Assembly and Operating Manual

PHE

Stroke module

Superior Clamping and Gripping

SCHUNK®

Imprint

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

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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.

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under Applicable documents [▶ 6] are applicable.

1.1.1 Presentation of Warning Labels

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

⚠ DANGER

Danger 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.

NOTICE

Material damage!

Information about avoiding material damage.

1.1.2 Applicable documents

- General terms of business*
- Catalog data sheet of the purchased product *
- Assembly and operating manuals of the accessories *

The documents marked with an asterisk (*) can be downloaded on our homepage **schunk.com**

1.1.3 Sizes

This operating manual applies to the following sizes:

- PHE 64
- PHE 80
- PHE 100

1.1.4 Variants

This operating manual applies to the following variations:

- PHE
- PHE high-temperature (V/HT)

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 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.

1.3 Scope of delivery

The scope of delivery includes

- Stroke module, pneumatic PHE in the version ordered (without adaptor plates and proximity switches)
- For PHE 100: mounted interrogation rod for proximity switches
- Accessory pack

1.3.1 Accessories pack

ID.-No. of the accessory pack

Accessory pack for	ID number
PHE 64	5509963
PHE 64 - High-temperature (HT)	395509963
PHE 80	5509962
PHE 80 - High-temperature (HT)	395509962
PHE 100	5509452
PHE 100 - High-temperature (HT)	395509452

Content - Accessory pack for PHE 64 and PHE 64 - High-temperature (HT)

Designation	Quantity
O-ring	4
Cylindrical pin	4
Slot nut	2

Content -Accessory pack for PHE 80 and PHE 80 - High-temperature (HT)

Designation	Quantity
O-ring	8
Cylindrical pin	4
Nut	2
Fixing spring for groove	2

Content - Accessory pack for PHE 100 und PHE 100 - High-temperature (HT)

Designation	Quantity
O-ring	4
Cylindrical pin	4
Nutr	4
Fixing spring for groove	4

1.4 Accessories

A wide range of accessories are available for this product

For information regarding which accessory articles can be used with the corresponding product variants, see catalog data sheet.

1.4.1 Seal kit

ID.-No. of the seal kit

Seal kit for	ID number
PHE 64 / Hub 20	0370746
PHE 64 / Hub 40, 60	0370738
PHE 80 / Hub 40, 60, 80	0370739
PHE 80 - High-temperature (HT) / Hub 40, 60, 80	0370816
PHE 100 / Hub 40, 80, 120	0370722
PHE 100 - High-temperature (HT) / Hub 40, 80, 120	0370937

Contents of the sealing kit, Assembly drawings [▶ 26].

2 Basic safety notes

2.1 Intended use

The lifting module is designed for positioning of workpieces or other automation components

- The product may only be used within the scope of its technical data, Technical data [▶ 16].
- When implementing and operating components in safety-related parts of the control systems, the basic safety principles in accordance with DIN EN ISO 13849-2 apply. The proven safety principles in accordance with DIN EN ISO 13849-2 also apply to categories 1, 2, 3 and 4.
- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

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

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- 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, Technical data [▶ 16].

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.
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.

2.7 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 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.

2.12.1 Protection during handling and assembly

Incorrect handling and assembly

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

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

Incorrect lifting of loads

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

2.12.2 Protection during commissioning and operation

Falling or violently ejected components

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

2.12.3 Protection against dangerous movements

Unexpected movements

Residual energy in the system may cause serious injuries while working with the product.

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Limit/prevent accidental access for people in this area due through technical safety measures. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

2.12.4 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.

2.13 Notes on particular risks

⚠ DANGER

Risk of fatal injury from suspended loads!

Falling loads can cause serious injuries and even death.

- Stand clear of suspended loads and do not step within their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.
- Wear suitable protective equipment.

⚠ WARNING

Risk of injury from objects falling and being ejected!

Falling and ejected objects during operation can lead to serious injury or death.

- Take appropriate protective measures to secure the danger zone.

⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

⚠ CAUTION

Risk of injury when the lifting plate extends quickly in the case of fast acceleration.

- Take appropriate protective measures to secure the danger zone.

3 Technical data

Designation	PHE		
	64	80	100
Piston force [N]	130	250	430
Retraction force [N]	100	200	310
Stroke [mm]	20	40	40
Weight [kg]	1,25	2,3	3,5
Max. permissible torsion moment (extended) [Nm]	10	7	7
Air consumption per double stroke [cm3]	15	46	58
Nominal working pressure [bar]	6		
Max. pressure [bar]	8		
Stroke time (extending) [s]	0,2	0,3	0,15
Number of air feed-throughs	2	4	4
Max. permissible pressure in air feed-through [bar]	8,0		
Pressure medium	Compressed air, compressed air quality according to ISO 8573-1:7 4 4		

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

Designation	PHE
Ambient temperature [°C] min. max.	 +5 +60
IP protection class *	42
Noise emission [dB(A)]	≤ 70

* For use in dirty ambient conditions (e.g. sprayed water, vapors, abrasion or processing dust) SCHUNK offers corresponding product options as standard. SCHUNK also offers customized solutions for special applications in dirty ambient conditions.

4 Assembly

4.1 Installing and connecting

⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.

NOTICE

Risk of damage to the product!

If the end position is approached too hard, the product may be damaged.

- As a rule, a rotary movement must take place without impact and bouncing.
- To do this, carry out sufficient throttle and dampening.
- Observe specifications in the catalog data sheet.

- ➢ Check the evenness of the mounting surface, Mechanical connection [▶ 18].
- ➢ Connect compressed air lines to the main air connections" A "and" B Pneumatic connection [▶ 18].
- ➢ Mount the adapter plate Assembling the adapter plate [▶ 22].
- ➢ Screw the product to the machine/system, Mechanical connection [▶ 18].
- ➢ Connect the sensor, see assembly and operating manual of the sensor.
- ➢ Mount the sensor, Mounting the sensor [▶ 20].
- ➢ If required, set the pneumatic end position dampers Setting the pneumatic end position dampers on PHE 64 [▶ 22].

4.2 Connections

4.2.1 Mechanical connection

Position of the item numbers Assembly drawings [▶ 26]

⚠ WARNING

Risk of injury from falling of the product!

By falling down the unit may cause serious injuries.

- While assembling secure unit with adequately sized straps.

The linear unit can be secured on the female threads on the bottom side or on the insertion nuts (for PHE 64: T-nuts) in the profile grooves on the side face.

- ➢ When securing the unit on side face do not clamp against cover or bottom.
- ➢ Only the basic body (1) should be used for flanging.
- ➢ For centering the linear unit on bottom side use the cylinder pins from the supplied accessories.
- ➢ Remove the sealing screws.

4.2.2 Pneumatic connection

⚠ WARNING

Risk of injury when the linear module moves unexpectedly as a result of compressed air loss.

Failure or reduction of compressed air implies the risk of losing the position.

- Take appropriate protective measures to secure the danger zone.
- Secure unit with pressure maintenance valve.

The air connections for the stroke movements are arranged on the side of the linear units.

For connection, always use one-way flow control valves!

4.2.3 Internal air feed-through

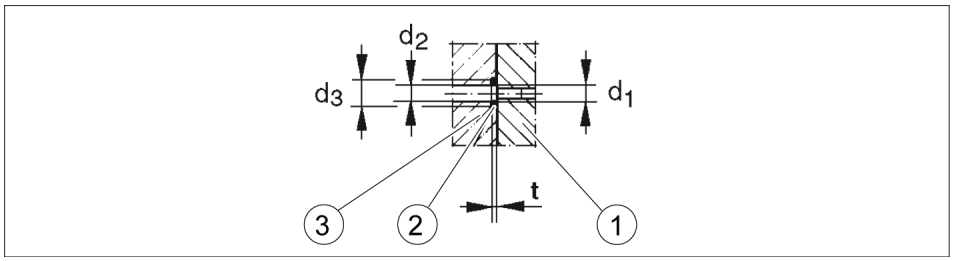
NOTE

The connections of the air through feedings are closed at the bottom by sealing screws. They may be removed during assembly works.

PHE 64 The linear unit PHE 64 offers 2 internal air feedings, which may be actuated from the bottom via M 5-connections or directly by means of O-rings Ø 4 x 1.5 (accessories supplied). Connection is done directly at the linear plate (bore Ø 3) with O-rings Ø 3 x 1 from the accessories supplied. (See Fig. below).

PHE 80 The linear unit PHE 80 offers 4 internal air feedings, at the bottom plate, which may be connected from below or laterally, and at the linear plate from above via M 5 threads. At the bottom and the linear plate side the connection may also be done directly by means of O-rings Ø 4 x 1.5 from the accessories supplied. (See Fig. below).

PHE 100 The linear unit PHE 100 offers 4 internal air feedings, which may be actuated from the bottom via G 1/8“ connections. The outlets at the linear plate are equipped with M 5 threads, which may also be directly connected via O-rings Ø 4 x 1.5 from the accessories supplied. (See Fig. below).



Hose-free direct connection

1	Linear unit	3	Adapter
2	O-ring		

Type	d_1	O-ring	d_2	d_3	t
PHE 64	Ø 3	Ø 3 x 1.0	Ø 3	Ø 5	0,7
PHE 64 / 80 / 100	M5	Ø 4 x 1.5	Ø 4	Ø 7	1

4.3 Mounting the sensor

NOTE

Observe the assembly and operating manual of the sensor for mounting and connecting.

The product is prepared for the use of sensors.

- For the exact type designations of suitable sensors, please see catalog datasheet and Overview of sensors [▶ 20].
- For technical data for the suitable sensors, see assembly and operating manual and catalog datasheet.
  - The assembly and operating manual and catalog datasheet are included in the scope of delivery for the sensors and are available at schunk.com.
- Information on handling sensors is available at schunk.com or from SCHUNK contact persons.

4.3.1 Overview of sensors

Designation	PHE		
	64	80	100
Analog magnetic switch MMS	X	X	X

4.3.2 Mounting magnetic switch MMS 30

NOTICE

Sensor can be damaged during assembly.

Observe the maximal tightening torque of 30 Ncm.

NOTE

Ferromagnetic material changes the switching positions of the sensor. For example: Adapter plate made of ordinary steel.

At ferromagnetic adapter plates:

- First mount the product on the adapter plate.
- Then set the position of the magnetic switch.

Assembly and adjustment of the sensors

Insert the sensors into the provided nut of the housing. In this nut, the sensors may be moved into the desired monitoring position. By means of the set-screw inside the housing, the sensors the nuts are jammed into it.

- Every consignment of a PHE 100 unit includes a bracket, into which the sensor can be moved. The bracket has to be fastened in the groove laterally on the same side as the monitoring rod (15).
- Cushioning of the sensor of the linear units PHE 64 and PHE 80 is done via magnets mounted onto the piston.
- In case of PHE 100 this magnet is positioned at the monitoring bar (15).

4.4 Assembling the adapter plate

The adaptor plates may be fastened from above or below on the lienear plate (4).

Herefore, the linear plate is equipped with female threads or through holes. For centering use the cylinder pins from the supplied accessories.

4.5 Setting the pneumatic end position dampers on PHE 64

Position of the item numbers Assembly drawings [▶ 26]

NOTE

The sizes PHE 80 and PHE 100 are equipped wth hydraulic self-adjusting shock absorbers.Assembly drawings [▶ 26].

The size PHE 64 is pneumatically cushioned (not applicable for stroke 20). (The standard verson of size PHE 64 – stroke 20 is not equipped with a cushionning. However, special versions may be supplied with cushionning. For further assistance, please contact our sales team).

NOTE

The pneumatic cushionning has to be adjusted before starting the operation of the linear unit!

Before shipment, the dampening throttle (70) is pre-adjusted and has to be adapted to the individual case of application.

- Open the throttle (70) step by step while the linear unit is stopped, e.g. half a rotation, and test the achieved effect of throttle during a test run.
- Repeat this procedure as often as necessary until the desired effect of the throttle is adjusted.
- Proceed for both end positions in the same manner.

NOTICE

The adjustment of the throttles, dampening throttle (70) and the air outlet throttles (71) have to be fine adjusted to the case of application!
Please also consider that different workpiece weights and fluctuations in pressure of the compressed- air ductwork system have an influence on the cushionning.
Never actuated the linear unit without cushionning! (Except for PHE 64-20).

5 Maintenance

5.1 Notes

Original spare parts

Use only original spare parts of SCHUNK when replacing spare and wear parts.

5.2 Maintenance intervals

NOTICE

Material damage due to hardening lubricants!

Lubricants harden more quickly at temperatures above 60°C, leading to possible product damage.

- Reduce the lubricant intervals accordingly.

Interval (million cycles) bei PHE	Maintenance work
2	Clean all parts thoroughly, check for damage and wear, if necessary replace seals and wearing parts, Disassembling the product [▶ 24]. The seals are in the enclosed sealing kit., Seal kit [▶ 8].
2	Treat all grease areas with lubricant, Lubricants/Lubrication points (basic lubrication) [▶ 23]. Oil or grease bare outside steel parts.

5.3 Lubricants/Lubrication points (basic lubrication)

During maintenance, treat all greased areas with lubricant. Thinly apply lubricant with a lint-free cloth.

SCHUNK recommends the lubricants listed.

Lubricant point	Lubricant
sliding faces of the shock absorber	Molykote BR 2 plus
Metallic sliding surfaces	Renolit HLT 2
All seals	Renolit HLT 2
linear bearings	Klübersynth UH1 14-151 Isoflex-Topas NCA 52

5.4 Disassembling the product

5.4.1 PHE 64

Position of the item numbers Assembly drawings [▶ 26]

- Remove all compressed air feedings.
- Unscrew the bottom (3).
- Loosen the piston (16) from the piston rod (6), by removing the cushioning sleeves (10).
- After detachment of the piston, draw off the second cushioning sleeve (9) from the piston rod.
- Draw out the linear plate (4) complete with all bars of the housing. **WARNING!** The guiding rod (7) should not be detached from the linear plate, since it would be otherwise necessary to re-adjust the complete unit.
- Remove all sealings. If it should be necessary to exchange the upper cushioning ring (35), the upper cover (2) has to be unscrewed, too.

5.4.2 PHE 80, PHE 100

Position of the item numbers Assembly drawings [▶ 26]

- Remove all compressed air feedings.
- Unscrew the bottom (3).
- Remove the centering piece (17).
- Remove the piston (16) from the piston rod (6), by removing the screw (44).
- Disassembly the shock absorber assembly group Installing and removing the shock absorber [▶ 25].
- Draw out the linear plate (4) with all the rods from the housing. The guiding rods (7) should not be detached from the linear plate, since it otherwise would be necessary to re-adjust the complete unit again.
- Remove all sealings.

5.5 Installing and removing the shock absorber

Position of the item numbers Assembly drawings [▶ 26]

NOTE

The shock absorbers are checked in a testing procedure and receives a control number G 141. For all the linear units only shock absorbers are used which have a control number. The shock absorber can be ordered at SCHUNK.

- Unscrew the bottom (3).
- Remove the screws (42).
- Take out the shock absorber assembly group from the housing.
- After loosing the set-screws (50), the shock absorbers (20 and 21) may be unscrewed from the supporting plate (11).

The assembly is done in reverse order.

NOTICE

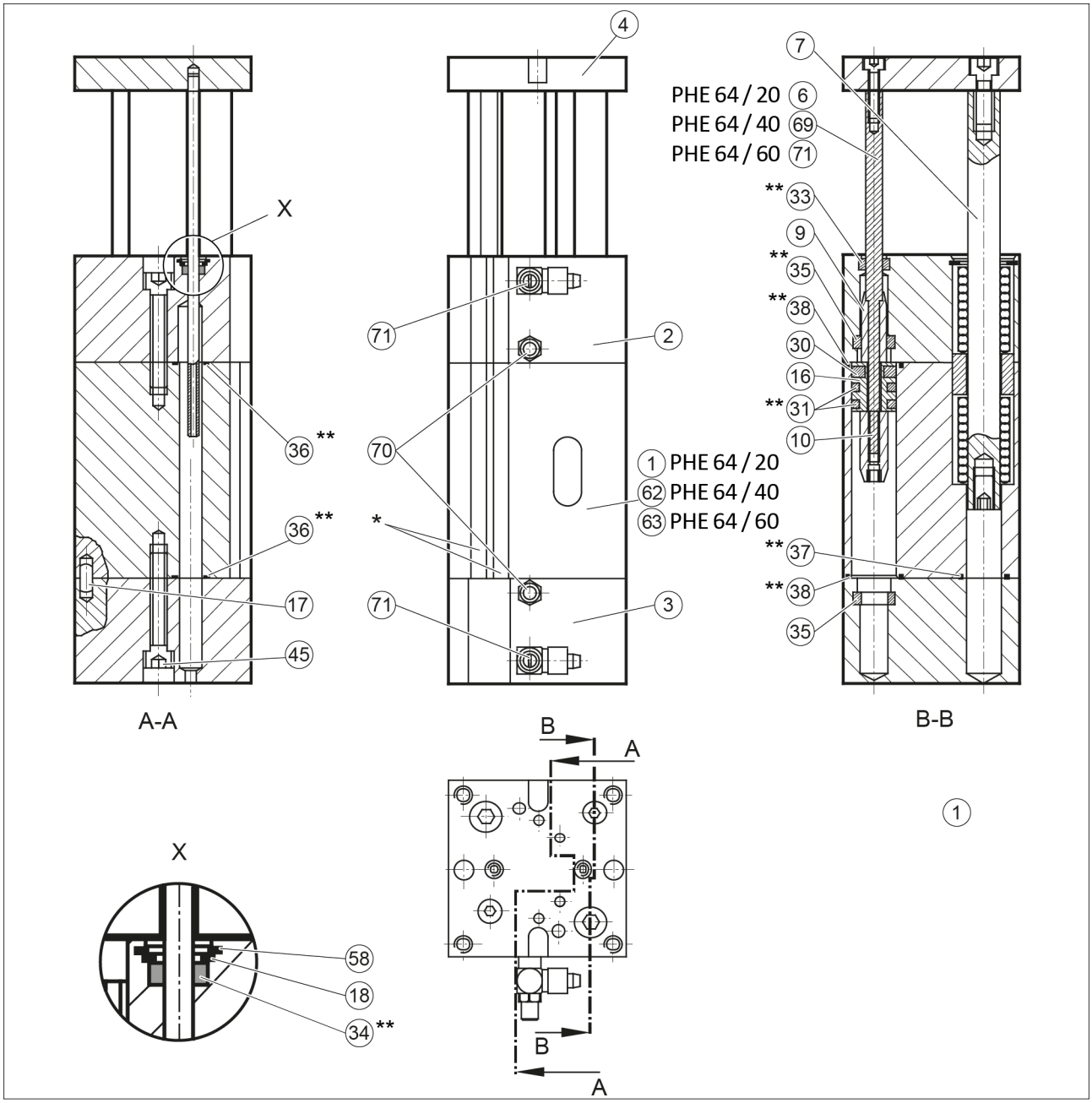
The shock absorbers have to be adusted during assembly.

- Please take the dimension of the supporting plate (11) up to the end of the telescoped shock absorber piston rod of the corresponding detailed illustrations in chapter 11.

✓ This dimension among the supporting plate and the end of the piston rod has to be observed for BOTH shock absorbers.

5.6 Assembly drawings

5.6.1 PHE 64

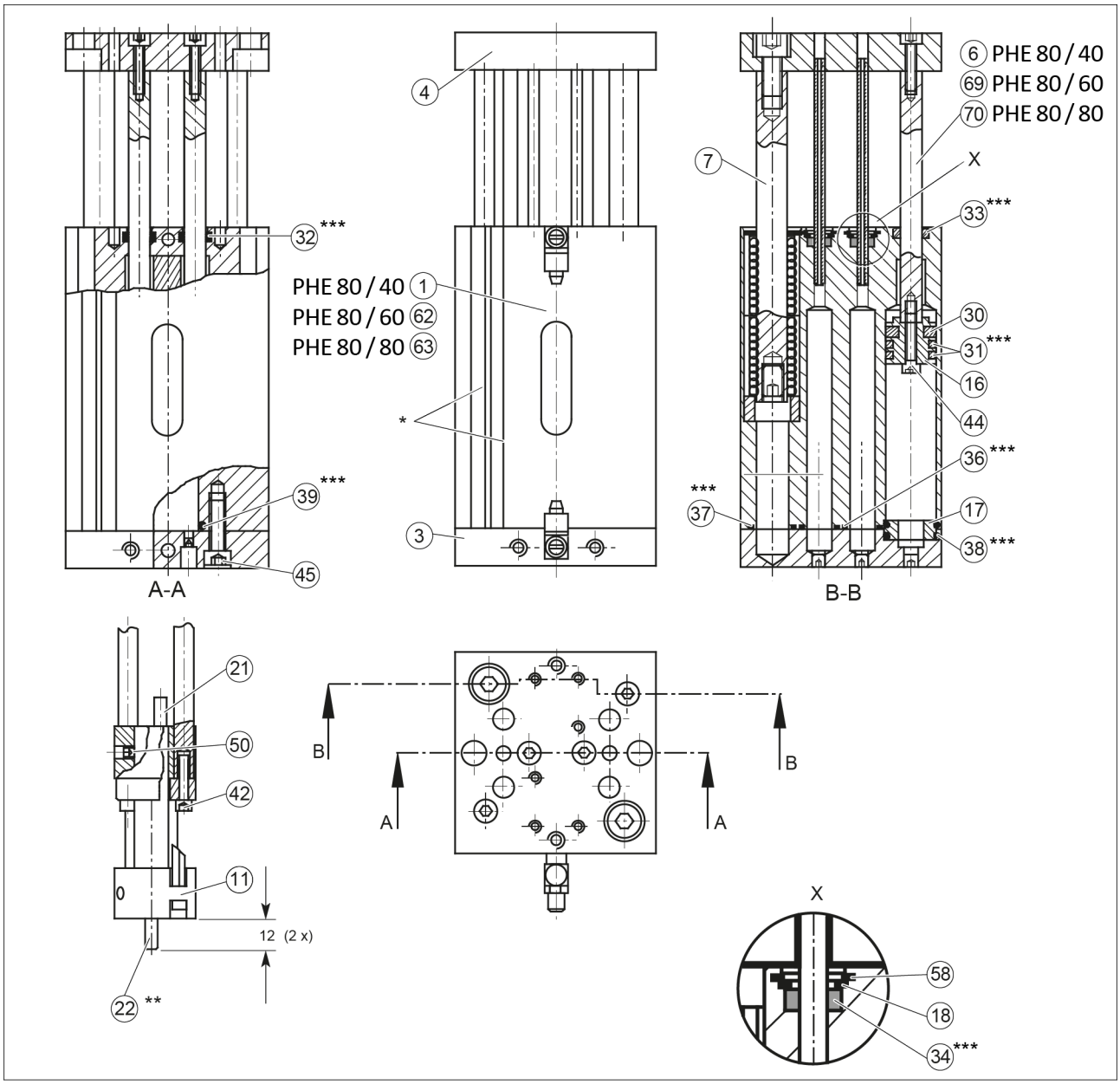


PHE 64

* Groove for proximity switches

** Wearing part, replace during maintenance.
Included in the seal kit. Seal kit can only be ordered completely.

5.6.2 PHE 80



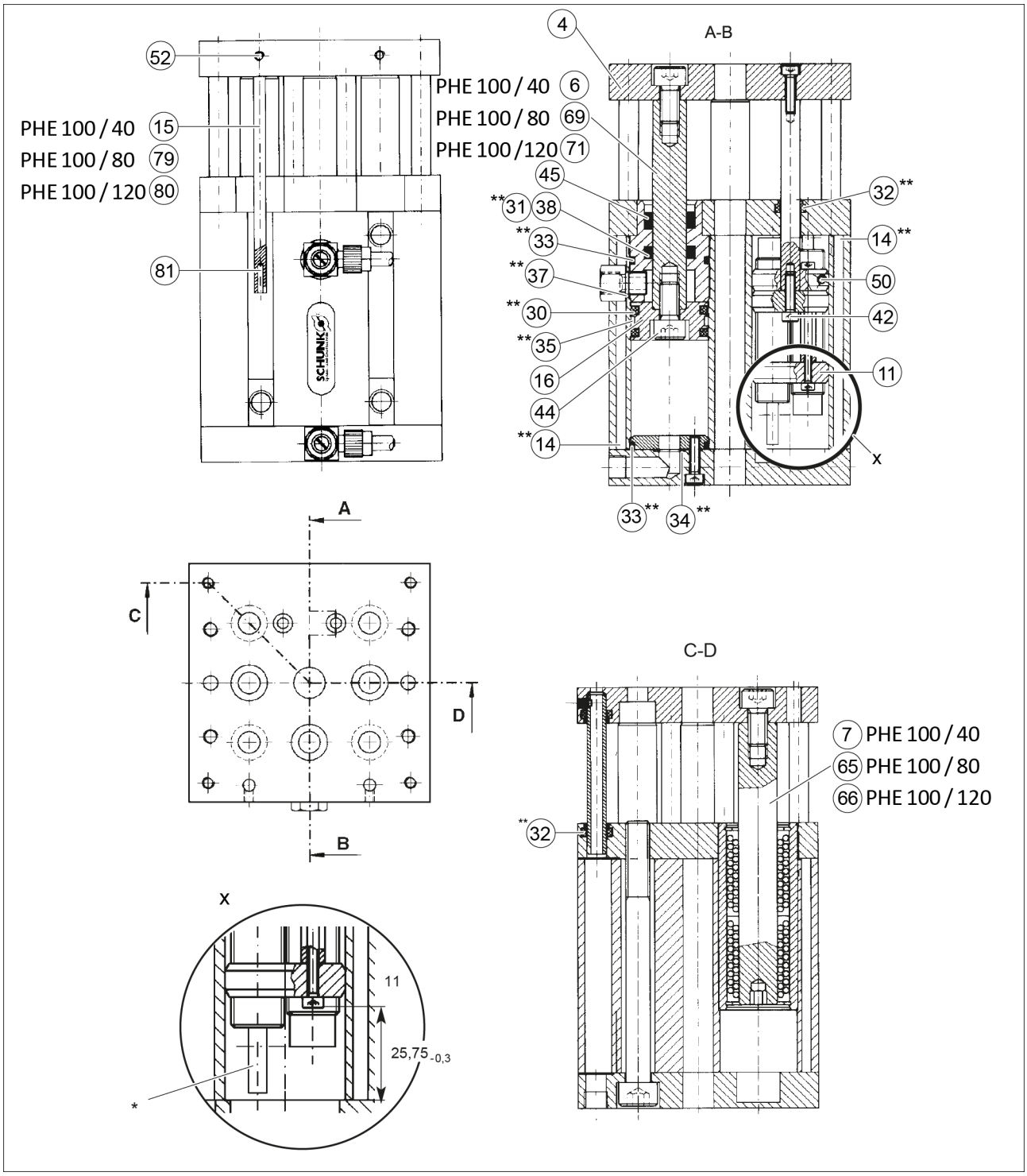
PHE 80

* Groove for proximity switches

** Piston rod of shock absorber

*** Wearing part, replace during maintenance.
Included in the seal kit. Seal kit can only be ordered completely.

5.6.3 PHE 100



PHE 100

* Piston rod of shock absorber

** Wearing part, replace during maintenance.
Included in the seal kit. Seal kit can only be ordered completely.

6 Translation of original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1.B of the European Parliament and of the Council on machinery.

Manufacturer/ Distributor	SCHUNK GmbH & Co. KG Spann- und Greiftechnik Bahnhofstr. 106 – 134 D-74348 Lauffen/Neckar

We hereby declare that on the date of the declaration the following partly completed machine complied with all basic safety and health regulations found in the directive 2006/42/EC of the European Parliament and of the Council on machinery. The declaration is rendered invalid if modifications are made to the product.

Product designation:	Stroke module, pneumatic / PHE / pneumatic
ID number	0300974 … 0300990

The partly completed machine may not be put into operation until conformity of the machine into which the partly completed machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

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

The manufacturer agrees to forward on demand the relevant technical documentation for the partly completed machinery in electronic form to national authorities.

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

Person authorized to compile the technical documentation:
Robert Leuthner, Address: see manufacturer's address

Signature: see original declaration

Lauffen/Neckar, May 2019

p.p. Ralf Winkler,
Manager for development
of gripping system components

7 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1.Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	Stroke module, pneumatic
Type designation	PHE
ID number	0300974 … 0300990

To be provided by the System Integrator for the overall machine		⇓
Fulfilled for the scope of the partly completed machine	⇓	
Not relevant	⇓	

1.1	**Essential Requirements**			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting		X	
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics		X	
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	**Control Systems**			
1.2.1	Safety and reliability of control systems		X	
1.2.2	Control devices		X	
1.2.3	Starting		X	
1.2.4	Stopping		X	
1.2.4.1	Normal stop		X	
1.2.4.2	Operational stop		X	
1.2.4.3	Emergency stop		X	
1.2.4.4	Assembly of machinery		X	
1.2.5	Selection of control or operating modes		X	
1.2.6	Failure of the power supply			X

1.3	**Protection against mechanical hazards**			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X

1.3	Protection against mechanical hazards			
1.3.6	Risks related to variations in operating conditions			X
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X

1.4	Required characteristics of guards and protective devices			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X

1.5	Risks due to other hazards			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X

1.6	Maintenance			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

1.7	**Information**			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		

	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	