



# Assembly and operating manual

## OPR 048

### Collision and Overload Protection Sensor

Original operating manual

Hand in hand for tomorrow

## Imprint

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### Technical changes:

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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

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

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## 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 ▶ 1.2 [ 6 ] are applicable.

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

### 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.

## 1.2 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](https://www.schunk.com/downloads).

## 1.3 Scope of delivery

The scope of delivery includes:

- Collision and Overload Protection Sensor OPR
- Accessory pack (electrical connection: connection cable 5 m, straight connector, open wire strands)
- Safety information (product-specific instructions available online)

## 2 Basic safety notes

### 2.1 Intended use

The OPR was designed as a device to protect industrial components and machinery from damage resulting from collisions and impacts.

The OPR has not been designed for, nor should it be used in, situations involving the safety of humans or animals. In all situations the user is responsible for insuring that applicable safety practices are followed as outlined by the manufacturer of the equipment on which the OPR will be used.

The module is intended for installation in a machine/system. The requirements of the applicable guidelines must be observed and complied with.

The module may be used only in the context of its defined application parameters ▶ 4 [13].

Any other use or use exceeding that specified is an infringement of use for intended purpose. The manufacturer bears no liability for damage resulting from such use.

### 2.2 Not intended use

It is not intended use if the product is used, for example, as a pressing tool, stamping tool, lifting gear, guide for tools, cutting tool, clamping device or a drilling tool.

- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

### 2.3 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.

## 2.4 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.

## 2.5 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, ▶ 4 [13].
- 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.

## 2.6 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.

<b>Qualified personnel</b>	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.
<b>Instructed person</b>	Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.
<b>Service personnel of the manufacturer</b>	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.

## 2.7 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.

## 2.8 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.

## 2.9 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.

## 2.10 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.

## 2.11 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.

## 2.12 Notes on particular risks



### **⚠ WARNING**

**Risk of injury from falling of the unit during transport, assembly and operation!**

- Secure gripper unit during transport and assembly with adequately sized straps.
- Ensure careful cultivation of the collision and overload system to the machine.



### **⚠ WARNING**

**Risk of injury from crushing fingers during deflection process!**



### **⚠ WARNING**

**Risk of injury from overload signal of the sensor (eg electrical short circuit) and in case of failure and reducing the supply of compressed air! The function of the electrical signal transmission is no longer guaranteed.**

### 3 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 specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions

Parts touching the workpiece and wear parts are not included in the warranty.

## 4 Technical data

Standard for quality of the compressed air		clean, dry, non-lubricated compressed air from a <b>self-relieving</b> regulator
Pressure range min./max. [bar]		OPR-048-P00: 1.4 / 6.2 OPR-048-P05: 1.4 / 5.9 OPR-048-P10: 1.4 / 5.5 OPR-048-P15: 1.4 / 5.2
Ambient temperature [°C]		5 to +50
Noise emission [dB(A)]		≤ 70
Connector Type Switch Rating	M8-3-pin male threaded connector 3-pole Nano Connector	100 mA 10 – 30 VDC
Optional interated springs		available corresponding to 0.3, 0.7, 1 bar

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

## 5 Product Overview

### 5.1 Introduction

The OPR is a pneumatically pressurized device offering protection to industrial robots and tooling in the event of accidental impacts and unanticipated loads. The unit works by “breaking away” from its working geometry in the event of excessive torsional, moment, or compressive axial forces, or any combination of these.

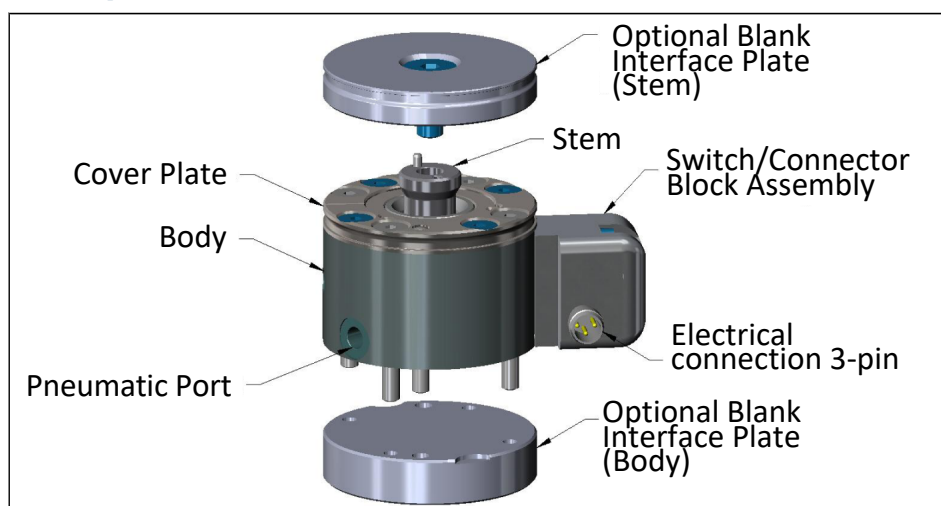
The OPR cannot respond to pure axial tension, which is an unlikely mode of loading. Removal of the upsetting force or moment allows the OPR to return to its initial position.

As a collision occurs, internal motion of the Protector components cause a switch to change state to an open circuit.

The switch circuit may be monitored by robotic controllers to stop operations before damage to the robot or tooling occurs. The load threshold at which the OPR breaks away is adjustable by controlling the air pressure supplied to the unit. The amount of compliance (travel) provided by the OPR before the switch circuit opens is adjustable by turning a switch adjustment screw.

All OPR devices provide axial (compression only), torsional, and moment compliance.

## 5.2 Description



The OPR consists of a piston housing (body) closed with a cover plate assembly. A stem assembly protrudes through the cover plate assembly. The cover plate assembly incorporates a cam to accurately and repeatably position the stem assembly. The stem assembly is forced into position against the cam by a piston. The piston is supported by user supplied compressed air and an optional assist spring. The stem provides a mounting surface for customized interface plates. Tapped and through holes on the back surface of the body allow direct bolting of the body to user tooling. All load bearing components and those with wear surfaces are made of hard-coat anodized aluminium, hardened bearing steel, or hardened tool steel.

A Collision Sensing Switch is positioned in the side of the body. A connector block assembly containing a M8, 3-pin male threaded connector is mounted on the side of the OPR body. The user connects to the switch using the M8 connector for which a variety of cables are available. The user must also supply the OPR with dry, regulated, compressed air through a port on the side of the OPR body. The size and location of these connections are shown in the drawing provided at the end of this manual.

## 6 Assembly

Protect electrical cables and compressed air lines as much as possible against tensile strain, kinking, breakage etc. when laying.

### CAUTION

**Prior to establishing or branching the compressed air line to the OPR, ensure that the compressed air supply is switched off and that enclosed compressed air has been discharged.**

### CAUTION

**The level of desired or required air pressure will vary according to the weight, loading, and motion of the user's tooling.**

When the pneumatically-supplied force is sufficient to re-seat the OPR, the tooling will move to its working position.

- Exercise caution while increasing the air pressure supplied to the OPR.

### 6.1 Mechanical connection

The OPR is usually installed with the housing facing the robot and the broach facing the insert tool, yet users can decide this for themselves.

The OPR can be attached directly to a robot or insert tool with the help of the alignment pin and through-hole / thread bores. Where this is not possible, please use an adapter plate.

### CAUTION

**The surface to which the OPR body is mounted must be flat and smooth and provide support for the entire surface of the body.**

A second interface plate is often required for mounting to the OPR stem. Such adapterplates may be ordered from SCHUNK as blank plates or machined as necessary for specific applications. Another option is for the user to fabricate their own interface plates. Once any required machining of the adapter plates is complete, mount the OPR using hardware appropriately sized for the application. Connect an appropriately sized air line and fitting to the OPR.

**Do not supply air pressure at this time.**

All mounting hardware should be tightened. The use of an industrial thread-locking compound is recommended for all fasteners.



**⚠ CAUTION**

**unexpected movement of the OPR**

Personal injury or damage to equipment is possible

- Before connecting or uncoupling the air supply to the OPR, ensure that the air supply is turned off and that all trapped air has been vented

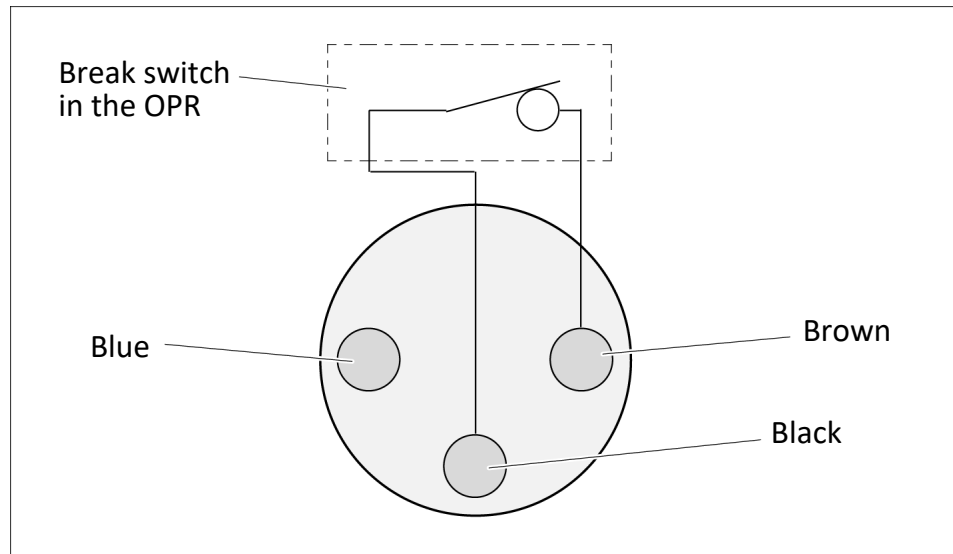
Screw [mm]	Tightening torque [Nm]
M3 - 12.70 mm	2.2 Nm
M4 - 17.78 mm	4.6 Nm
M5 - 20.32 mm	9.6 Nm
M6 - 25.40 mm	7.9 Nm

Tab.: Fastener Torque Specifications

## 6.2 Electrical connection

For connection to the user's controls, the OPR is equipped with a collision sensing switch. When the OPR is in the collision mode or the electrical cable to the switch is disconnected an open circuit is generated.

Following you can find the connections between the internal switch and the pins in the Connector Block Assembly. Optional mating cables, available from SCHUNK ▶ 6.1 [16], utilize the brown-black-blue color code indicated.



Switch wiring as a normally-closed , dry contact switch

### NOTE

The user is responsible for connecting the OPR to their controls and providing an "electrical load" in series with the collision sensing switch.

- The switches are suitable for electrical signals of max. 100 mA, at 10 - 30 VDC.
- The desired or required pressure of the compressed air depends on the weight, load and movement of the attached tools. Resetting the compressed air of the OPR moves the tool to its working position.

Once the OPR has been installed and connected as described in the preceding paragraphs proper electrical operation of the unit may be confirmed.

1. Supply the OPR with approximately 1 bar and ensure that the unit is electrically connected to the user's control circuit or to a test box.
  - ⇒ The switch should appear closed.

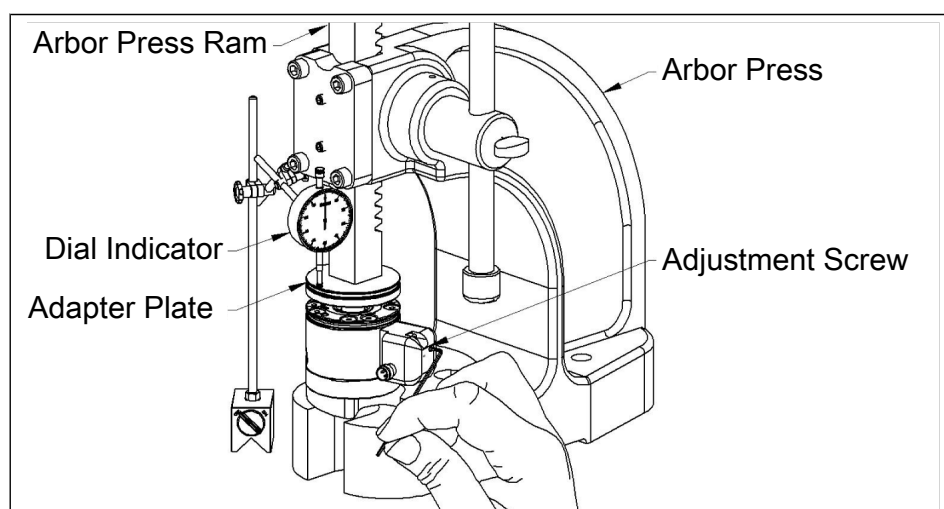
2. Manually push the OPR to simulate a collision while observing the switch output. .
  - ⇒ When the collision occurs the switch will open and the test light will turn off
3. Release the OPR and it will return to its working position.
  - ⇒ The test light will illuminate

### 6.2.1 Switch Adjustment

#### NOTE

**The switch is factory adjusted to open after the stem has traveled 0.5 mm in the axial direction. Adjustments should only be made if replacing the switch.**

1. De-energize all electrical and pneumatic power supplied to the OPR. Drain all stored air and electric power in compliance with standard safety practices and standards.
2. Disconnect the air lines and signal wires connected to the OPR.
3. Remove the user-installed mounting hardware from the OPR and remove the unit. Take the unit to a test bench equipped with a clean working surface and compressed air.
4. Insure that the OPR returns to its Reset or Working position with the stem fully extended and the alignment mark on the stem in line with the alignment mark on the cover plate. (Temporarily supply approx. 1 bar to the unit unless equipped with a preload spring.)
5. Connect a test box (see top drawing).
6. Attach an adapter plate to the stem of the OPR.



Checking Switch Height Adjustment

7. Center the OPR under the press ram.

8. Set a dial indicator in contact with the adapter plate and adjust it so that the probe is vertical. Set the dial indicator height so that it can read at least 1.5mm stroke. Set the dial ring to zero.
9. Push on the press handle until the switch circuit opens and check the distance traveled on the dial indicator.
10. If the distance traveled is greater than desired turn the adjustment screw counterclockwise. If the distance traveled is less turn the proximity switch clockwise.
11. Repeat steps (9) and (10) as necessary to obtain the desired switch setting.
12. Re-install the OPR using the user-installed mounting hardware.

### **CAUTION**

**Before putting the OPR back into operation, confirm that the switch is functioning properly ▶ 6.2 [18].**

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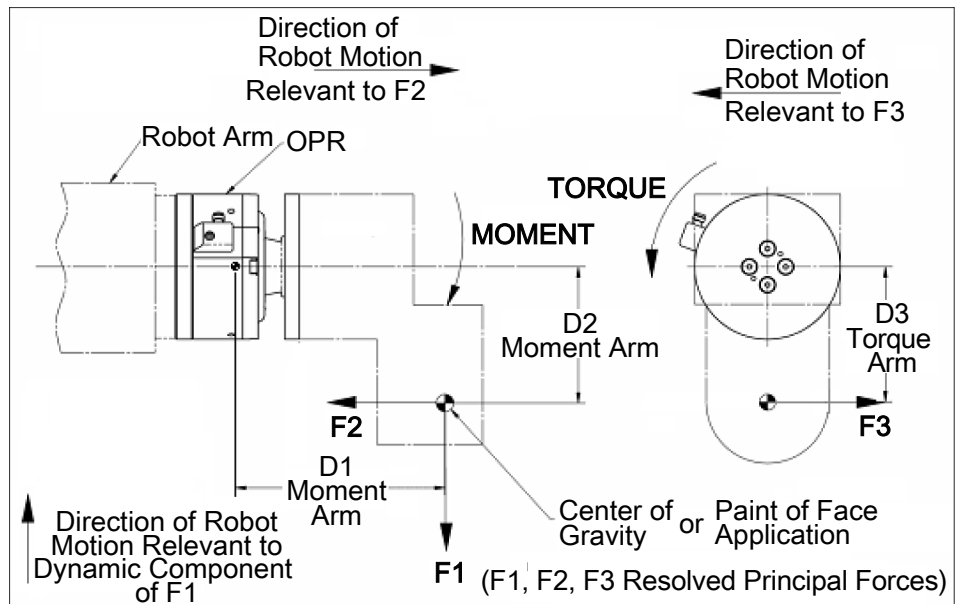
## **6.3 Pneumatic**

Compressed air is to be supplied to the port marked "P" in the range of 1,4 bar to 6,2 bar. This port accepts #10-32 or M5 pneumatic fittings. The pressure setting required for a particular application can be estimated using the procedure outlined in ▶ 6.3.2 [23]. The exact pressure required must be determined through testing using the procedure outlined in ▶ 6.3.3 [24].

### **Calculating operating pressure**

In order to determine the proper pressure setting for the collision sensor one must consider all static and dynamic loads to which it is subjected. These include the loads produced due to the static weight of the tooling, the inertial loads imposed by robot motion and the loads produced by the end-effector when performing its intended tasks. Once these loads are calculated the nominal pressure setting for the break-away point can be determined. The calculation proceeds as described in the following chapter.

### 6.3.1 Calculate Applied Loads



Collision Sensor Loading Diagram

The diagram can be used to convert the forces acting on the end-effector tooling into the resulting moment, torque, and axial loads applied to the OPR. Use the diagram to show and the formulas below to calculate the worst case applied loads for your application. All three load cases—Axial, Torque, and Moment—should be assessed for their Static, Dynamic, and Working force components.

**NOTE**

Not all of the component forces (Static, Dynamic, and Working) are present during all phases of the robot program. As a result, the worst case conditions for Axial, Torque, and Moment loads may occur at different times in the program.

**Formulas:**

Axial Load (F) =  $F_2$

Torque (T) =  $F_3 \cdot D_3$

Moment (M) =  $\sqrt{(F_1 \cdot D_1)^2 + (F_2 \cdot D_2)^2}$

**NOTE**

- $F_1$ ,  $F_2$ , &  $F_3$  consist of the sum of their respective Static, Dynamic, and Working force components; and should always be positive for purposes of calculating break-away pressure settings.
- $D_1$  should include the distance from the end of the stem to the internal pivot point on the collision sensor (15mm on an OPR48) and the thickness of the tooling side adapter plate (8.1mm on an OPR48 with optional blank adapter plate)

- **Static Force:**  
The load applied by tooling weight while the robot arm is idle. This includes the weight of all parts attached to the OPR, acting at the assembly's center of gravity along the direction of gravity.
- **Dynamic Force:**  
The inertial force imposed at the center of gravity of the tooling due to acceleration of the robot arm. This force acts in the direction opposite of motion. Dynamic forces are additive to static forces and must be carefully considered to ensure proper sizing of the OPR.
- **Working Force:**  
Forces are generated at the tool-tip under normal working conditions. If these forces and their location are known, they can be converted into loads on the OPR using the same technique.

### 6.3.2 Obtain required pressure setting

The pressure setting required can be approximated from the following formula:

$$P = P_m + P_t + P_f + P_{m_A} + P_{t_A}$$

Where  $P_m$ ,  $P_t$ , and  $P_f$  are the pressure components which depend on the moment, torque, and force load components expected at the trigger point.  $P_{m_A}$  and  $P_{t_A}$  are the dynamic versions of  $P_m$  and  $P_t$ . Dynamic forces from axial loading can usually be ignored since the robot is usually not accelerating in the axial direction.  $P_m$ ,  $P_t$ , and  $P_f$  are calculated using the following formulas, where  $M$ ,  $T$ , and  $F$  are the expected loads at the set trigger point:

#### Nm, Bar, N

$$P_m = (M \times 1.0874) - 0.5$$

$$P_t = (T \times 0.9267) - 0.2$$

$$P_f = F \times 0.01435$$

$P_{m_A}$  and  $P_{t_A}$  are calculated using the following formulas where  $A$  is the maximum acceleration in multiples to due gravities ( $G$ ):

#### Nm, Bar

$$P_m = (M \times 1.0874) - 0.5$$

$$P_t = (T \times 0.9267) - 0.2$$

#### Example:

For an OPR-48 with a static moment load of 1,13 Nm, a static torque load of 0,565 Nm, no axial load, and an acceleration of 2 G, the pressure setting is calculated as follows:

$$\begin{aligned} P &= [(1,13 \text{ Nm} \times 1.0874) - 0,4] + [(0,565 \text{ Nm} \times 0,9267) - 0,2] + \\ &\{[(1,13 \text{ Nm} \times 1.0874) - 0,5] \times 2G\} + \{[(0,565 \text{ Nm} \times 0,9267) - 0,2] \times 2G\} \\ &= 0,73 \text{ bar} + 0,32 \text{ bar} + 1,46 \text{ bar} + 0,64 \text{ bar} \\ &= 3,15 \text{ bar} \end{aligned}$$

A nominal air pressure setting of 3,2 bar is required.

#### NOTE

- If the calculated pressure required is above 6,2 bar do not install the unit. Contact SCHUNK to determine the correctly sized collision sensor model for the application.
- If the unit is equipped with P05 (0,33 bar equivalent), P10 (0,66 bar equivalent), or P15 (1 bar equivalent) preload spring, subtract this pressure to determine the actual pressure to be supplied.

### 6.3.3 Determining Exact Pressure Required

1. Set the pressure approximately 0.3 Bar higher than the pressure calculated in ▶ Section 3.4.1—Calculating Estimated Pressure Setting [ 23].
2. Run the robot through a fully loaded cycle.
3. Watch for crash signals. If the collision sensor does not generate a crash signal (open circuit) slightly reduce the pressure until a crash signal is generated and then increase the pressure slightly until the unit runs without false crash signals. If the collision sensor does generate a crash signal increase the pressure slightly until the unit runs without false crash signals.

---

#### **NOTE**

If the pressure required is above 6,2 Bar remove the unit from service and contact SCHUNK to determine the correctly sized collision sensor model for this application.

---

#### **CAUTION**

**Use of pressures in excess of 6,2 Bar can result in excessive damage to the unit in the event of a crash and voids the warranty.**

---

## 7 Operation

With the OPR mounted and connected pneumatically and electrically the unit may be placed into operation.

### Commissioning

1. If possible for safety and convenience, position the OPR and the tooling vertically so that the load is suspended below the OPR.
2. Apply low-pressure air (1 bar) to the unit.
3. Gradually increase the air pressure until the desired working pressure is applied.

In operation the OPR should be supplied with the minimum air pressure necessary to allow continuous, uninterrupted operation of the unit.

Nuisance collision detections caused by high accelerations and unanticipated loads will occur if the air pressure is too low.

The magnitude of overhung loads, robot accelerations, and applied loads prevent SCHUNK from recommending air pressure settings.

Where high robots accelerations are anticipated the user may wish to supply the OPR with electronically variable or multiple, switchable air supplies.

Alternatively, where working loads are small the OPR may be outfitted with auxiliary springs and supplied with high-pressure air only during robot moves. Using these techniques, the OPR may be supplied with higher air pressure when higher loads or accelerations are anticipated.

## 8 Troubleshooting

The OPR will offer exceptional performance in normal operation. However, the OPR is not a compliance device and frequent collisions should be avoided to maximize performance and life.

The OPR is designed to automatically return to its working position once the disturbing force is removed. Should this fail to happen the following examinations should be performed to verify proper operation of the unit.

- **Check the supply air pressure.**  
Insure that the supply air pressure is sufficient to support the loads placed upon the unit. If the supply pressure is too low the OPR will experience excessive nuisance collision sensings and fail to reset.  
SCHUNK recommend: After collision, move to a vertical hanging position and apply max. air pressure.
- Once proper air supply pressure has been verified, check the **self-relieving function of the pressure regulator**. Do so by deflecting the tooling while listening for the regulator to exhaust air in response to compression of the air trapped within the OPR. If the regulator does not properly relieve the air pressure, it may need to be cleaned or replaced.
- **Check the control wiring.** Disconnect the cable from the OPR and use a volt-ohm meter on the Nano connector to confirm that the switch is closed when the OPR is in the working position. (The scribe lines on the OPR cover plate and stem must be aligned and the mounting surfaces of the body and stem must be parallel. Remove tooling or increase air pressure if necessary to allow the unit to move to its working position.) If the switch does not close adjustment or replacement may be necessary ▶ 6.2.1 [19]. If the switch is closed under this condition examine the system for control wiring and logic problems.
- **Check for mechanical obstructions.** The OPR will not be free to rotate back to its working position if obstructions prevent its free motion. Insure that there are no obstructions either on or around the tooling or the stem of the OPR. Pay particular attention to cables and tubing that may become trapped or snagged.

If the OPR still fails to reset or if the switch fails to close after adjustment when the unloaded unit is in its working condition, contact SCHUNK.

## 9 Maintenance



### **⚠ WARNING**

**Danger when changes to the set screws in the wall of the body are made!**

Doing so may result in personal injury and/or damage to the unit.

- Do not adjust or remove any of the three set screws installed in the wall of the Body.

### 9.1 General

The OPR is a reliable device fabricated using heavy-duty components. In normal operation the unit requires no maintenance if proper air quality and pressures are maintained. Service kits are available in the event that the M8, 3-pin male threaded connector/ Nano connector or collision sensing switch becomes damaged.

Proper collision sensing should be verified on a regular basis. This can be scheduled twice a year or as a part of any robot or work cell preventative maintenance activities.

In applications where a high number of collisions occur on a regular basis, the life of the OPR can be extended with periodic maintenance.

### **CAUTION**

**Never disassemble OPR Versions with integrated springs.**

The OPR could be damaged

- Send the OPR for maintenance to SCHUNK
- Partial disassembly allows the unit to be cleaned, re-greased, and reassembled without special tools or adjustment procedures. Such maintenance work should be conducted every 5.000 or fewer collisions.
- Check the control wiring for shorts.



- If necessary, readjust the switching point.

### **⚠ WARNING**

#### **Danger from unexpected movements**

Damage to equipment or personnel injury is possible

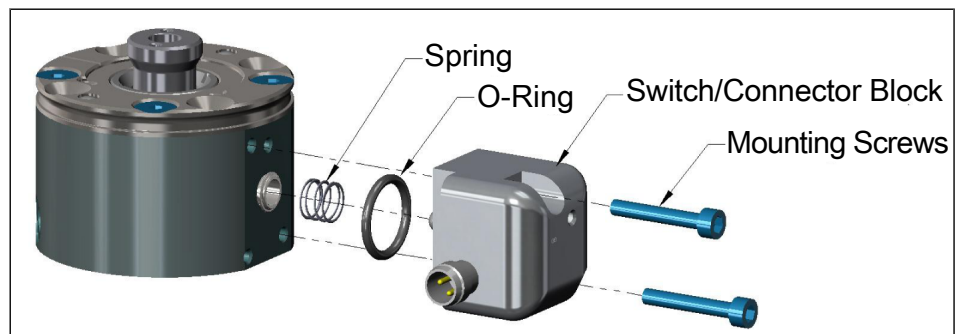
- In all instances where the OPR is to be examined, installed, or removed from service, ensure that air pressure has been vented from the unit, that electrical current is not supplied to the OPR's signal circuit, and that the robot is in a safe, locked-out, condition consistent with local and national safety standards.

## 9.2 Cable Replacement

If the cable attached to your OPR becomes broken or worn, replacement cables may be purchased as follows:

*OPR Model Number/0301623 KA BG08-L 3P-0500-PNP, 5m.*

## 9.3 Replacement of connector block assembly



*Removal of Switch/Connector Block Assembly from the OPR*

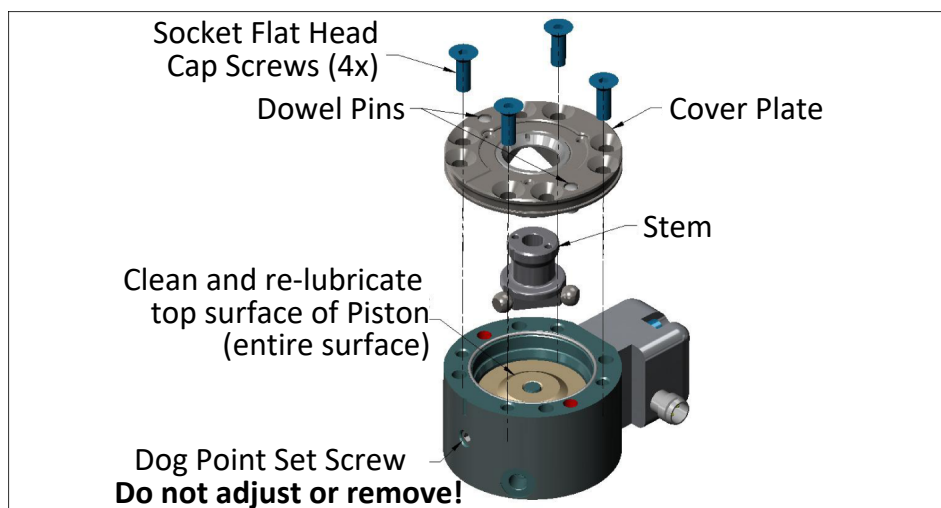
1. Remove the mounting screws using a 2.5mm hex key
2. Remove and discard the entire Switch/Connector Block assembly, including spring and O-ring.
3. In the new assembly, make certain that the O-ring is in the counterbore in the face of the switch/connector block and that the spring is in the counterbore surrounding the switch.
4. Assemble the switch/connector block to the unit lining up the dowel pins to the holes in the main body.
5. Insert the new socket head cap screws, and tighten to 1,4 Nm.
6. Adjust per ▶ 6.2.1 [19].

## 9.4 Periodic Lubrication Instructions

### 9.4.1 Cover and Stem Disassembly (only Version without integrated spring)

#### NOTE

Cleaning may be accomplished with a clean, dry rag. For more thorough cleaning, use isopropyl alcohol.



*Disassembly of Cover Plate*

1. Remove the flat head socket head cap screws securing the Cover Plate assembly to the Body using an M2.5 hex key.

#### CAUTION

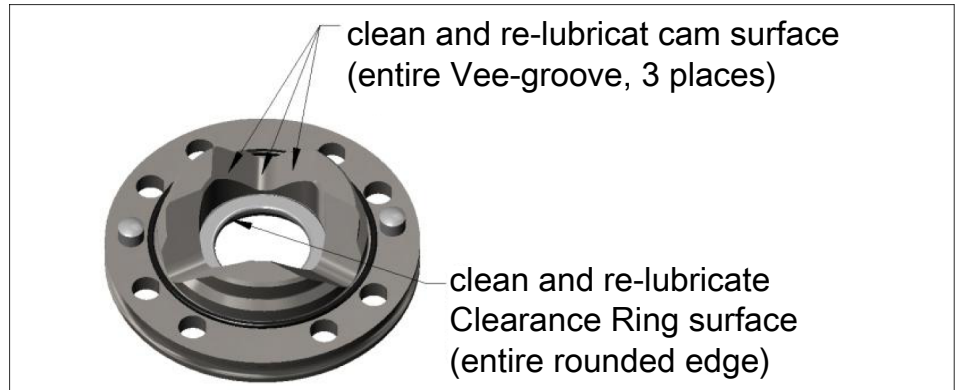
**Do not attempt to pry or wedge the Cover Plate assembly and Body apart. Doing so can damage the mating surfaces and may render the parts unusable.**

2. Remove the Cover Plate assembly by carefully pulling it straight up and off of the Body. This may be difficult due to the close fit of the dowel pins used to align the parts. It may be necessary to hold the unit up by the Cover Plate and lightly tap on the Stem with a rubber or plastic mallet. Note: The dowel pins are pressed into the Cover Plate and are a slip fit into the Body.

#### CAUTION

**The Cover Plate assemblies and Stem assemblies are factory-assembled as matched parts. Do not allow either of these assemblies to be mixed with those from other units.**

3. Clean the lubricant from the top surface of the Piston.



*Cleaning and Re-lubricating the Cover Plate Assembly*

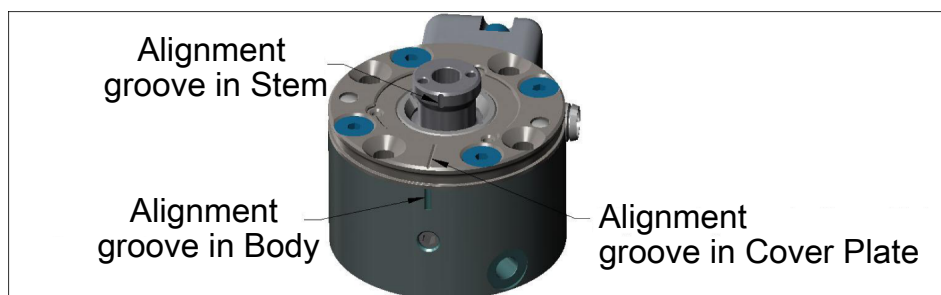
4. Clean the lubricant from the working surfaces of the Cam and the Clearance Ring. Set the Cover Plate assembly aside for later re-use.



*Cleaning and Re-lubricating the Stem*

5. Remove the Stem assembly and clean the lubricant from the working surfaces of the balls and the Stem. Set the Stem assembly aside for later re-use.

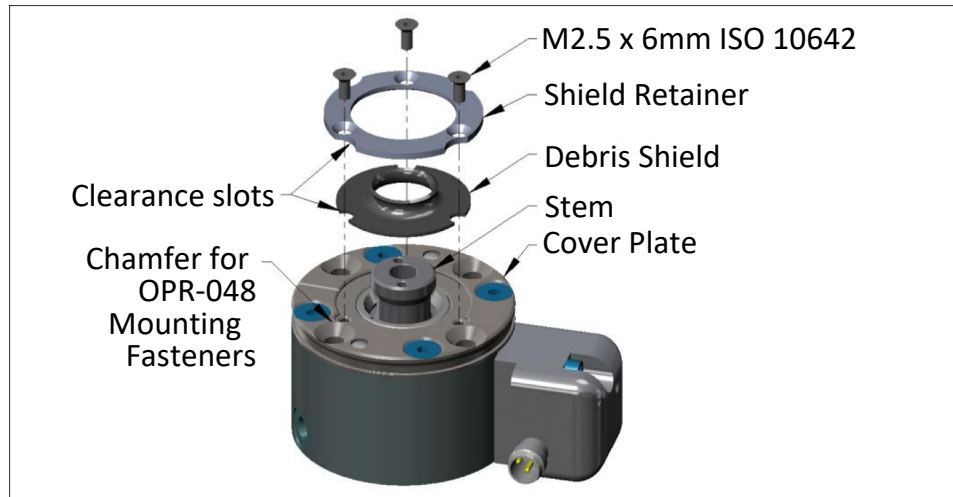
### 9.4.2 Cover and Stem Re-assembly



*Body, Cover Plate, and Stem Alignment*

1. Apply a generous coating of Molycote BR2+ to the top surface of the Piston (see drawing "Disassembly of Cover Plate").
2. Apply a generous coat of Molycote BR2+ to each of the three balls on the Stem Assembly and to the rounded edge of the shoulders above the balls. Apply a layer of Molycote BR2+ to the flat underneath surface of the Stem (see drawing "Cleaning and Re-lubricating the Stem").
3. Apply a generous coat of Molycote BR2+ to each of the three v-grooves in the Cam and to the rounded edge of the Clearance Ring (see drawing "Cleaning and Re-lubricating the Cover Plate Assembly").
4. With the Stem assembly upright, set the Cover Plate assembly onto it. Make certain that the alignment grooves are lined up (see drawing "Body, Cover Plate, and Stem Alignment").
5. Place the Stem and Cover Plate together onto the Body. Make certain that the alignment grooves in the body, Plate and the Stem are lined up (see drawing "Body, Cover Plate, and Stem Alignment").
6. Press the Cover Plate down onto the Body.
7. Apply liquid screw lock (low-strength) to the four socket flat head cap screws and thread them into the Body. Tighten the screws to 2.8 Nm

## 9.5 Weld Splatter Shield Replacement



*Weld Splatter Shield Replacement*

### Disassembly

1. Remove three countersunk screws M2.5 x 6 ISO 10642 and Shield Retainer (see lower drawing).
2. Remove Debris Shield and discard.

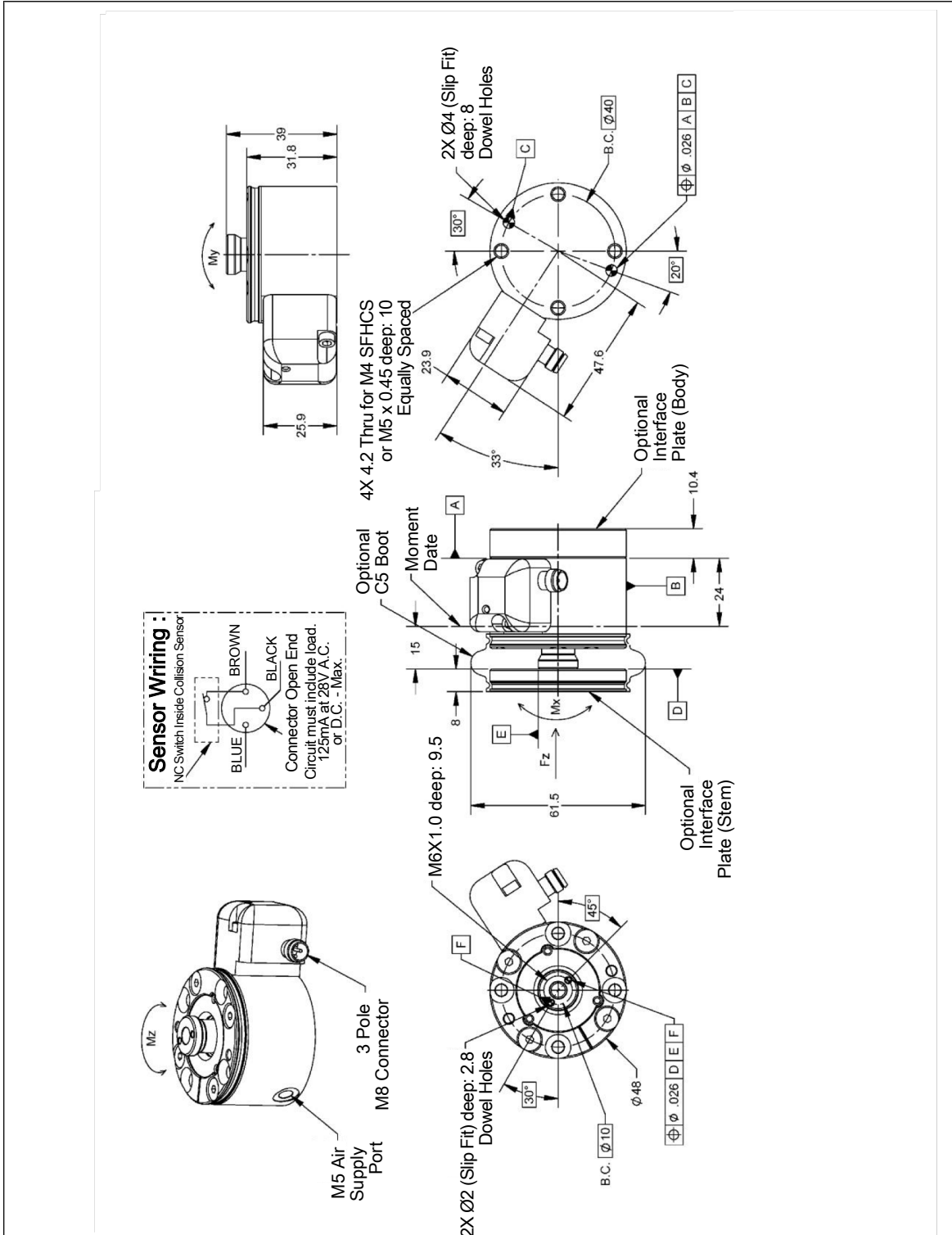
### Re-assembly

1. Install new Debris Shield by stretching the center hole over the Stem, align the clearance slots in the Debris Shield with the holes in the Cover Plate for the Shield retainer mounting screws.
2. Place the Shield Retainer on top of the Weld Shield, line up the mounting holes and the clearance slots to the chamfers for the OPR-048 mounting fasteners.
3. Apply liquid screw lock (low-strength) to threads of the three M2.5 x 6mm ISO 10642 and install through the Shield Retainer into the Cover Plate. Tighten to 0,4 Nm.

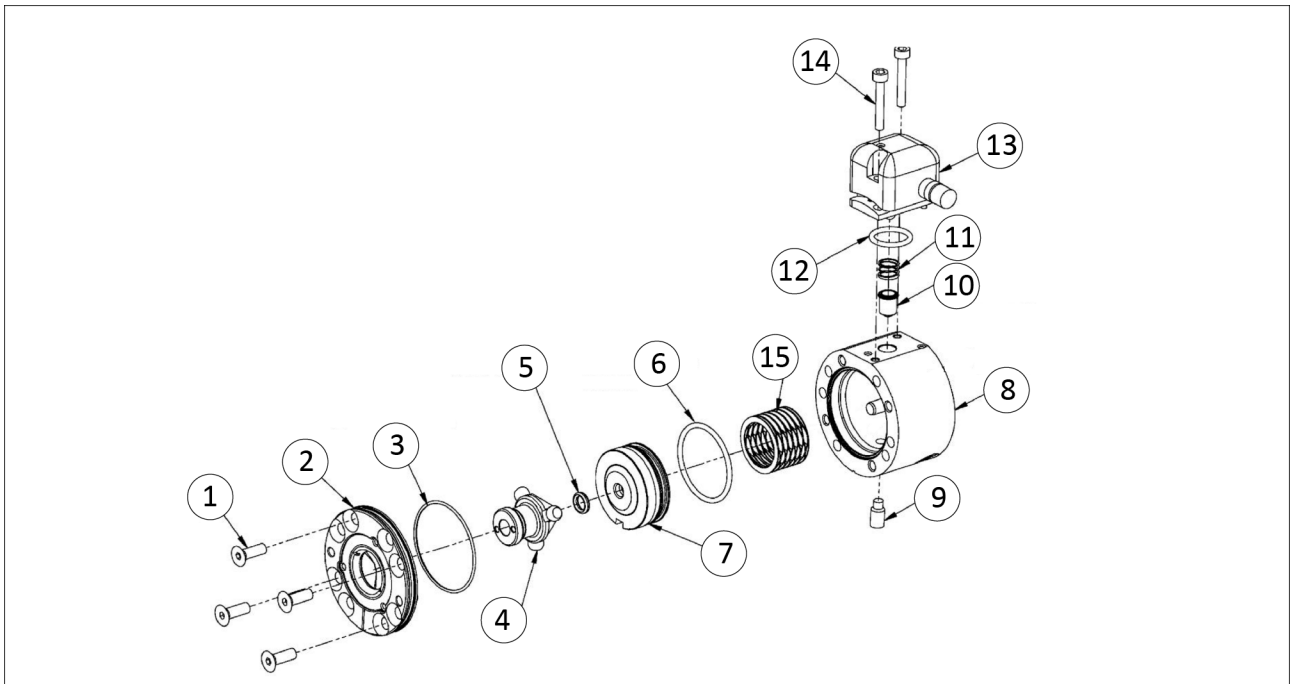
## 10 Assembly drawings

The following figures are example images. They serve for illustration and assignment of the spare parts. Variations are possible depending on size and variant.

### 10.1 Assembly Drawing



## 10.2 Replacement Parts



## 11 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 Sensor / OPR 048/pneumatic  
ID number                         0321341...0321344, 0321361...0321368, 0321381...0321388,  
0321401...0321408, 0321431...0321437, 0321476...0321483,  
0321521...0321528

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*

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

Lauffen/Neckar, October 2024



## 13 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

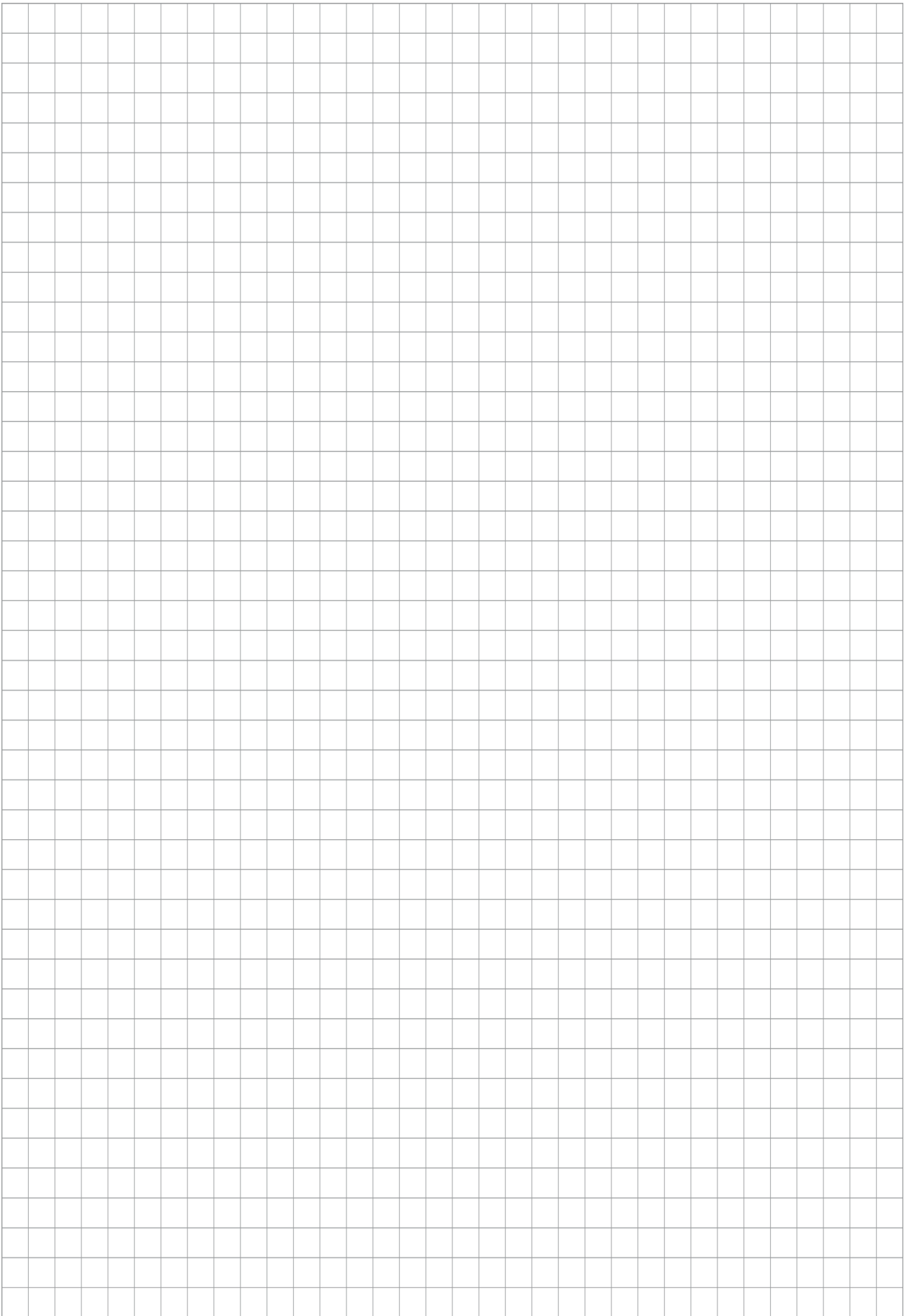
Products from SCHUNK fully comply with the regulations of Regulation (EC) No. 1907/2006 "concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)" and its amendment 2022/477. SCHUNK attaches great importance to completely avoiding chemicals of concern to humans and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

*Signature: see original declaration*

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

Lauffen/Neckar, October 2024







**SCHUNK SE & Co. KG**  
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