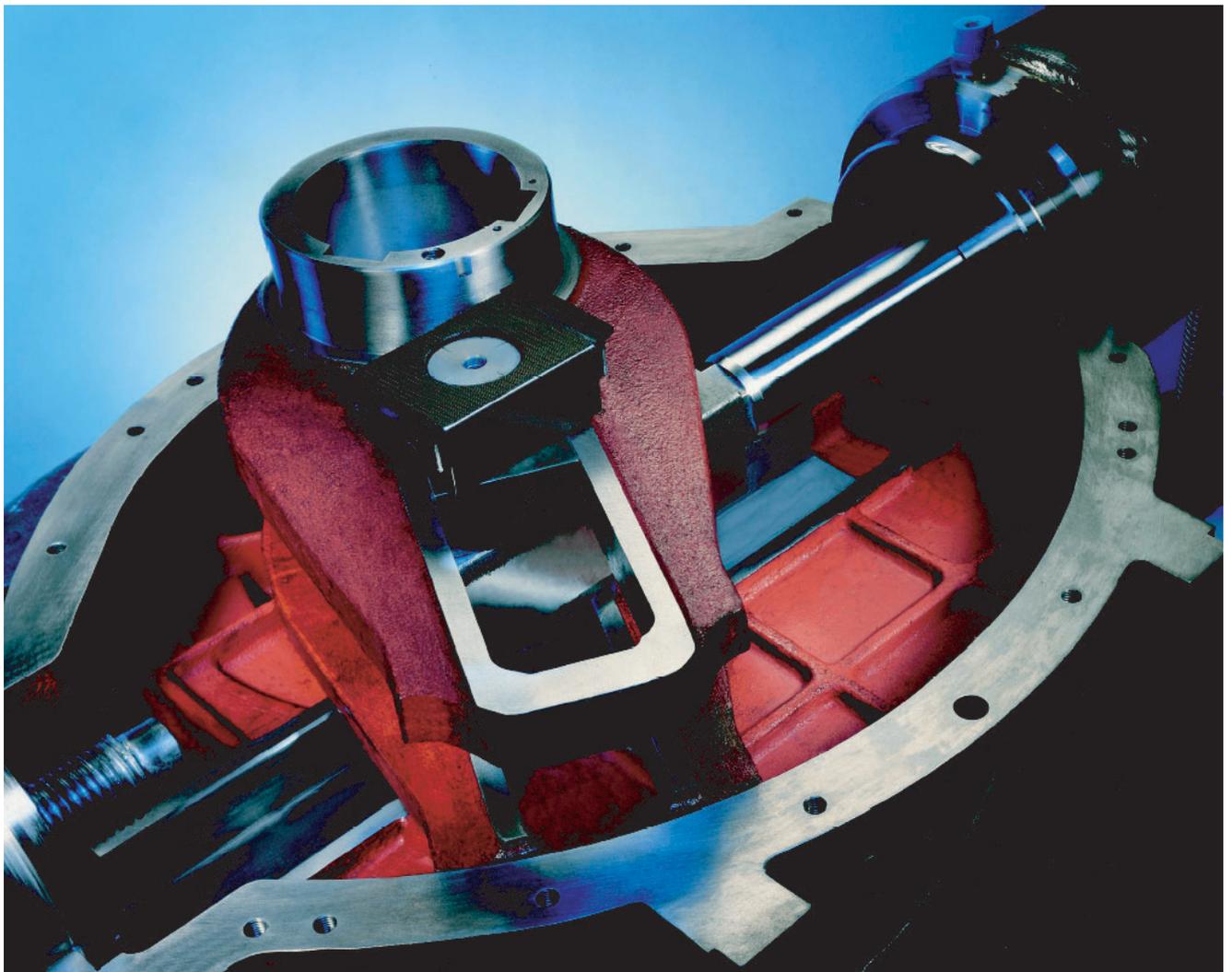


Installation/Operation Manual Actuators Type K7/K8 (High pressure)

Basic actuators / Control systems / Additional attachments



Keep for future use!

Introduction

This manual is written for operating, maintenance and supervisory personnel.

This manual also describes components and auxiliary units which may not or may only partially be contained in the scope of delivery.

The manual must be read, understood and observed by operating personnel. We emphasise that Franz Schuck GmbH assumes no liability for damage or malfunctions arising from non-compliance with this manual.

With regard to the illustrations and information in this manual, we reserve the right to make technical modifications which are required for the improvement of components.

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1 Regarding this operating manual

CAUTION

Danger of consequential damage due to incorrect operation, maintenance and/or handling!

We explicitly emphasise that we assume no liability for damage or malfunctions arising from non-compliance with this manual.

⇒ Therefore it is important to comply with all instructions in this manual!

This manual is to provide technicians and users trained by the Franz Schuck GmbH with the necessary information for assembly and adjustment work and to help in implementing work quickly and correctly.

For your own safety, read this manual carefully and pay particular attention to the highlighted tips. In any case, keep this manual to hand.

Read all safety instructions in this manual carefully. You will find the safety instructions in Chapter 2, in the introductions to chapters and before practical instructions. The General Terms and Conditions of the company apply exclusively for all deliveries and performances made by Franz Schuck GmbH, including any future transactions.

1.1 Legal notes

The component may only be installed and operated by skilled personnel.

Please check parts upon receipt for any possible damage that may have occurred during transport. Only undamaged parts may be fitted or used.

No warranty can be claimed if maintenance work is neglected or carried out incorrectly. Only original spare parts guarantee quality, reliability and exchangeability.

Any modifications of the component are in general prohibited by Franz Schuck GmbH. The manufacturer guarantee becomes void if this prohibition is not complied with!

1.2 Application range

This operating manual applies to the Franz Schuck GmbH product described in this manual.

The appropriate operating manuals for optional accessories must likewise be observed.

These operating manuals are included in the overall documentation if the accessories belong to the scope of supply from Franz Schuck GmbH.

2 Safety

| CAUTION |
|--|
| <p>Dangers to the health and safety of operating and maintenance staff as well as to the functioning capacity of the actuator system. Dangers to the environment due to escaping gaseous or liquid media.</p> <p>Non-compliance with these instructions jeopardizes the obligation by Franz Schuck GmbH to follow through on the warranty/guarantee.</p> <p>⇒ The safety instructions in this operation manual must be unconditionally observed!</p> |

2.1 Fundamental safety instructions

2.1.1 General

Modifications on the actuator system and its components which could affect safety may not be carried out without written permission from the manufacturer.

Non-compliance jeopardizes the obligation to follow through on the warranty/guarantee.



- This product has been manufactured according to the recognised rules of technology and according to internal Schuck quality standards; the product is shipped from the factory in a perfect technical condition
- Nevertheless, ball valves and actuator systems can cause hazards to people, material goods and the environment if operating personnel use them improperly or in a manner that is contrary to their intended use
- Any person dealing with assembly, commissioning, operation and/or maintenance of the actuator system must have read and understand this entire manual
- The manual must be kept safe and accessible at the place where the actuator system is in use
- If malfunctions occur, notify Franz Schuck GmbH immediately and take appropriate measures
- Work on actuator system (such as inspection work, servicing and/or maintenance work) may only be carried out in a depressurized state and with the energy supply secured and switched off
- Actuator systems must be effectively covered and/or protected when work is being carried out that could lead to contamination of or damage to the ball valve, the actuator system, the attachments and/ or the anti-corrosion protection

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Revision: -

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: -

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2.1.2 Intended use

The Schuck SST actuator is exclusively intended for opening and closing ball valves of the corresponding type and size.

The SST rotates the ball valve by 0° to the required final position. No other alternative or additional use is authorised.

The operating instructions should be read in full before transporting, beginning to operate or repairing the SST or its components. The instructions on the rating plate must be complied with. The advice and maintenance specifications must also be observed.

The actuator system and its components may only be used and serviced by persons familiar with the operation manual and applicable regulations concerning on-the-job safety and accident prevention.

Repairs, especially during the warranty period, may only be carried out by the Franz Schuck GmbH service team or by personnel trained accordingly. Non-compliance jeopardizes the obligation by Franz Schuck GmbH to follow through on the warranty/guarantee.

2.1.2.1 Instructions for proper repair work

Observe the following safety and repair instructions when carrying out repairs on the actuator system SST or its components.

- This operation manual should be read in full before transporting, installing or repairing the actuator system or its components
- Only Franz Schuck GmbH original spare parts and assembly equipment should be used when carrying out repairs

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Editor: biplant.de GmbH Schön
Translator: –

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2.1.3 Organisational measures

2.1.3.1 Special hazard points

There is no immediate danger from an actuator system that is installed and serviced according to the instructions however, depending on the operating conditions, vibrations, frequent operation and/or wear can cause damage to sealings and screw connections.

- Danger from escaping media
 - depending on the working medium, fire or explosion hazards can arise from electrical contact, naked flames, light and/or smoking
 - there is a risk of poisoning, chemical burns, scolding and environmental pollution
 - hazardous materials must be collected or sucked up, if necessary, and disposed properly
- The voltage in electrically operated actuator system poses a potential danger
 - all works on electrical installations may only be carried out by skilled electricians and only at zero potential
- Stored energy is an imminent danger in the case of actuator systems that are actuated pneumatically, hydraulically or gas-hydraulically
 - all energy-storing systems (hydraulic, pneumatic, spring cylinder) must be discharged during servicing and maintenance works

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2.1.3.2 Workplace and personal protective gear

Sufficient space is required for carrying out assembly and maintenance work safely. The operator must ensure that the workplace is clean and clearly arranged.

If media (including residues) can escape in case the ball valve or the actuator system experiences operational faults or malfunctions, then the endangered persons must use suitable personal protective gear, as far as this is necessary.

Only use components in a technically undamaged condition; use them according to specifications in a safety and risk conscious manner while complying with the operating manual! Remedy faults in particular that could impair safety (or have them remedied)!

The operating manual must be supplemented by instructions which take into account supervisory and reporting duties with regard to work related particularities, e.g. in respect of how work is organised, working procedures and the personnel employed.

Staff commissioned to work on a component must have read the chapter on safety in this operating manual **before starting work**. Staff must already be aware of potential hazard sources when working in order to be in a position to react quickly and correctly. This applies in particular to staff who are only employed occasionally to work on a component, e.g. when setting up or servicing.

Observe all safety and hazard instructions for the equipment/the component!

Make sure all safety and hazard signs are complete and legible!

No modifications, attachments or conversions which could impair safety may be implemented without authorisation from Franz Schuck GmbH! This also applies to the assembly and the adjustment of safety devices and safety valves as well as for welding on load-bearing parts.

Lubricants and sealing compounds as well as spare parts should conform to the technical specifications. This is always guaranteed when using original spare parts.

Replace hydraulic and pneumatic hose lines in specified or appropriate intervals, even if no security-relevant defects are evident.

Maintain the prescribed deadlines, or the deadlines stated in the operating manual, for reoccurring tests/inspections!

An appropriate workshop equipment is essential for carrying out maintenance work.

Make sure the location of fire extinguishers is clearly indicated and operating instructions are available!

Note the fire alarm and fire fighting options!

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3 System overview

3.1 Schuck actuators

Type SST Schuck actuators have been developed as a modular system.

The same basic actuator design is employed. Basic actuators are produced in eight different sizes with torques ranging from 1,000 Nm to 350,000 Nm. Depending on the required input energy, the basic actuator is equipped with the corresponding attachments.

Basic actuators always consist of an actuator casing with recurring, self-similar components of different installation sizes.

The casing and the pivoting yoke contained in it are made from robust and ductile cast iron or carbon steel respectively.

The basic unit, together with the attachments, forms a complete, fully functioning actuator.

Depending on the attachments selected, the input force at the basic actuator can be applied either hydraulically, pneumatically, electrically, manually or by means of spring force. The input force is used to generate an output torque via the lever of the yoke arm.

All attachments may be fixed to the right-hand or left-hand universal mounting. This allows for different designs of the swivelling actuator, in the form of a manual, electric, hydraulic or pneumatic unit.

Retrofitting is possible at any time.

All bearings are dry-running and have a synthetic coating. They do not require a grease or oil lubricant. The internal parts are greased to prevent corrosion.

Each basic actuator is fitted with a 3D position indicator on the outside. The position of the ball valve is indicated throughout the entire travel in proportion to the travelled distance.

The pivoting action is limited to $90^\circ \pm 4^\circ$ by adjustable stops which are set up in accordance with the maximum torque.

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Overall design

Actuator housing and ball valve are either connected directly with the trunnion of the ball valve or via a stem extension with trunnion extension. The torque is transferred to the ball valve via trunnions and trunnion extension respectively.

The SST actuator system can consist of the following components:

- a basic actuator (→ page 3-4, chapter 3.2) and attachments
 - with a cylinder
 - with a cylinder combination
 - hand wheel
 - electric motor
- an actuator control system (→ page 3-16, chapter 3.5)
 - gas over oil
 - direct gas high pressure (> 10 bar)
 - direct gas low pressure (< 10 bar)
 - electro-hydraulic
 - electrical
 - manual operation
 - additional options
- optional additional attachments (→ page 3-24, chapter 3.6)
 - limit switch
 - energy storage device
 - hydraulic manual operation for emergencies
 - electronic line break SEC-200

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3.1.1 Operating data

| | | |
|--|--|--------|
| | | DANGER |
| | <p>Risk of injury from bursting components/system parts!</p> <p>If the permissible limit values are exceeded, the component/system can be destroyed, and as a consequence of this persons can be injured or killed!</p> <p>⇒ Always operate components/system parts within the permissible limit values!</p> | |

All maximum values for capacity, load, pressure, vacuum etc. stated for the respective actuator system are limit values. These values are the basis for the constructive design and the strength calculation of the components.

The exceeding or non-compliance of the stated limit values during operation of the component/system endangers personnel and component and excludes any liability on the part of Franz Schuck GmbH for any damage caused thereby.

| Actuator dimensions | Value | |
|---------------------|-----------|------------|
| Output torque | VG | 1,000 Nm |
| | WG | 4,000 Nm |
| | AG | 8,000 Nm |
| | BG | 20,000 Nm |
| | CG | 40,000 Nm |
| | DG | 86,000 Nm |
| | EG | 150,000 Nm |
| | FG | 350,000 Nm |

Tab. 3-1 Schuck actuator systems operating data

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3.2 Scotch Yoke System SST basic actuator

This chapter describes the basic actuator without attachments.

For a description of the attachments please refer to → page 3-9, chapter 3.4.

3.2.1 Basic actuator rating plate

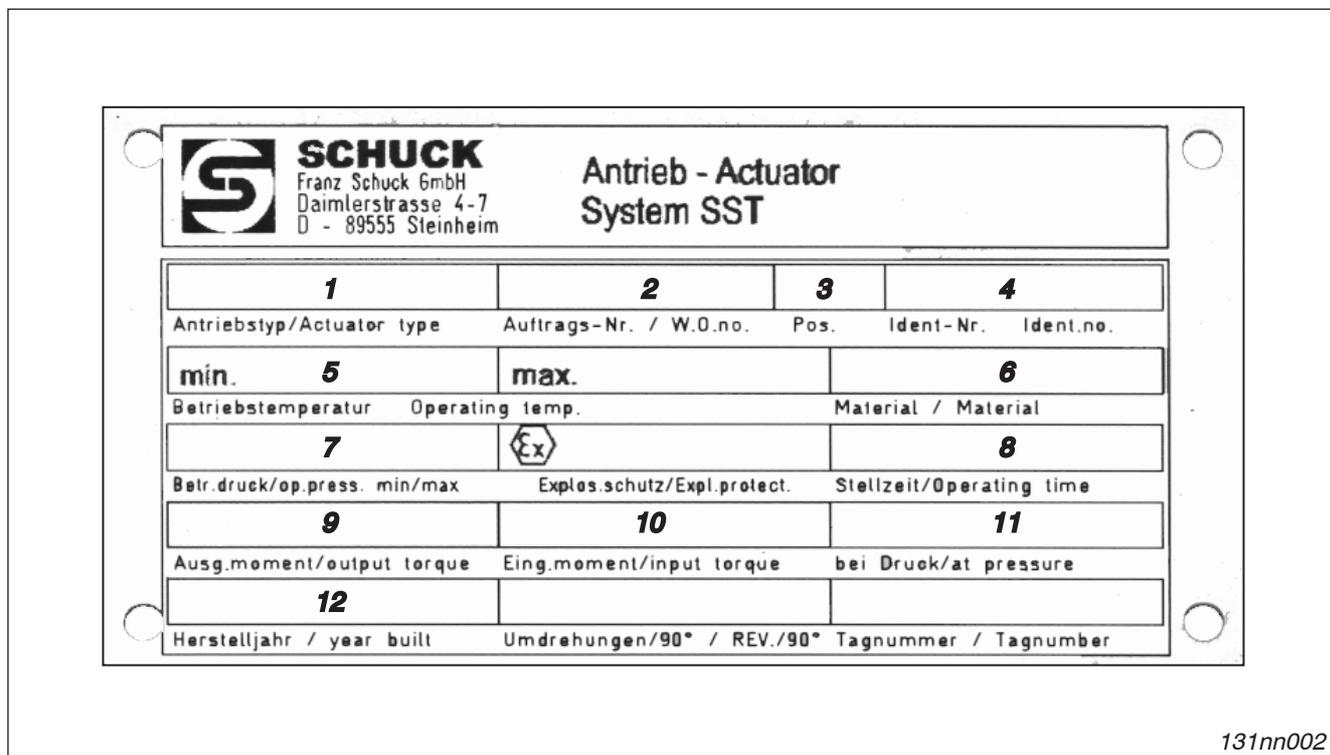


Fig. 3-1 Specifications on the basic actuator rating plate

- | | |
|--------------------------------|-----------------------------|
| 1 Actuator type | 7 Operating pressure |
| 2 W.O. no. | 8 Operating time |
| 3 Position | 9 Output torque |
| 4 Ident. no. | 10 Input torque |
| 5 Operating temperature | 11 At pressure |
| 6 Material | 12 Year built |

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3.2.2 Description

Task

The linear movement of the attachments in the basic actuator is converted into a 90° pivoting movement at the output which opens or closes the ball valve.

Components

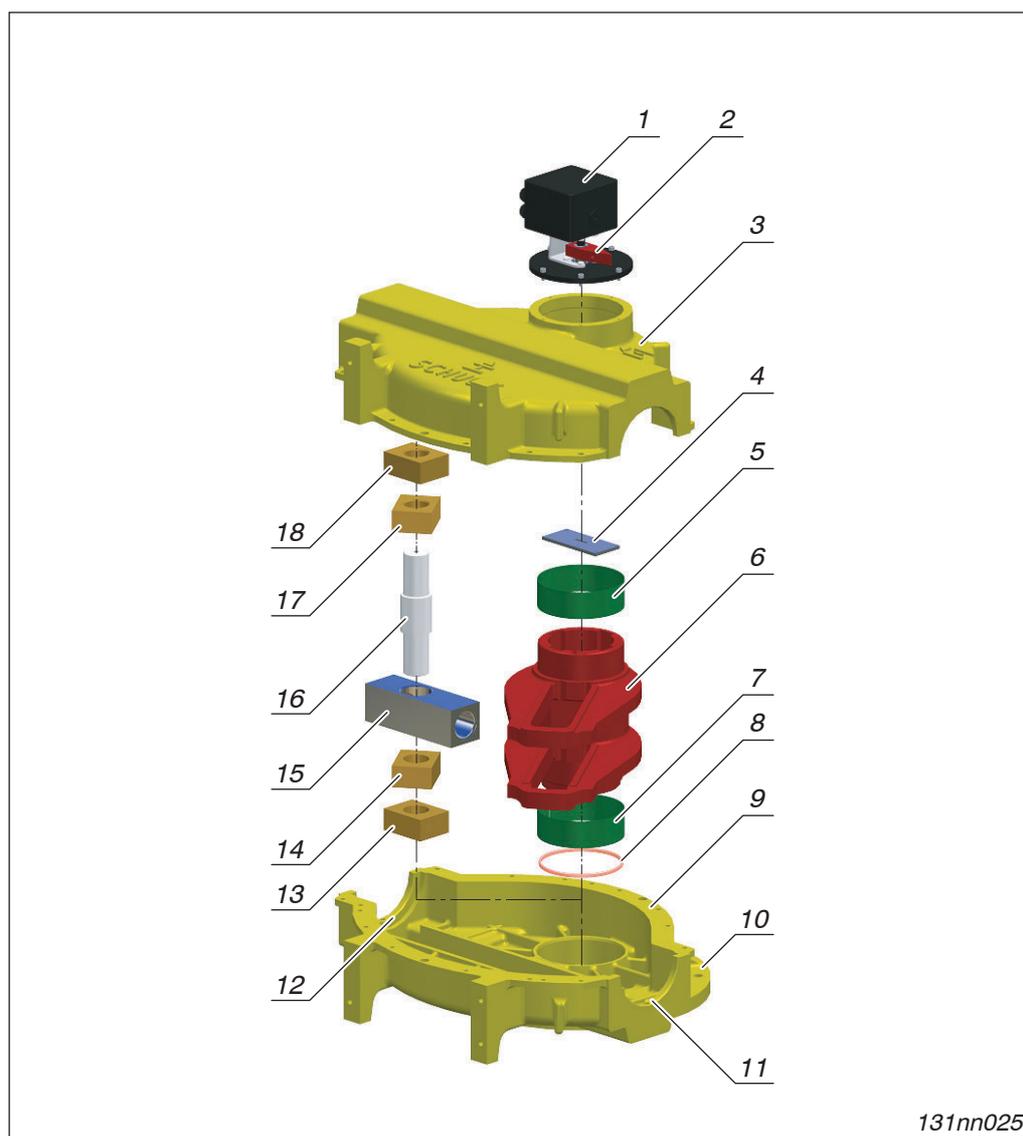


Fig. 3-2 Basic actuator CG - FG components

- | | |
|---|---|
| <ul style="list-style-type: none"> 1 Limit switch (optional additional attachment) 2 3D position indicator 3 Upper casing 4 Indicator panel 5 Sliding bearing for casing, upper 6 Yoke 7 Sliding bearing for casing, lower 8 O-ring 9 Lower casing 10 Output flange | <ul style="list-style-type: none"> 11 Ring flange mounting for attachments, right-hand 12 Ring flange mounting for attachments, left-hand 13 Sliding pad for casing, lower 14 Sliding pad for yoke, lower 15 Carrier 16 Retaining bolts 17 Sliding pad for yoke, upper 18 Sliding pad for casing, upper |
|---|---|

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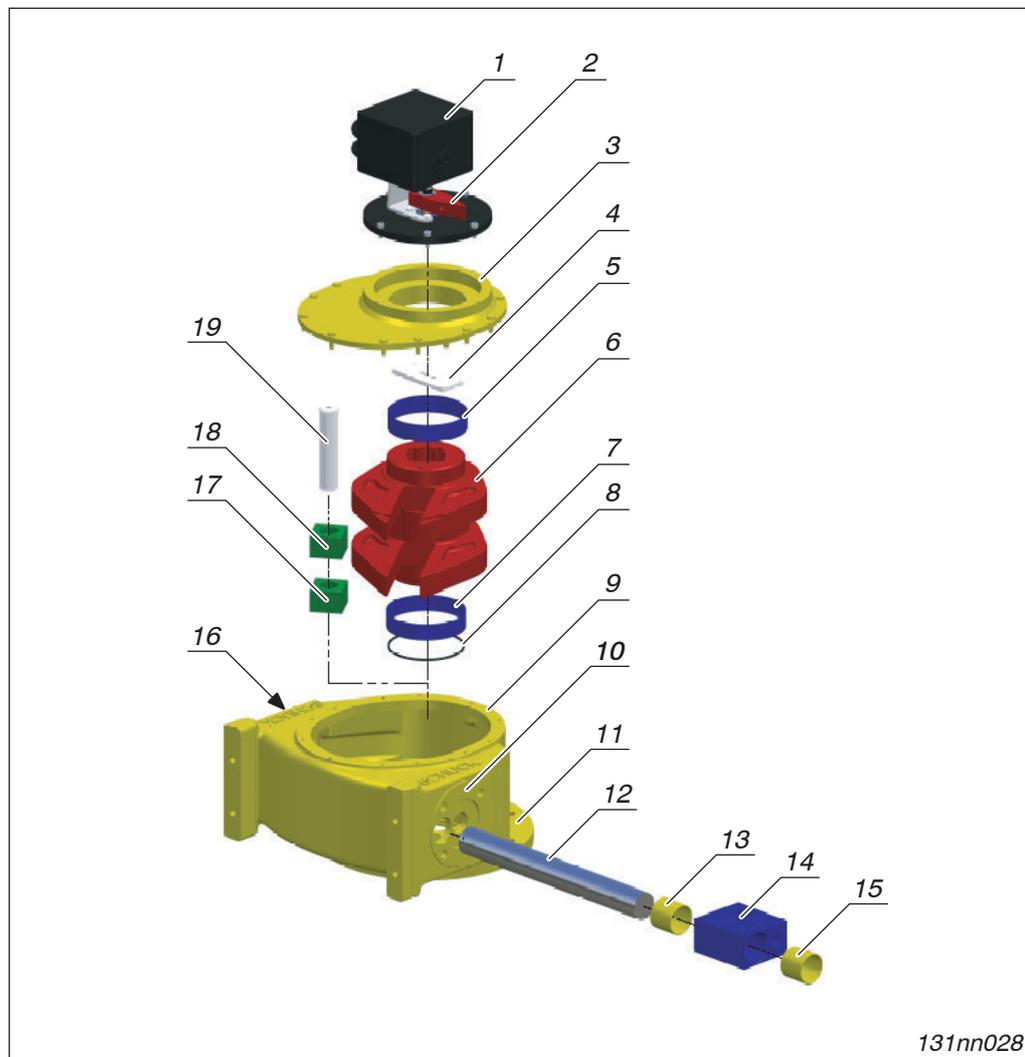
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Due to the design, actuator systems of the VG – BG series do not contain sliding pads to absorb the transverse forces. A sliding rod is responsible for guidance
 → page 3-6, fig. 3-3.



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Fig. 3-3 VG - BG basic actuator

- | | |
|---|--|
| 1 Limit switch (optional additional attachment) | right-hand |
| 2 3D position indicator | 11 Output flange |
| 3 Upper casing | 12 Sliding rod |
| 4 Indicator panel | 13 Sliding bearing |
| 5 Sliding bearing for casing, upper | 14 Carrier |
| 6 Yoke | 15 Sliding bearing |
| 7 Sliding bearing for casing, lower | 16 Ring flange mounting for attachments, left-hand |
| 8 O-ring | 17 Sliding pad for yoke, lower |
| 9 Lower casing | 18 Sliding pad for yoke, upper |
| 10 Ring flange mounting for attachments, right-hand | 19 Retaining bolts |

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Function

The linear movement of the attachments (such as cylinder, spring cylinder, bevel gear → page 3-9, chapter 3.4) is transmitted via the carrier (15), the carrier pin (16) and the sliding pads (10, 14, 17 and 18) on the lever arm of the yoke (6).

Swivelling actions produced in this way are also referred to as Scotch Yoke principle. The advantage of the Scotch Yoke principle is that the output torque is adjusted to the torque of the ball valve at a constant input torque or input pressure and the compact design resulting from it.

With their limited friction, Schuck actuators are highly efficient. The actuators are self-locking and jerk-free.

Overview torque curve

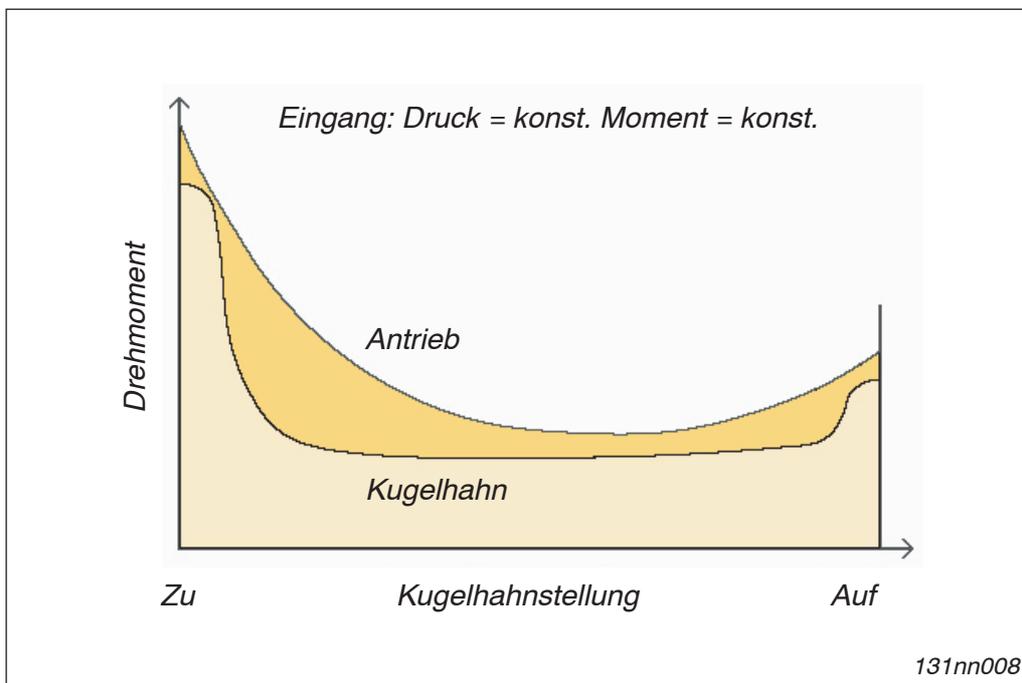


Fig. 3-4 Principle characteristics of actuator and ball valve torque

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3.2.3 Maintenance

Schuck basic actuators are maintenance-free.
For inspection intervals please refer to → page 6-6, chapter 6.2.2.



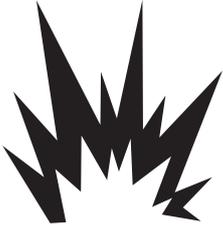
3.2.3.1 Maintenance works

Before carrying out maintenance work at the basic actuator always contact Franz Schuck GmbH.



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3.3 Pneumatic system type K system description

| | | |
|---|--|--------|
|  |  | DANGER |
| | <p>Risk of injury from bursting components/system parts!</p> <p>If the permissible limit values are exceeded, the component/system can be destroyed, and as a consequence of this persons can be injured or killed!</p> <p>⇒ Always operate components/system parts within the permissible limit values!</p> | |

In addition to the basic actuator, the type K pneumatic system consists of the following components (detailed descriptions can be found in the following chapters):

1. Cylinder attachments at the basic actuator (→ page 3-9, chapter 3.4)
2. Pneumatic actuator control system (→ page 3-16, chapter 3.5)
3. Additional attachments (→ page 3-24, chapter 3.6)

In the case of direct gas actuators, the position energy is used for direct and double action generation of the starting torque required to operate the ball valve.

Attention! System-dependent setting and limit values are specified in the enclosed technical specifications and on the rating plate.



3.4 Attachments at the basic actuator

This chapter describes the basic actuator attachments. The basic actuator, the actuator control system and the optional additional attachments form a complete and functioning actuator system.

3.4.1 Technical specifications

| Reference variable | | Value | |
|-----------------------|---|---|---------------|
| Type | | Scotch Yoke | |
| Operating medium | | Compressed air | Gas |
| Operating pressure | | 2.5 to 10 bar | 10 to 160 bar |
| Spring return opens | | 00/19, 12/15 | |
| Spring return closes | | 19/00, 15/12 | |
| Operating time | | 5 – 60 seconds | |
| Manual operation | | OPEN/CLOSE as additional attachment Y | |
| Explosion protection |  | II 2G II cT1...T4 (X) | |
| Operating temperature | | –25 °C to +80 °C (standard cast iron) | |
| | | –40 °C to +80 °C (low temperature cast iron) | |
| | | –40 °C to +80 °C (standard carbon steel) | |
| | | –60 °C to +80 °C (low temperature carbon steel) | |

Tab. 3-2 Features of the pneumatic actuator system K7/K8 with spring release

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3.4.2 Description

In the case of actuator systems with spring return, a spring is actuated by means of the position energy (compressed air, gas, oil) which allows to move the ball valve (actuator) into the fail safe position should an emergency occur.

There are two different systems:

- Type 00/19, 19/00
 (→ page 3-11, fig. 3-5)
 - Pneumatic/hydraulic part and spring release in one cylinder
- Type 12/15, 15/12 (compressed air, gas) or 11/15, 15/11 respectively (oil)
 (→ page 3-11, fig. 3-6)
 - Pneumatic/hydraulic cylinder and spring cylinder in two separate units

The pneumatic/hydraulic cylinders are suitable for oil, natural gas and compressed air. They are corrosion- and wear-resistant to ensure reliability and a long working life.

The springs are made of high-tempered high-quality steels that guarantee a high corrosion resistance as well as endurance strength even under extreme temperature conditions.

The end positions are adjusted by means of the adjustment screw at the spring and pneumatic/gas/hydraulic cylinder (12/15, 15/12 or 11/15, 15/11) and pneumatic cylinder and adjustment flange (00/19, 19/00) respectively.

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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3.4.2.1 Sub-assembly overview

Components (Working example 00/19)



131nn009

Fig. 3-5 Sub-assembly overview working example 00/19

- 1 Integrated pneumatic/spring cylinder

Components (Working example 12/15)



131nn010

Fig. 3-6 Sub-assembly overview working example 12/15

- 1 Spring cylinder
- 2 Pneumatic cylinder

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Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: --

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3.4.3 Assembly/start-up

CAUTION

Danger from applying pressure and control voltage!

Actuator leaves end position.

1. Please observe the chapters on Assembly/Start-up of the control system before starting work (→ page 3-20, chapter 3.5.1.3)!
2. Consult the operator of the control room before starting work.
3. Stay away from moving parts when starting up the control unit.

CAUTION

Risk of damage due to incorrect adjustments of the limit switches!

Actuator does no longer open/close completely.

- ⇨ If the actuator system was already mounted to the ball valve at the time of shipping from the factory, the limit switches may not be readjusted. It is only necessary to check the correct settings once the installation of the ball valve is completed by approaching the OPEN/CLOSE end positions (→ see also ball valve operation manual).

Adjusting the limit switches

The adjustment screws of the cylinders or the adjustment flange allow to mechanically restrict the travel and with it the swiveling motion of the actuator system in the "OPEN" or "CLOSE" position.

The final mechanical position is factory-preset to the exact "END" position.

The adjusting screws are secured with counter nuts.

The cover cap must be filled with grease at all times and the o-ring must be available for sealing.

For correct adjustment of the cylinder stop it is required that the actuator system is mounted and fixed on the ball valve.

Components (end stop 00/19)

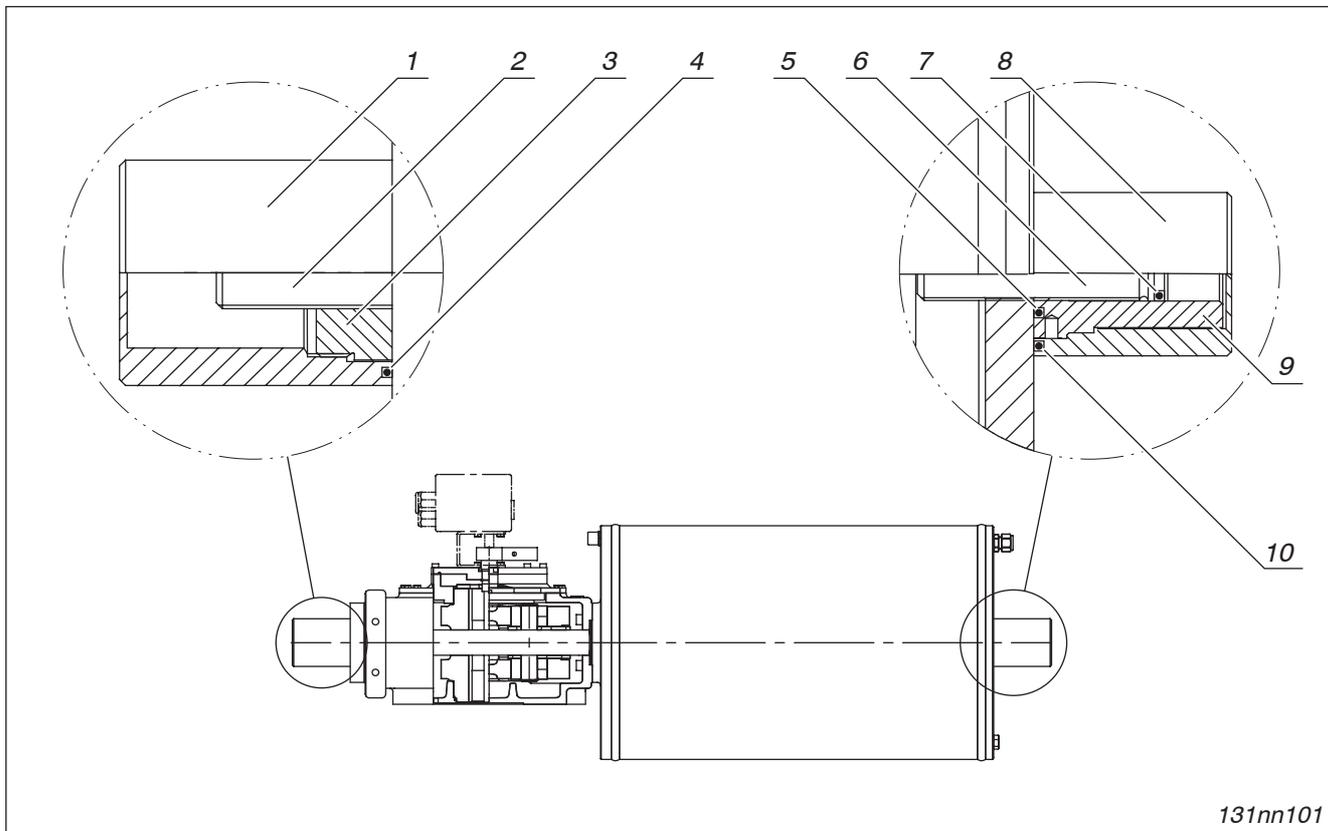


Fig. 3-7 End stop working example 00/19

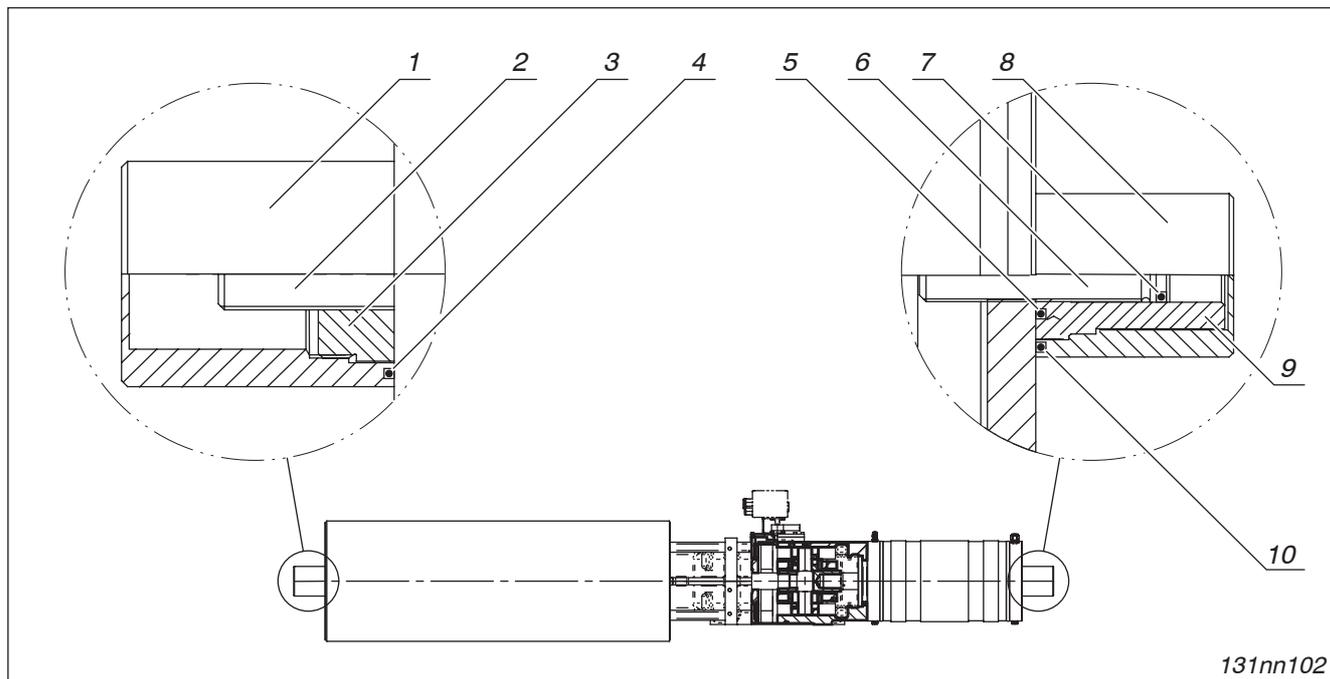
- | | |
|--------------------------------------|-----------------------------|
| 1 Adjustment flange cover cap | 6 Cylinder adjustment screw |
| 2 Adjustment flange adjustment screw | 7 O-ring |
| 3 Counter nut | 8 Cylinder cover cap |
| 4 O-ring cover cap | 9 Counter nut |
| 5 O-ring counter nut | 10 O-ring cover cap |

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Revision: --

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
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Components (end stop 12/15)



131nn102

Fig. 3-8 End stop working example 12/15

- | | |
|--------------------------------------|-----------------------------|
| 1 Adjustment flange cover cap | 6 Cylinder adjustment screw |
| 2 Adjustment flange adjustment screw | 7 O-ring |
| 3 Counter nut | 8 Cylinder cover cap |
| 4 O-ring cover cap | 9 Counter nut |
| 5 O-ring counter nut | 10 O-ring cover cap |

Procedure

1. Move the ball valve completely into the respective end position (→ see also the operation manual of the ball valve).
2. Remove the cover cap and use the adjustment screw to adjust the end stop.
3. Turn back the adjustment screw 1/2 of a turn.
4. Tighten the counter nut. Make sure not to twist the adjustment screw.
5. Lubricate adjustment screw and counter nut.
6. Assemble the cover cap and make sure that the o-ring seal is available.
7. Recheck by operating the system to the end positions again.

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Revision: --

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: --

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3.4.4 Maintenance

| CAUTION |
|---|
| <p>Danger from pressure!</p> <p>⇒ Depressurise the actuator system before removing the hydraulic cylinder adjustment screw!</p> |

3.4.4.1 Maintenance works

Annually

Procedure

1. Check the cover caps of the end stops for leaks and damage.
2. Remove the caps and check o-rings.
3. Make sure that the counter nut is tightened firmly.
4. Replace damaged cover caps and o-rings.
5. Lubricate adjustment screw, counter nut and o-rings of the cover caps if applicable.
6. Install the cover caps and tighten hand-tight.

3.4.4.1.1 Recommended lubricating grease

| Manufacturer | Model | Temperature range |
|--------------|-------------|-------------------|
| Bantleon | Aviacal 2LD | -30 °C to +120 °C |
| | OKS 475 | -60 °C to +120 °C |

Tab. 3-3 Recommended lubricating grease

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Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: -

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3.5 Actuator control system pneumatic system type K

3.5.1 Pneumatic control type K7/K8 with spring release

3.5.1.1 Technical specifications

| Reference variable | Value | |
|--|---|--------------------------|
| Operating medium | Compressed air | Gas |
| Input pressure | 16 bar max. | 160 bar max. |
| Operating pressure | 2.5 to 10 bar | 10 to 100 bar |
| Control voltage | 12 V _{DC} , 24 V _{DC} , 110 V _{DC/AC} , 230 V _{DC/AC} | |
| Remote control solenoid valve | Actuating time adjustment (standard) | |
| | pneumatic OPEN | |
| | pneumatic CLOSE | |
| | K7: electric OPEN/ CLOSE p = 0 => OPEN | |
| K8: electric OPEN/ CLOSE p = 0 => CLOSE | | |
| Explosion protection |  | II 2G II B T1 ... T4 (X) |
| Protection type control cabinet | max. IP65 | |
| Ambient temperature | -30 °C to +60 °C (for low temperature option -40 °C to +60 °C with control cabinet heating as additional attachment) | |
| Pressure connection | G1/4", G1/2", NPT 1/4", NPT 1/2", NPT 3/4" | |
| Electrical connection | M12 x 1.5, M16 x 1.5, M20 x 1.5 | |

Tab. 3-4 Pneumatic control type K7/K8 features

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Author: Franz Schuck GmbH Hoster/Mack
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3.5.1.1.1 Actuator control system rating plate

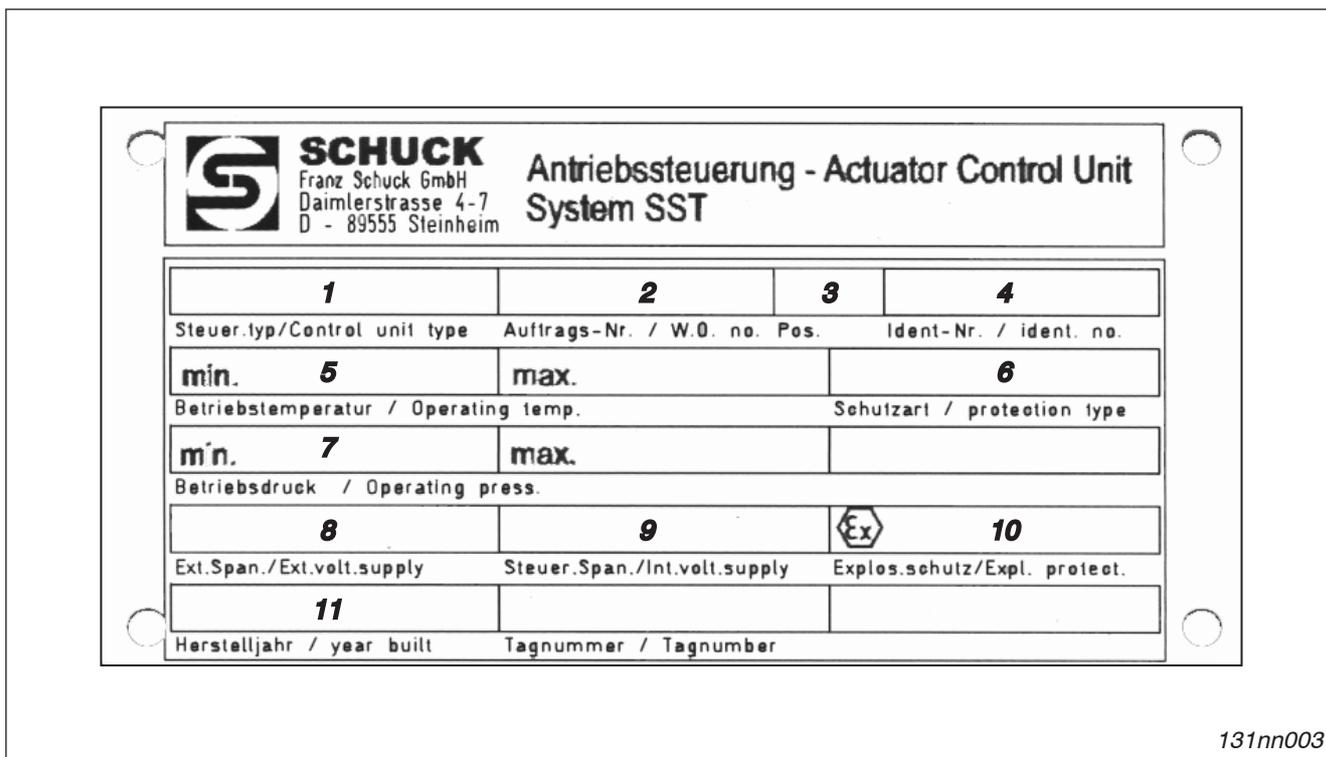


Fig. 3-9 Specifications on the actuator control rating plate

- | | |
|--------------------------------|----------------------------------|
| 1 Control unit type | 7 Operating pressure |
| 2 W.O. no. | 8 External voltage supply |
| 3 Position | 9 Control voltage |
| 4 Ident. no. | 10 Explosion protection |
| 5 Operating temperature | 11 Year built |
| 6 Protection type | |

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Revision: --

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: --

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3.5.1.2 Description

Schuck actuator control system for the SST have been developed as a modular system. All control system valves are leak-proof seat valves that guarantee absolute leak tightness. The system features a compact design, minimal maintenance effort and a high functional reliability.

Task

The task of the control system is to limit the input pressure and to supply the cylinder with the operating medium via a valve or a valve combination respectively.

The medium is cleaned, dried and lubricated as necessary.

This control type is suitable for high input pressures and media such as natural gas (sour gas optionally).

A multitude of applicable valves and valve combinations allows to fulfil customer-specific control requirements.

Control cabinet of the high pressure control system

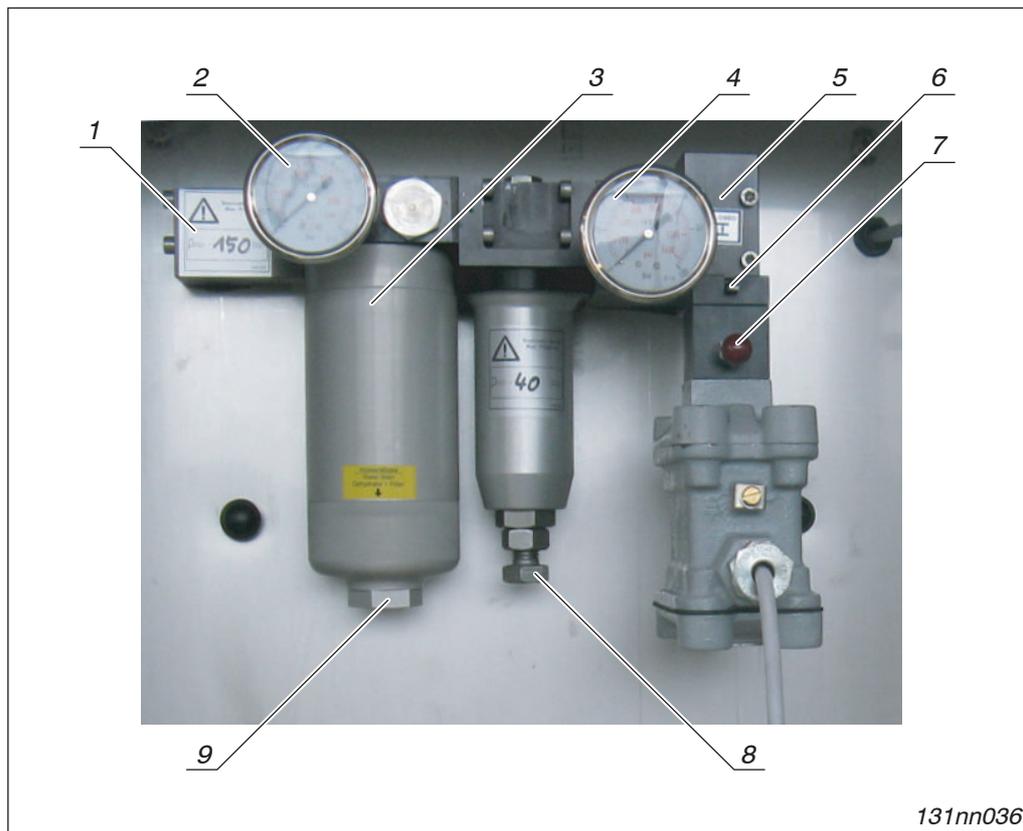


Fig. 3-10 Control cabinet of the high-pressure control system (design may vary)

- | | |
|--|-----------------------------------|
| 1 Pressure connection customer (back side) | 6 Hand lever for valve activation |
| 2 Input pressure manometer | 7 Reset button |
| 3 Filter cap/filter cartridge | 8 Pressure controller |
| 4 Output pressure manometer | 9 Condensate drain |
| 5 Control valve | |

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Revision: --

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: --

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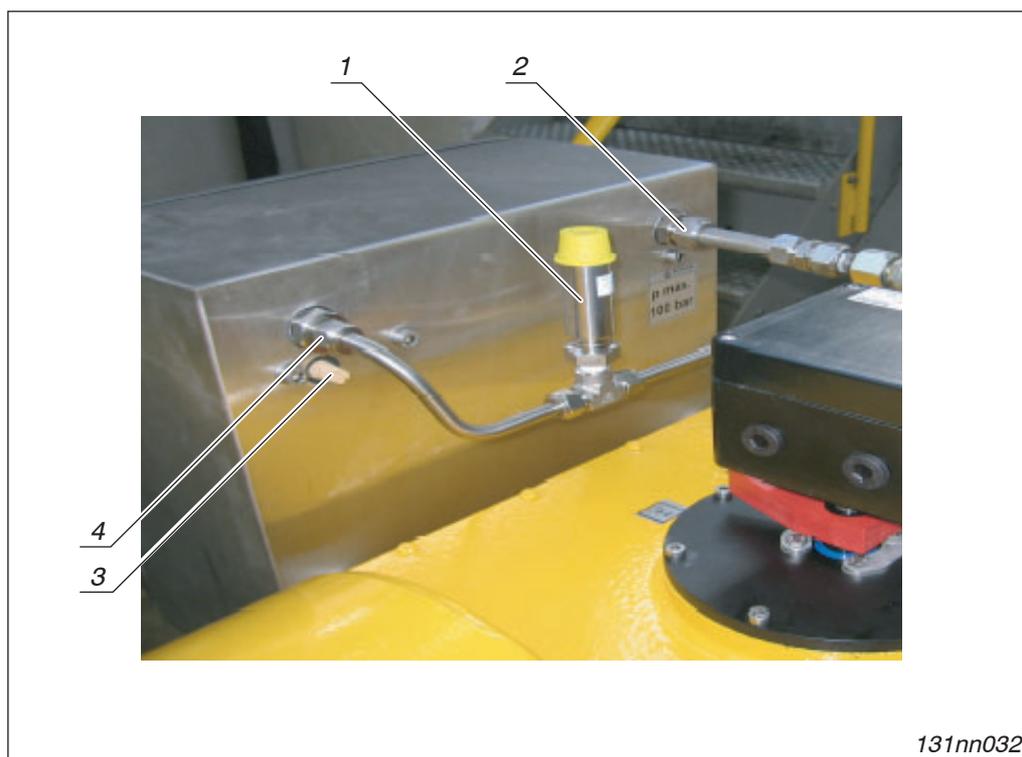


Fig. 3-11 Control cabinet of the high-pressure control system (design may vary)

- | | |
|---------------------------------------|-------------------------------------|
| 1 Safety valve | 3 Relief line (silencer) |
| 2 Pressure connection customer | 4 Pressure output (cylinder) |

Function

If a voltage (solenoid valve) or a control pressure (pressure control valve) is applied to the control valve (→ page 3-18, fig. 3-10, item 5), the gas pressure (if present at item 2) is conducted into the pneumatic cylinder which bends the spring. The actuator moves into operating position.

In the event of a failure in the main pressure supply, the solenoid valve voltage or the control pressure at the control pressure valve, the spring is released and the actuator moves to the fail safe position.

- K7
 - OPEN – 00/19 (12/15)
- K8
 - CLOSE – 19/00 (15/12)

If the system is equipped with an additional function, the basic actuator is extended by one or more control valves (→ wiring diagram in the provided documentation).

3.5.1.3 Assembly/start-up

CAUTION

Danger from applying pressure and control voltage!

Actuator leaves end position.

1. Please observe the chapters on Assembly/Start-up of the actuator system before starting work (→ page 3-12, chapter 3.4.3)!
2. Consult the operator of the control room before starting work.
3. Stay away from moving parts when starting up the control unit.

Actuator control systems in control cabinets are mounted to the basic actuator in the factory and adjusted according to the customer requirements.

When starting up the system it is necessary to check the actuator control thoroughly before a voltage is supplied or the system is pressurised (→ page 3-20, chapter 3.5.1.3.1)

All electrical components are explosion-protected and suitable for explosive zones up to and including Ex Zone 1.

The control cabinet is mounted to the basic actuator by means of the provided drill hole.

The actuator control system is connected to the cylinder via rust-proof pipes and screw fittings.

Control systems can be retrofitted or mounted on third-party systems if required by the customer.




3.5.1.3.1 Checking the actuator control system

Procedure

1. Thoroughly check the control system and all attachments and connections for damages.
2. Check the electrical connections of the solenoid valve and the signalling to the control room if applicable.
3. Make sure that the relief line (→ page 3-19, fig. 3-11, item 3) of the control system is open and not blocked or clogged.

This allows to move the actuator system into the fail safe position and the pressure to escape from the cylinder.

3.5.1.4 Operation

Depending on the type, the actuator system type K7/K8 can be operated locally and/or from the control room.

The manual controls for emergencies (additional attachment Y, optional) can only be operated locally.

It is recommended to check the actuator control system prior to local operation (→ page 3-20, chapter 3.5.1.3.1).

3.5.1.4.1 Local operation

Pushing the hand lever allows to control the control valve locally with hand operation (optional). The actuator moves into fail safe position.

To reset the actuator to operating position, push the reset button (→ page 3-18, fig. 3-10, item 7).

The operation of the manual controls for emergencies (additional attachment Y, optional) is described in a separate chapter (→ page 3-37, chapter 3.6.4).

3.5.1.4.2 Remote control

The K7/K8 actuator control is operated from the control room.

The control valve (→ page 3-18, fig. 3-10, item 5) is permanently connected to a power supply and a pressure is applied to it if applicable.

In the case of a voltage or pressure drop, the spring force returns the actuator to the fail safe position.

To reset the actuator to operating position, push the reset button (→ page 3-18, fig. 3-10, item 7).

Procedure

| | | |
|--|---|---------------|
| | | DANGER |
| | <p>Risk of injury from bursting components/system parts!</p> <p>If the permissible limit values are exceeded, the component/system can be destroyed, and as a consequence of this persons can be injured or killed!</p> <p>⇒ Do not exceed the stated maximum values for input and output pressure!</p> | |

1. Pressurise the system.

Never exceed the stated maximum values for input and output pressure!

The output pressure manometer (→ page 3-18, fig. 3-10, item 4) must indicate at least the minimum operating pressure specified on the rating plate of the control system.

2. Supply a voltage to the control valve (→ page 3-18, fig. 3-10, item 5), or control pressure if applicable.

ATTENTION: Actuator moves against the spring into operating position.

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: -

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: -

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3. Perform a test run of the actuator system via the control valve.
(→ page 3-18, fig. 3-10, item 5). To do so, operate the solenoid valve from the control room and the pressure control valve respectively.

Solenoid valves must be controlled electrically for this purpose to enable the actuator system to move into operating position.

The actuator moves into fail safe position in the event of an operating pressure failure or if the electric solenoid valve control fails.

A pressure control valve must be connected to the control pressure line to enable the actuator system to move into operating position.

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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3.5.1.5 Maintenance

Schuck actuator control systems are low-maintenance.

The maintenance work required for the main components is described subsequently.

For details on the maintenance of the additional attachments see the chapter “Additional attachments” (→ page 3-24, chapter 3.6).

3.5.1.5.1 Pressure relief

CAUTION

Danger from turning off pressure and control voltage!

The ball valve moves into fail safe position if the pressure is relieved.

1. Consult the operator of the control room before starting work.
2. Separate the actuator control system from the pressure supply and completely depressurise the actuator system.
3. Stay away from moving parts when depressurising the pneumatic cylinder.

Procedure

1. Make sure to depressurise the actuator and control systems, disconnect them from the power supply and secure them against unintentional restart before performing any maintenance work.

The “Input pressure” (→ page 3-18, fig. 3-10, item 2) and “Output pressure” (→ page 3-18, fig. 3-10, item 4) manometers must indicate “0” bar.

2. Make sure the pressure supply is shut off until the maintenance works are finished.
3. Release the condensate drain (→ page 3-18, fig. 3-10, item 9) at the filter controller until the remaining pressure has escaped completely.

Attention: Wastewater can escape!

4. Unscrew the filter housing and remove from the bottom.
5. Unscrew the filter cartridge on the inside.
6. Clean the filter cartridge or replace if heavily contaminated.
7. Reinstall the components in reverse order.
8. Tighten condensate drain again.
9. Start up the actuator control system as specified in the instructions (→ page 3-16, chapter 3.5).

3.6 Additional attachments

3.6.1 Pneumatic main control valves

This chapter describes the pneumatic main control valves used for Schuck actuator control systems.

3.6.1.1 Technical specifications

| Reference variable | Value | | |
|-----------------------------------|--|---------------------------------------|-----------------------------------|
| Type | 1 (standard) | 2 (sour gas) | 3 (low temperature) |
| Manufacturer | Dr. Breit | | |
| Operating pressure | 0 –160 bar | | |
| Nominal size | DN3, DN6 | | |
| Nominal size as valve combination | DN2/DN3, DN2/DN6 | | |
| Material | AlMgSi1 anodised | Stainless steel 1.4571 AISI316 TI | |
| Temperature range | –25 °C to +70 °C | –20 °C to +60 °C | –40 °C to +60 °C |
| Sealing material | NBR | Viton | Fluorine silicone |
| Operating types | – solenoid, all voltages AC/DC, 10-13W (DN3), 20W (DN6), 3W (DN2) – pressure-operated | | |
| Medium | neutral gaseous and liquid fluids | neutral gaseous and aggressive fluids | neutral gaseous and liquid fluids |
| Electrical connection | Standard hole pattern | | |
| Pressure connection | | | |
| EEx |  | IIG2 EEx de IIB +H2 T4/T6 | |
| SIL | applicable up to SIL 2 | | |
| Manual operation | yes | | |
| Reset lockout | Optional manual or automatic unlocking device | | |

Tab. 3-5 Features of pneumatic main control valves, type 1 (standard compressed air)

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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3.6.1.2 Description

Task

The task of the pneumatic main control valves (→ page 3-27, fig. 3-12) is to conduct a pressurised, gaseous medium at valve connection P to valve connection A in the event of a control signal.

The control signal can be both electric and pneumatic.

Components

Pneumatic main control valves consist of a valve unit with input P, output A, relief passage T and an electro-magnetic or pressure-operated control piston.

Depending on the requirements, the main control valve is equipped with several options.

- reset lockout with reset option
 - a defined switching status of the valve is mechanically locked and must be reset
 - there are three different types of resets: “manual reset”, “local reset” and “remote-controlled reset from a remote control room”
- electrical insulation
 - this option involves that the magnetic head is separated electrically from the valve to prevent the cathode current of the pipeline to discharge via the earthing

Function

Depending on the position of the control piston, the flow is either conducted from valve connection P to valve connection A or from valve connection A to valve connection T.

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Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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3.6.1.3 Assembly/start-up

This section is exclusively intended to support the operator in replacing the pneumatic main control valve on Schuck actuator systems using only original Schuck spare parts. Observe the related actuator control operation manual!

Function

All pneumatic and electrical (if applicable) inputs and outputs must be connected in accordance with the electric and pneumatic wiring diagram of the actuator control system to ensure correct functioning of the valve.

Pressure-bearing connections (pipes, threaded connections) must be installed according to the state-of-the-art, i.e. correctly, stress-free and pressure-tight.

Procedure

1. Make sure to depressurise the actuator and control systems, disconnect them from the power supply and secure them against unintentional restart before performing any installation work.

The actuator control system pressure gauge must indicate "0" bar.

2. Separate the pressure line and the electric line if applicable from the defective main control valve.
3. Remove the defective valve.
4. Clean the flange surface on the replacement valve and make sure the sealing rings are positioned correctly.
5. Install the replacement valve.
6. Reinstall the pressure line and the electric line if applicable.
7. Start up the actuator control system as specified in the instructions (→ page 3-16, chapter 3.5).

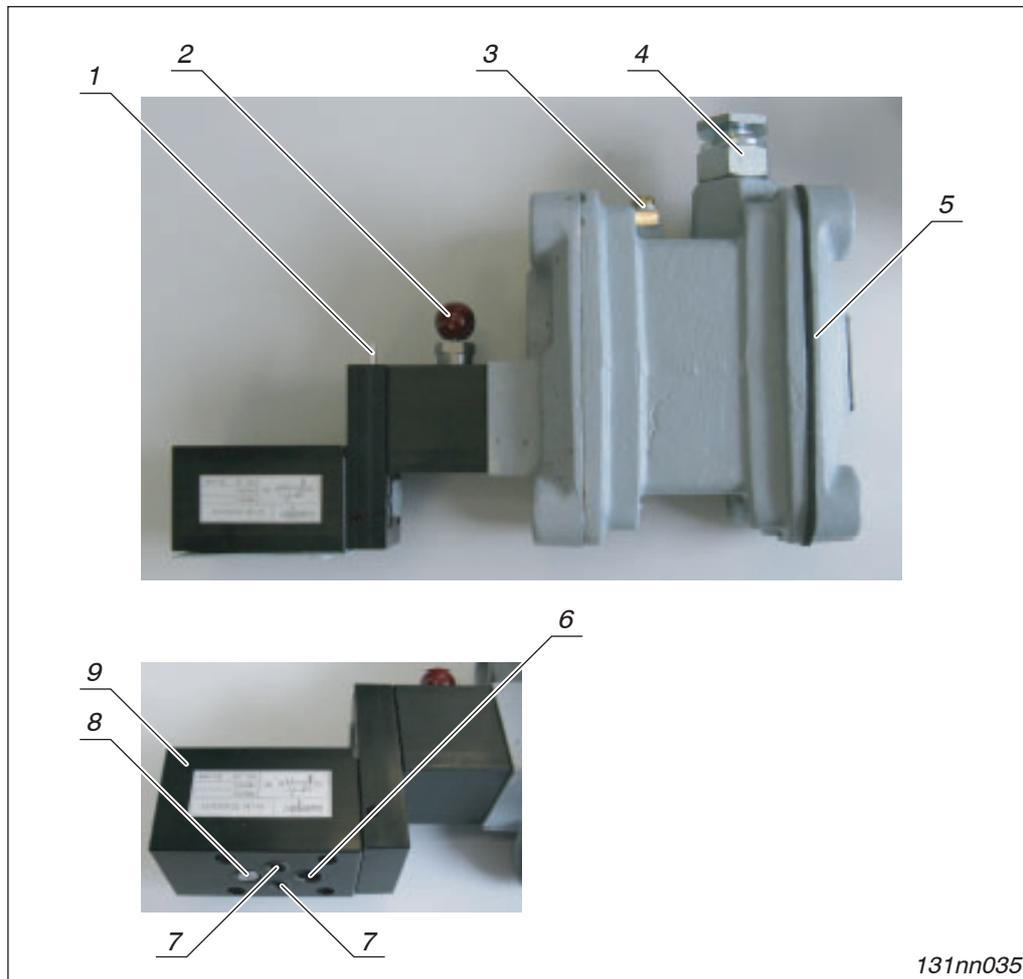
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Revision: –

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Editor: biplant.de GmbH Schön
Translator: –

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3.6.1.4 Operation

Components



131nn035

Fig. 3-12 Pneumatic main control valve

- | | |
|--|----------------------|
| 1 Hand lever | 6 Valve connection T |
| 2 Reset lockout with manual reset (optional) | 7 Valve connection A |
| 3 Earthing | 8 Valve connection P |
| 4 Electrical connection | 9 Vale unit |
| 5 Magnetic head | |

Procedure

Depending on the type, pneumatic main control valves are operated in different ways:

- A – electro-magnetically controlled by turning the magnet on/off
- B – pneumatically controlled by turning the control pressure on/off
- C – by hand lever operation (1)

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Revision: --

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: --

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3.6.1.5 Maintenance

Pneumatic main control valves are practically maintenance-free but regular inspections and tests for correct functioning under operating conditions are required nonetheless.

Recommended monthly intervals:

- Check all pressure-bearing connections for leaks
- Check all cables and cable connections on electromagnetically controlled valves, run tests for correct functioning at least once per quarter
- Switch the valve

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Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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3.6.2 Limit switch L – type 07-31B1

3.6.2.1 Technical specifications

| Reference variable | Value |
|-------------------------------|---|
| Voltage U | 12 V _{DC} , 24 V _{DC} , 48 V _{DC} , 110 V _{AC} , 230 V _{AC} , 250 V _{AC} |
| Nominal operational current I | 5 A (250 V _{AC}) |
| | 7 A (30 V _{DC}) |
| Explosion protection |  EEx d |
| Protection type | max. IP65 |
| Ambient temperature | (–60 °C) –25 °C to +80 °C |
| Electrical connection | 1 x M 25 x 1.5 (13 – 20 mm) |
| | 2 x M 20 x 1.5 (6 – 12 mm) |

Tab. 3-6 Features of the limit switch P5-EEx

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Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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3.6.2.2 Description

Franz Schuck GmbH offers different types of limit switches with different equipment of signal transmitters.

This function description is only applicable for the limit switch type 07-31B1 with mechanical double micro switches.

Task

The limit switch signals are used for end position signalling and to turn off the operating command shortly before reaching the mechanical end position.

There is one double micro switch for each end position in the limit switch housing.

Components

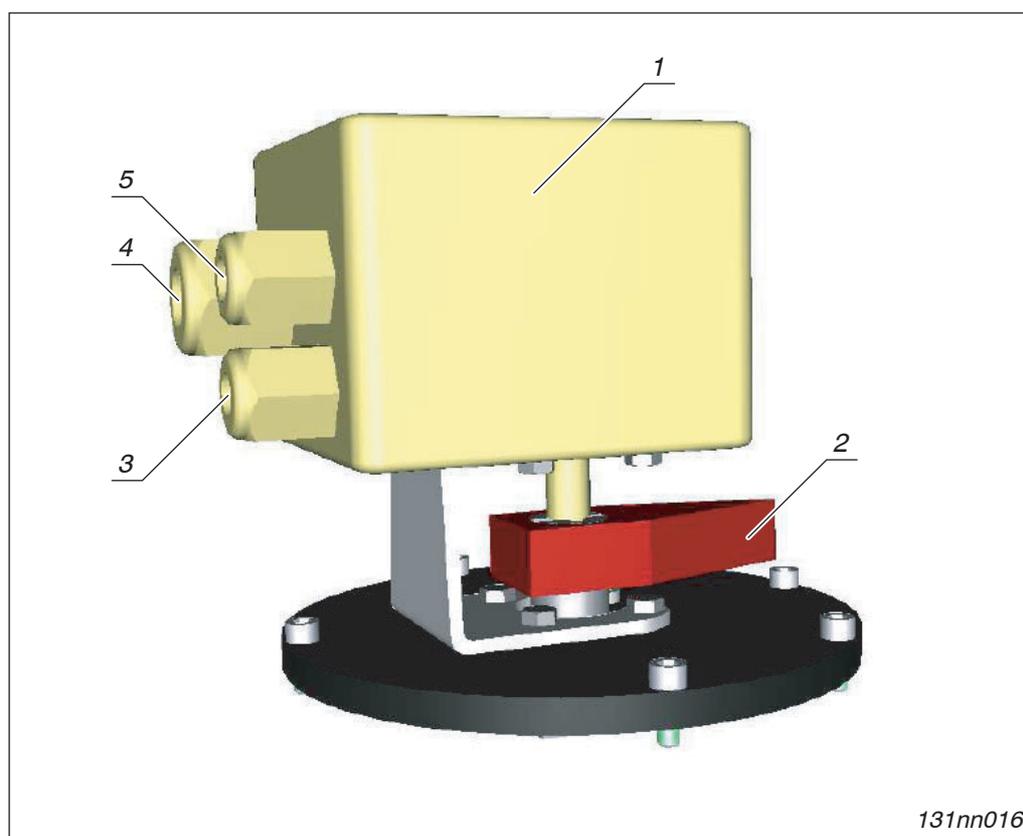


Fig. 3-13 Limit switch with position indication

- | | | | |
|---|----------------------------|---|----------------------|
| 1 | Limit switch housing QS014 | 4 | Connection M25 x 1.5 |
| 2 | 3D position indicator | 5 | Connection M20 x 1.5 |
| 3 | Connection M20 x 1.5 | | |

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Revision: --

Author: Franz Schuck GmbH Hoster/Mack
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Procedure

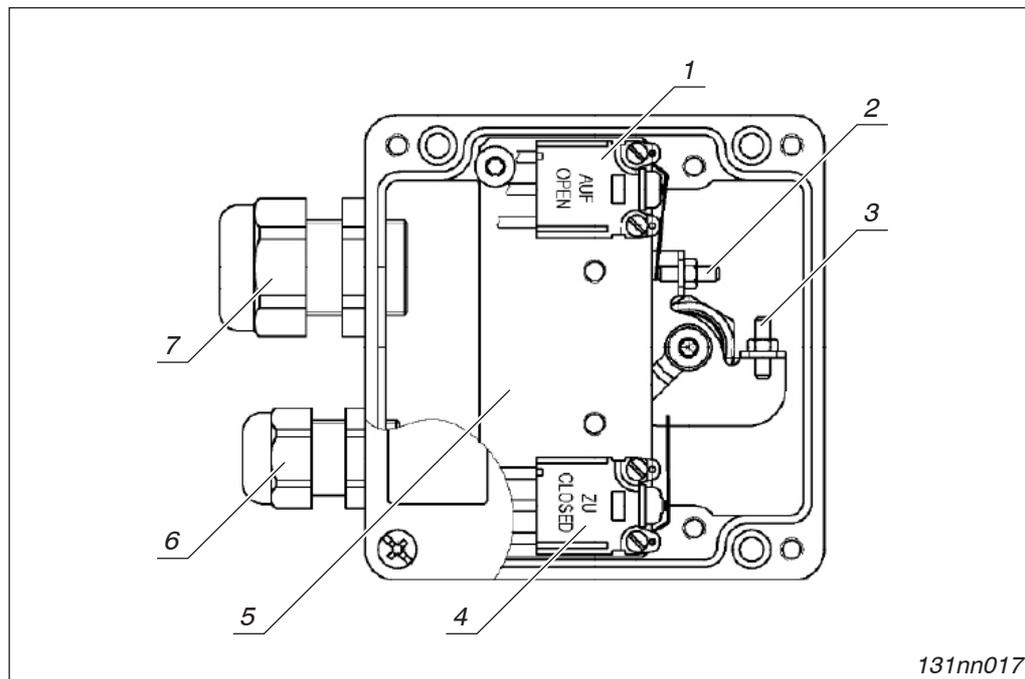


Fig. 3-14 Limit switch

- | | | | |
|---|--|---|---|
| 1 | Micro switch "OPEN" | 5 | Screw-on terminal block (terminal block not displayed) |
| 2 | Micro switch adjustment screw "OPEN" | 6 | Connection 2 x M20 x 1.5 |
| 3 | Micro switch adjustment screw "CLOSED" | 7 | Connection M25 x 1.5 |
| 4 | Micro switch "CLOSED" | | |

Function

The actuator trunnion of the ball valve is connected to a limit switch shaft with attached adjustable switch cams. The switch cams activate the respective micro switches (1) and (4) when reaching an end position.

The double micro switches operate with a defined switching sequence: Contact I switches always before contact II.

The limit switch housing contains a terminal block for the micro switches and other electrical connections.

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: -

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: -

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Codeword: Standard
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3.6.2.3 Assembly/start-up

In standard shipment the limit switch box is mounted to the 3D display by means of a bridge.

Procedure

⇒ Connect the limit switch box to the control system according to the terminal diagram.

The connecting diagram applicable to the system can be found in the customer documentation and additionally, depending on the type, directly on the limit switch box.

3.6.2.4 Operation

3.6.2.4.1 Checking the limit switches

For an illustration, see → page 3-31, fig. 3-14.

The system must be wired up with the control room at the installation location of the ball valve.

Procedure

⇒ Check the limit switch for correct functioning by operating the system to the end positions.

Achieving the end position must be indicated in the control room and the operating command must be turned off.

The limit switches are factory-preset. It is usually not required to change these settings. If the display is not correct, readjust the limit switches (→ page 3-33, chapter 3.6.2.5.1).



As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
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3.6.2.5 Maintenance

Limit switches are factory-preset and adjusted with the relevant ball valve. To ensure that the end position signalling is correct, limit switches may only be replaced after consultation with Franz Schuck GmbH.

Factory settings

- The micro switches in the limit switch used to cut off the operating command (e.g. for the solenoid valve), are set to a switching point of 0.2 degrees **ahead** of the final position.
- The mechanical limit stop is set at an angle of 0.2 degrees **after** each final position with an adjustment screw and is locked by means of the counter nut.

3.6.2.5.1 Adjusting the limit switches

For an illustration, see → page 3-31, fig. 3-14.

Prerequisite

- The actuator system is in the desired end position

Depending on the end position, the relevant micro switch can now be adjusted (→ page 3-31, fig. 3-14).

- Micro switch 1 switches the “**OPEN**” position
- Micro switch 4 switches the “**CLOSED**” position
- The switch has two stages:
 - Switch point 1: the solenoid valves are de-energised (only true for actuator types G0, K0, C0)
 - Switch point 2: the end position is signalled

Procedure

1. Remove the cover of the limit switch box.
2. Connect the testing lamp cable to the micro switch terminals of the end position that is to be checked.
3. Turn the sensitive adjustment screw until the switch-over point is achieved.
4. Repeat the procedure for the second micro switch.
5. Close the limit switch housing carefully to prevent the ingress of moisture and contamination.

3.6.3 Energy storage Q – pneumatic

3.6.3.1 Technical specifications

| Reference variable | Value | |
|---------------------|--------------------------|------------------------|
| Type | Compressed air tank | Gas storage (pipeline) |
| Material | Steel plate, zinc coated | – |
| Operating pressure | 11 bar max. | – |
| Safety valve | 11 bar | – |
| Ambient temperature | –10 °C to +80 °C | – |

Tab. 3-7 Energy storage device features

3.6.3.2 Description

Task

The energy storage for pneumatic actuator systems is a compressed air tank (2) that, in the event of a power failure, supplies sufficient energy to the actuator system to enable a defined number of operations.

Components

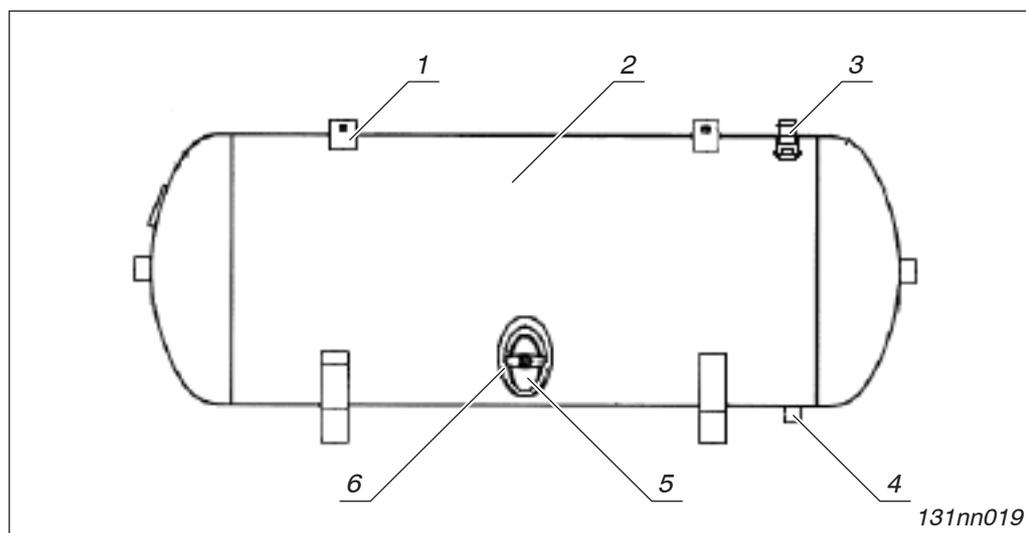


Fig. 3-15 Energy storage device

- 1 Safety valve
- 2 Compressed air tank
- 3 Shut-off valve
- 4 Drain valve
- 5 Cover
- 6 Inspection port

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Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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Function

The energy storage is designed according to the customer's specifications.

The compressed air tank is shipped with safety valve (1), check valve and drain valve (4) and can be connected directly to the actuator control system.

The storage pressure is indicated on the manometer.

For further information (→ page 7-1, chapter 7.3 component supplier documentation).

3.6.3.3 Assembly/start-up

⇒ Assure that all screw connections on the storage are tightened and all closing plugs are tight.

3.6.3.4 Operation

3.6.3.4.1 Checking the energy storage

| | | |
|--|---|--------|
| | | DANGER |
| | <p>Risk of injury from bursting components/system parts!</p> <p>If the permissible limit values are exceeded, the component/system can be destroyed, and as a consequence of this persons can be injured or killed!</p> <p>⇒ Do not damage the sealing on the safety valve (1) or change the adjustments!</p> | |

For an illustration, see → page 3-34, fig. 3-15.

The drain valve (4) must always be closed during operation.

Procedure

Without pressure

1. Check the connection to the actuator control system, the screw connections and make sure the inspection port cover is tightened firmly.
2. Check for leaks.

Under operating pressure

1. Open the shut-off valve (3) to guarantee that pressure is supplied even in the event of a pressure failure.
2. Check the safety valve (1) for leaks and correct settings.

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Revision: --

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Editor: biplant.de GmbH Schön
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3.6.3.5 Maintenance

For an illustration, see → page 3-34, fig. 3-15.

Maintenance work on the compressed air tank should be performed during maintenance work on the actuator control system (→ page 3-23, chapter 3.5.1.5).

Procedure

1. Before carrying out maintenance work on the compressed air tank (2), close the shut-off valve (3) and secure against unauthorised opening.
2. Open the drain valve (4).
Depending on the condition of the medium, moisture and contamination can escape at the drain valve.
3. Make sure that the pressure tank is completely depressurised.
4. Remove the cover (5) of the inspection port (6).
5. Use the inspection port to check the tank for corrosion and contamination (visual inspection and manual scanning).
6. Carry out the required maintenance and repair work.
Comply with the provided documentation of the tank manufacturer when carrying out the work.
7. Close the inspection hole (6) using a new sealing and make sure the cover (5) is positioned correctly.
8. Check for leaks.
9. Close the drain valve (4) and make sure that the plug is leak-proof and screwed tightly.
10. Open the shut-off valve on completion of the maintenance work.
The shut-off valve (3) must be open during normal operation to ensure correct functioning of the energy storage.

3.6.3.6 Inspection intervals

| Time interval | Action |
|--|---|
| After 100 switching cycles (at least after 1 year) | ⇒ Check the inside of the compressed air tank (visual inspection and manual scanning) |

Tab. 3-8 Inspection intervals

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Author: Franz Schuck GmbH Hoster/Mack
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3.6.4 Hydraulic manual operation for emergencies Y for pneumatic controls

3.6.4.1 Technical specifications

| Reference variable | Value | | |
|---------------------|---------------------------------------|---|----------------|
| Manual operation | Hydraulic hand pump | pneumatic/gas (with manual operation for emergencies alternatively) | Oil (standard) |
| Tank capacity | Customer-specific (4 sizes available) | | |
| Operating pressure | 200 bar max. | | |
| Ambient temperature | −30 °C to +90 °C | | |

Tab. 3-9 Features of the manual operation for emergencies Y

3.6.4.2 Description

For an illustration, see → page 3-38, fig. 3-16.

The manual operation for emergencies is characterized by its compact design, minimal maintenance effort, high functional reliability and a small hydraulic tank.

The retrofitable additional attachment for pneumatic actuator systems consists of a hydraulic cylinder (4) and a hand pump (2) that are both installed directly at the gas cylinder.

Task

The hydraulic cylinder can be operated with the hand pump (2) in the event of a power failure and/or a pressure drop.

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Revision: –

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Components

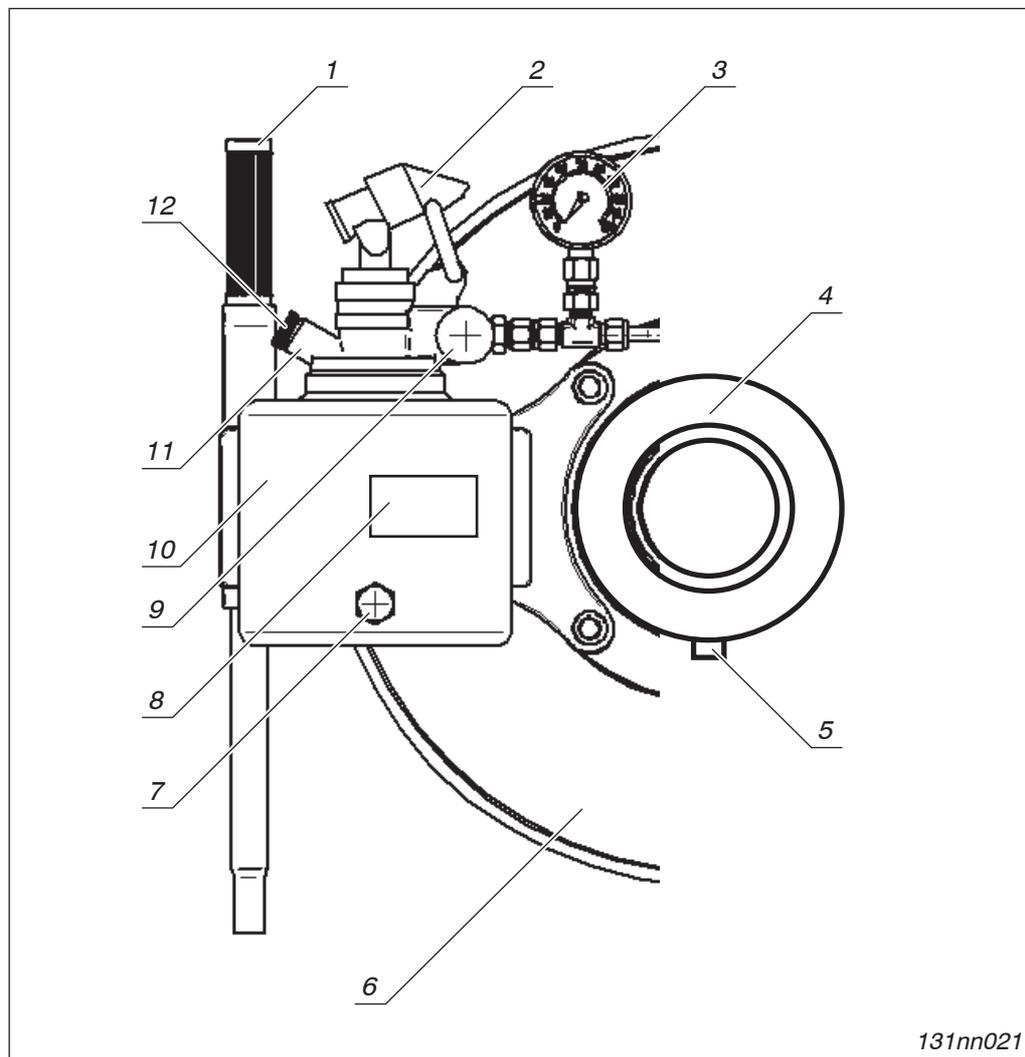


Fig. 3-16 Manual operation for emergencies

- | | |
|----------------------------------|------------------------|
| 1 Hand lever | 7 Oil tank drain screw |
| 2 Hand pump | 8 Rating plate |
| 3 Pressure gauge | 9 Isolating valve |
| 4 Hydraulic cylinder | 10 Oil tank |
| 5 Hydraulic cylinder drain screw | 11 Oil filler neck |
| 6 Gas cylinder | 12 Ventilation cover |

Function

When the isolating valve (9) is closed, the hand lever (1) allows to build up a system pressure in the hydraulic cylinder (2) via the hand pump (4).

The actuator system thus returns to the operating position.

Opening the isolating valve reduces the system pressure in the hydraulic cylinder. The actuator system returns to the fail safe position.

Turn the isolating valve twice and leave open!

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3.6.4.3 Assembly/start-up

The retrofittable additional attachment consists of a hydraulic cylinder and a hand pump that are both installed directly at the gas cylinder.

Procedure

1. Check all pipes for leaks.
2. Use the manual operation for emergencies to move the ball valve 20° – 30° towards the operating position.
3. Move the ball valve back to the fail safe position.

3.6.4.4 Operation

3.6.4.4.1 Checking the manual operation for emergencies

For an illustration, see → page 3-38, fig. 3-16.

Do not exceed the maximum operating pressure (→ rating plate).

Carefully open the isolating valve. Do not open the valve too much to prevent the oil from leaking!



Procedure

1. Remove the ventilation cover (12).
2. Make sure that the tank (10) is filled with oil up to the top edge.
3. Close the isolating valve (9).
4. Use the hand pump (2) to build up a pressure and move the ball valve by several degrees.
5. Check the system for leaks.
6. Turn the isolating valve twice and relieve the system pressure!
Actuators with spring return move to the fail safe position.
7. Re-check the oil level in the tank.

3.6.4.5 Maintenance

For an illustration, see → page 3-38, fig. 3-16.

The hand operation for emergencies requires a minimum of maintenance. The maintenance work required is described subsequently.

Procedure

1. Make sure that the actuator system cannot be operated before carrying out maintenance work on the manual operation for emergencies.
2. Make sure that the actuator control system is not supplied with power until the maintenance work is finished.

3.6.4.5.1 Annual maintenance work

Procedure

1. Unscrew the oil tank drain screw (7), drain the oil from the tank (10) into an appropriate container and dispose.
2. Use a new sealing ring to tighten the drain screw again.
3. Fill the tank to the upper edge with the appropriate oil type (→ page 3-41, tab. 3-10).
4. Start up the actuator control system again.
5. Check the oil level in the tank.
6. Top up oil if required.

3.6.4.5.2 Maintenance work after 5 years

Procedure

1. In addition to the annual maintenance work, unscrew the drain screw at the hydraulic cylinder (5) of the manual operation for emergencies and drain the hydraulic fluid into a suitable container.
2. Use a new sealing ring to tighten the drain screw.
3. Fill in the required amount of appropriate oil (→ page 3-41, tab. 3-10).

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3.6.4.5.3 Recommended hydraulic fluids

| Manufacturer | Model | Temperature range |
|--------------|---------------------------|-------------------|
| AGIP | Arnica 22 | -25 °C to +80 °C |
| Bantleon | BE B10 Syntofluid | -60 °C to +80 °C |
| ESSO | Univis Y 13 | – |
| FUCHS | Renolin MR 310 | – |
| MOBIL | Aero HFA | – |
| SHELL | Naturelle HF-E 15 | – |
| TEXACO | Aircraft hydraulic oil 15 | – |

Tab. 3-10 Recommended hydraulic fluids

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Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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4 Assembly

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| | | |
|--|--|--------|
| | | DANGER |
| | <p>Risk of injury from bursting components/system parts!</p> <p>If the permissible limit values are exceeded, the component/system can be destroyed, and as a consequence of this persons can be injured or killed!</p> <p>⇒ Always operate components/system parts within the permissible limit values!</p> | |

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| | | |
|--|---|--------|
| | | DANGER |
| | <p>Danger of electric shock!</p> <ol style="list-style-type: none"> 1. Do not connect the system to power before the earth resistance and the earthing connection has been tested, examined and approved by the customer. 2. Ground resistance must be less than 2 Ω. | |

This chapter describes the steps required to install a complete actuator system to an ball valve, the actuator consisting of basic actuator, attachments to the basic actuator, actuator control system with and without additional functions and attachments.



Make sure to also observe the operation manual of the respective ball valve manufacturer.

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4.1 Preparing the actuator system

4.1.1 As-delivered condition

The SST basic actuator is an integral part of the actuator system.

The actuator system is either factory-mounted on the ball valve or delivered in a separate transport packaging.

4.1.2 Transport

| | |
|---|---|
|  | <div style="background-color: #333; color: white; padding: 5px; text-align: center;">  DANGER </div> <p>Life hazard from suspended loads or shifting of loads!</p> <p>Move the actuator system carefully during transport!</p> <ol style="list-style-type: none"> 1. To lift the actuator system only use the designated and marked attachment points! 2. Never attach to or lift the actuator system at actuator components or supply lines! 3. If the actuator system is already assembled to the ball valve, do not attach to or lift the ball valve at the actuator system. Use the attachment points on the ball valve instead. |
|---|---|

Use the transport packaging the actuators were delivered in for longer transports.

Procedure

1. Use the transport packaging for transporting the actuator system to its place of installation.

Incorrect handling can lead to damage.

2. Only use lifting devices that are appropriate and designed for the weight being moved.
3. Use appropriate protective materials when using steel cables, lifting belts or chains in order to protect the outer coating.
4. Use edge protectors.
5. Ensure the load does not tip sideways.

Observe the labelling on the boxes and the provided brochure "Transport and safety instructions"!



4.1.3 Control

Procedure

1. Check the goods immediately on receipt for damages that occurred during transport.

In the event of damage occurring, observe the stipulations of the insurance company which, among other things, prescribe that evidence of damage is confirmed immediately by the forwarding agent.

2. Photograph damage to proof evidence.
3. Check that the delivery is complete using the delivery notes.
4. If there are any discrepancies, contact Franz Schuck GmbH immediately.

4.1.4 Storage

The SST actuator system must be stored in such a way that no one is put at risk.

According to the type of component it must be stored depressurized and stress-free.

The unit must be stored in the transport position or in upright position. Precautions must be taken to prevent it from tipping over.

Do not use pipework and/or attachments for support.

Make sure to protect the unit from moisture during longer storage times.

Attention: Do not stack boxes!

Observe the labelling on the boxes and the provided brochure "Transport and safety instructions"!



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4.2 Installing the actuator system

| | |
|--|---|
| | DANGER |
| | <p>Life hazard from suspended loads!</p> <p>⇒ To lift the actuator system only use the designated and marked attachment points!</p> |

| |
|--|
| CAUTION |
| <p>Danger when installing the actuator system!</p> <ol style="list-style-type: none"> 1. Observe the safety standards of the respective installation site! 2. Do not pressurise system components during installation. 3. On completion of the installation check the unit for correct functioning. |

Ball valve, actuator system as well as actuator control system and additional attachments are usually factory-mounted and delivered to the customer in this way.



Please observe the following operation instructions if the actuator system is delivered separately!

Prerequisite

- The mechanical components of the system have been checked
- All damages have been reported and corrected
- General safety instructions have been observed prior to assembly/disassembly
- Preparations have been made (in table form, with overview of tools)
- Direct sources of danger (electricity/temperature/mechanics/crushing injuries etc.) have been eliminated

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Installing the actuator system tension-free

Lower the actuator system onto the ball valve in a horizontal position (*Fig. 4-1*) for installation. Do not level out the actuator and the ball valve before they have been lowered completely.



Do not exert excessive force during assembly. The actuator system must reach the installation position on the actuator trunnion with its own weight.

Lowering the actuator system in upright position

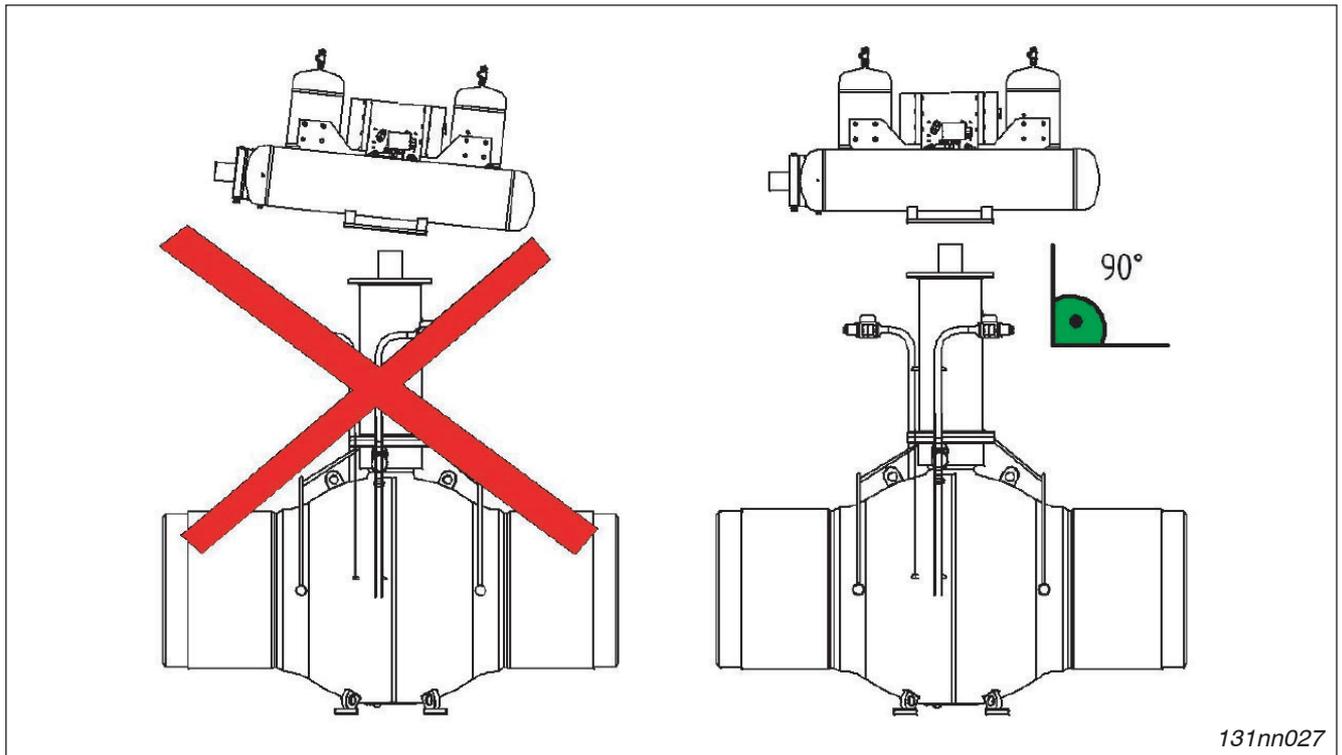


Fig. 4-1 Lowering the actuator system in upright position

Procedure

1. Make sure to attach hoisting gear in such a way that no parts are damaged.
2. Put the dowel pins (→ page 4-6, fig. 4-2, item 2) through the ball valve flange from below until the complete bevel is visible at the upper side of the flange.
3. Lubricate actuator trunnion and contact surface of the ball valve.
4. Lift the actuator system and ensure that it is in horizontal position.
5. Slowly lower the actuator onto the ball valve in an upright position (*Fig. 4-1*).
Ensure that the initial contact is made by the actuator bush in the actuator casing and by the trunnion of the ball valve.
6. Ensure that the feather key of the ball valve (→ page 4-6, fig. 4-2, item 1) fits exactly into the groove on the actuator bush.
7. Lower the actuator until the dowel pins (item 2) in the ball valve flange are almost touching the actuator casing.

5 Operation

5.1 Safety instructions regarding operation

Comply with the safety instructions and protective measures specified in chapter 2 as well as the applicable legal regulations.



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| | | |
|--|--|--------|
| | | DANGER |
| | <p>Risk of injury from bursting component parts of the actuator control system!</p> <p>The required operating pressure is factory-preset via the filter controller. Rating plate and label refer to the maximum permissible operating pressure.</p> <p>⇒ Never exceed the stated maximum pressure!</p> | |

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| | | |
|--|--|--------|
| | | DANGER |
| | <p>Risk of injury from bursting component parts of the energy storage device!</p> <p>⇒ Do not damage the sealing on the safety valve or change the settings!</p> | |

| |
|---|
| CAUTION |
| <p>Danger of crushing due to uncontrollable movements of the hand lever!</p> <p>Never leave the hand lever behind during normal operation.</p> <p>⇒ Always insert the hand lever in the provided holder after operating the pump!</p> |

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| |
|--|
| CAUTION |
| <p>Incorrect operation of the actuator system can lead to damages or function changes!</p> <p>⇒ Carry out all operating steps carefully.</p> |

5.2 Start-up

Check all components before start-up.

If a component (actuator system, control system etc.) is damaged, Franz Schuck GmbH must be informed immediately according to the demands in the Safety instructions.

Photograph damage to proof evidence and send to the Franz Schuck GmbH.

Repair work may only be carried out by the Franz Schuck GmbH service team or by personnel trained accordingly, especially during the length of warranty.

5.2.1 Checking the actuator system

Procedure

1. Thoroughly check the actuator system and all attachments and connections for damages.
2. Check if the actuator system is fixed correctly to the ball valve with all flange mountings (screws and dowel pins).
3. Check the professional combination of all electrical and pressure connections at the actuator.
4. Pressurise the actuator system.
5. Check all actuator system components that are flown through by operating media for leaks.

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5.2.2 Final function test

Make sure that the operating personnel is familiar with the functioning and the operation of the components described in chapter 3 before running a final performance test.



Always perform a test run before using the actuator system in normal operation.

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5.2.3 Pressure testing pipeline sections

The ball valve must be brought into an intermediate position during the pressure build-up. This is required to ensure a pressure equalisation between the dead storage of the ball valve and the pipeline.



It may be necessary to operate the actuator even before start-up for this purpose. Procedure (→ page 3-21, chapter 3.5.1.4.1 local operation).

ATTENTION: Observe the instructions stated in the operation manual of the ball valve manufacturer!

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5.3 Running operation

5.3.1 Actuator system

The position of the actuator system can be read off the 3D position indicator (1). Labels for both the “OPEN” and the “CLOSED” position can be found on the actuator housing.

Components

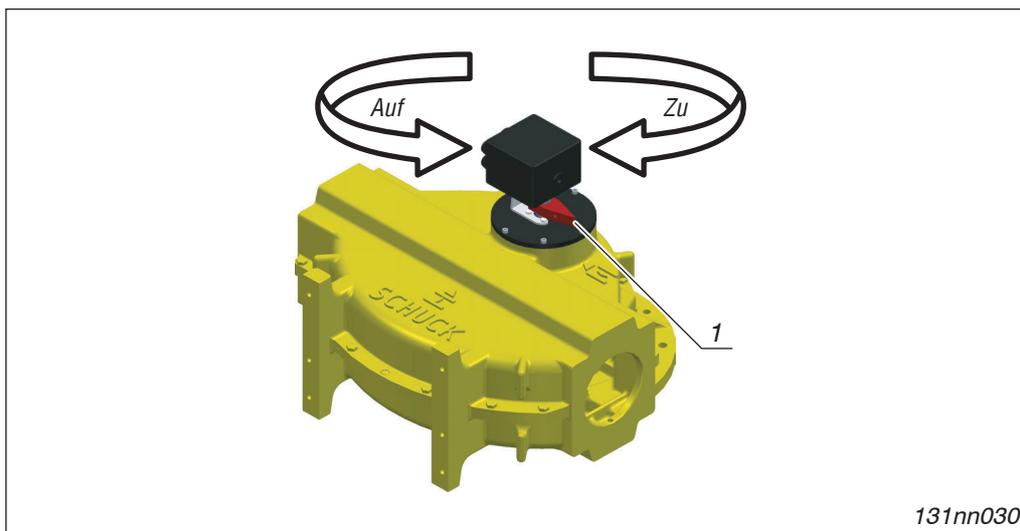


Fig. 5-1 Actuator system (open and close function)

1 3D position indicator

Procedure

For details on the exact procedure to open and close the actuator system, please see chapter 3.



Open

⇨ With view on the 3D position indicator (1) from above, the actuator opens according to valid standards **anticlockwise**.

Close

⇨ With view on the 3D position indicator (1) from above, the actuator closes according to valid standards **clockwise**.

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6 Maintenance

It is recommended to contact the service department of the Franz Schuck GmbH for support in maintenance and improvement of the system.

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6.1 General instructions

SST actuators are not allowed to leave the factory until they have passed a number of tests. The types of tests performed are determined by the purchase contract, and by official and in-house quality standards.

Nevertheless, it may become necessary to replace worn parts after a period of continuous use.

For details on how to carry out maintenance work on the particular components, please see chapter 3.



| | |
|--|--|
| | DANGER |
| | <p>Danger of crushing due to uncontrolled movements of the actuator system!</p> <p>Make sure to prevent unintentional operation of the actuator system when carrying out repair work.</p> <ol style="list-style-type: none"> 1. Depressurise and de-energise the system! 2. When repairs are being carried out, operating personnel must comply with the following instructions and rules specified by the manufacturer. |

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6.2 Inspection

6.2.1 Faults and troubleshooting

6.2.1.1 General

| Fault | Cause | Troubleshooting |
|---|---|---|
| Actuator does not move into operating position (gas/oil pressure operation) | Not enough pressure Pressure does not build up | Check the pressure at the manometer of the pressure controller or the manometer on the display of the SEC-100. Without reset lockout <ul style="list-style-type: none"> • contact the Schuck service department With reset lockout <ul style="list-style-type: none"> • if the system pressure is < 30 bar, relieve the pilot valve (switch off voltage/take away pressure) • wait until system pressure > 30 bar • apply voltage/pressure to the pilot valve • push reset button |
| | Control valve (main/pilot valve) defective | Contact the Schuck service department (see also Failure below) |
| | Manual reset (optional) not reset | Reset the manual reset (optional) |
| | Ball valve torque too high | Contact the ball valve manufacturer |
| Actuator does not move into fail safe position (spring force operation) | Ball valve torque too high | Contact the ball valve manufacturer |
| | Spring breakage | Contact the Schuck service department |
| | | 1 / 2 |

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| Fault | Cause | Troubleshooting |
|---|---|--|
| Actuator does not move to end position entirely | End stops displaced | Contact the Schuck service department |
| | Not enough pressure (gas/oil operation) | <p>Check the pressure at the manometer of the pressure controller or the manometer on the display of the SEC-100 and compare with min./max. values</p> <p>Without reset lockout</p> <ul style="list-style-type: none"> • contact the Schuck service department <p>With reset lockout</p> <ul style="list-style-type: none"> • if the system pressure is <30 bar, relieve the pilot valve (switch off voltage/take away pressure) • wait until system pressure >30 bar • apply voltage/pressure to the pilot valve • push reset button |
| | Ball valve torque too high | Contact the ball valve manufacturer |
| | | 2 / 2 |

Tab. 6-1 Faults and troubleshooting – general

6.2.1.2 Cylinder attachments

| Fault | Cause | Troubleshooting |
|----------------------|--|--|
| Cover cap is loose | O-ring of the adjustment screw untight | Replace o-rings of counter nut and adjustment screw |
| Counter nut is loose | Vibrations, untight/defective o-rings on adjustment screw and/or counter nut | Replace o-rings, adjust end stop and tighten counter nut |
| Grease/gas leakage | Untight/defective o-rings | Replace o-rings, replace cover cap if applicable |
| Cover cap defective | Age, shocks | Replace cover cap with o-ring |

Tab. 6-2 Faults and troubleshooting – cylinder attachments

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Editor: biplant.de GmbH Schön
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6.2.1.3 Valve combination

| Fault | Cause | Troubleshooting |
|---|---|---|
| Valve does not switch (electro-magnetical direct control) | Electrical connection wiring defective | Check if the fault is on the customer side Contact the Schuck service department |
| | Magnetic head/valve defective | Contact the Schuck service department |
| Valve does not switch (pneumatic pilot control) | Pressure connection not tight or no pressure at valve | Repair the pressure connection or connect pressure |
| Valve leaks (gas valves high pressure) | Sealing ring/rings defective | Replace sealing rings at valve flange |

Tab. 6-3 Faults and troubleshooting – valve combination

6.2.1.4 Limit switch L – general

| Fault | Cause | Troubleshooting |
|--|------------------------------------|--|
| End position signalling does not work | Electrical wiring incorrect | Check wiring according to wiring diagram and correct |
| | Switch/sensor defective | Replace switch/sensor |
| | Cable defective | Replace cable |
| | Switch/sensor adjustment incorrect | Readjust switch/sensor |
| Switch off command does not work (mechanical switches) | Electrical wiring incorrect | Check wiring according to wiring diagram and correct |
| | Switch/sensor defective | Replace switch/sensor |
| | Cable defective | Replace cable |
| | Switch/sensor adjustment incorrect | Readjust switch/sensor |

Tab. 6-4 Faults and troubleshooting – limit switch L

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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6.2.1.5 Energy storage Q – pneumatic

| Fault | Cause | Troubleshooting |
|---|--|---|
| Gas storage leaky | Untight fittings, defective safety valve | Retighten fittings, replace if applicable |
| | Pressure is always exceeded, safety valve responds | Check the pressure at the manometer and reduce if necessary |
| Gas storage does not have sufficient capacity | Condensate in the storage | Reduce gas pressure and drain condensate |
| | Gas storage leaky | s. fault above |

Tab. 6-5 Faults and troubleshooting – energy storage Q – pneumatic

6.2.1.6 Energy storage Q – bladder accumulator

| Fault | Cause | Troubleshooting |
|-------------------|--|---|
| Gas storage leaky | Untight fittings, defective safety valve | Retighten fittings, replace if applicable |

Tab. 6-6 Faults and troubleshooting – energy storage Q – bladder accumulator

If faults on the bladder accumulator occur, please observe the operation manual of the manufacturer (→ supplied customer documentation) and contact the Schuck service department respectively.



As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
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Translator: –

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6.2.2 Inspection intervals

| Time interval | Component | Action |
|---|----------------------------------|--|
| After 1 year | Actuator system | Check the actuator for smooth open and close operation |
| | | Run a function test, make sure that it can be moved easily |
| After 100 switching cycles (at least after 1 year) | Actuator control system | Check the solenoid valves |
| | | Check the filter controller |
| | | Check the filter element Replace dirty filter |
| – | Limit switch | – |
| After 100 switching cycles (at least after 1 year) | Energy storage device | Check the inside of the compressed air tank (visual inspection and manual scanning) |
| Annually | Manual operation for emergencies | Change the oil in the feeder tank |
| After 5 years | | Change the oil in the hydraulic cylinders |

Tab. 6-7 Inspection intervals

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: –

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6.3 Repairs

In principle, repair work may only be carried out by the Franz Schuck GmbH service team or by personnel trained by Franz Schuck.

This is the only way to ensure that repairs are carried out correctly using original spare parts. This will maintain the validity of the warranty.



The following instructions need to be observed:

- If faults occur, immediately notify the Schuck service personnel in charge and take appropriate measures
- A statement should be obtained from Franz Schuck GmbH before carrying out repairs
- Do not carry out work on pressurised systems, do not open the equipment
 - De-pressurise system before starting work
- Do not remove any components during operation
 - Turn off control pressure, voltage and electricity
- Display warning signs that refer to the risks involved if the system is started up unintentionally or if the electricity or line pressure is switched on
- If there is damage or a defect, switch off the affected equipment and systems
- In the case of damage of any kind, stop work on the affected equipment and systems
- After completion of work, check that it is functioning correctly and if appropriate fulfil and comply with all technical guidelines
- Check that the optionally mounted accessories are functioning correctly
- Take photographs before and after each repair
- Only use Franz Schuck GmbH original spare parts and/or mounting devices for repairs
- Repairs should only be carried in accordance with the repair manual and under the supervision of a senior engineer
- Do not carry out repairs at the actuator system before releasing the pressure
- All electrical components must be de-energized
- A record should be made of the cause and the extent of the damage
- Non-compliance with these instructions jeopardizes the obligation by Franz Schuck GmbH to follow through on the warranty/guarantee

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: –

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Translator: –

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7 Appendix

7.1 Installation plans

→ supplied project data sheet.

7.2 Component labelling

Details on the component type, nominal pressure, maximum operating pressure, identification number and the year built can be found on the rating plate of the actuator system and the particular component respectively.



7.3 Component supplier documentation

→ supplied project data sheet.

As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: --

Author: Franz Schuck GmbH Hoster/Mack
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Translator: --

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7.4 Type codes for actuators

Anbau links

- 00 - Blind-/Einstellflansch
- 11 - Hydraulikzylinder
- 12 - Pneumatikzylinder
- 15 - Federzylinder
- 19 - Pneumo-Federzylinder

31 - Kegelradgetriebe, Handrad

32 - Kegelradgetriebe, E-Antrieb und Handrad

Zusatzanbau L

Steuerung (siehe Typenschlüssel S. 18)

Armatur

Anbau rechts

- 32 - Kegelradgetriebe, E-Antrieb und Handrad
- 31 - Kegelradgetriebe, Handrad
- 00 - Blind-/Einstellflansch
- 11 - Hydraulikzylinder
- 12 - Pneumatikzylinder
- 15 - Federzylinder
- 19 - Pneumo-Federzylinder

Grundantrie bstyp (Codetabelle)

| | | | | | | | | |
|------------|----|----|---|----|---|----------|---|------------------|
| 1.000 Nm | VG | / | / | / | / | / | / | |
| 4.000 Nm | WG | / | / | / | / | / | / | |
| 8.000 Nm | AG | 12 | / | 15 | / | 400 | / | 96 K7-0-0 / LQ a |
| 20.000 Nm | BG | / | / | / | / | / | / | |
| 40.000 Nm | CG | 31 | / | 00 | / | 56PFH600 | / | b |
| 85.000 Nm | DG | / | / | / | / | / | / | |
| 150.000 Nm | EG | / | / | / | / | / | / | |
| 350.000 Nm | FG | / | / | / | / | / | / | |

Antriebsgröße

Anbau links

Zylinder-Ø

Federkraft in 1.000 N

Motor- u., o. Getriebetyp

Anbau rechts

Zylinder-Ø

Federkraft in 1.000 N

Motor- u., o. Getriebetyp

Zusatzanbauten

(siehe Typenschlüssel S. 18)

Beispiel a

| | | | | | | | | |
|------------------|----------|-------------|---|---------------|---|-----------|---|---------------------|
| Code | AG | 12 | / | 15 | / | 400 | / | 96 |
| Erklärung | 8.000 Nm | Gaszylinder | | Federzylinder | | Gaszyl. Ø | | Federkraft 96.000 N |

Beispiel b

| | | | | | | | | |
|------------------|-----------|-------------------|---|--------------|---|---|--|--|
| Code | CG | 31 | / | 00 | / | 56PFH600 | | |
| Erklärung | 40.000 Nm | Getriebe, Handrad | | Blindflansch | | Getriebetyp, Übersetzungsverhältnis, Option | | |

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As of: 2008-08-25 (Release 1.3 in Arbeit)
Revision: -

Author: Franz Schuck GmbH Hoster/Mack
Editor: biplant.de GmbH Schön
Translator: -

Basic actuators / Control systems / Additional attachments
Codeword: Standard
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Fig. 7-1 Type codes for actuators

7.5 Type codes for control systems

| Antriebssystem | | Fernsteuerung Standard : Stelzeitregulierung Hand-AUF/ ZU Handnotbetätigung | | Signalaufnahme Entriegelung : a = Autom., h = Hand ZU | | | Zusatzbauten | | | |
|----------------|--|--|--|--|---|--|--------------|---|-------------|------------------------------------|
| | | | | | | AUF | | | | |
| 0 | ohne Antriebssteuerung | 0 | elektrisch AUF/ZU | 0 | | ohne | 0 | L | Endschalter | |
| A | Gas-über-Öl-Antrieb mit Umlaufsystem | 1 | pneumat. AUF/ZU | 1 | a | Rohrbruchautomatik für Gas | 1 | a | Q | Energiespeicher |
| B | elektropneum. Antrieb mit hydraul. Dämpfung | 2 | elektrisch AUF | 2 | a | Differenzdruckschalter | 2 | a | D | Drehmomentbegrenzung |
| C | elektrohydraul. Antrieb mit Pumpe | 3 | elektrisch ZU | 3 | a | Druckpunktüberschreitung | 3 | a | N | Hilfsenergieumschaltung |
| D | pneum.-hydraul. Regelantrieb | 4 | pneumat. AUF | 4 | a | Druckpunktüberschreitung | 4 | a | E | elektr. Stellungsgeber |
| E | gashydraul. Regelantrieb | 5 | pneumat. ZU | 5 | a | Steuerdruckausfall | 5 | a | P | Druckausgleichssystem |
| F | Gas-über-Öl-Antrieb mit Niveaueausgleich | 6 | Handbetätigung | 6 | a | Spannungsausfall | 6 | a | H | Sitzringanpressung für Kugelhahn |
| G | Gas-über-Öl-Antrieb ohne Niveaueausgleich | 7 | elektrisch AUF/ZU p = 0 => AUF | 7 | a | Hochdruckzeitauslösung | 7 | a | S | automatische Sitzringansteuerung |
| H | hydraulischer Antrieb | 8 | elektrisch AUF/ZU p = 0 => ZU | 8 | a | Spannungseintritt | 8 | a | F | Funksteuerung |
| K | pneumatischer Antrieb | 9 | elektrisch AUF/ZU p = 0 => ZU, ohne Handnotbetätigung | 9 | a | Handnot | 9 | a | Y | hydraulische Handnotbetätigung |
| L | Gas-über-Öl-Antrieb mit Umlaufsystem, mit pneum. Verstärkung | 10 | hydraulisch AUF/ZU | 10 | a | | 10 | a | G | elektronische Line Guard |
| M | Subsea hydraulisch | 11 | elektrisch AUF/ZU Steuersignale Spannungsausfall ZU Spannungseintritt AUF | 11 | a | Rohrbruchautomatik für Flüssigkeit | 11 | a | M | Handnotgetriebe |
| W | Subsea pneumatisch | 12 | elektrisch AUF/ZU Steuersignale Spannungsausfall AUF Spannungseintritt ZU | 12 | a | elektrische Rohrbruchautomatik für Gas/Flüssigkeit | 12 | a | A | Abschließvorrichtung |
| P | Gas-über-Öl-Regelantrieb | 13 | | 13 | a | Rohrbruchautomatik mit hydraulischer Übersetzung | 13 | a | R | Einstellset für Rohrbruchautomatik |
| X | elektrohydraulischer Antrieb mit links/rechts laufender Motorpumpe | 14 | | 14 | a | | 14 | a | O | VOR ORT/FERN Schalter |

Beispiel für den Gebrauch des Typenschlüssels:
G0-1a7h-0-Q - Antriebssystem: Gas über Öl ohne Niveaueausgleich
 - elektrische Fernsteuerung AUF/ZU
 - ZU-Signal: Rohrbruchautomatik für Gas mit automatischer Entriegelung
 Hochdruckzeitauslösung mit Handentriegelung
 - Energiespeicher

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Fig. 7-2 Type codes for control systems

As of: 2008-08-25 (Release 1.3 in Arbeit)
 Revision: -

Author: Franz Schuck GmbH Hoster/Mack
 Editor: biplant.de GmbH Schön
 Translator: -

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7.6 Conversion factors

| Value | Unit | Conversion unit | Factor |
|-------------|--------|-----------------|--------------------------|
| Length | mm | in | 0.03934 |
| | in | mm | 25.4 |
| | m | ft | 3.28084 |
| | ft | m | 0.3048 |
| Weight | kg | lb | 2.204622 |
| | lb | kg | 0.453592 |
| Pressure | bar | psi | 14.5035 |
| | psi | bar | 0.06895 |
| | MPa | psi | 145.035 |
| | psi | MPa | 0.006895 |
| | bar | MPa | 0.1 |
| | MPa | bar | 10 |
| Temperature | °C | °F | $1.8 \text{ °C} + 32$ |
| | °F | °C | $0.5556 \text{ °F} - 32$ |
| Torque | Nm | ft/lbs | 0.7375 |
| | ft/lbs | Nm | 1.3558 |

Tab. 7-1 Conversion factors

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Revision: –

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Translator: –

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