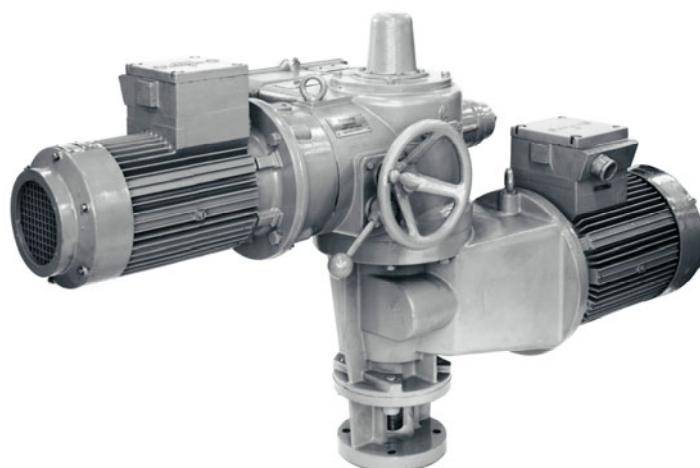


# Operation instructions M76348

## **Electric double motor actuators**



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# 1 General information



These electrical devices are intended for use in high voltage industrial installations. During electrical operation, this equipment has dangerous, uninsulated live parts as well as moving or rotating parts. In the event of unauthorized removal of the necessary covers, improper use, incorrect operator control or inadequate maintenance, they can cause serious damage to health or property.

Persons responsible for plant safety must therefore ensure that:

- Only qualified persons are authorized to work on the machines.
- These persons are familiar with operation instructions and all other product documentation, which is applicable for all relevant work to be carried out, and are obliged to observe this documentation at all times,
- Unqualified persons are not permitted to work on the machines or in the vicinity of the machines.

## 1.1 Safety-related terms

The headings **DANGER**, **WARNING**, **CAUTION** and **NOTE** are used in these operation instructions to draw attention to specific dangers or unusual information that requires special emphasis:



- DANGER** indicates that non-observance can result in death and/or substantial property damage.
- WARNING** indicates that non-observance can result in severe personal injury and/or substantial property damage.
- CAUTION** indicates that non-observance can result in personal injury and/or property damage.



**NOTE** indicates that attention is being drawn to technical implications because they are not always self-explanatory even to qualified technical personnel.



Compliance with other transport, installation, operating and maintenance instructions not specifically emphasized as well as with technical data (in the operation instructions, product documentation and on the equipment) is also essential in order to prevent faults that can directly or indirectly result in severe personal injury or property damage.

Correct transport, proper storage, mounting and installation, as well as careful commissioning are essential to ensure a trouble-free and safe operation.

**Qualified personnel** are persons who as a result of their training and experience as well as knowledge of the pertinent standards, regulations, accident prevention regulations and operating conditions have been authorized by the person responsible for the safety of the installation to perform the respective tasks and to identify and prevent any associated dangers.

Knowledge of first aid and the local emergency services is also essential.

For work on power installations, prohibition of use of non-qualified persons or similar is stipulated in EN 50110-1 (formerly DIN VDE 0105) or IEC 60364-4-47 (VDE 0100 part 470).

## 1.2 General safety information

The devices referred to in this document are components of installations conceived for industrial applications. They are designed in accordance with the recognized engineering rules.



**DANGER** Due to its functional characteristics, this equipment may cause serious damage to health or property in the event of, for example, improper use, incorrect operator control, inadequate maintenance or unauthorized intervention by unqualified personnel.



**WARNING** It is assumed that the basic planning work for the installation, as well as all work involved in transport, assembly, installation, commissioning, maintenance and repair is carried out by qualified personnel or checked by responsible specialists.

Furthermore, the following has to be observed:

- the technical data and information concerning the permissible use (installation, connection, ambient and operating conditions) provided in the catalog, order documents, operation instructions, rating plate data and in the other product documentation;
- the general installation and safety guidelines;
- the local plant-specific regulations and requirements,
- the proper use of tools, lifting and transport equipment;
- the use of personal protective clothing and equipment, especially in high noise levels, with high ambient temperatures and with high actuator surface temperatures (caused by frequent and long activation times) and when handling cleaning agents and lubricants, glues, paints and the like.
- die Pflicht des Verantwortlichen zur Sicherheitsunterweisung von Beschäftigten nach §20 der Deutschen GEFAHRSTOFFVERORDNUNG, wenn sie Stoffe anwenden, bei denen eine Gesundheits- oder Umweltgefährdung möglich ist (z. B. Reinigungs- oder Schmiermittel, Kleber, Anstriche usw.). For detailed information on individual products refer to the pertaining material safety data sheets of the manufacturer.

For the sake of clarity, not all details of all possible versions of the product are described in the operation instructions, nor can they cover all conceivable cases regarding installation, operation and maintenance. The operation instructions therefore only contain information that is required for the intended use of the devices or in industrial applications by qualified personnel (see above).

In special cases, if the devices are to be used in non-industrial areas and higher requirements are necessary (e.g. protection against the penetration of children's fingers), these requirements must be met by the customer on site by implementing additional protective measures.

In the event of doubt, especially in cases of a lack of product-specific details, clarification must be obtained via your local SIPOS Aktorik sales department. Please specify the type designation and works number in any correspondence (see actuator rating plate).



IT IS RECOMMENDED THAT THE SERVICES AND SUPPORT OF THE RESPONSIBLE SIPOS AKTORIK SERVICE CENTERS ARE UTILIZED FOR ALL PLANNING, INSTALLATION, COMMISSIONING AND SERVICE TASKS.



### NOTES:

- For general tasks, e.g. for checking incoming deliveries (for transport damage) and for long-term storage and preservation of equipment, additional information is provided in the SIPOS Aktorik installation documents that can be obtained on request from the sales departments.
- The contents of these operation instructions and product documentation shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The Sales Contract contains the entire obligations of SIPOS Aktorik. Any statements contained in this document do not create new warranties or restrict the existing warranty.

## 1.3 Transport

Only lift actuators by means of the transport lugs or wrap a rope around the motor and the spring cup. Never attach a rope to the handwheel or the changeover lever. Do not wrap a rope around external electrical cables or subject them to any other type of mechanical loading.  
The transport instructions attached with the devices must be observed.

## 1.4 Storage

If an actuator is not installed immediately after delivery, it should be stored in a dry, vibration-free location.

If an actuator is stored in a damp environment, desiccant should be placed inside the housing and its effectiveness must be checked.

Take care not to damage the packaging of actuators sealed in plastic film and only remove it just before attaching the actuator to the valve.

The hoods covering the electrical control equipment and the cable feed-through holes must remain closed even during the interval between installing and commissioning the actuator. The build-up of condensation can be prevented by operating a heater inside the housing of the control equipment or by using a desiccant.

## 1.5 Disposal and recycling

### 1.5.1 Packaging

Our products are protected by special packaging for the transport ex works. The packaging consists of environmentally materials which can easily be separated and recycled.

For the disposal of the packaging material, we recommend recycling and collection centers.

We use following packaging materials:

Wooden material boards (OSB), cardboard, paper and PE-film.

### 1.5.2 Actuator

SIPOS actuators have an extremely long lifetime. However, there will come a time when you have to replace them.

Our actuators have a modular design and may therefore easily be disassembled, separated and sorted according to materials, i. e.:

- various metals
- plastics
- greases and oils

#### The following generally applies:

- Collect greases and oils during disassembly. As a rule, these are substances hazardous to water and must not be released into the environment.
- Arrange for controlled waste disposal of the disassembled material or for separate recycling according to materials.
- Observe the national/local regulations for waste disposal.

## 2 Description

### 2.1 Scope of supply

The scope of versions of electrical rotary actuators that can be supplied is specified in the catalogs or ordering data.

### 2.2 Applications

Double-motor actuators are special actuators which are used for open-loop control functions in addition to the closed-loop control operation. The positioning time reached by the control motor with the gear unit lies well within the range normally used for closed-loop control circuits. The positioning time reached by the high-speed motor is required for particular operating conditions in view of safety considerations. When the safe position is reached with the high-speed motor, the control motor once again takes over the closed-loop control function of the actuator in the control circuit via an appropriate switching unit.

In accordance with the specific tasks in a power station, three actuators with cut-off torques of 750 Nm, 1,500 Nm and 3,000 Nm can be supplied; the output speed ratios are specified in the ordering data.

Double-motor actuators are normally mounted directly on the valve, for instance on a steam reduction valve.

### 2.3 Mechanical construction and functions

#### 2.3.1 Motorized mode

The gear unit is a combination of a primary spur gear, two self-locking worm gears and a planetary gear (see Fig. 2.3.1).

In modulating duty, the power flow goes from the closed-loop control motor (6) via the primary spur gear and the worm gear I (9) to the sun wheel of the planetary gear (6). The annulus of the planetary gear (6) is held in position by the self-locking worm gear II (8) via a hollow shaft. As a result, the sun wheel transmits its rotary motion via the planetary gear (6) carrier onto the drive shaft (shaft end) (7).

In high-speed operation, the power of the high-speed motor (5) is transmitted to the annulus of the planetary gear (6) via worm gear II (8). In this case, the sun wheel of the planetary gear (6) is held in position by the self-locking of worm gear I (9) and the annulus rotation is transmitted to the carrier of the planetary gear (6) and in this way to the securely coupled drive shaft (7).

The torque-dependent cut-off is triggered by the traveling worm of worm gear I.

For torque measurement, the worm is held in the center of the worm wheel with cup springs. It can be moved axially to both sides. When a load torque is applied to the actuator shaft, the tangential force on the worm wheel pushes the worm shaft out of its central position and operates the torque switch within the switching and signaling unit via a system of levers. The torque switch provides a signal for switching the motor off.



The high-speed motor can only be switched off by travel-dependent switches.

The switching and signaling unit is driven by the drive shaft through an intermediate reduction gear.

The gears are filled with lubricant and sealed on all sides. All gear shafts in the power train run in roller bearings or in special friction-bearing bushes.

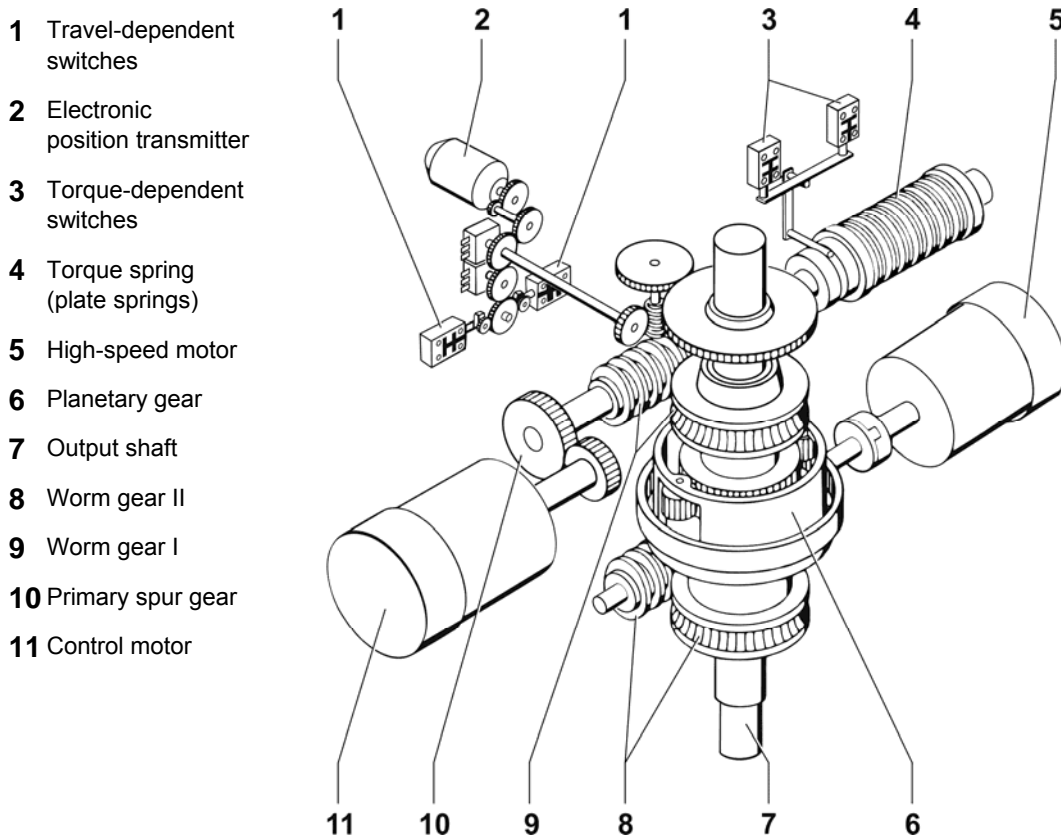


Fig. 2.3.1: Functional interaction of the main section of the double-motor actuator

### 2.3.2 Manual mode

All actuators can be operated by a handwheel which is motionless in motorized mode.

This series of actuators is equipped with a hand wheel reduction gear. When the handwheel is used, the power train is diverted via the helical shaft due to the high torque. The manual drive acts upon the helical shaft of worm gear I via the change-over mechanism.

A changeover lever can be operated to disconnect the actuator motor from the actuator shaft and to connect the handwheel. This position is locked by a special mechanism. The handwheel is automatically disconnected without danger for the operator when the control motor starts up and the motor is connected again.

Motorized mode always has priority over manual mode.



- NOTE** The changeover lever can only be used to switch from motorized mode to manual mode (see 4.2):
- NOTE** The rule is that clockwise rotation of the hand wheel produces clockwise rotation of the actuated valve or final control element shaft.

## 3 Assembly



- **WARNING** General safety information and requirements concerning the permissible use of the equipment and the specialist knowledge necessary for working on high-voltage installations are provided in section 1.2. Complete compliance with these instructions is essential.
- Before installation work starts, ensure that the intended action (operation of valves, etc.) will not cause any danger to persons or interfere with the installation.
- Assembly work has to be performed by trained and qualified personnel.

### 3.1 Assembly with the final control element



If operating conditions permit that injury can result from touching moving parts, these part must be covered appropriately.

The actuator can be mounted in any position. Preferred position: Output shaft vertical. In the case of mounting position other than vertical (e. g. horizontal output shaft), the actuator must be supported

#### General mounting tasks:

- Remove cover from the connecting flange; clean the connecting parts carefully.
- Grease the connecting parts.
- Place actuator with connecting flange on the final control element, check for correct centering and sliding seating of the connecting parts.
- Do not apply force!
- Attach the actuator to the final control element with screws of type 8.8. Screwing depth:  $\geq 1.25d$ .
- Check actuator and valve for damage. Repair any damage, rectify any damage to the coating.

### 3.2 Electrical connection

The motor and the modules of the switching and signaling equipment must be connected in accordance with the circuit diagrams attached to the inside of the hood of the switching and signaling unit.

#### 3.2.1 Additional connection measures are necessary:

- Tightly seal the housing for the electrical connection.
- Only use suitable cable glands for the entry of control and motor cables in the housing of the electrical connection or the motor terminal box.
- Seal unused cable openings with blind metal plugs, insert the thread with "Silastic" RTV 732 by Dow Corning, D-65201 Wiesbaden, Germany, or with an equivalent silicon sealant.
- Protect wires against damage from the sharp edges of the connector hood using heat-shrink tubing (material to DIN ISO 1629: FPM), see figure 3.2.1.

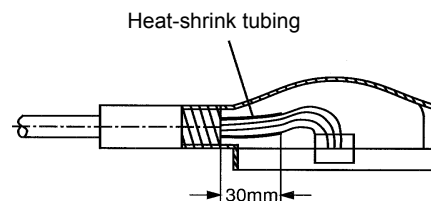


Fig. 3.2.1: Tubing for wire protection

#### 3.2.2 Connection of the motor

The motor has to be connected in accordance with the connection diagram attached inside the actuator.



### 3.2.3 Circuit for versions with brake motor

The mounted brake motor with fast-response excitation (by SIEMENS AG, Type 1LC) can be connected in 2 ways for cut-off:

■ Normal cut-off

The brake connection BR is connected with V1 by means of a link in the terminal box or plug connector.

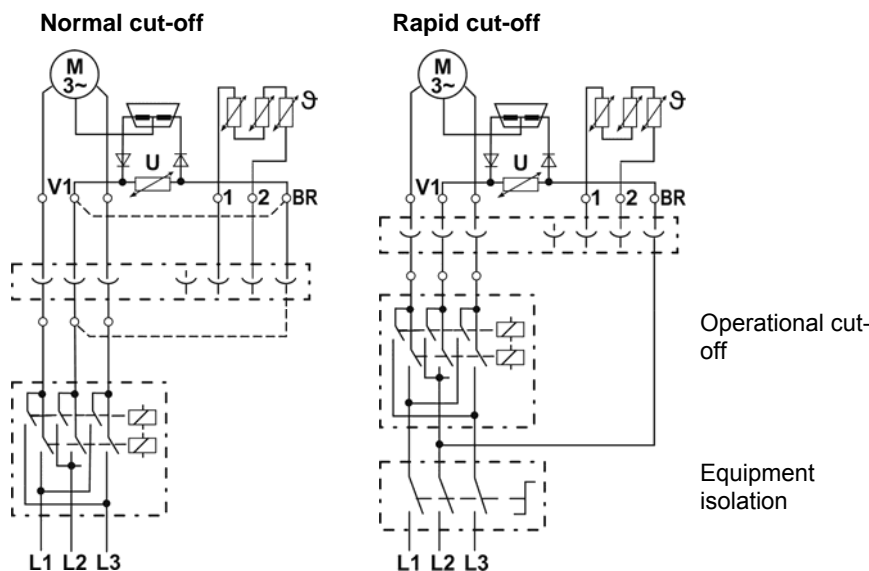
■ Rapid cut-off

The brake connection (BR) must be connected before the reversing contactor unit on outer main phase L2 (see terminal drawing in the connection compartment).



**DANGER** In the circuit for rapid cut-off, equipment isolation is only possible via the main switch because even with a tripped contactor, the equipment can still be live via the "BR" feeder that branches off before of the contactor!

It is only permitted to change the direction of rotation by exchanging phases L1 and L3!



The braking motor type 1LC (SIEMENS AG), if fitted and wired in the factory, is used for rapid cut-off.

Brake motors type OLB ... / Q 28 (by Emod Motoren GmbH) are to be connected in accordance with the terminal plan in the connection compartment or the motor terminal box (refer to pertaining operation instructions of the brake motor).

## 3.3 Adjusting switching and signaling equipment

### 3.3.1 Torque-dependent switching mechanism (DSW)

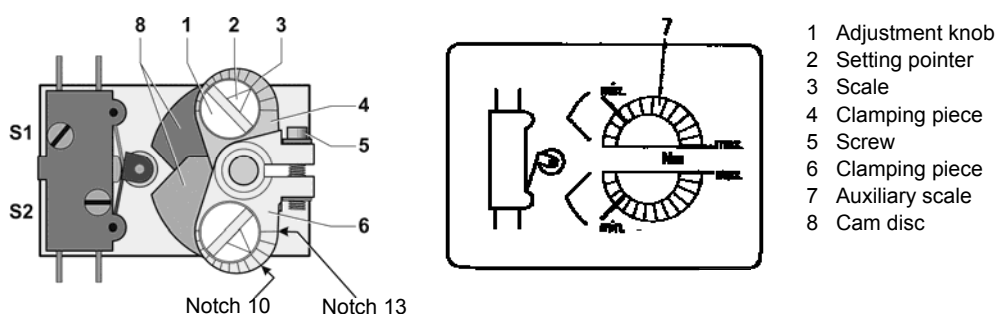
The standard settings are implemented in the factory.



The torque-dependent switches (S1 and S2, in figure 3.3.1 a) are permanently set to the rated positioning torque. These settings must not be changed!

The tripping torque required for valve operation of the valve is set as follows in the factory: the arrow mark (2, figure 3.3.1) is set to the 11<sup>th</sup> line of the scale of the clamping piece (4). If necessary, the torque can be subsequently increased by 15 % by turning the adjustment knob (1) to line 13.

The tripping torque for ccw and cw rotation required at the valve and set to line 11 is entered in the label (7) glued into the switching unit.



**Fig. 3.3.1: Torque-dependent switching mechanism with 2 switches in top view (left) and the associated sticker with auxiliary scales**

### 3.3.2 Travel-dependent switches (roller and cam switching mechanism)

Determining and compensating the overtravel:

For the travel-dependent switch-off, the overtravel has to be determined for the actuator with a connected final control element. Then the travel limit switch has to be adjusted such that the final control element just reaches the final position when the motor comes to a standstill.



Compliance with the installation checks is essential (see 3.3.1).

#### Travel-dependent roller switching mechanism (RSW)

Adjusting the switches:

Rotate the handwheel clockwise (closing direction) or counterclockwise (opening direction) until the final control element reaches the required position.

#### Directions of rotation

##### Switch S3 (fig. 3.3.2 a):

Clockwise rotation of the handwheel

- Clockwise rotation of the output shaft (view on final control element)
- Clockwise rotation of the switching cam (3)

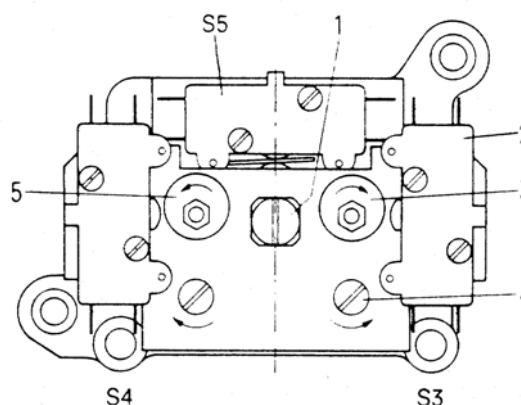
##### Switch S4:

Counterclockwise rotation of the handwheel

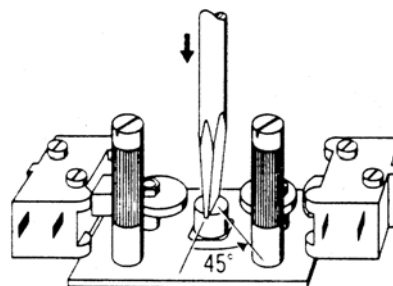
- Counterclockwise rotation of the output shaft
- Counterclockwise rotation of the switching cam 5

##### S5 Blinker switch

- Disconnect central drive by depressing the pin 1 (fig. 3.3.2 a) and rotating it by 45° (fig. 3.3.2 b); central drive is now disengaged (fig. 3.3.2 c.).



**Fig. 3.3.2 a: Roller switching mechanism (plan view)**



**Fig. 3.3.2 b: Disengaging the central drive**

- Adjust switching point on switch S3 (fig. 3.3.2 a); Rotate the roller axle (4) using a screwdriver or by hand in the direction of the arrow until the cam (3) just operates the micro switch (2). Determine the switching point with the indicator light.



- Do not rotate the roller axle beyond the switching point, otherwise the setting will be incorrect.
- Do not rotate the handwheel while central drive is disengaged.

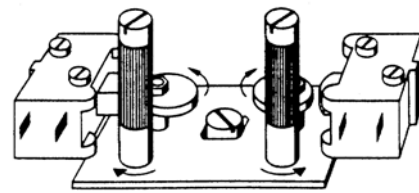


Fig. 3.3.2 c: Setting the switching point

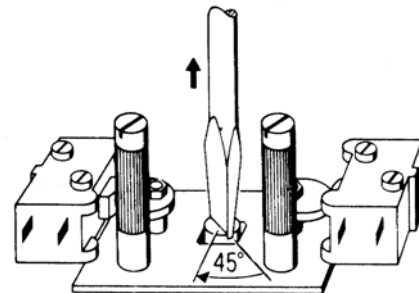


Fig. 3.3.2 d: Re-engaging the central drive

- Re-engage central drive (Figure 3.3.2 d)
- For counterclockwise handwheel rotation (switch S4, figure 3.3.2 a), e.g. for the opening direction, proceed appropriately as described.
- Operate actuator across the entire travel range using the motor. Check the adjustment of the switching points and correct if necessary.

### Travel-dependent cam switching mechanism ( NSW )

This switching mechanism is installed when additional switches are required.

Adjusting the switches:

- Operate actuator into the required position and note the direction of rotation for the cam disc which has to be adjusted (fig. 3.3.2 g)!
- Loosen knurled nut 3 (fig. 3.3.2 g). Locking nut 4 must not be moved.
- Set switching point: On the appropriate cam disc, rotate the upper or lower fan disc (see table) in the direction of rotation determined as described above until microswitch 1 just operates.

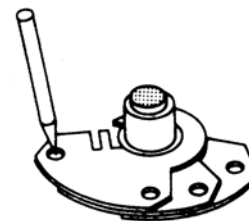


Fig. 3.3.2 e: Cam disc comprising 3 fan discs

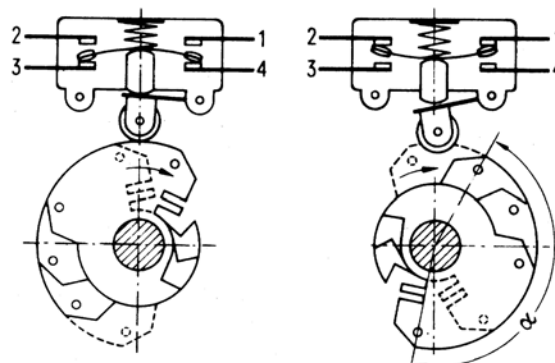
Direction of rotation of the cam disc on approaching the switch position	Switching with make contact (fig. 3.3.2 f left )	Switching with break contact (fig. 3.3.2 f right)
Clockwise	Set with upper fan disc	Set with lower fan disc
Counterclockwise	Set with lower fan disc	Set with upper fan disc

- Spread the remaining fan discs to ensure that the required switching state is retained across the remaining travel.



The central fan disc must not protrude beyond the upper or lower fan discs!

- Tighten the knurled nut again by hand. If the knurled nut is loose, the fan discs might move out of position.



Switching NC  
Contact made 3 – 4

Switching with NO  
Contact made 1 – 2

Fig. 3.3.2 f: Switching with the cam disc

Once all switches have been set, operate the actuator across the entire travel using the motor, checking the adjustment of the switching points and correcting if necessary.

- 1 Micro switch
- 2 Fan disc
- 3 Knurled nut
- 4 Locking nut

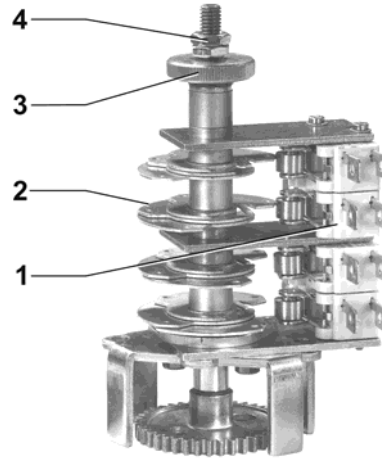


Fig. 3.3.2 g: Cam switching mechanism with 4 travel-dependent switches

### 3.3.3 Position transmitter

#### Potentiometer (POT)

This item is used for remote electrical signaling of the actuator position.

Operate the actuator into both end positions. This causes the potentiometer to adjust itself via the integral friction clutch.

Determine utilized resistance range by means of friction clutch, if necessary.

#### Electronic position transmitter (ESR)

The electronic position indicator (ESR ) is used for remote signaling and feedback signaling of the actuator position. Please refer to the operation instructions for the ESR (Y070.191/GB).

To meet the requirements of the EMC directive, the external (customer) connecting cables of the electronic position transmitter (ESR) have to be screened and fixed at both sides. If required, use special EMC cable glands.

#### Mechanical position indicator (SA)

- Operate actuator into the "CLOSED" end position; set the red, movable pointer (2 or 3) to the fixed pointer (1) on the edge of the disc (see Figure 3.3.3 a).
- Operate actuator into the "OPEN" end position; set the green, movable pointer (2 or 3) to the fixed pointer.
- The position pointer can be removed; bend the fixed pointer 1 to one side and lift the axle (4) from the drive pin 5.

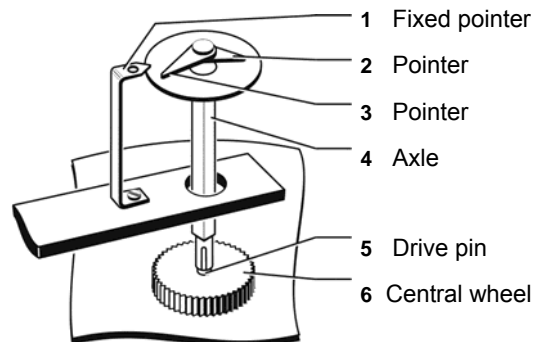


Fig. 3.3.3 a: Design of mechanical position indicator SA

## 3.4 Commissioning

### 3.4.1 Checks to be performed before commissioning

Following installation, check and ensure that

- the actuator is correctly installed and aligned.
- all fixing screws and connecting elements as well as the electrical connections are properly tightened.
- the grounding and equipotential bonding has been implemented correctly.
- electrical connection of the motor and the control corresponds to the circuit diagram.
- any additional devices are connected and function correctly.
- control is implemented such that an actuator which has been switched off due to a temperature sensor cannot start up again automatically after cooling down.
- all protection measures against accidental contact have been implemented for moving or live parts.
- all plant-specific safety measures have been complied with.

This list cannot include all conceivable cases. Further checks may be necessary in accordance with the plant-specific conditions.

### 3.4.2 Switching on



**WARNING:** Consult the responsible plant personnel to obtain authorization and to ensure that the commissioning work to be performed cannot result in a plant disturbance or injury to staff.

After the mains voltage has been applied to the control, check and ensure that

- the direction of rotation is correct. For this purpose, operate the actuator using the handwheel approximately to the center of the travel range and briefly activate open and close commands. Check at the same time that the actuator moves in the required direction. If this is not the case, exchange two connection cables (phases L1 and L3) and repeat the check.
- The signals from the limit switches are issued correctly when the two limit positions are approached.
- The motor is disconnected from the mains supply by the control once the end positions have been reached.
- The assignment of the torque switches and travel switches with the specified direction of rotation is correct.
- The automatic control operates correctly.

## 4 Operation

### 4.1 Safety instructions


**WARNING:**

Covers which prevent touching of live or moving parts must not be opened during operation. See "Safety measures" in section 5, "Maintenance".

If changes to the normal operating conditions are detected (higher power consumption, changes in temperature or vibration, unusual noises or smells, signals from the monitoring equipment, etc.) equipment function is impaired.

In order to prevent faults which can cause serious personal injury or damage to property either directly or indirectly, the responsible maintenance personnel must be immediately informed.

If a fault is suspected, immediately switch off the relevant equipment and, if necessary, traverse the final control element into a safe position using the handwheel. The plant-specific conditions must be complied with here!

### 4.2 Operating modes

Manual or motorized operation of the actuator is possible (see section 2.3.2).

- **Motorized mode:** Under normal operating conditions, the motor of the actuator is remote controlled.
- **Manual mode:** Only switch the actuator to manual operation when the motor is at standstill. For this, operate switching lever in the direction of the arrow until it latches. If resistance is felt, rotate the handwheel slowly to the left or right until the changeover mechanism is able to latch in place.


**NOTE**

Following torque-dependent cut-off, a greater force is required to switch over to "manual mode" for self-locking actuators, due to the tension within the actuator.


**WARNING**

If the motor is switched on, the actuator automatically resets to motorized mode, i.e. manual operation is disengaged. Do not use the handheld lever to reset the actuator. This is not permitted and would damage the change-over mechanism!

## 5 Maintenance

### 5.1 Safety measures



**WARNING:**

General requirements regarding the specialist knowledge necessary for operation and maintenance of systems and installations of this type are provided in section 1.2 of these operation instructions and require special attention.

Before any work is carried out on the actuator, ensure that

- The intended action (operation of valves, etc.) cannot cause any injury to persons or interfere with the installation.
- The actuator (both motors) or plant section must be correctly isolated. Apart from the main circuits, also ensure that any additional or auxiliary circuits, especially standstill heating circuits, are also isolated!

General safety rules:

- Disconnect all poles (see section 3.2.3)
- prevent accidental reconnection.
- confirm that equipment is not live.
- fit barriers or covers to neighboring live components.
- ground and short-circuit equipment.

After work on/changes of the electrical part of the actuator (motor, switching and signalling unit), an insulation resistance test and protective earthing test in accordance with the applicable regulations has to be performed.

The tests have to be performed and recorded by qualified and trained personnel.

### 5.2 Inspections

It is recommended that under normal circumstances, the actuator is subjected to a general inspection following commissioning, in order to ensure that

- the equipment complies with its technical specifications and the automatic control operates correctly.
- the running smoothness of the actuator has not deteriorated.
- the fixing components have not become loose,
- no impermissible leakages have occurred.

This list cannot include all conceivable cases. Further checks may be necessary in accordance with the plant-specific conditions. Any impermissible deviations or changes detected during inspection must be rectified immediately.

The operating conditions may vary considerably, so the maintenance intervals must be adapted to the local conditions (taking into account the switch-on frequency, loading, etc.).

Under normal operating conditions, the following actions are necessary for maintenance purposes and therefore to guarantee correct functioning of the actuators:

- Monitoring: all actuators annually (visual inspection)
- Inspection: all actuators, once every 8 years (detailed internal and external checking of condition, functioning, wear and lubrication).
- all actuators, once every 8 years (replacement of seals and lubricant, including functional checks).



The operation instructions for the motor must be observed when work is carried out on the motor. In the event of malfunction or overload, the appropriate inspections must be carried out earlier.



It is recommended that the appropriate and trained specialists from the responsible SIPOS Aktorik Services are consulted in this case. Please direct any inquiries to:

**SIPOS Aktorik GmbH**  
**Im Erlet 2**  
**D-90518 Altdorf, Germany**  
**+49 9187 9227-5215**  
**Fax: +49 9187 9227-5122**

### 5.3 Lubrication intervals and checks

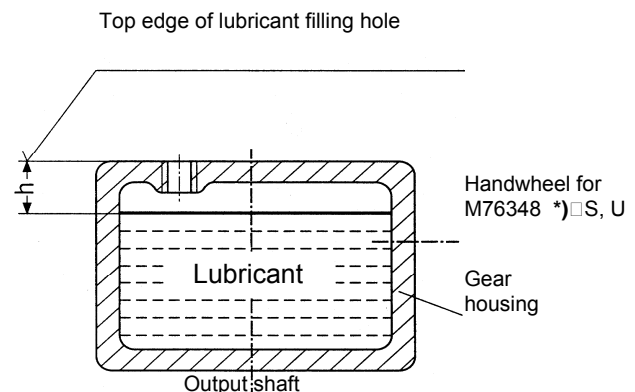
Under normal loading conditions, the following intervals are recommended for the actuators (for type and quantity of lubricant, see table 5.3 b).

#### After approximately 8 years:

- Replace the lubricant in the gear housing and the reduction gear housing.  
For the type and quantity of lubricant, see table 5.3 b.  
The necessary filling level is listed in table 5.3 a.
- Lightly lubricate the gear cogs and bearings of the switching and signaling equipment.
- Regrease parts of the manual change-over mechanism and the manual drive. For the type and quantity of lubricant, see table 5.3 b.
- Regrease motor bearing, see motor operation instructions.
- Replace all seals.
- Replace radial sealing rings of the motors.

Actuator Type	h [ mm ]
M76348 - D	35 + / - 10
M76348 - E / F	35 + / - 10

**Table 5.3 a: Filling level of lubricant in the gear housing**



\*) Handwheel for sizes D, E and F lateral arrangement

Lubrication point	Lubricant	Lubricant quantity*	
		- D	- E / - F
Gear compartment	Vehicle gear oil SAE 90 according to DIN 51512	11.5 dm³	16 dm³
Reduction gear housing	Mobilux EP 004 (Mobil Oil)	2.5 dm³	3.0 dm³
Handwheel reduction :	Mobilgrease Special (Mobil Oil)	0.2 dm³	
Handwheel reduction gear, □ Roller bearing:	Shell Gadus S2 V100 3 (Shell Dt. Schmierstoffe GmbH)	0.1 dm³	
Switching and signaling unit	Mobiltemp SHC 100 (Mobil Oil)	5 cm³	
*) The quantities of lubricants listed are for guidance only; compliance with the filling levels listed in table 5.3a is essential			

**Table 5.3 b: Lubricant types and quantities according to lubrication point**  
(valid for temperature range: -20° C to +60° C,  
for other temperature ranges: lubricants on request.)



## 5.4 Repairs and modifications

Diagrams and parts lists are provided with the appropriate spare parts lists. These diagrams usually contain useful information for the specialist concerning the technical design of standard devices and modules.

Special designs and versions can however differ with respect to certain technical details. It is therefore imperative to check immediately with SIPOS Aktorik, indicating details of the device type and works number, in the event of any uncertainty. Any repairs or modifications should be carried out by the responsible SIPOS Aktorik Service point (for inquiries, see 5.2).

During reassembly, it must be ensured that all sealing surfaces are in perfect order. They must be undamaged, clean and greased.

When the equipment has been reassembled, the instructions given in section 3, "Installation", must be observed for any work carried out at the installation site.

## 5.5 Spare parts and diagrammatic presentation

Only the spare parts list pertaining to the actuator type is valid for ordering spare parts:

Type range	No. of spare parts list
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M76348 -D, -E and -F	NMA 3912 DER
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Order examples are shown in the respective lists.

## 5.6 Supplementary instructions

Any special installation and operation instructions furnished by the suppliers of subcontracted components, attachments or fitments are attached to the set of instructions and have to be observed.

