bürkert
FLUID CONTROL SYSTEMS

Type 6020

Direct-acting 2-way proportional valve

Operating Instructions

MAN 1000587458 EN Version: D Status: RL (released | freigegeben) printed: 26.08.2024

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Operating Instructions 2408/03_EUen 00815430 / Original DE

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1 ABOUT THIS DOCUMENT

The document is an important part of the product and guides the user to safe installation and operation. The information and instructions in this document are binding for the use of the product.

- Before using the product for the first time, read and observe the whole safety chapter.
- Before starting any work on the product, read and observe the respective sections of the document.
- Keep the document available for reference and give it to the next user.
- Contact the Bürkert sales office for any questions.

Further information concerning the product at country.burkert.com.

1.1 Manufacturer

Bürkert Fluid Control Systems

Christian-Bürkert-Str. 13–17

D-74653 Ingelfingen

The contact addresses are available at country.burkert.com in the menu "Contact".

1.2 Symbols

DANGER!

Warns of a danger that leads to death or serious injuries.

WARNING!

Warns of a danger that can lead to death or serious injuries.

CAUTION!

Warns of a danger that can lead to minor injuries.

NOTICE!

Warns of property damage that can damage the product or the installation.

Indicates important additional information, tips and recommendations.

Refers to information in this document or in other documents.

➔ Indicates a step to be carried out.

✓ Indicates a result.

Menu Indicates a software user-interface text.

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1.3 Terms and abbreviations

The terms and abbreviations are used in this document to refer to following definitions.

Device	Type 6020 2-way proportional valve
bar	Unit for relative pressure

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2 SAFETY

2.1 Intended use

The device is designed to control the flow rate of media. The permitted media are listed in Technical data [▶ 10].

Prerequisites for safe and trouble-free operation are correct proper transportation, storage, installation, start-up, operation and maintenance.

The instructions are part of the device. The device is intended exclusively for use within the scope of these instructions. Uses of the device that are not described in these instructions, the contractual documents or the type label can lead to severe personal injury or death, damage to the device or property and dangers for the surrounding area or the environment.

- ➔ Do not mechanically load the device.
- ➔ Only trained and qualified personnel may install, operate and maintain the device. See qualification of persons in Safety instructions [▶ 6]
- ➔ Use the device only in conjunction with third-party devices and components recommended and authorized by Bürkert.
- ➔ Use the device only when it is in perfect condition.

2.2 Safety instructions

Qualification of personnel working with the device

Improper use of the device can lead to serious personal injury or death. To avoid accidents when working with the device, the following minimum requirements must be met:

- ➔ Carry out work on the device within the scope of these instructions in a safety-compliant manner.
- ➔ Detect and avoid dangers when working on the device.
- ➔ Understand the instructions and implement the information contained therein accordingly.

Responsibility of the operator

The operator is responsible for observing the location-specific safety regulations, also in relation to personnel.

- ➔ Observe the general rules of technology.
- ➔ Install the device according to the regulations applicable in the respective country.
- ➔ The operator must make hazards arising from the location of the device avoidable by providing appropriate operating instructions.

Changes and other modifications, spare parts and accessories

Changes to the device, incorrect installation or use of non-approved devices or components create hazards that can lead to accidents and injuries.

- ➔ Do not make any changes to the device.
- ➔ Do not mechanically load the device.
- ➔ Observe the operating instructions of the device or component used.
- ➔ Only use the devices in conjunction with approved devices or components.

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Spare parts and accessories that do not meet Bürkert's requirements may impair the operational safety of the device and cause accidents.

➔ To ensure operational safety, only use original parts from Bürkert.

Operation only after proper transport, storage, installation, start-up or maintenance.

Improper transport, storage, installation, start-up or maintenance endanger the operational safety of the device and can cause accidents. This can lead to serious personal injury or death.

➔ Only carry out works which are described in these instructions.

➔ Only carry out works using suitable tools.

➔ Have all other works carried out by Bürkert only.

Technical limit values and media

Non-compliance with technical limit values or unsuitable media can damage the device and lead to leaks. This can cause accidents and seriously injure or kill people.

➔ Comply with limit values. See Technical data [▸ 10] and information on the type label.

➔ Only feed media into the media ports that are listed in the chapter Technical data [▸ 10].

➔ Observe the safety data sheet for the media used.

Medium under pressure

Medium under pressure can seriously injure people. In the event of overpressure or pressure surges, the device or lines can burst. Pneumatic lines that are defective or not securely fastened can come loose and swing around.

➔ Before working on the device or system, switch off the pressure. Vent or empty the lines.

➔ Adhere to the permitted pressure ranges of the medium.

➔ Comply with the permitted temperature ranges of the medium.

Electric shock due to electrical components

Touching live parts can result in severe electric shock. This can lead to serious personal injury or death.

➔ Before working on the device or system, switch off the power supply. Secure it against reactivation.

➔ Observe any applicable accident prevention and safety regulations for electrical devices.

Hot surfaces and fire hazard

The surface of the device can become hot with fast-switching actuators or with hot media.

➔ Wear suitable protective gloves.

➔ Keep highly flammable substances and media away from the device.

Working on the device

Working on the device that has not been powered down, unauthorised switching on or uncontrolled start-up of the system can cause accidents. This can lead to serious personal injury or death.

➔ Only work on the device when it is not in use.

➔ Ensure that the device or system cannot be switched on unintentionally.

➔ Only start the process in a controlled manner following disruptions. Observe sequence:
1. Apply supply voltage or pneumatic supply.
2. Charge the device with medium.

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3 PRODUCT DESCRIPTION

Type 6020 is a direct-acting 2/2-way proportional valve with the following properties:

- Proportional valve for flow or pressure control and fuel cell systems and other hydrogen applications
- Integrated shut-off function with reliably high tightness
- Excellent responding behaviour and high setting range
- Available as flange or cartridge variant for quick system integration
- Degree of protection IP65 or IP6K9K with automotive plug

3.1 Product structure

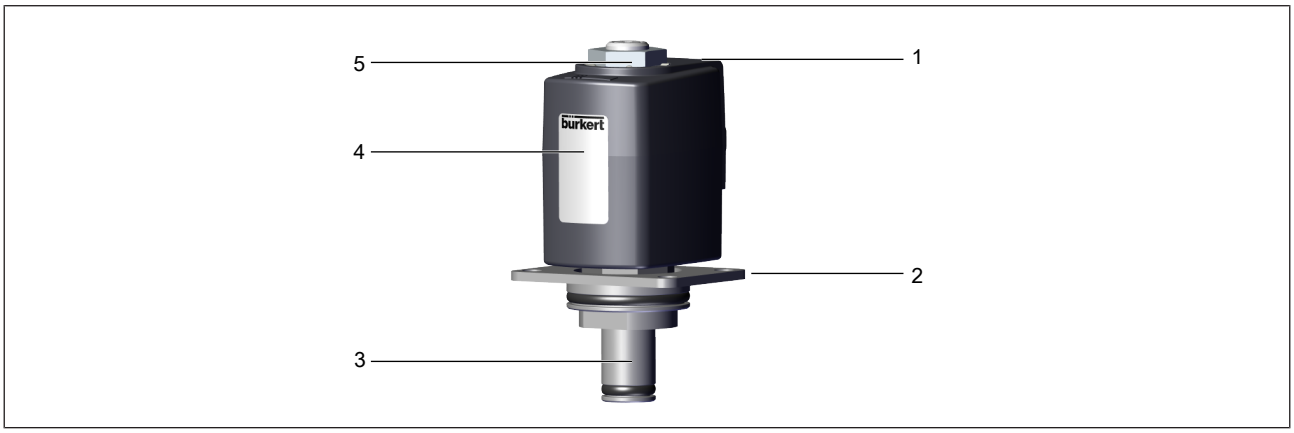

Fig. 1: Type 6020 cartridge variant FC17

1	Coil	2	Retaining plate
3	Valve body	4	Type label
5	Nut for coil attachment		

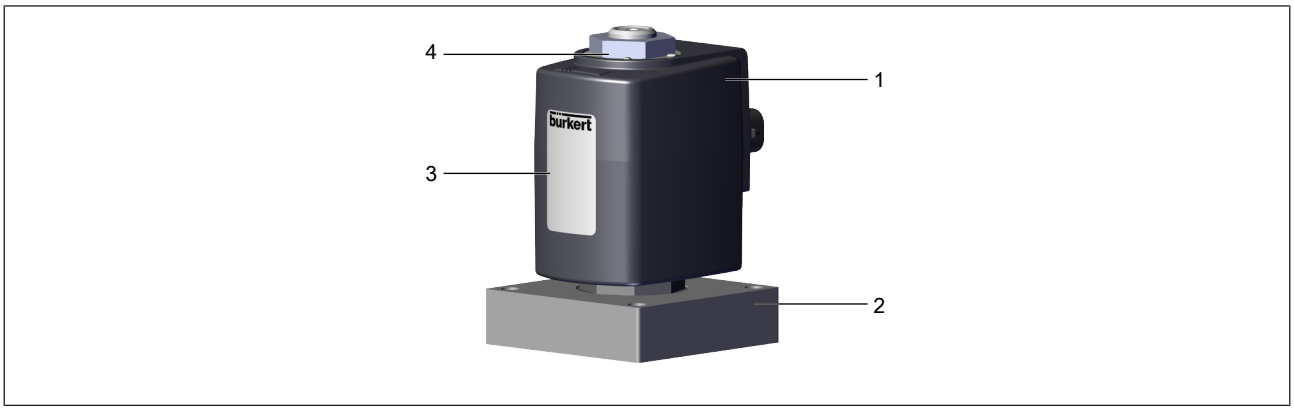

Fig. 2: Type 6020 flange variant FK15

1	Coil	2	Valve body
3	Type label	4	Nut for coil attachment

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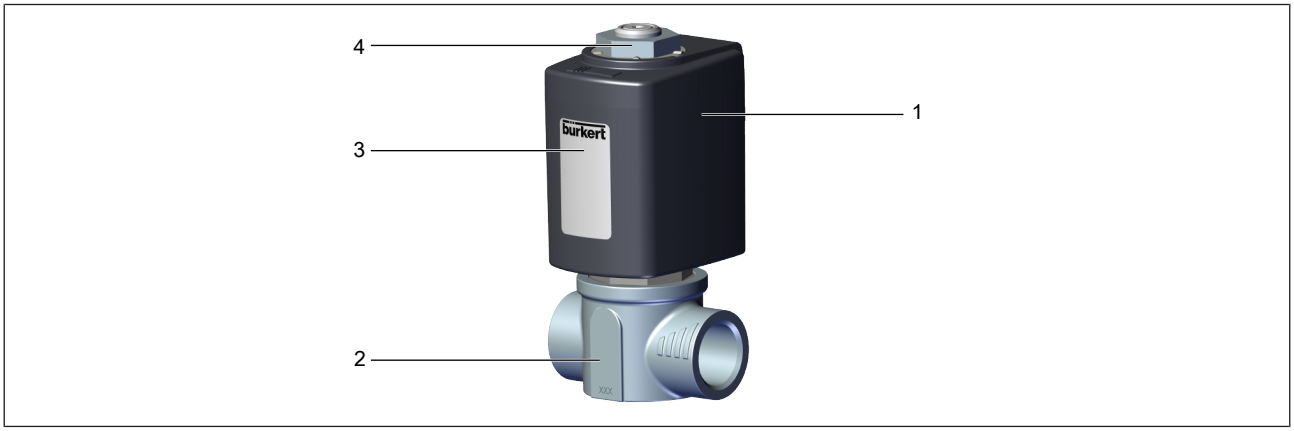

Fig. 3: Type 6020 socket variants

1	Coil	2	Valve body
3	Type label	4	Nut for coil attachment

3.2 Product identification

3.2.1 Type label

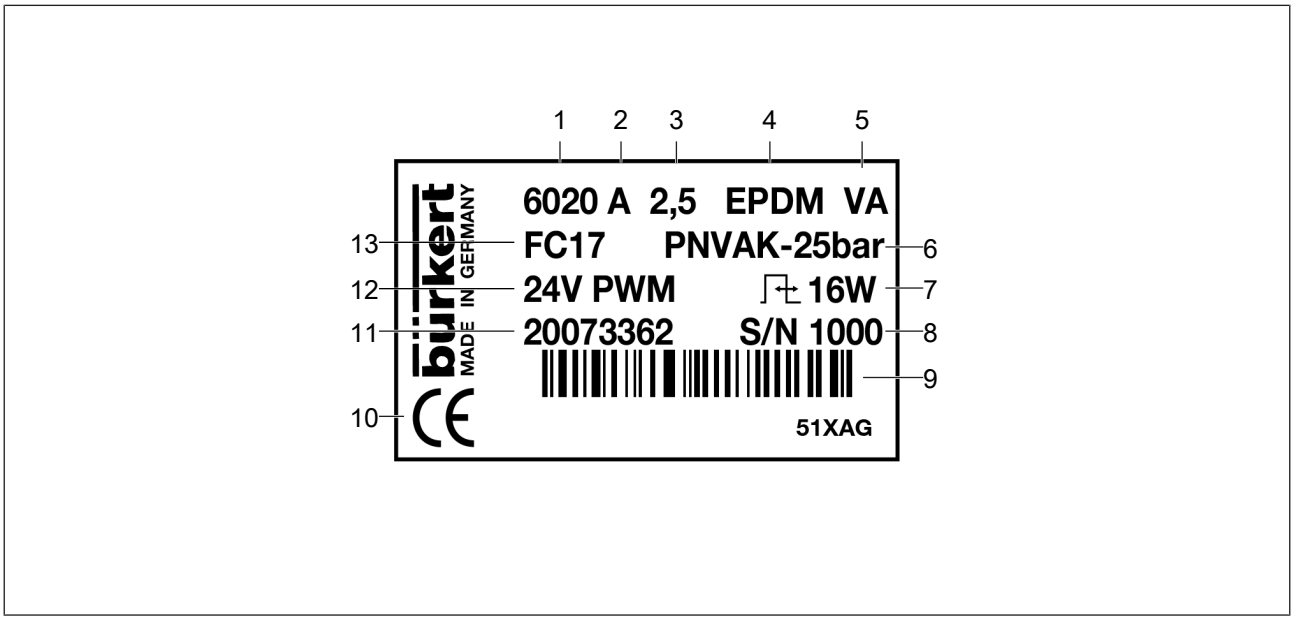

Fig. 4: Type 6020 type label (example)

1	Type	2	Circuit function
3	Orifice	4	Sealing material
5	Body material	6	Operating pressure
7	Nominal power	8	Serial number
9	Barcode	10	CE marking
11	Article number	12	Operating voltage
13	Port connection		

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4 TECHNICAL DATA

4.1 Standards and directives

The device complies with the valid EU harmonisation legislation.

The harmonised standards that have been applied for the conformity assessment procedure are listed in the current version of the EU Declaration of Conformity.

The raw materials used for the components in contact with media correspond to the UBA-listed materials in the Drinking Water Directive KTW and W270. The raw materials with the largest surfaces in contact with media are FDA-compatible. The device was developed pursuant to DIN EN ISO 7494-2:2015.

4.2 Instructions for operating proportional valves

Proportional valves with the same identification number are set at the factory so that they have almost the same degree of opening and therefore a comparable flow level when operated with the same control unit. However, this only applies for identical operating conditions. The procedure depends on several influencing factors.

Operating behaviour with flow under the seat (Standard)

- **Input pressure:** As the input pressure decreases, the duty cycle or current required to reach the opening point of the valve increases. The maximum specified input pressure must not be exceeded; otherwise, the shut-off function can no longer be guaranteed.
- **Back pressure:** The back pressure has no influence on the opening start of the valve, but it does have an influence on the maximum achievable flow rate and the characteristic curve of the flow characteristic.

Operating behaviour with flow above the seat (V code MC13)

- **Input pressure:** As the input pressure decreases, the duty cycle or current required to reach the opening point of the valve decreases. The maximum specified input pressure must not be exceeded as otherwise the valve can no longer open or the nominal flow rate can no longer be achieved. A reliable shut-off function can be guaranteed in the event of short-term pressure peaks with flow above the seat.
- **Back pressure:** The back pressure has no influence on the opening start of the valve, but it does have an influence on the maximum achievable flow rate and the characteristic curve of the flow characteristic. At high back pressures, the control behaviour is influenced by increased linearity deviation of the flow characteristic.

Regardless of the flow, the thermal operating conditions also have an influence on the control behaviour of proportional valves: the duty cycle of the PWM signal for the opening start or a specific flow value of the valve is temperature-dependent. The ambient temperature and the self-heating of the valve are critical. When the coil is cold, a smaller duty cycle is sufficient to open the valve or achieve a desired flow value. However, the required duty cycle increases when the coil is at operating temperature and/or at higher ambient temperatures.

Operating behaviour at risk of frost: If there is moisture in the valve when it is cold and switched off, there is a risk of icing, which prevents opening and satisfactory control. In such cases, it is recommended to run through a warm-up phase without the operating medium present before commissioning. To do this, initially operate the valve with nominal voltage without current limitation (100% duty cycle) for rapid heating. However, this process must not last longer than 5 minutes. Then, switch the valve several times (at least 5 times). During the closing process, observe the specifications for the valve control specified in the chapter Operating conditions [▶ 11] .

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4.3 Operating conditions

NOTICE!

High pressure surges

Liquids and high differential pressure may cause high pressure surges.

Specification for valve control

To ensure an unlimited service life of the valve seat seal, the valve must not be repeatedly and abruptly de-energised during normal operation.

It is recommended to implement a ramp time of at least 0.2 s to switch off the valve. Alternatively, the PWM duty cycle can be set to 20% for 0.2 seconds before the valve is completely de-energised.

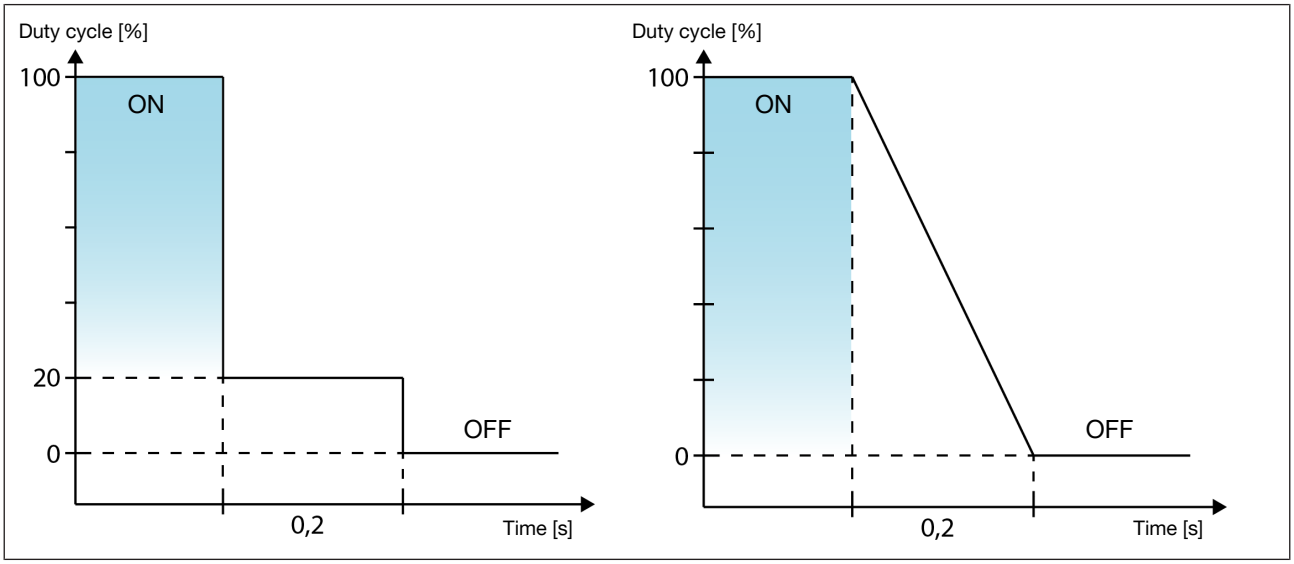

Fig. 5: Softclose

Operating mode	Unless otherwise specified on the type label, the solenoid actuator is suitable for continuous operation. ■ 24 V to maximum 70 °C ambient temperature: 810 mA ■ 24 V to maximum 85 °C ambient temperature: 760 mA ■ 12 V to maximum 70 °C ambient temperature: 1530 mA ■ 12 V to maximum 85 °C ambient temperature: 1430 mA
Medium	neutral gases, pure hydrogen, natural gas, others on request
Installation position	Any, preferably actuator face up
Medium temperature	–40…+90 °C
Ambient temperature	–40...+70 °C –40…+85 °C
Storage temperature	–40…+80 °C
Materials	see data sheet
Protection classes (according to VDE 0580)	I (standard coil)
	III (coil with automotive plug)

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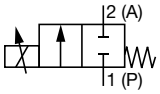
Degree of protection (EN 60529 / IEC 60529)	IP65*
	**With correctly connected cable plug*.
Degree of protection (NEMA 250)	4X*
	**With correctly connected Type 2509 cable plug for VA variants (other variants on request)*.
Degree of protection (ISO 20653)	IP6K, IPX7 (immersion test in accordance with ISO 16750-4), IPX9K*
	**Degree of protection can only be guaranteed if the coil is not removed from the valve*.

4.4 Circuit function

Icon	Description
	Circuit function A (WW A), NC 2/2-way solenoid proportional valve, direct-acting Normally closed

Tab. 1: Circuit function

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5 INSTALLATION

5.1 Preparatory work

DANGER!

Risk of injury from high pressure and discharge of medium.

➔ Before working on the device or system, switch off the pressure. Vent or drain lines.

➔ Clear pipes of any dirt.

➔ Fit a dirt trap on a dirty medium before the valve inlet (mesh size 0.2...0.4 mm).

➔ Devices that are suitable for use with food according to the manufacturer should be flushed for 5 minutes prior to start-up.

➔ Seal pipe connections using an elastomer seal or PTFE tape. Ensure that seal material does not get into the device.

5.2 Cable plug installation

CAUTION!

If there is no protective conductor function, there is a risk of injury from electric shock.

➔ Always connect the protective conductor.

➔ Check electrical continuity between coil and body.

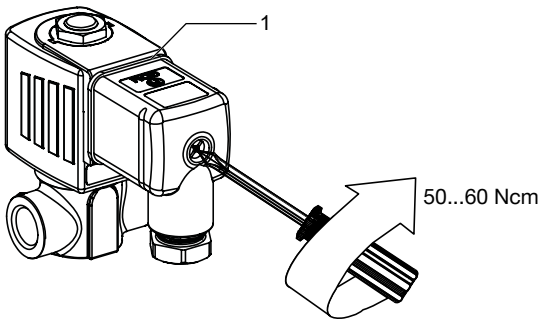

Fig. 6: Install the cable plug

1	Seal

➔ Attach the cable plug (for permitted types, see data sheet) to the contacts on the coil.

➔ Check that the seal is properly fitted.

➔ Tightly screw cable plug, while observing a tightening torque between 50 Ncm and 60 Ncm.

➔ Connect the protective conductor.

➔ Check electrical continuity between coil and body.

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5.3 Installation of socket variants

Fig. 7: Installation of socket variants

- ➔ Note flow direction: see data sheet
- ➔ Ensure that the seal surfaces on the body port connections are free of any damage.
- ➔ Hold the device on the valve body using an open-end wrench and screw into the pipeline.

NOTICE!

- ➔ Be sure not to damage the seal surfaces on the body port connections when screwing into the pipeline.

5.4 Cartridge variant installation

Fig. 8: Installation of cartridge variants, example FC17

- ➔ Ensure that the O-rings on the valve body and the seal surfaces of the connection housing are free of any damage.
- ➔ Recommendation:coat O-rings on the body in a suitable lubricant to prevent damage.
- ➔ Press the valve into the connection housing.
- ➔ Tightly screw in the retaining plate crosswise, observing the tightening torque indicated in the following table.

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NOTICE!

➔ Ensure that the O-rings on the valve body and the seal surfaces of the connection housing are not damaged during installation.

Variant	Tightening torque [Nm]	Screwing
FC17	6	M5 (screws not included in the scope of delivery)

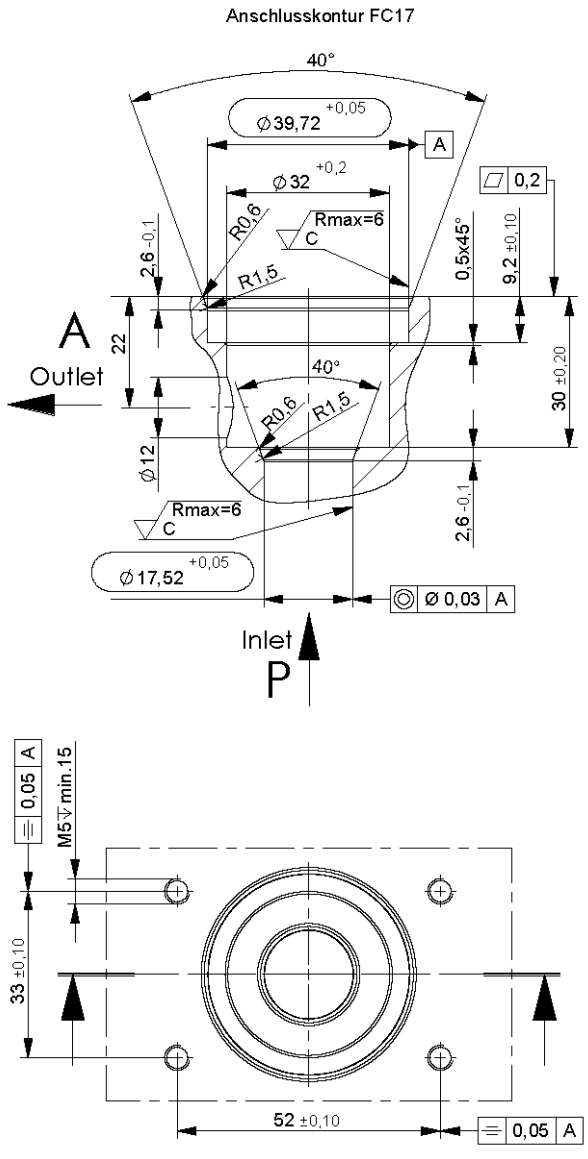

Fig. 9: Connection diagram for cartridge variant FC17

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5.5 Flange variant installation

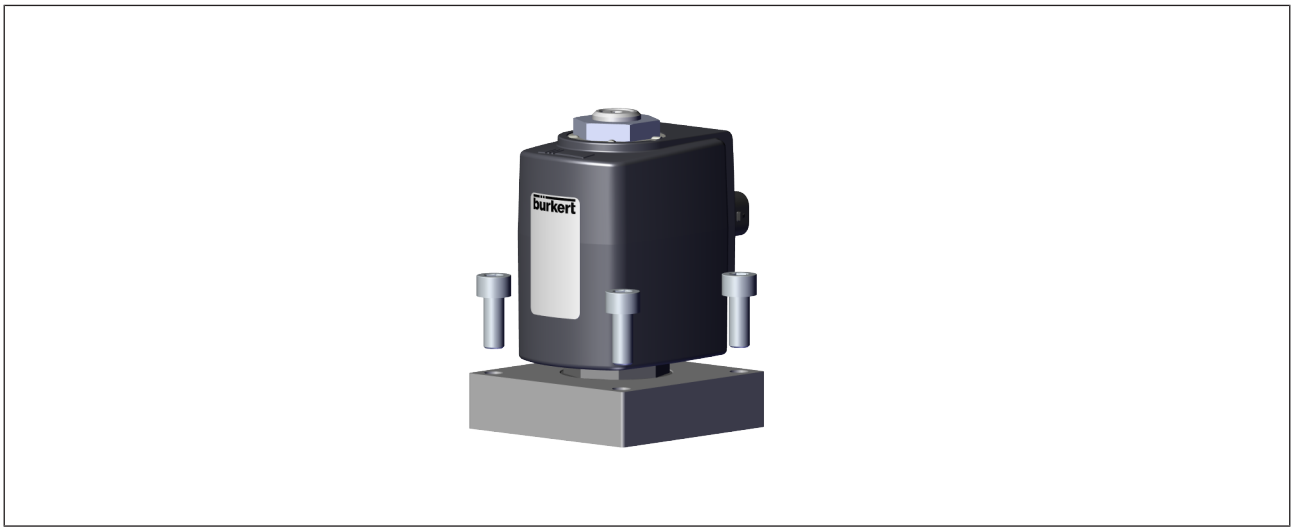

Fig. 10: Flange variant installation

➔ Ensure that the O-rings on the valve body and the seal surfaces of the connection housing are free of any damage.

➔ Place the valve on the connection housing.

➔ Tightly screw in the valve body crosswise, observing the tightening torque indicated in the following table.

NOTICE!

➔ Ensure that the O-rings on the valve body and the seal surfaces of the connection housing are not damaged during installation.

Variant	Tightening torque [Nm]	Screwing
FK15	6	M5 (screws not included in the scope of delivery)

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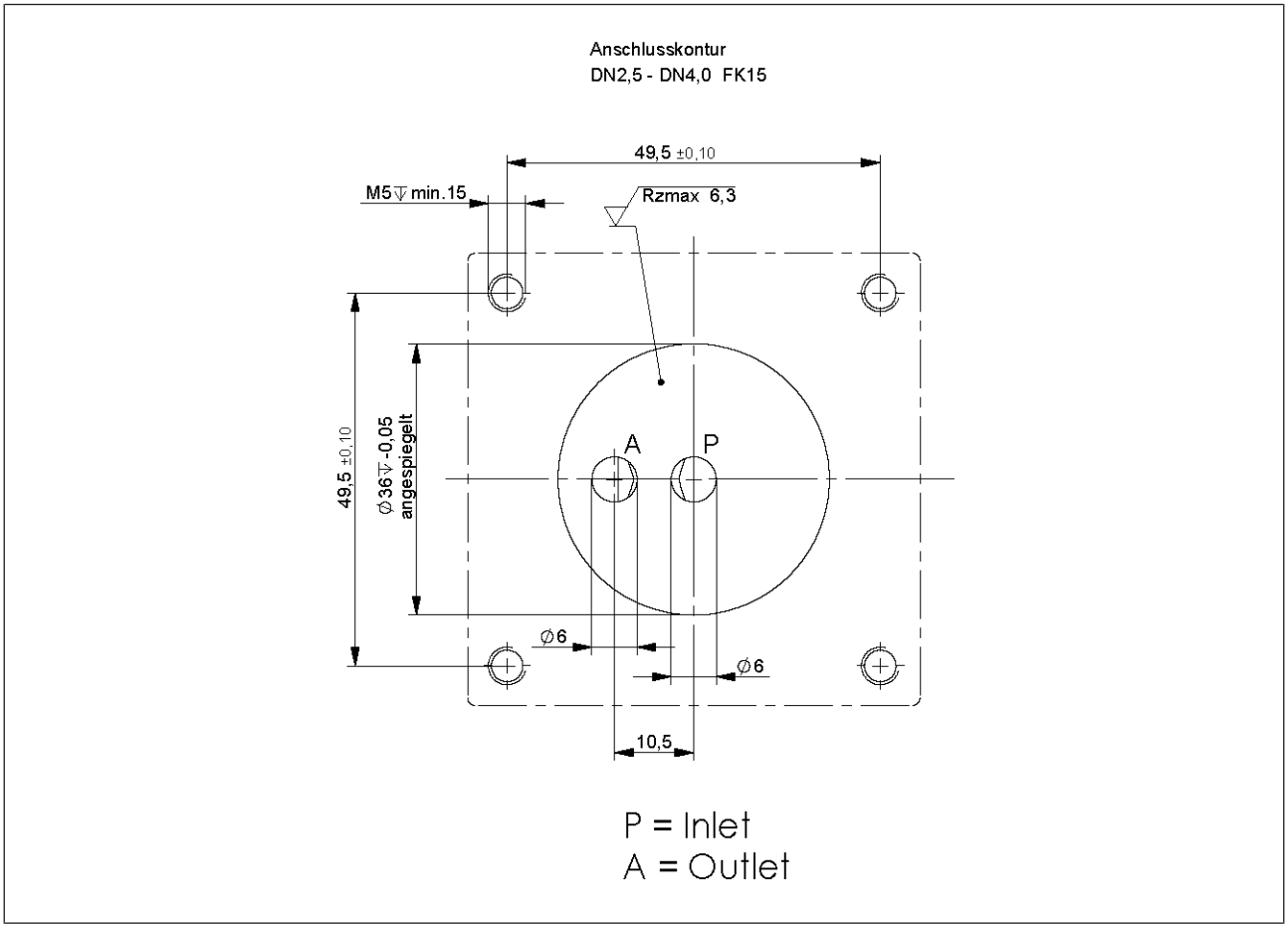

Fig. 11: Connection diagram for flange variant FK15

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6 ELECTRICAL CONNECTION

WARNING!

Risk of injury from electric shock.

➔ Switch off the power supply before working on the device or system. Secure it against reactivation.

➔ Observe the applicable accident prevention and safety regulations for electrical devices.

6.1 Cable plug Type 2518, plug shape A according to DIN EN 175301-803

Other cable plug variants can be found on the data sheet for Type 2518 at country.burkert.com.

Fig. 12: Cable plug Type 2518, plug shape A according to DIN EN 175301-803

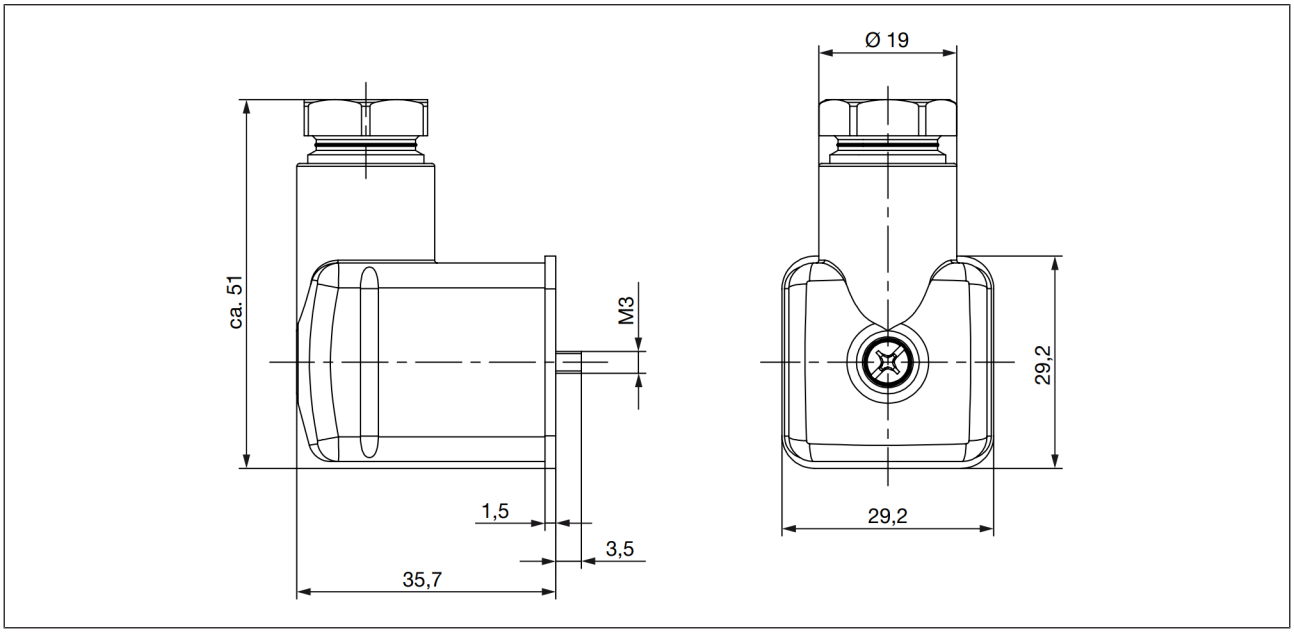

Fig. 13: Cable plug dimensions Type 2518

Further information, such as wiring and electrical values can be found on the data sheet for Type 2518 at country.burkert.com.

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6.2 Automotive plugs for IP6K9K coil variants

For mobile applications, coils are provided with the following automotive plugs:

- KOSTAL MLK1.2 plug, 2-pin, coding A (male)
- TE MCON 1.2 plug, 2-pin, coding A (male)

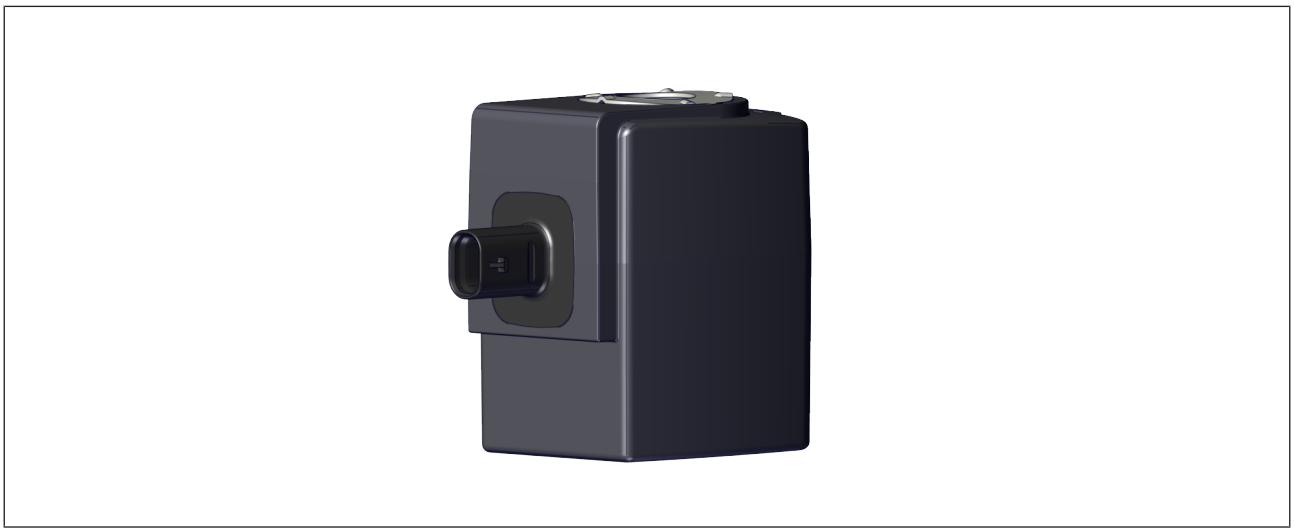

Fig. 14: Automotive plugs for IP6K9K coil variants

Customer-specific plug forms available on request.

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7 FAULTS

DANGER!

Risk of injury from high pressure and discharge of medium.

➔ Before working on the device or system, switch off the pressure. Vent or drain lines.

WARNING!

Risk of injury from electric shock.

➔ Switch off the power supply before working on the device or system. Secure it against reactivation.

➔ Observe the applicable accident prevention and safety regulations for electrical devices.

Error	Possible cause	Remedy
No flow	No supply pressure	Check supply pressure
	Valve connections switched	Check if pressure applied to valve is correct (see installation chapter)
	Electrical connection faulty	Check if electrical contacts and supply voltage are correct
	Filter clogged	Check filter and clean if necessary
Flow value not reached	Input pressure level too low	Check if sufficient input pressure level is present for desired flow
	Other pressure drop in system	Check filter for soiling. Check armatures and lines in system for sufficient dimensioning
	Supply voltage is too low	Adjust supply voltage (see operating conditions)
	Ambient temperature too high and/or average modulation too high	Reduce ambient temperature Adjust valve layout
	Valve layout not correct	Contact Bürkert contact person
Increased noise development	PWM frequency not coordinated to valve	Set recommended PWM frequency
	Vibration stimulation present in system	If possible, reduce pressure level If possible, increase cable cross-section Otherwise, contact Bürkert contact person

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8 LOGISTICS

8.1 Transport and storage

- ➔ Protect the device against moisture and dirt in the original packaging during transportation and storage.
- ➔ Avoid UV radiation and direct sunlight.
- ➔ Protect connections from damage with protective caps.
- ➔ Observe permitted storage temperature.

8.2 Disposal

Environmentally friendly disposal

- ➔ Follow national regulations regarding disposal and the environment.
- ➔ Collect electrical and electronic devices separately and dispose of them as special waste.

Further information at country.burkert.com

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