



Assembly and Operating Manual

OPS

Collision and Overload Protection

Translation of the original manual

Hand in hand for tomorrow

Imprint

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Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

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Dear Customer,

Thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

Customer Management

Tel. +49-7133-103-2503

Fax +49-7133-103-2189

cmg@de.schunk.com



Please read the operating manual in full and keep it close to the product.

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1 General

1.1 About this manual

This manual contains important information for a safe and appropriate use of the product.

This manual is an integral part of the product and must be kept accessible for the personnel at all times.

Before starting work, the personnel must have read and understood this operating manual. Prerequisite for safe working is the observance of all safety instructions in this manual.

In addition to these instructions, the documents listed under ▶ 1.1.3 [📄 5] are applicable.

NOTE: The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.

1.1.1 Presentation of Warning Labels

To make risks clear, the following signal words and symbols are used for safety notes.



⚠ DANGER

Dangers for persons!

Non-observance will inevitably cause irreversible injury or death.



⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.



⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

CAUTION

Material damage!

Information about avoiding material damage.

1.1.2 Definition of Terms

The term "product" replaces the product name on the title page in this manual.

1.1.3 Applicable documents

- General terms of business *
- Catalog data sheet of the purchased product *

The documents labeled with an asterisk (*) can be downloaded from schunk.com/downloads.

1.2 Warranty

If the product is used as intended, the warranty is valid for 24 months from the ex-works delivery date under the following conditions:

- Observe the applicable documents, ▶ 1.1.3 [5]
- Observe the ambient conditions and operating conditions, ▶ 2.4 [6]

1.3 Scope of delivery

The scope of delivery includes

- Collision and Overload Protection OPS in the version ordered
- Accessory pack (electrical connection: angular plug with 5m cable, open wire strands)
- Safety information (product-specific instructions available online)

Accessory pack

Content of the accessory pack:

- 1 x Swiveling connection
- 1 x cable for sensors, ID number: 0301502
- Cylinder pin for mounting
- Screws for mounting

Size	ID number
80	5510476
100	5511310
160	5511335
200	5510618
300	5511076

Tab.: ID.-No. of the accessory pack

2 Basic safety notes

2.1 Intended use

The product was designed as a device to protect robots and handling unit from damage resulting from collisions and overload conditions.

- The product may only be used within the scope of its technical data, ▶ 3 [10].
- The product is intended for installation in a machine/ automated system. The applicable guidelines for the machine/ automated system must be observed and complied with.
- The product is intended for industrial and industry-oriented use. Its use outside enclosed spaces is only permitted if suitable protective measures are taken against outdoor exposure. The product is not suitable for use in salty air.
- Appropriate use of the product includes compliance with all instructions in this manual.
- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

2.2 Constructional changes

Implementation of structural changes

Modifications, changes or reworking, e.g. additional threads, holes, or safety devices, can damage the product or impair its functionality or safety.

- Structural changes should only be made with the written approval of SCHUNK.

2.3 Spare parts

Use of unauthorized spare parts

Using unauthorized spare parts can endanger personnel and damage the product or cause it to malfunction.

- Use only original spare parts or spares authorized by SCHUNK.

2.4 Ambient conditions and operating conditions

Required ambient conditions and operating conditions

Incorrect ambient and operating conditions can make the product unsafe, leading to the risk of serious injuries, considerable material damage and/or a significant reduction to the product's life span.

- Make sure that the product is used only in the context of its defined application parameters, ▶ 3 [10].

- Make sure that the product is a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

2.5 Personnel qualification

Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

- All work may only be performed by qualified personnel.
- Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
- Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

Trained electrician

Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.

Qualified personnel

Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.

Instructed person

Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.

Service personnel of the manufacturer

Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

2.6 Personal protective equipment

Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.

- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

2.7 Notes on safe operation

Incorrect handling of the personnel

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

2.8 Transport

Handling during transport

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

2.9 Malfunctions

Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.

- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

2.10 Disposal

Handling of disposal

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.

2.11 Fundamental dangers

General

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or movement area of the product during operation.

2.11.1 Protection against electric shock

Possible electrostatic energy

Components or assembly groups may become electrostatically charged. When the electrostatic charge is touched, the discharge may trigger a shock reaction leading to injuries.

- The operator must ensure that all components and assembly groups are included in the local potential equalisation in accordance with the applicable regulations.
- While paying attention to the actual conditions of the working environment, the potential equalisation must be implemented by a specialist electrician according to the applicable regulations.
- The effectiveness of the potential equalisation must be verified by executing regular safety measurements.

3 Technical Data

Size	Operating pressure [bar]	Deflection		
		axial [mm]	angular [°]	rotational [°]
80	0.5 – 3	12.0	12	360
100	0.5 – 5	14.0	12	360
160	0.5 – 5	8.0	5	360
200	1 – 6	9.5	4	360
300	1 – 6	3.5	ca. ± 1 *	14 **

* The size 300 (special) is equipped with flexible stop elements. Therefore higher payloads at larger angles of deflection are involved.

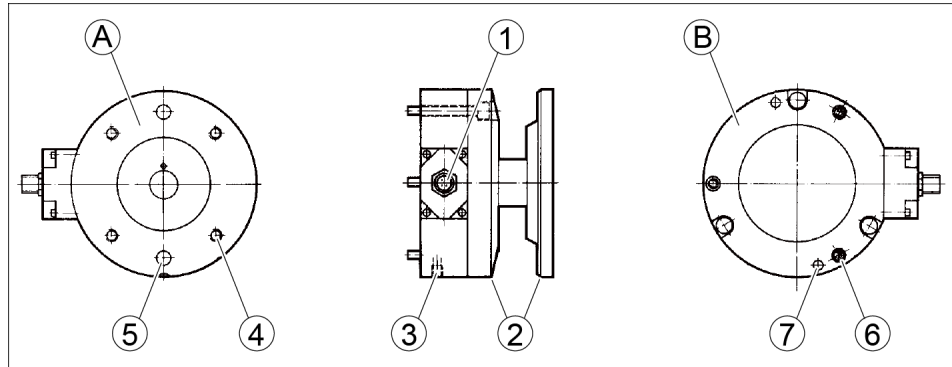
** With rotational limitations

More technical data is included in the catalog data sheet. Whichever is the latest version.

4 Assembly

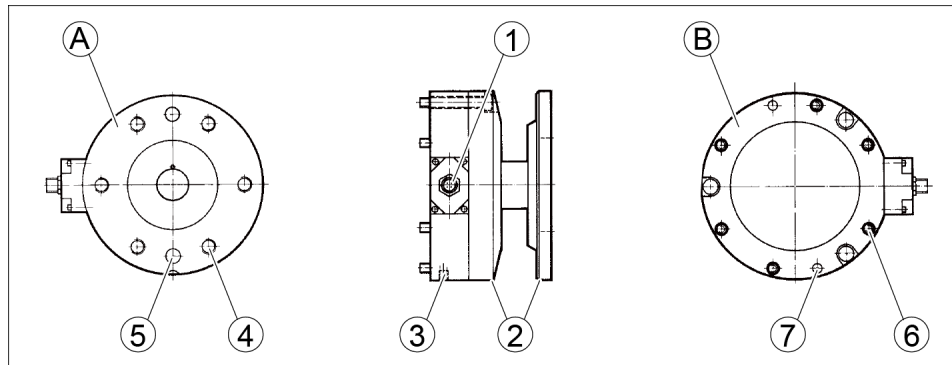
4.1 Mechanical connection

Size 80



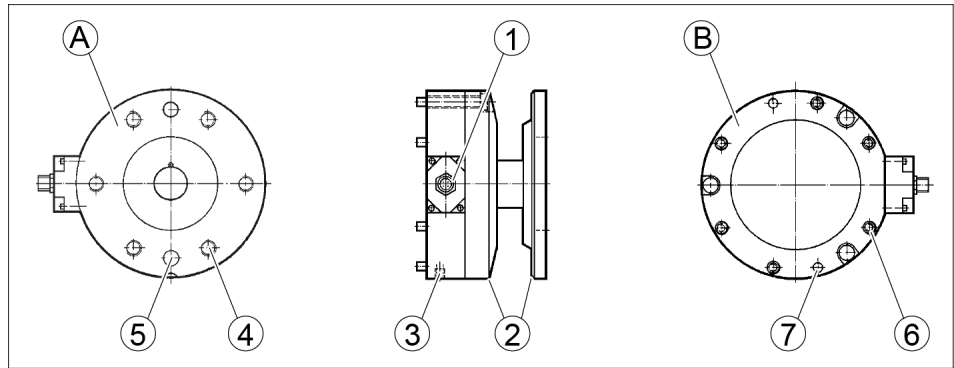
Item	Designation	Item	Designation
1	Sensor connection	3	Air connection
2	Notch		
A	Tool side		
4	Cylinder head screw 4 x M6	5	Cylindrical pin 2x Ø 6mm
B	Robot side		
6	Cylinder head screw 3 x M4	7	Cylindrical pin 2x Ø 4mm

Size 100



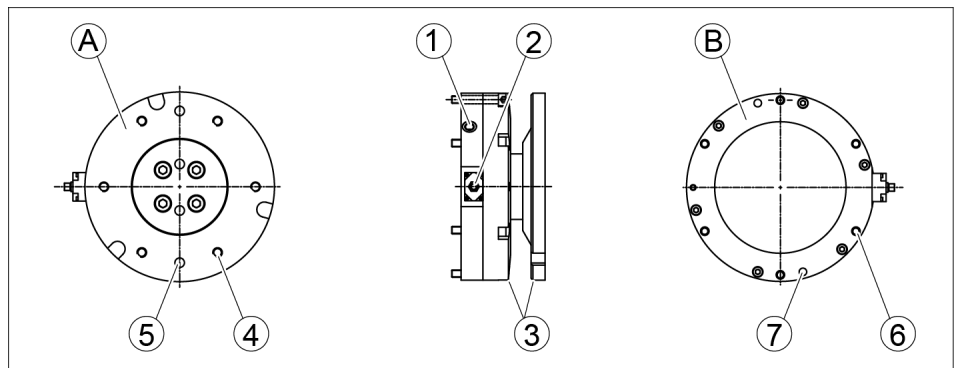
Item	Designation	Item	Designation
1	Sensor connection	3	Air connection
2	Notch		
A	Tool side		
4	Cylinder head screw 6 x M8	5	Cylindrical pin 2x Ø 8mm
B	Robot side		
6	Cylinder head screw 6 x M5	7	Cylindrical pin 2x Ø 5mm

Size 160



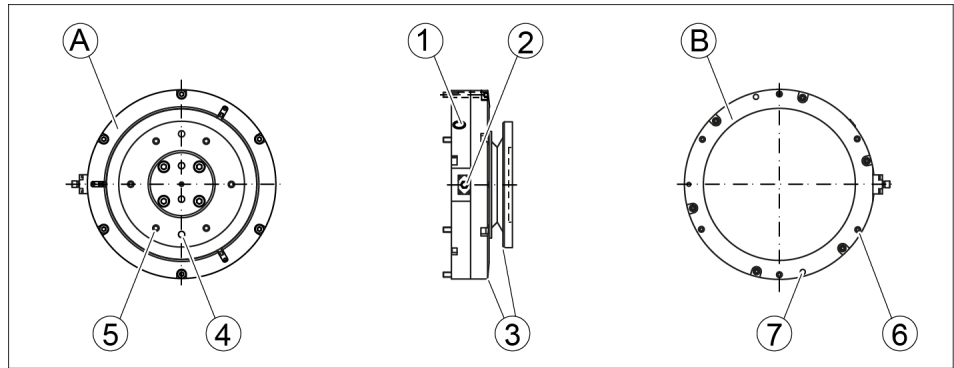
Item	Designation	Item	Designation
1	Sensor connection	3	Air connection
2	Notch		
A	Tool side		
4	Cylinder head screw 6 x M10	5	Cylindrical pin 2x Ø 10mm
B	Robot side		
6	Cylinder head screw 6 x M8	7	Cylindrical pin 2x Ø 8mm

Size 200



Item	Designation	Item	Designation
1	Air connection	3	Notch
2	Sensor connection		
A	Tool side		
4	Cylinder head screw 6 x M10	5	Cylindrical pin 2x Ø 10mm
B	Robot side		
6	Cylinder head screw 6 x M8	7	Cylindrical pin 2x Ø 8mm

Size 300



Item	Designation	Item	Designation
1	Air connection	3	Notch
2	Sensor connection		
A	Tool side		
4	Cylinder head screw 6 x M10	5	Cylindrical pin 2x Ø 10mm
B	Robot side		
6	Cylinder head screw 6 x M8	7	Cylindrical pin 2x Ø 8mm

NOTE

The basic position of the OPS is clearly defined, since it only snaps in a certain position.

The OPS snaps, when the notch of the flange is aligned with the notch on the housing.

4.2 Electrical connection



⚠ DANGER

Danger from electric voltage!

Touching live parts may result in death.

- Switch off the power supply before any assembly, adjustment or maintenance work and secure against being switched on again.
- Only qualified electricians may perform electrical installations.
- Check if de-energized, ground it and hot-wire.
- Cover live parts.



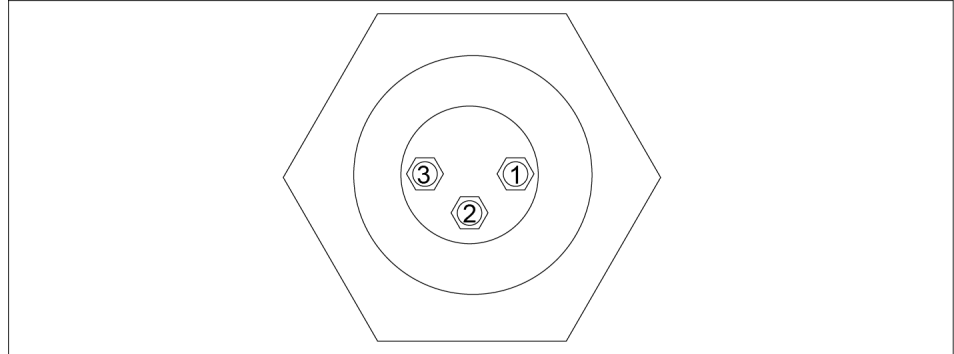
⚠ WARNING

For connection of inductive loads switch a recovery diode parallelly to the load!

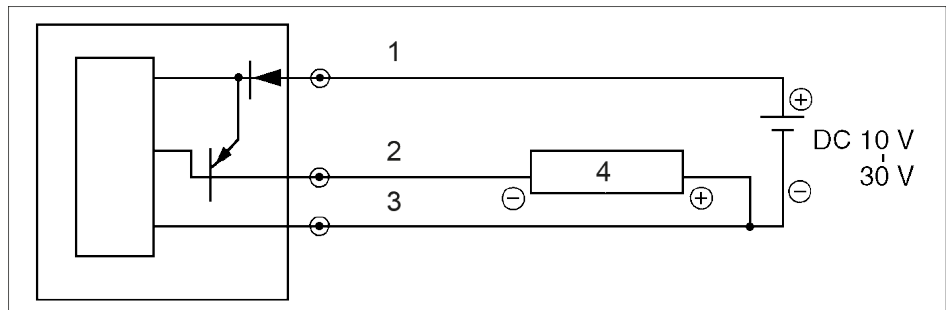
Please make sure that power supply will be correctly polarized. The electronic has a reverse battery protection.

4.2.1 Sensor PNP-Version (standard)

When the OPS is in basic position (not released), the circuit is closed. As soon as the collision sensor got deflected (no longer in basic position), the circuit is open.



Sensor connector



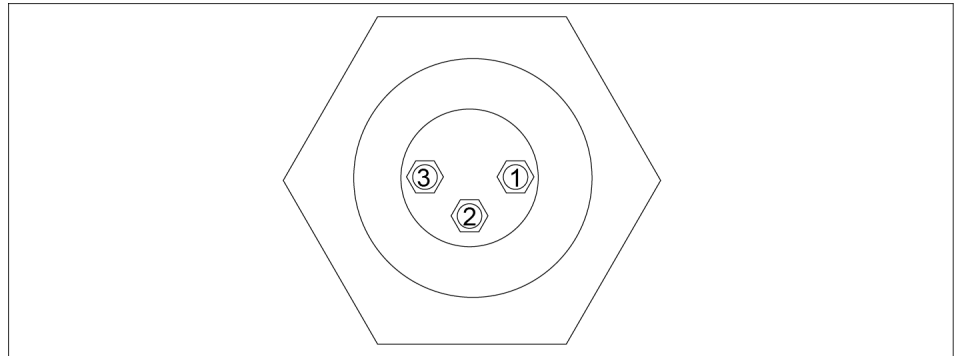
Circuit diagram sensor PNP-Version

Item	Designation	Color
1	+24V	Brown
2	Signal	Black
3	GND	Blue
4	Load	

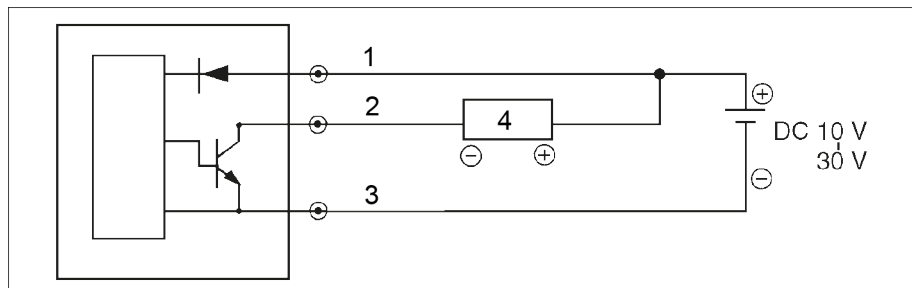
Designation	Value
Power supply [VDC]	10 ... 30 (Remaining ripple max. 10%)
Power demand [mA]	Max. 7.5 (without load at 24 V)
Voltage drop [V]	Max. 3,6
Output	PNP switching
Max. power output [mA]	180 (resistive load); short circuit proof
Output signal	OPS locked – transistor leading OPS unlocked – transistor not leading

4.2.2 Sensor NPN-Version (special)

The basic sensor position is closed, the sensor is energized.



Sensor connector



Circuit diagram sensor NPN-Version

Item	Designation	Color
1	+24V	Brown
2	Signal	Black
3	GND	Blue
4	Load	

Designation	Value
Power supply [VDC]	10 ... 30 (Remaining ripple max. 10%)
Power demand [mA]	Max. 2 (without load)
Voltage drop [V]	Max. 3,5
Output	NPN switching, Open Collector
Max. power output [mA]	40 (resistive load); short circuit proof
Output signal	OPS locked – transistor not leading OPS unlocked – transistor leading

4.3 Air connections

CAUTION

Observe the requirements for the air supply, ▶ 3 [10].

The compressed air must be filtered (10 µm), dry, oiled or unoiled.

Standard for quality of the compressed air according to ISO 8573-1: 6 4 4.

Size	Hose Ø
80	4 x 1
100	4 x 1
160	6 / 4
200	6 / 4
300	6 / 4

Tab.: Compressed air connection at the throttle check valve

4.4 How to determine the operating pressure

CAUTION

The OPS deflects during deaeration!

- During deflection air will exhaust permanently from the OPS. If this should have to be avoided, the compressed air should be switched off via an external valve during this time.
- If the facility should be switched off, please make sure that the air supply of the OPS is assured. If this shouldn't be possible, the OPS has to be positioned in a way that no more deflection may occur (possibly via devices or hanging position). During a longer stillstand, for example over night or weekend put the OPS always in a hanging position

NOTE

- Because of an attached throttle check valve the pressure in the OPS can be short term maintain. This is especially important during assembly work.
- Before adjusting the operating pressure open the throttle check valve by turning the adjusting screw to the left.

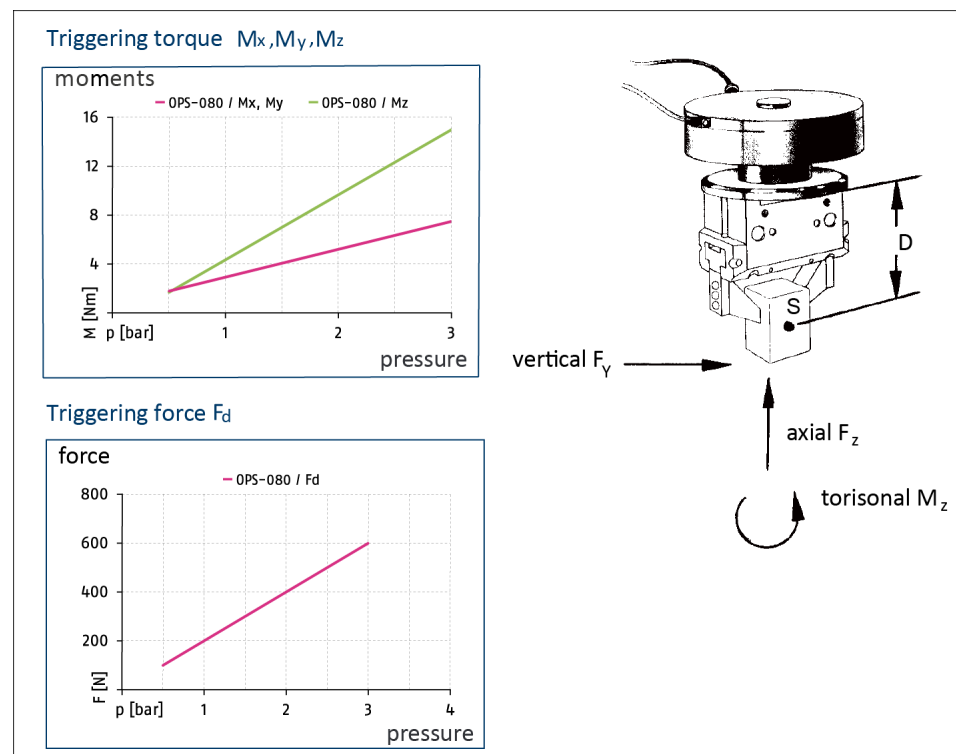
4.4.1 Calculation of the input air pressure (P)

For the rough calculation of the input air pressure use the following formulas and charts:

- **Fy and Fz:**
Force (F) out of mass (m) and acceleration (a) calculated in N,
 $F=m \cdot a$
- **My and Mz:**
Moment (M) out of force (F) and lever arm (L) calculated in Nm,
 $M=F \cdot L$
- **P:**
input air pressure in bar
- **S:**
center of gravity
- **D:**
Distance of the mounting surface OPS to the center of gravity (S) in mm

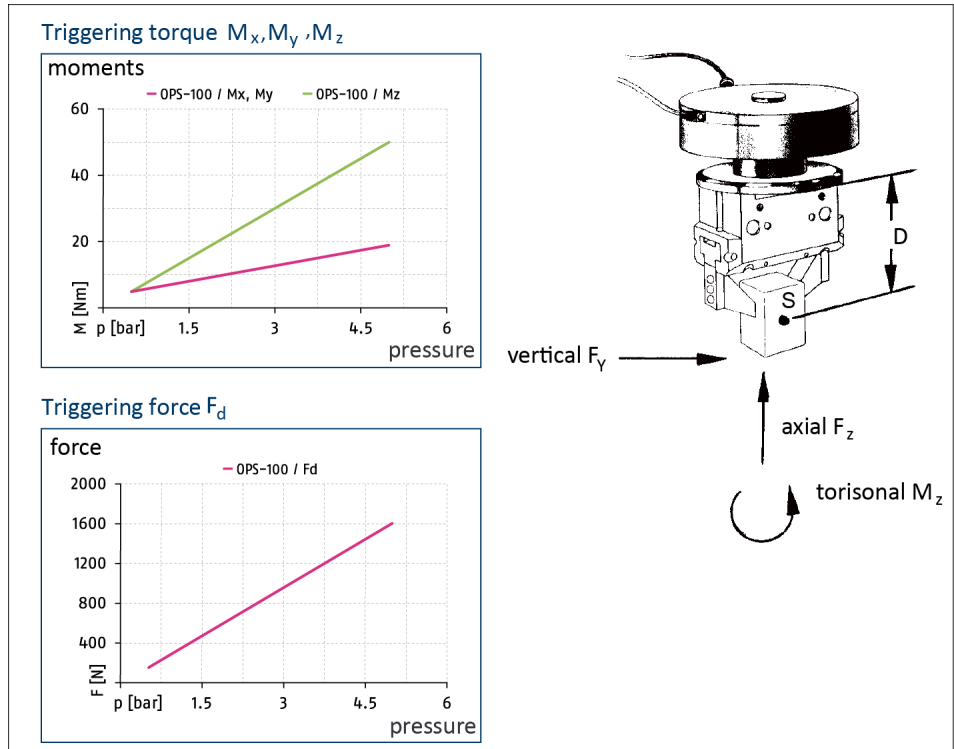
The determined input air pressure (P) must be within the operating pressure range of the OPS, ▶ 3 [10].

Size 80



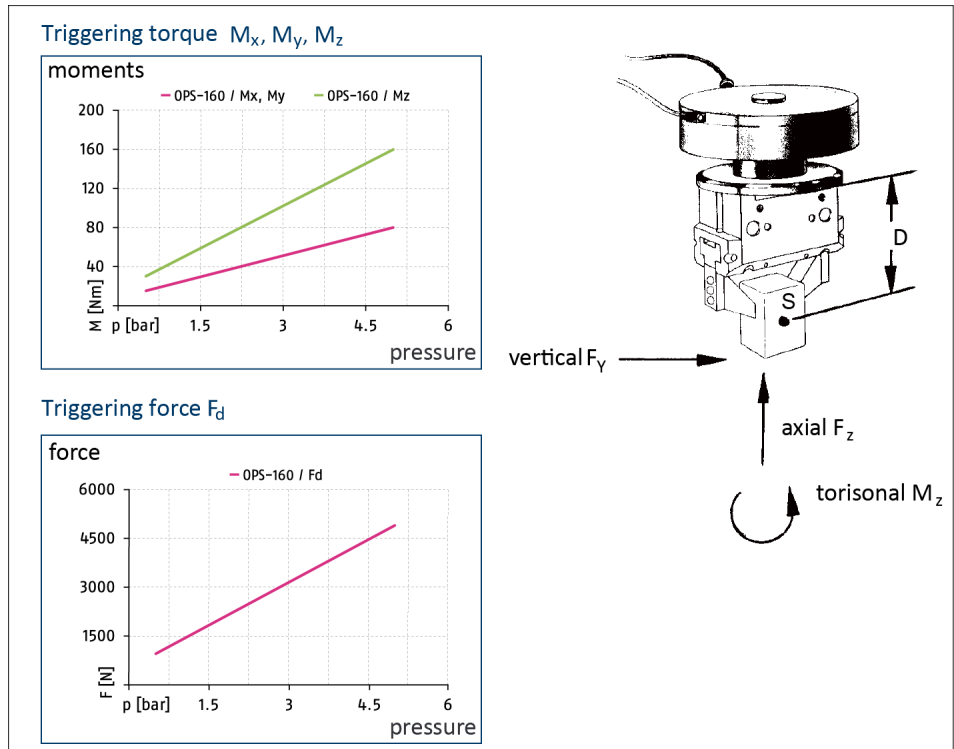
Calculation input air pressure

Size 100



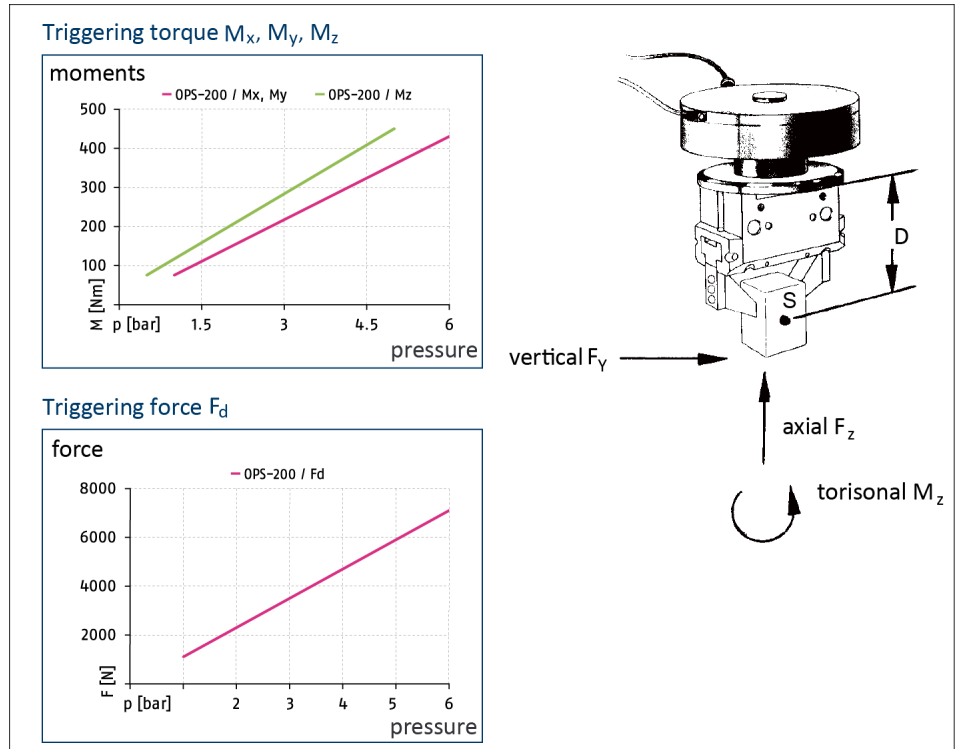
Calculation input air pressure

Size 160



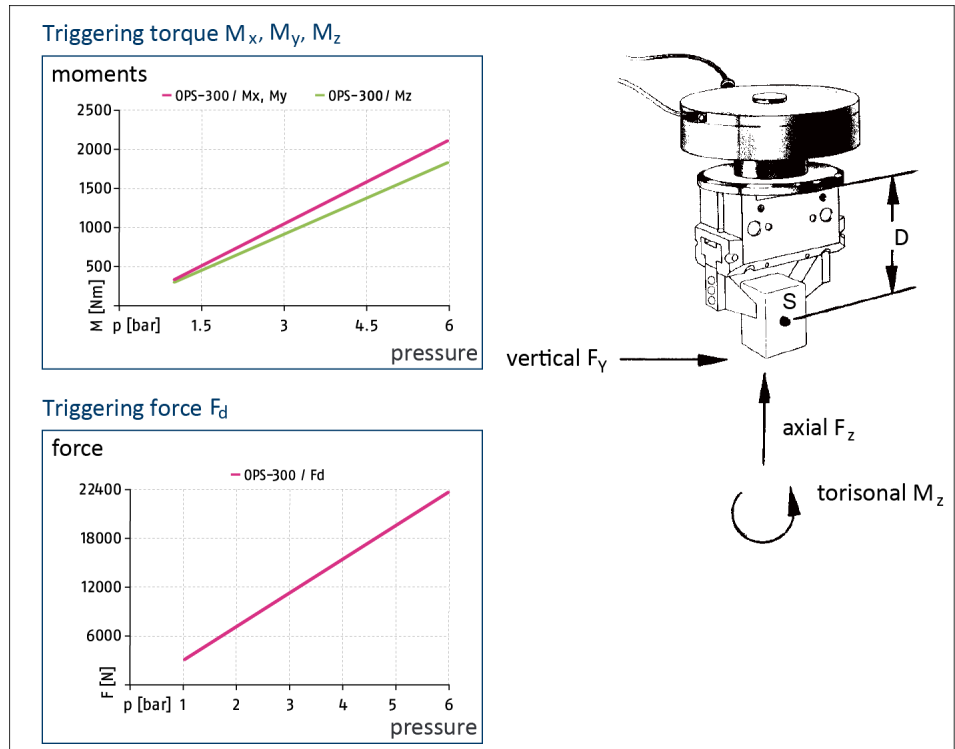
Calculation input air pressure

Size 200



Calculation input air pressure

Size 300



Calculation input air pressure OPS 300 (Sonder)

5 Troubleshooting

5.1 OPS does not react?

Possible cause	Corrective action
Operating pressure too high.	Check operating pressure., Link Betriebsdruckxx

5.2 OPS does not lock?

Possible cause	Corrective action
Basic alignment is incorrect	Turn module to basic position, ▶ 4.1 [📄 11]
Dirt deposits in the piston chamber	Remove the cover, Clean and lubricate product., ▶ 6 [📄 21]
Supply voltage too low.	Check operating pressure., Link Betriebsdruckxx
Piston sealing is defective.	Replace the seals., ▶ 6 [📄 21]

5.3 No electrical signal?

Possible cause	Corrective action
Cable connected incorrectly.	Check circular connections and both miniature flat connections on the right seat..
Electrical outputs not connected correctly	Check pin allocation..
Installed electrical signal transmitter defective	Send the product to SCHUNK with a repair order..
Cable breakage.	Exchange cable.

6 Maintenance

Collision and Overload protection OPS is maintenance-free.

- Carefully clean the OPS from dirt with a soft cloth.
- Don't use any solvents.
- Pay attention that no dirt penetrates into piston area when OPS is depressurized.

CAUTION

Proximity switches are poured in and can not be removed.
If the proximity switches or seals should be damaged, return the OPS for repair to SCHUNK.

7 Translation of the original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1 Section B.

Manufacturer/
Distributor SCHUNK SE & Co. KG
Spanntechnik | Greiftechnik | Automatisierungstechnik
Bahnhofstr. 106 – 134
D-74348 Lauffen/Neckar

We hereby declare that the partly completed machine described below

Product designation: Collision and Overload Protection / OPS /pneumatic
ID number 0321125, 0321130, 0321135, 0321140, 0321141, 0321145

meets the following basic occupational health and safety of the Machinery Directive 2006/42/EC:
No. 1.1.1, No. 1.1.2, No. 1.1.3, No. 1.1.5, No. 1.3.2, No. 1.5.3, No. 1.5.4, No. 1.5.6, No. 1.5.8,
No. 1.5.10, No. 1.5.11, No. 1.5.13

The partly completed machinery may not be put into operation until it has been confirmed that the machine into which the partly completed machinery is to be installed complies with the provisions of the Machinery Directive (2006/42/EC). The declaration shall be rendered invalid if modifications are made to the product.

Applied harmonized standards, especially:

EN ISO 12100:2010 Safety of machinery – General principles for design –
Risk assessment and risk reduction

The special technical documentation according to Annex VII, Part B, belonging to the partly completed machine, has been created.

Person authorized to compile the technical documentation:
Stefanie Walter, Address: see manufacturer's address

Signature: see original declaration

Lauffen/Neckar, October 2024

Dr.-Ing. Manuel Baumeister,
Head of Systems Engineering,
Technology & Innovation

9 Information on the RoHS Directive, REACH Regulation and Substances of Very High Concern (SVHC)

RoHS Directive

SCHUNK products are classified as "large-scale stationary installations" or as "large-scale stationary industrial tools" within the meaning of Directive 2011/65/EU and its extension 2015/863/EU "on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)", or fulfill their intended function only as part of one. Therefore products from SCHUNK do not fall within the scope of the directive at this time.

REACH Regulation

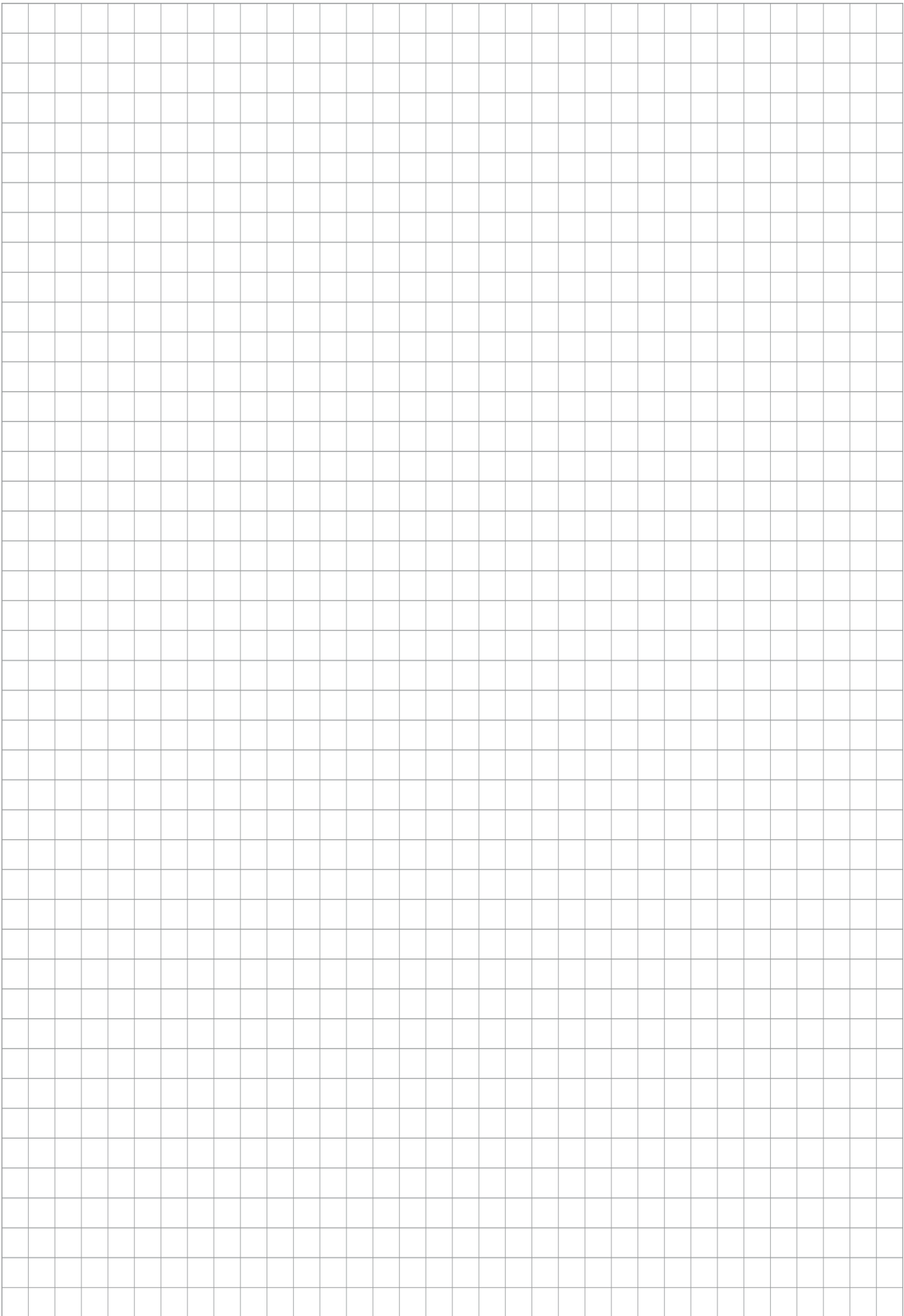
Products from SCHUNK fully comply with the regulations of Regulation (EC) No. 1907/2006 "concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)" and its amendment 2022/477. SCHUNK attaches great importance to completely avoiding chemicals of concern to humans and the environment wherever possible.

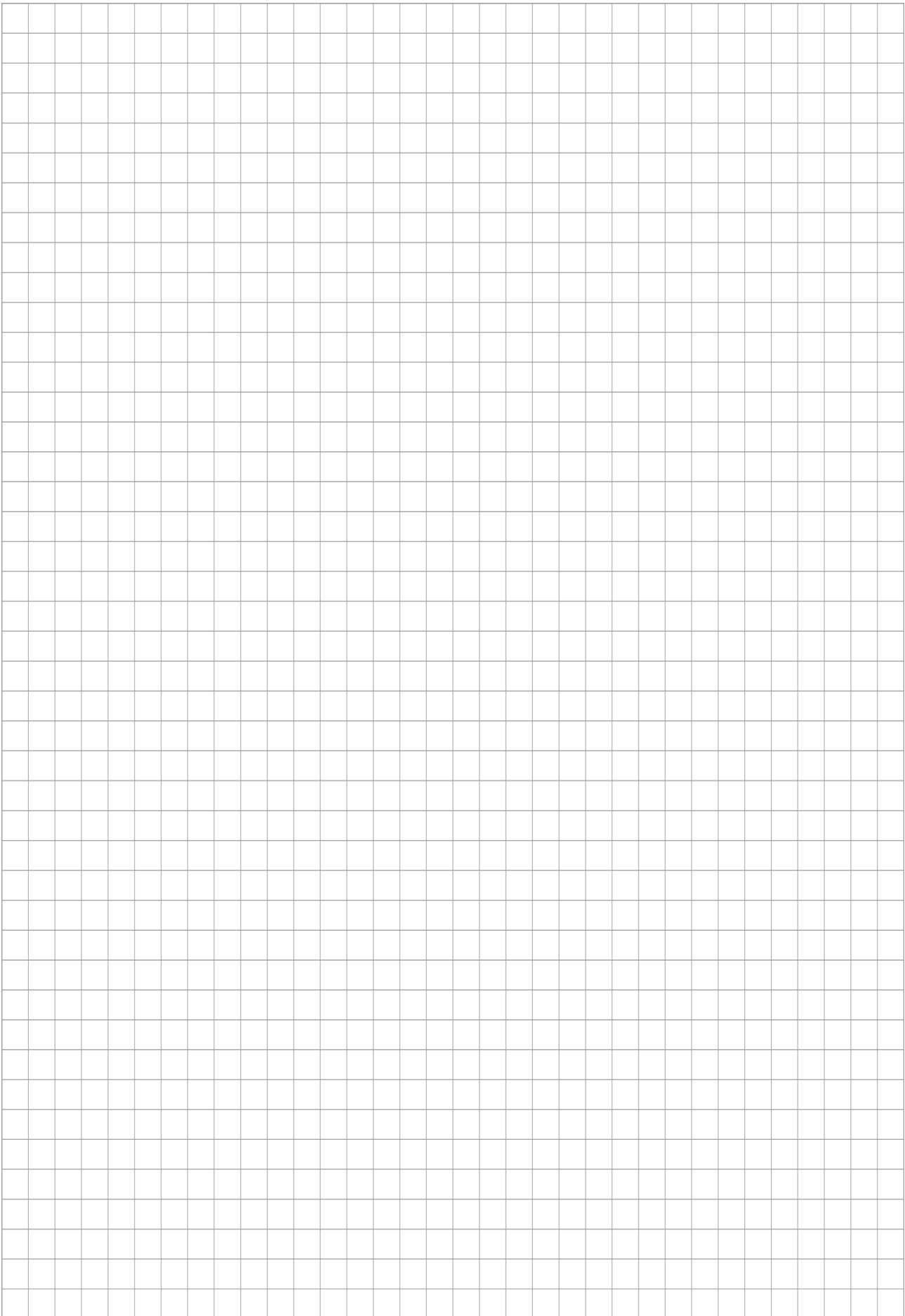
Only in rare exceptional cases do SCHUNK products contain SVHC substances on the candidate list with a mass content above 0.1%. In accordance with Article. 33 (1) of Regulation (EC) No. 1907/2006, SCHUNK complies with its duty to "communicate information on substances in articles" and lists the components concerned and the substances used in an overview that can be viewed at [schunk.com/SVHC](https://www.schunk.com/SVHC).

Signature: see original declaration

Lauffen/Neckar, October 2024

Dr.-Ing. Manuel Baumeister,
Head of Systems Engineering,
Technology & Innovation









SCHUNK SE & Co. KG
Spanntechnik | Greiftechnik | Automatisierungstechnik

Bahnhofstr. 106 - 134
D-74348 Lauffen/Neckar
Tel. +49-7133-103-0
info@de.schunk.com
schunk.com

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