is responsible for a defect, HOERBIGER Flow Control GmbH will, at its option, provide rectification or substitute performance.

Liability of HOERBIGER Flow Control GmbH – regardless of the legal justification – exists only in case of intention or gross negligence, negligent injury of life, body, health for defects that were fraudulently concealed or whose absence was guaranteed expressly in writing. Furthermore, according to the product liability law for personal injury or property damage to privately used objects.

In case of negligent injury of essential contract duties, HOERBIGER Flow Control GmbH is also liable, also in case of slight negligence, however limited to the contract-typical, foreseeable damages. Additional claims are excluded.

In case individual regulations of these operating instructions, the applicable legal regulations or other instructions of HOERBIGER Flow Control GmbH are disregarded, material defects and defects of title are terminated.

In particular, HOERBIGER Flow Control GmbH is not responsible for failures or faults that are caused by modifications by the customer or other persons. In such cases, the repair costs due will be invoiced. These will also be invoiced for the checking of the device if no fault could be found on the device.

There are no claims to the availability of previous versions and to the ability to refit devices delivered to the respective current series state.

10.4 Declaration of conformity

The current declaration of conformity is included in the scope of delivery and it can be found in the download area on the company's website:

<http://www.hoerbiger.com/>

