

Technical Documentation

Job No.	28865
Customer Order No.	4500024241
Customer Job No.	ASU Kosice
Year	2005

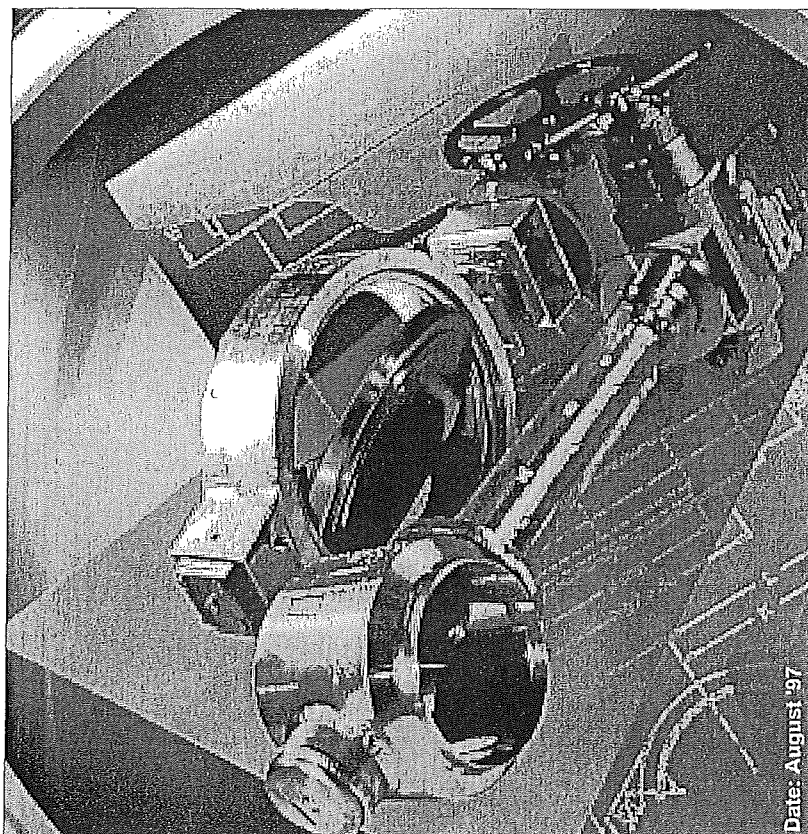
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 - Drawings
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1 Summary scope of delivery

Job No. 28865
Customer Order No. 4500024241
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Pos.	Tag No.	DN	PN	Type	Actuator	Accessories	PS bar	TS °C
1	PK 40003	400	10	E570	F 250-90/12-K	Positioner Siemens type 6DR5010-0NG00-0AA0	10	+65 -196

General instruction manual for heavy-duty valves (section 1)



Date: August '97

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1 Proper use

The butterfly valve supplied to you has been specially designed to satisfy the requirements that are specified in the documentation relating to this order, particularly as regards the operating parameters pressure, temperature and medium. If pipes are by mistake subjected to a wrong medium, a higher pressure level or a higher or lower temperature, this can lead to destruction of the complete unit. The damaged parts then have to be replaced immediately.

There must be no contamination of the pipes and the medium used at any time. If there is, this may have an adverse effect on the tightness of the butterfly valve seal.

One of the requirements which proper use of the butterfly valve involves is that the operating, installation and maintenance personnel have read and understood this instruction manual.

All installation work must be carried out by appropriately trained skilled personnel.

Important note:

If you are operating the butterfly valve in high or low temperature ranges, we recommend that you provide the butterfly valve with external insulation, as there is otherwise a considerable danger of injury. When there is a manual actuator system, the hand wheel may only be operated wearing suitable gloves in such cases!



In operating temperatures higher than 50°C or lower than -50°C, the valves must be insulated to prevent the risk of injury caused by contact (security) and to maintain the function of the valve (varying heat expansion).

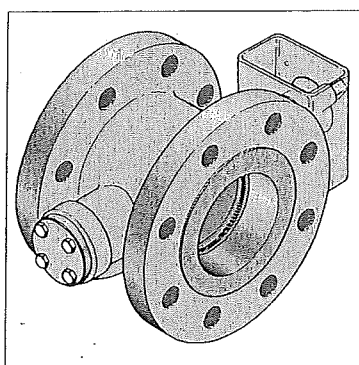
The insulation must be designed such that the temperature generated by the medium does not exceed 50°C on its outside. We do not accept any liability for structural alterations that are made without the express approval of the Linde AG MAPAG plant. Please make sure that you always use genuine spare parts. If you intend to use the butterfly valve for a different medium, different temperatures or different pressure levels than originally specified, please find out in advance from our specialists whether the butterfly valve is suitable for the requirements concerned. We will be delighted to advise you.

We do not accept any liability for injuries and damage to property that are caused by improper use of the butterfly valve.

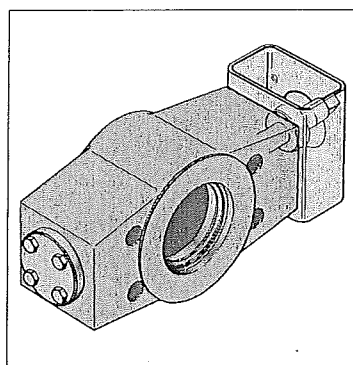
2 Configurations

The butterfly valve is supplied in one of four possible configurations: a flange configuration, a sandwich configuration, a monoflange configuration or a configuration with welding ends.

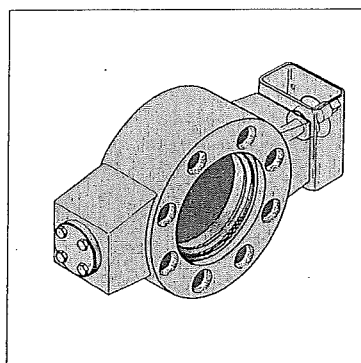
Information about the installation and removal of bodys with welding ends can be found in section 2 of the instruction manual for model E and model K valves.



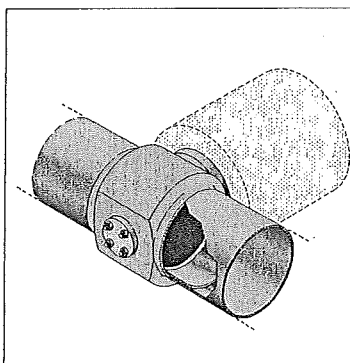
Flange



Sandwich

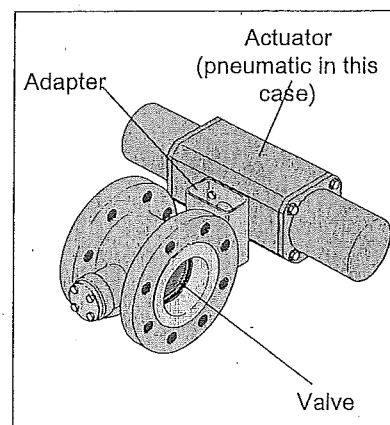


Monoflange



Welding ends

Flange-configuration butterfly valve with a pneumatic actuator. As an alternative, the valve can also be operated by a hand wheel or by an electric or hydraulic actuator.



The butterfly valve is normally delivered complete with a actuator unit. Special parts or spare parts are only supplied if they have been included in the order confirmation.

3 Visual check

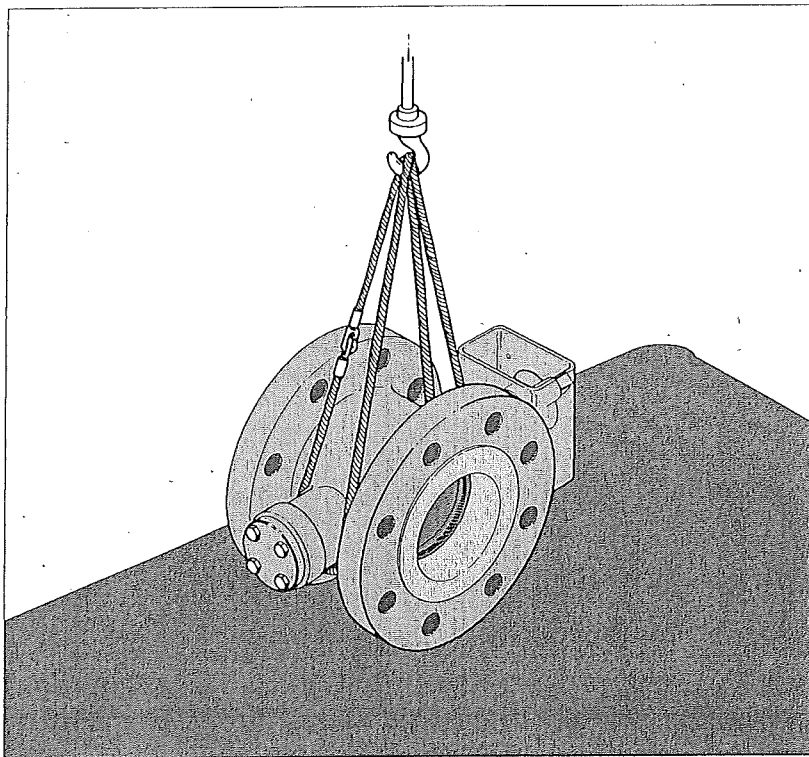
Before it left the MAPAG plant, the butterfly valve was checked by our quality assurance department to make sure it works properly and does not leak. It was also set appropriately in accordance with the documentation prepared for the order in question.

Please check the butterfly valve for any transport damage before you install it. If you find that any of the parts delivered have been damaged, please inform our specialists immediately.

Check that the butterfly valve is working properly before you install it. To do this, proceed as follows:

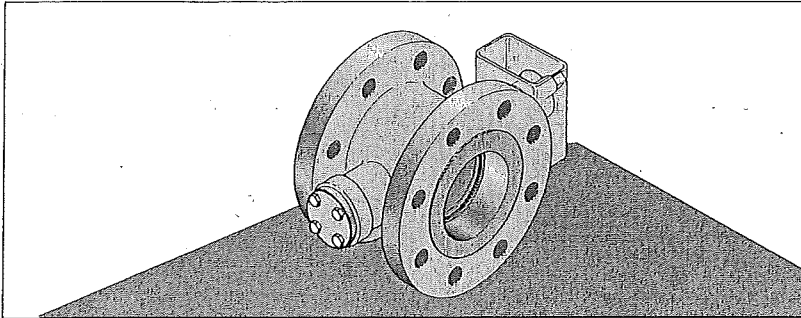
- You may need ropes to lift the butterfly valve, depending on its size and weight.

Make sure you always attach lifting ropes to the body (see illustration). The shaft could be damaged if you attach ropes to the actuator.



Preparing for the function test

- Set the butterfly valve up in a vertical position.



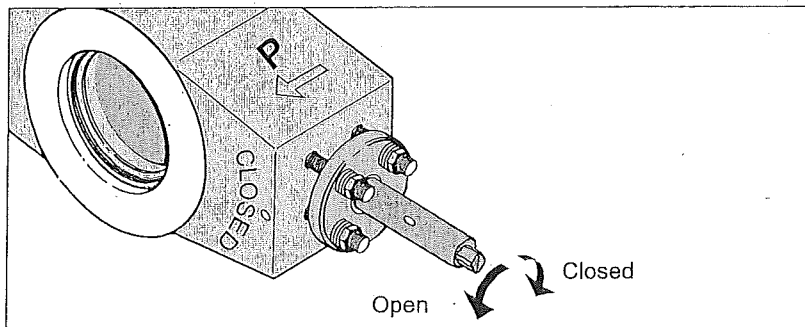
Function test

It is possible that the butterfly valve may move in an uncontrolled way in the course of the function test. It is therefore important to make sure that the butterfly valve cannot under any circumstances move or even tip over during the function test.



- Connect the energy supply system now. Make sure that the actuator opens into the correct direction of movement.

The general rule is: opening to the left, closing to the right (it is possible that a different arrangement may be specified in individual cases).



Direction of actuator movement

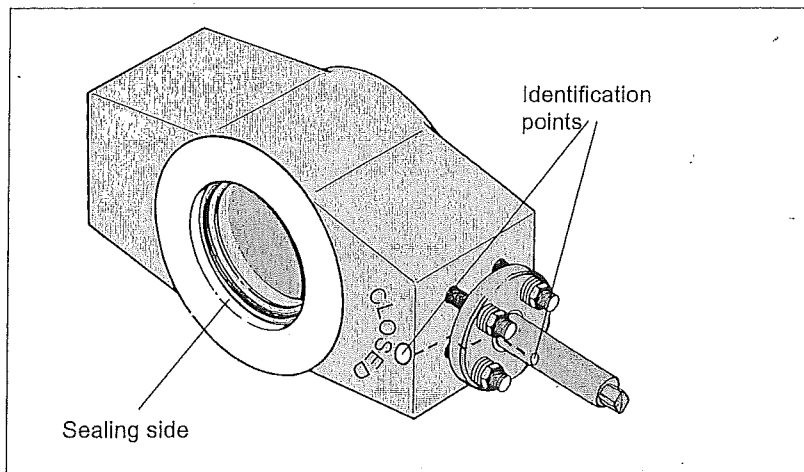
- Check whether the butterfly valve is working properly. Open and close the butterfly valve several times. The stop that is provided in the actuator makes sure that the shut-off disc cannot be turned beyond the closed position as set at the factory.
- Switch the energy supply off after the function test has been completed.

Please contact our specialists if the butterfly valve does not work smoothly in the function test.

4 Marking

The following marks have been made to identify the position of the disc when the unit has been installed:

- CLOSED sign with a coloured mark on the body (with an extension on the top flange of the lengthening joint in the case of insulated valves).
- Coloured mark on the valve shaft.



Direction of actuator movement and position of the shut-off disc

If these two red marks are aligned with each other, then the valve position is „Closed“. The sealing element is on the side of the body on which the „Closed“ sign is provided.

5 Installation

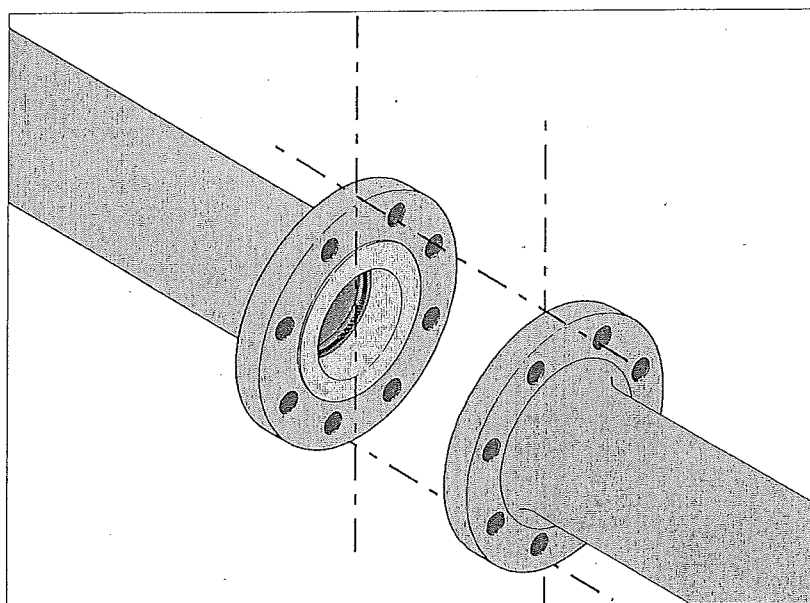
All butterfly valve installation work must be carried out by appropriately trained skilled personnel.



5.1 Planning

Consider the following points before you start to install the butterfly valve:

- You must install the butterfly valve in such a way that the actuator is accessible at all times.
- If you are operating the butterfly valves in high or low temperature ranges, we recommend that you provide the butterfly valve with external insulation, as there is otherwise a considerable danger of injury. When there is a manual actuator system, the hand wheel may only be operated wearing suitable gloves.
- The energy supply to actuators that are operated electrically, pneumatically or hydraulically must not be connected until the butterfly valve has been installed.
- The holes in the flanges at the ends of both pipes must be aligned precisely and the sealing surfaces of the opposite flanges must be parallel to each other. The holes in the flanges must not be out of line with each other at all, so that the butterfly valve is not subjected to tension of any kind when it is installed.



Alignment of the pipe flanges

5.2 Preparations

Make sure that the pipes are not contaminated in any way before you install the butterfly valve. Contamination of any kind - such as welding residue, rust or dirt - can have an adverse effect on the tightness of the butterfly valve and can damage the sealing surface of the shut-off disc or the sealing elements. When the butterfly valve is in operation, the medium must not carry any contaminants with it that might be deposited in the sealing area either.

Be careful when fitting valves with the safety setting „Spring opening“

If the shut-off disc projects beyond the fitting length of the unit, the butterfly valve has to be closed before it is installed (pneumatically, hydraulically etc.). It is essential that you make sure the energy supply facilities are attached securely and cannot under any circumstances be damaged or torn off during the installation operations.

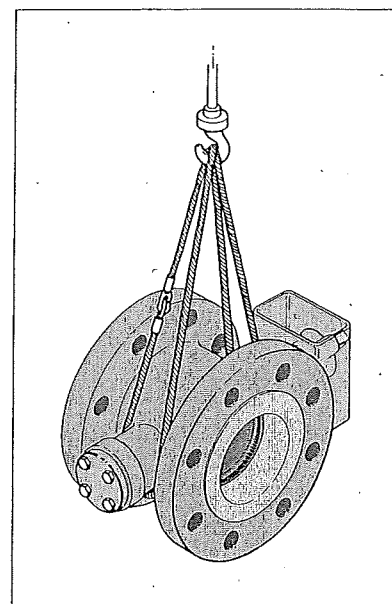
If the energy supply is suddenly interrupted, the valve opens abruptly. This can cause serious injury or material damage.

You need lifting tackle to fit larger butterfly valves in the necessary pipe. Information about the weight of the butterfly valve can be found in the documentation compiled for the order in question.

Always attach lifting ropes to the body - never attach them to the actuator, because this might damage the shaft.



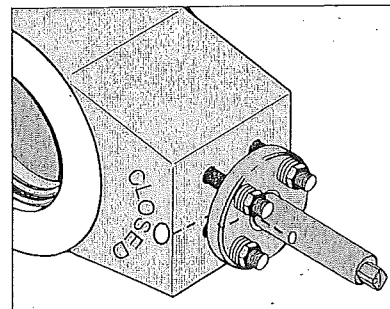
Equipment for lifting the butterfly valve



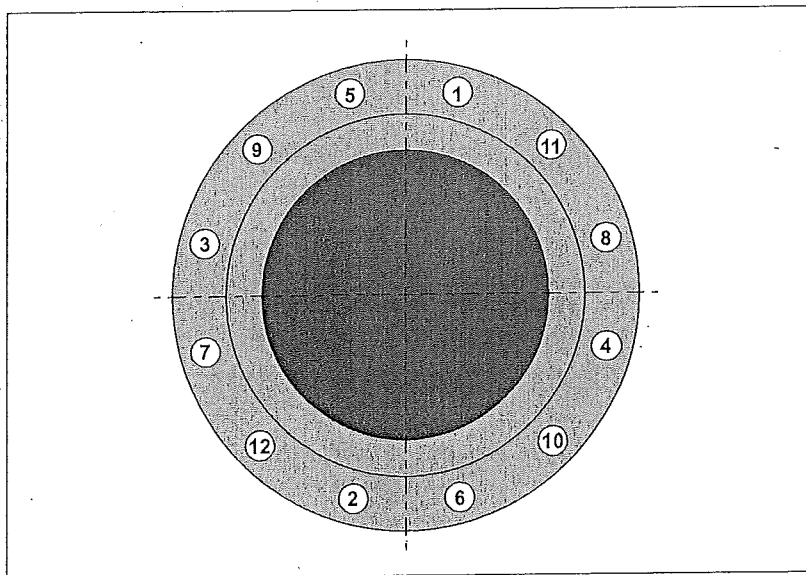
5.3 Fitting

Carry out the following procedure when you are fitting the butterfly valve:

- Turn the butterfly valve in such a way that the arrow (P) on the body points in the pressure direction (see the illustration „Pressure direction“).
- Close the butterfly valve for the duration of the installation operations. When it is open, the sealing surface of the shut-off disc may project out of the body and be damaged when the valve is being fitted.
- Use a o-ring that is suitable for your application on both sides of the butterfly valve between the body and the opposing flanges. The two o-rings are not supplied as standard. We can supply the required o-rings to you on request.
- Tighten the opposing flange nuts or bolts diagonally and evenly using a torque wrench.
- Connect the energy supply in a final operation.



Pressure direction



Example of how to connect the pipe flanges diagonally when there are twelve holes in each flange

5.4 Permissible tightening moments

Permissible tightening moments for bolts in steel category A2-70.2 and A4-70 with a metric coarse-pitch thread in accordance with DIN 13, 70% utilisation of the $R_p 0.2$, coefficient of friction 0.16.

Ø	Stressed cross-section AS in mm ²	Stress ¹⁾ Force at Tfe		Pre-stress force N	Tightening moment Nm
		$R_{p 0.2}$ in N	R_m in N		
M4	8,8	3951	6146	2489	2,13
M5	14,2	6390	9940	4026	4,19
M6	20,1	9045	14070	5698	7,3
M8	36,6	16470	25620	10376	17,5
M10	58,0	26100	40600	16443	35,2
M12	84,3	37935	59010	23899	60,3
M14	115,0	51750	80500	32603	95,8
M16	157,0	70650	109900	44510	146,2
M18	192,0	86400	134400	54432	203,1
M20	245,0	110250	171500	69458	285,7
M22	303,0	75750	151500	47723	212,4
M24	353,0	88250	176500	55598	273,9
M27	459,0	114750	229500	72293	405,3
M30	561,0	140250	280500	88358	549,0

1) Figures corresponding to 100% of the 0.2% proof stress

There is a considerable danger of injury when any maintenance work is being carried out due to the unintentional actuation of the remote control.

If you use a remote control to operate the butterfly valve, you must install a device that interrupts the energy supply in the actuator unit for safety reasons (e.g. an emergency stop switch).

If you are operating the butterfly valve in high or low temperature ranges, we recommend that you provide the butterfly valve with external insulation. If necessary, install an external temperature gauge to provide protection against injury.



6 Removal

The butterfly valve must be closed during installation and removal operations in order to avoid damage to it.

6.1 Preparations

The following conditions have to be met before you remove the butterfly valve:

- Make sure that the pipes are depressurised and empty.

Check whether the butterfly valve has already cooled down or warmed up to such an extent that there is no further danger due to extreme temperatures.



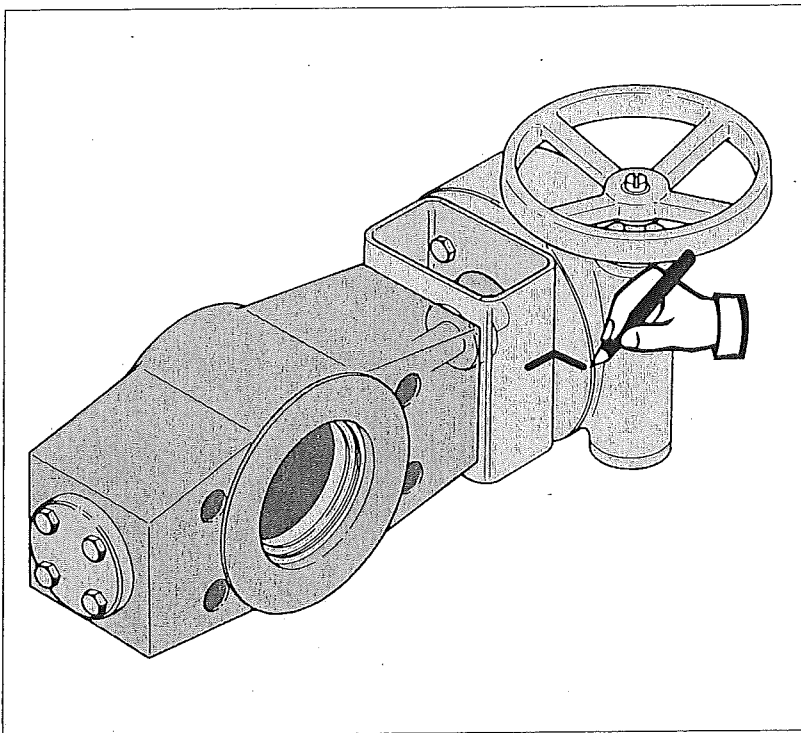
- Find out what medium last ran through the butterfly valve. There may be residues in the valve. Make sure that there is no danger of poisoning or burning if you come into contact with such residues. If necessary, protect yourself by wearing appropriate protective clothing, safety goggles and breathing equipment.

If you are not removing the valve yourself, warn the staff who are carrying out this assignment. Make protective clothing available to them if necessary.

6.2 Removal

Carry out the following operations in the specified order when you are removing the butterfly valve:

- Close the butterfly valve.
- If the actuator has to be taken off in order to remove the butterfly valve, mark the position of the actuator to the shaft and to the shut-off disc on the adapter before removing the actuator (see illustration). This will enable you to position the actuator again correctly when you re-install it, so that it does not cause any malfunctioning of the system.

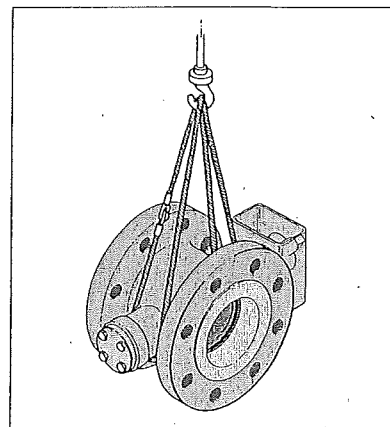


Mark the position of the actuator to the shaft and to the shut-off disc on the adapter before removing the actuator.

Switch the energy supply to the actuator off. To do this, actuate the emergency stop switch for the actuator energy supply or guard the remote control unit in such a way that no-one can switch the energy supply system on again by mistake.



- Remove the actuator.
- Secure the butterfly valve with ropes. Attach the ropes to the body (and not to the shaft) of the butterfly valve.
- Separate the flanges of the butterfly valve by undoing the opposing bolts or nuts diagonally.
- Transport the butterfly valve in such a way that it cannot be moved or damaged during the transport process.

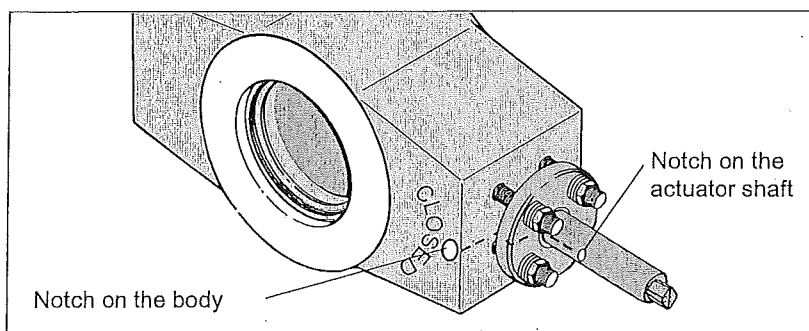


Securing the butterfly valve with ropes

7 Re-installation

Proceed as follows to re-install the butterfly valve:

- Close the butterfly valve.
- There is a round notch at the end of the actuator shaft and on the body of the butterfly valve. The round notch on the actuator shaft must point in the direction of the round notch on the body when the valve is installed again.
- Move the actuator to its closed position.



Installation marks

- Make sure that you fit the actuator to the actuator shaft in the right position. To do this, use the mark that you made on the adapter and the actuator when you removed the butterfly valve.
- Fit the butterfly valve between the pipes (see chapter 4 „Installation“).

8 Troubleshooting

The butterfly valve does not close tightly

1. Do not under any circumstances use force to close the butterfly valve. There is too great a risk that damage may occur.
2. Check whether the energy supply has been switched on.
3. Check whether the closed position of the actuator and the closed position of the shut-off disc match.
4. Check the sealing surface of the shut-off disc and the sealing elements to see if they have been damaged. Remove the butterfly valve. Check whether there are any foreign bodies between the shut-off disc and the sealing elements. Remove any foreign bodies or deposits that you find. Change any damaged parts.

You will find instructions about removing ...

...the butterfly valve on page 10
...in the chapter entitled Removal

...the sealing elements instruction manual, section 2
...in the chapter entitled Replacement of the sealing elements

...the shut-off disc instruction manual, section 2
...in the chapter entitled Replacement of mechanical parts

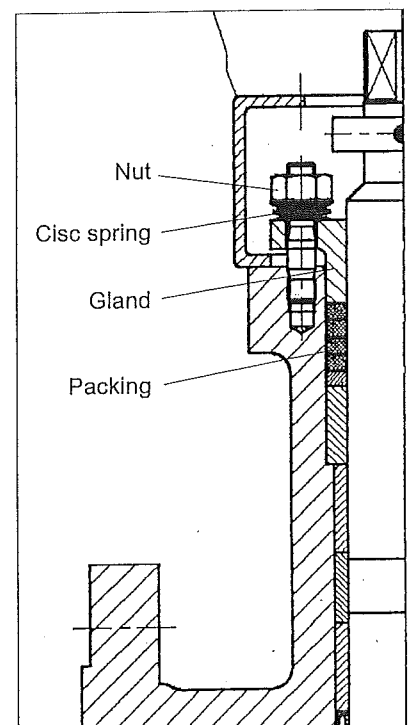
Please follow the instructions given in the chapter entitled „Cleaning and maintenance“ in section 2 of the instruction manual as well.

Liquid or gas is escaping ...

... from heavy-duty valves with a gland

Check whether the gland is still being pre-stressed effectively by the disc springs. It is possible that the disc springs may be damaged. If this is the case, change the disc springs. If the tension applied by the disc springs is too small, tighten the nuts more securely - but not as far as the stop, because this would damage the disc springs. If the tension applied by the disc springs is correct, then the packing is damaged. Change the packing. Instructions about removing the packing can be found in the chapter entitled „Replacement of mechanical parts“ in section 2 of the instruction manual.

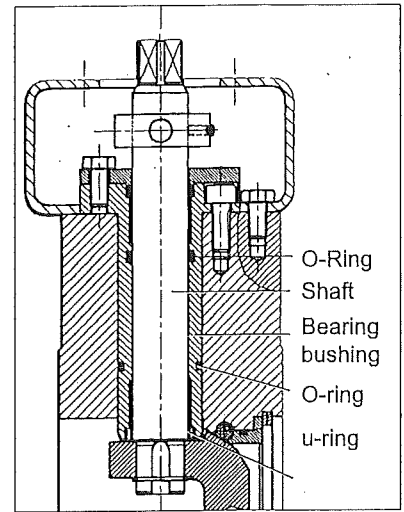
Heavy-duty valves with a gland



... from heavy-duty valves with an O-ring seal

Check whether the O-rings are damaged in the area of the bearing bushing. If so, change the O-rings and the u-ring.

Please read chapter 5 „Removal“ in this instruction manual for information about the removal process.

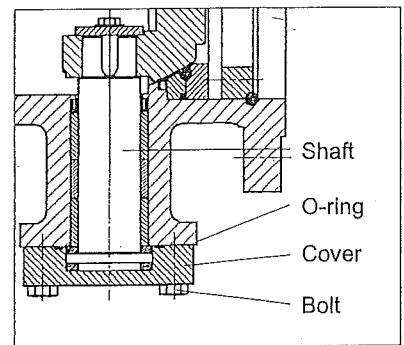


Heavy-duty valve with bearing bushing

Liquid or gas is escaping from the cover

Check whether the bolts on the cover have been tightened properly. Change the o-ring if necessary.

Please read chapter 5 „Removal“ in this instruction manual for information about the removal process.



Checking the tightness of the shaft

The medium is too cold when it is running through the valve

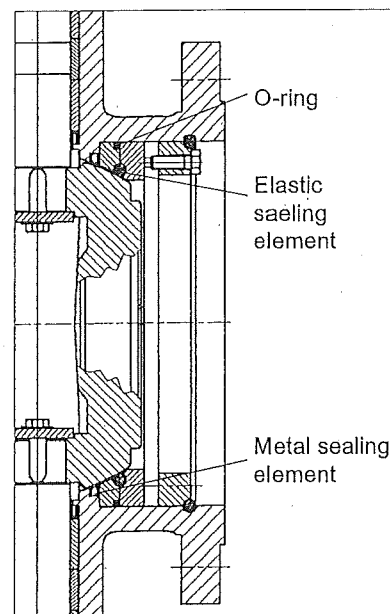
The minimum temperature for operating your butterfly valve depends to a very large extent on the materials used for your order. You will find information about the appropriate temperature range for your butterfly valve in the documentation compiled for your order.

The sealing element is chosen in accordance with the permissible temperature of the medium depending on the design of your system (see the order documents and the table on page 14). If the medium is running through the butterfly valve at a lower temperature by mistake, the sealing element may be damaged. In this situation it is necessary to check the condition of the sealing element and to carry out a function test. The sealing element may need to be replaced.

The medium is too hot when it is running through the valve

The maximum temperature for operating your butterfly valve depends to a very large extent on the materials used for your order. You will find information about the maximum operating temperature in the documentation compiled for your order.

Irrespective of this maximum operating temperature, the elastic sealing element and the O-ring must not be subjected to temperatures higher than their specified maximum limit. PTFE parts are designed to withstand temperatures up to a maximum of 220° C. These parts are destroyed if the medium is hotter than this. The butterfly valve continues to close tightly with the metal sealing element (23a), but the elastic sealing element (23) and the O-ring (16) have to be replaced immediately.



Important note!

If the elastic parts are destroyed by an excessively hot medium, the medium may escape from the gland / bearing bushing and the cover.



Temperature resistance of the flexible sealing elements

	FKM	EPDM	PTFE (rein)
Minimum temperature	-10°C	-60°C	-200°C
Maximum temperature	+180°C	+180°C	+220°C

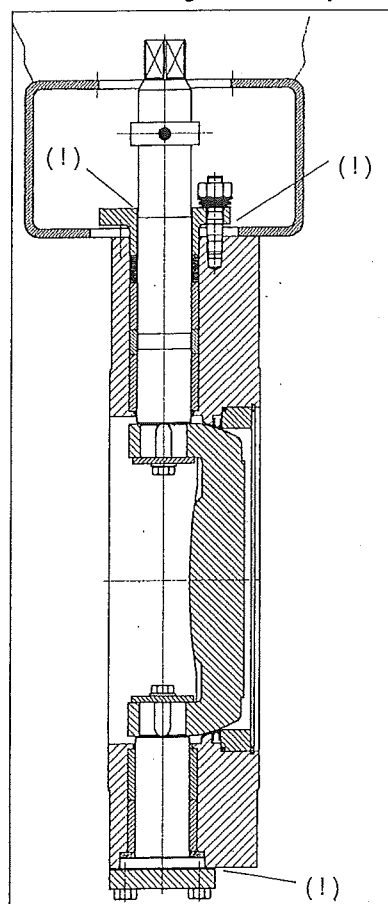
9 Safety instructions

Please observe the following safety instructions when you are installing, maintaining and operating the heavy-duty valve:

1. For safety reasons you are not allowed to make any changes to the method of operation of the heavy-duty valve or to its actuator.
2. All installation work on the heavy-duty valve must be carried out by appropriately trained skilled personnel.
3. When a function test is being made, there is a danger that the heavy-duty valve may suddenly move in an uncontrolled way due to the supply of energy. Make sure therefore that the valve cannot under any circumstances move or even tip over during the function test.
4. Be careful when fitting valves with the safety setting „Spring opening“. If the shut-off disc projects beyond the fitting length of the unit, the butterfly valve has to be closed before it is installed (pneumatically, hydraulically etc.). It is essential that you make sure the energy supply facilities are attached securely and cannot under any circumstances be damaged or torn off during the installation operations. If the energy supply is suddenly interrupted, the valve opens abruptly. This can cause serious injury or material damage.
5. There is a considerable danger of injury when any maintenance work is being carried out due to the unintentional actuation of the remote control. If you are planning to use a remote control unit in operation of the heavy-duty valve, you will need to incorporate an additional emergency stop switch in the actuator as a locking facility.
6. Make sure that cleaning agents cannot cause any undesirable chemical reactions in combination with possible residues in the heavy-duty valve.
7. When you are working in the area of the sealing surface of the shut-off disc, secure the shut-off disc with wooden wedges in order to eliminate the danger of crushing. Make sure that you do not damage the sealing area of the shut-off disc while you are doing this.
8. If the o-rings are destroyed by a medium that is too hot, the medium that is being used may escape from the shafts.



Possible leakage after an excessively hot medium has flowed through the butterfly valve



10 Spare parts

Most of the spare parts depend on the technical specification of your system.

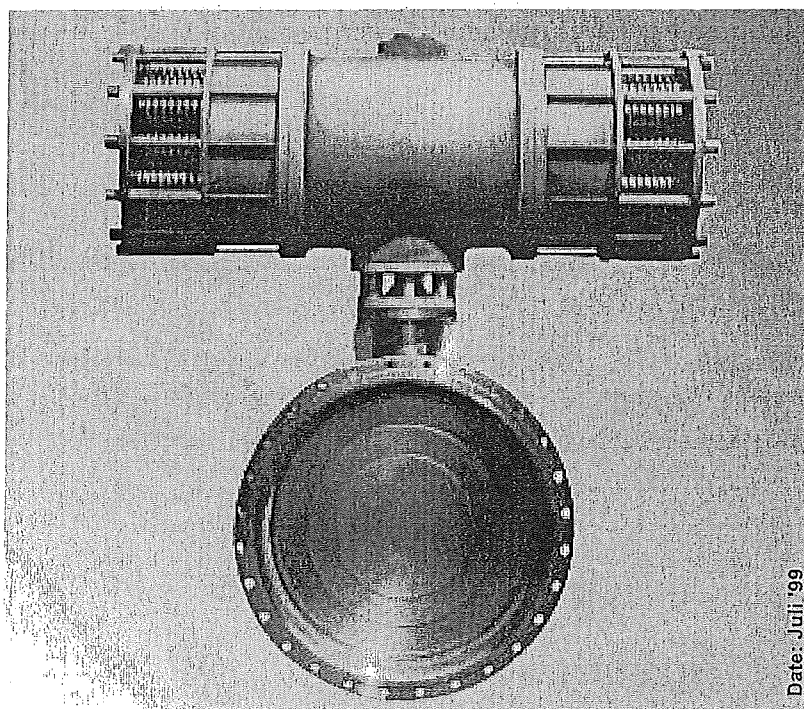
Every time you place an order for spare parts, please indicate to us therefore not only the identification number from the spare parts list but also the Mapag order number under which the heavy-duty valve was planned and supplied to you.

Our guarantee commitments only apply if genuine spare parts are used.

Mapag Control Valve - Type E

For Cryogenic Flow Control Applications

Instruction Manual (Section 2)



Date: Juli '99

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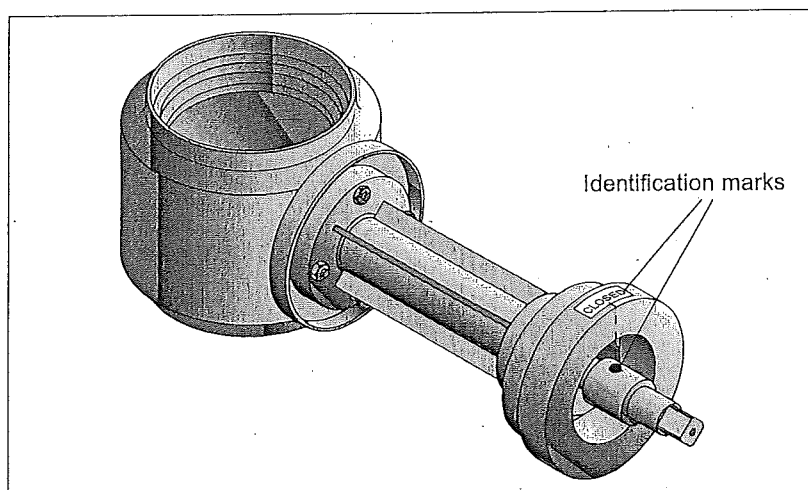
1 Method of operation

The purpose of MAPAG Model E butterfly valves is to regulate the flow of products in both directions.

The butterfly valve can be used for liquids or gases between 200° C and + 100° C, depending on the medium and the configuration of your system. Information about the exact application area for your Model E butterfly valve can be found in the documentation compiled for your order.

Model E butterfly valves have an extension (lengthening joint) to enable them to be insulated for their planned use in low temperature ranges. This extension guarantees that the gland packing which provides external sealing is accessible even when the valve is insulated. The low temperatures are not transferred to the actuator either.

MAPAG Model E butterfly valves are operated by an actuator (manual, electric, pneumatic or hydraulic). There is a mark on the actuator shaft as well as one on the o-ring side of the body. The valve is closed when the two marks are in line with each other.



Position of the installed
regulating disc

2 Cleaning and maintenance

Model E butterfly valves require practically no maintenance.

Check the butterfly valve regularly to make sure it is working properly. You should check the condition of the other seals - i.e. the O-ring (107), the o-ring (471) and the packing (451) - after two years at the latest.

In order to avoid lengthy stoppages during maintenance operations, you should order spare parts in good time and keep them in stock.

If the medium carries contaminants that may have an adverse effect on operation of the butterfly valve, you will need to clean the regulating disc on a regular basis.

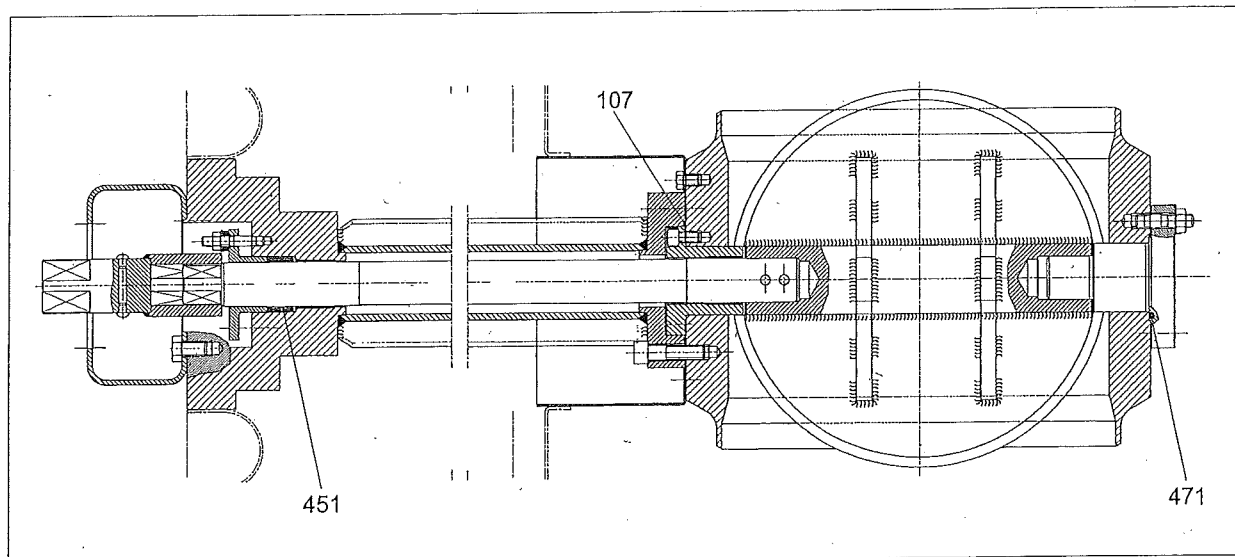
Do not use any agents to remove residues that might attack the sealing surface or the sealing elements. Use water, soap suds or other liquid solvents and a soft, lint-free cloth instead.

Do not under any circumstances use files or sandpaper. And do not use any cleaning agents that might cause undesirable chemical reactions with the residues of the medium.



If you outsource the butterfly valve cleaning operation, it is essential that you draw attention to the dangers of the medium being used as well as to any residues that may be present.

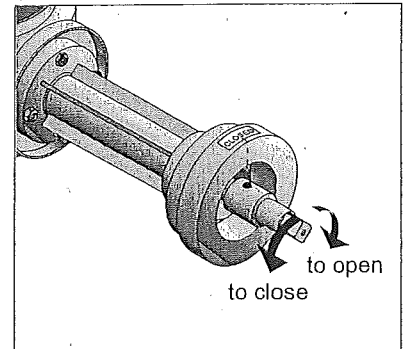
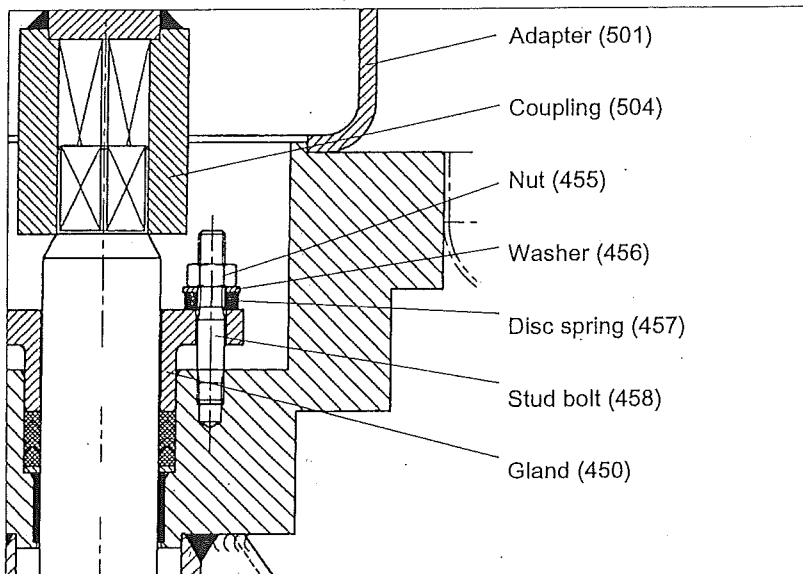
Checking that the butterfly valve does not leak



2.1 Replacement of mechanical parts on the actuator side

Proceed as follows to replace mechanical parts on the actuator side:

1. Start off by removing the actuator and the adapter (501) and by then pulling the coupling (504) down.
2. Remove the nut (455), the washer (456) and the disc spring (457) and pull the gland (450) out.

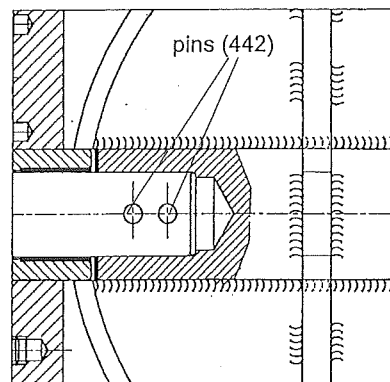


Screw connection of the gland

3. Undo the bolt (103). You can now pull the lengthing joint (102) off over the actuator shaft (401).

The following parts are now accessible and can be replaced if necessary:

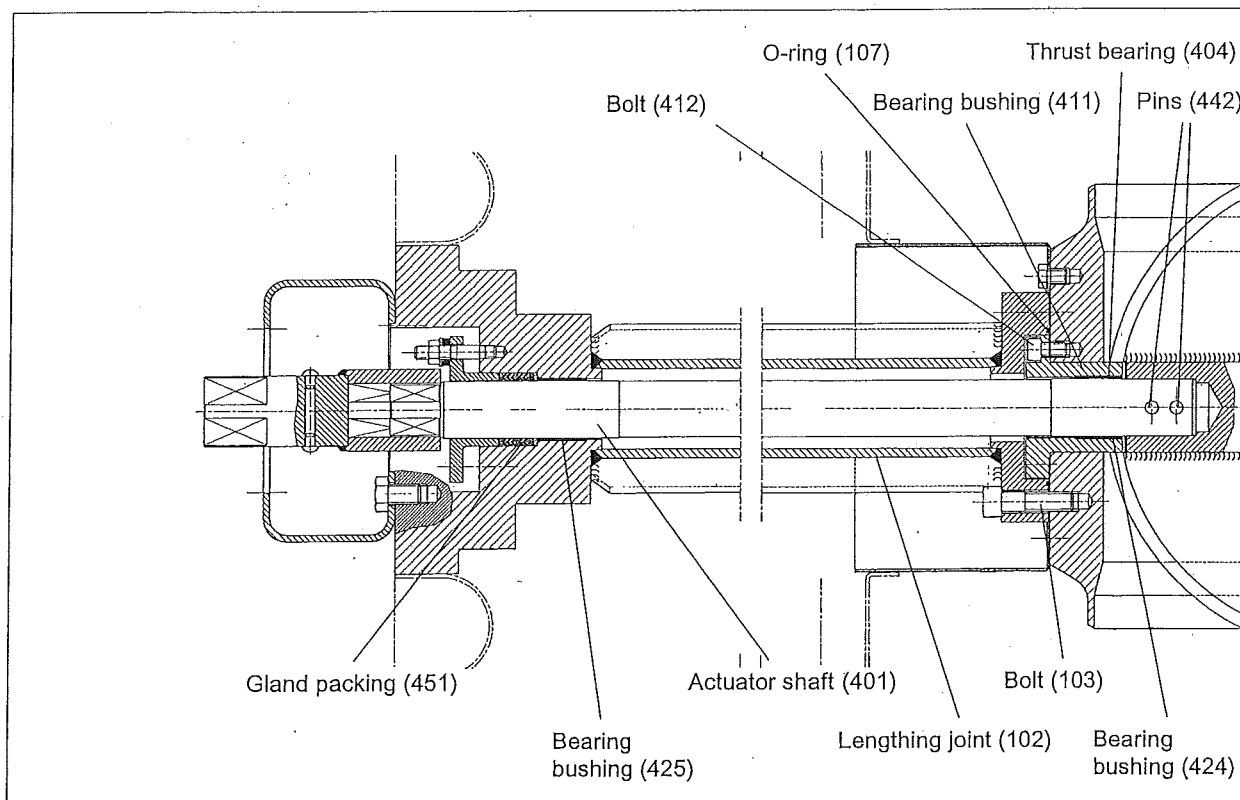
- the gland packing (451)
- the bearing (425) and
- the O-ring (107).



Removing the pins

4. Remove the pins (442) and then pull the actuator shaft (401) out.
5. Undo the bolts (412). The bearing bushing (411) can now be pulled out of the body and the bearing bushing (424) and the thrust bearing (404) can be replaced.

Mechanical parts on the actuator side

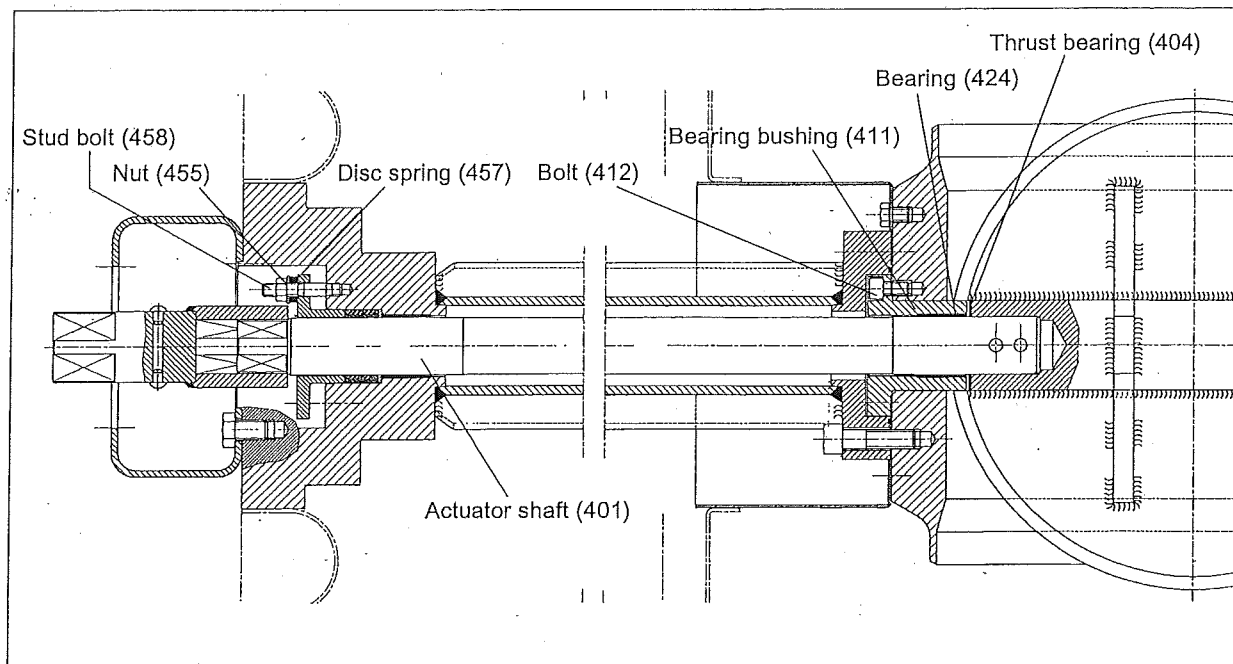


Installation is carried out as follows:

7. Insert the actuator shaft (401) through the body into the regulating disc. Push the thrust bearing (404) and then the bearing bushing (411) - with the bearing (424) already fitted - onto the actuator shaft (401). Tighten the bearing bushing (411) with the bolts (412). Check whether the actuator shaft moves freely by turning it backwards and forwards repeatedly. Make sure that the thrust bearing (411) has been fitted properly.

The rest of the installation process is carried out by completing the same operations as before, except in the opposite order. Please do not tighten the nut (455) to the stud bolt (458) until it reaches the stop, because the disc spring (457) will be damaged if you do. The tighter you screw on the nut (455), the higher the resistance on the actuator shaft (401). When you attach the coupling (504), make sure that the mark points to the CLOSED sign on the lengthening joint / body when the regulating disc is closed. Check that the butterfly valve is tight before fitting it again. Information about the installation operations can be found in section 1 of the instruction manual.

Mechanical parts on the actuator side

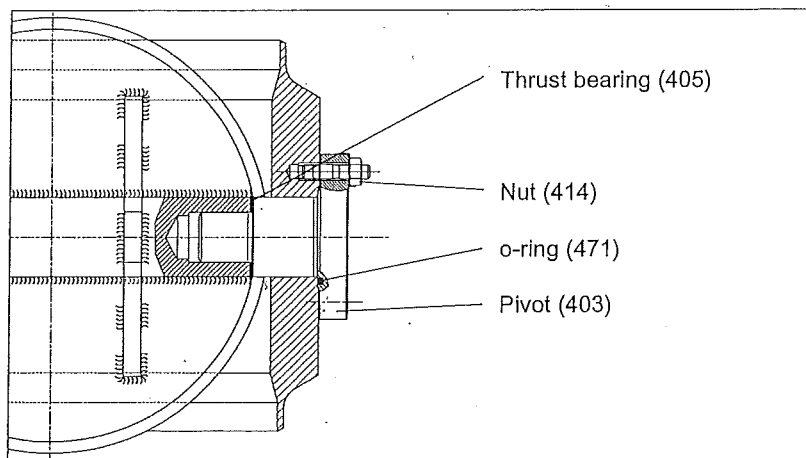


2.2 Replacement of mechanical parts on the cover side

Proceed as follows to replace mechanical parts on the cover side:

1. Undo and remove the nuts (414) on the opposite side of the butterfly valve from the actuator.
2. Force the pivot (403) from the body using both threads.
3. You can now pull the o-ring (471) and the thrust bearing (405) out and replace them if necessary.

Installation is carried out by completing the same operations in the opposite order. Check that the butterfly valve is tight before fitting it again. Information about the installation operations can be found in section 1 of the instruction manual.

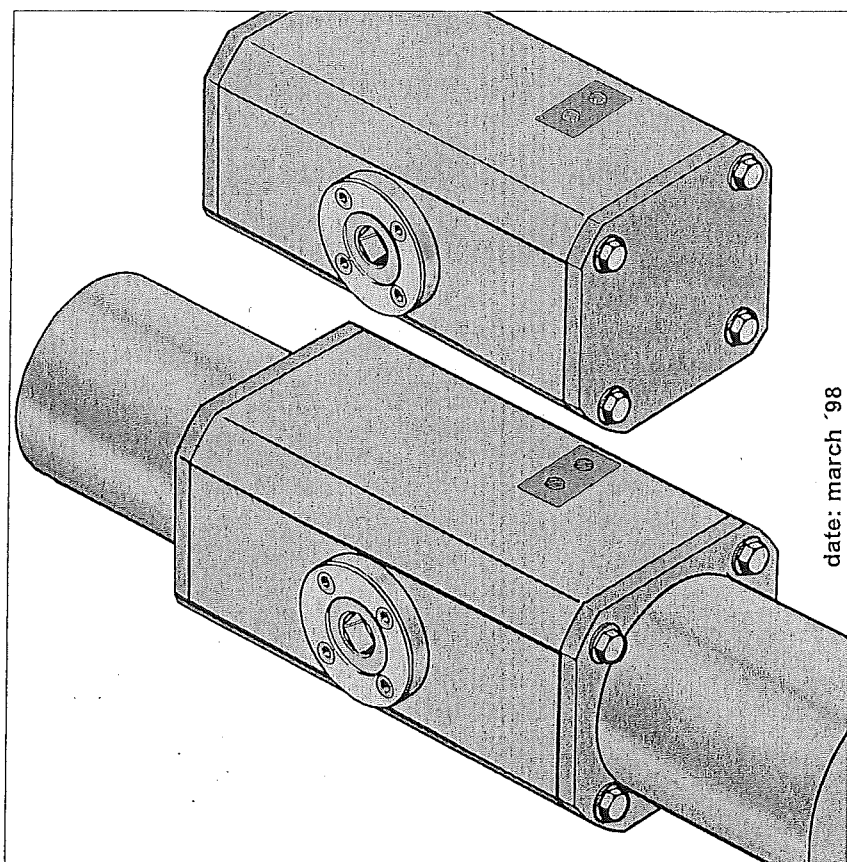


Mechanical parts on the cover side

MAPAG double-piston part-turn valve actuators

- Models A/F -

Instruction manual



Contents

Method of operation	2
Proper use	6
Configurations	7
Functional test.....	8
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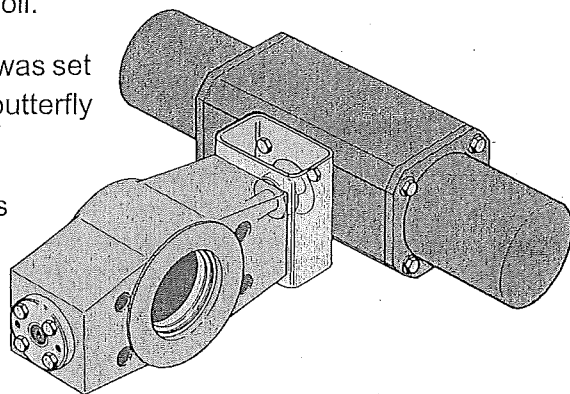
MAPAG double-piston part-turn valve actuators are used to turn a actuator shaft 90° - for example in order to open and close or adjust butterfly valves. The actuators have a long service life and are extremely reliable even when they are deployed under demanding conditions. The actuating shaft, for example, has been made from stainless steel to make sure not only that it is resistant to corrosion but also that it is very strong.

Method of operation

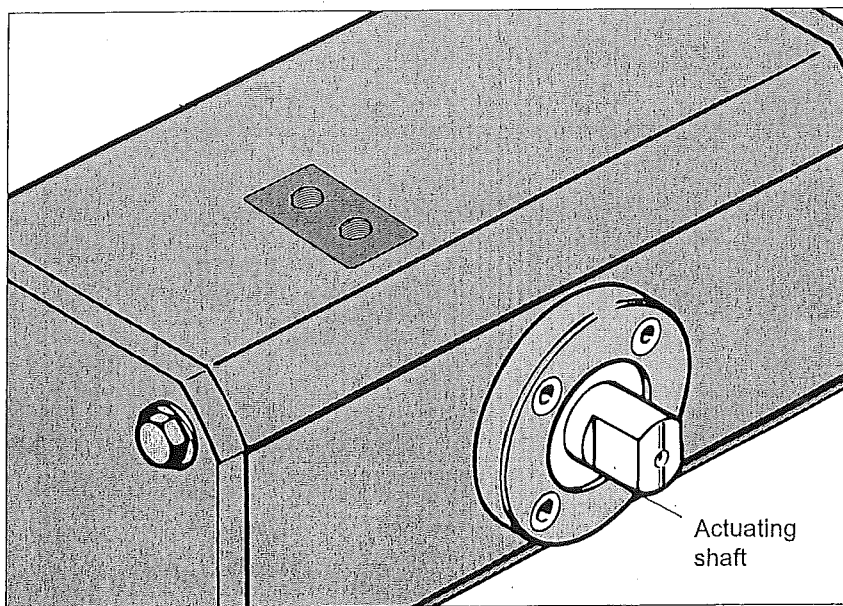
The valve actuators can be used at operating temperatures of - 20 to + 80° C. The pistons have special seals, so the valve actuators up to models A/F 500 can work even when the air supplied is extremely dry, i.e. they do not require air that contains oil.

When it was produced at the factory, the valve actuator was set for horizontal deployment, i.e. at right angles to the butterfly valve.

The groove on the end of the actuating shaft always indicates the current position of the shut-off disc (see the illustration below).



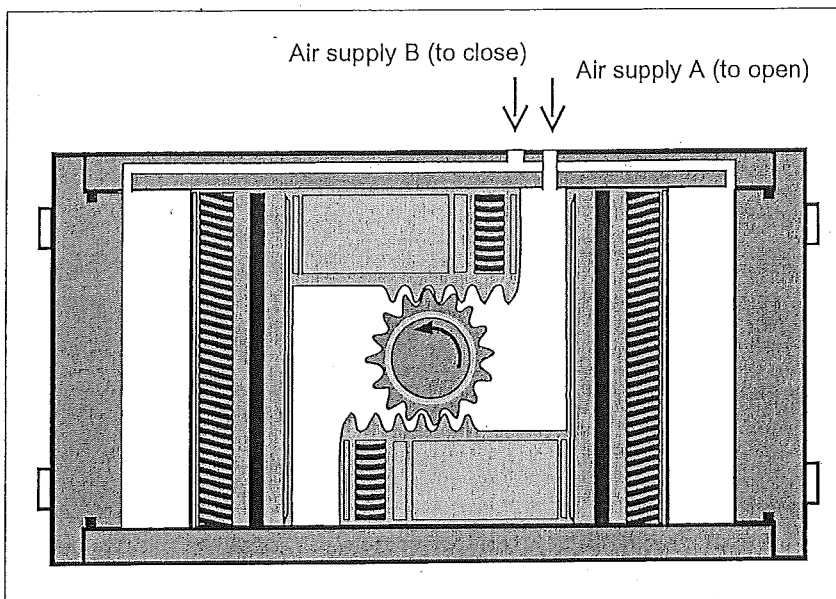
In view of the fact that the actuating shaft has teeth all the way around, it is, however, also possible to set the valve actuator to operate in a different position at the installation location. In order to make sure that the groove on the actuating shaft always indicates the position of the shut-off disc even so, it is necessary for you to remove the actuating shaft in such cases and then fit it again after it has been turned appropriately. Instructions about this can be found on page 13 in the section entitled „Removal of the valve actuator“.



The groove in the actuating shaft indicates the position of the shut-off

How the valve actuators work

The valve actuators work pneumatically. When compressed air is supplied to them, two pistons are forced apart or back together again. In the course of this movement, they turn the actuating shaft - with which they are engaged - through 90°.



How the Mapag Model A double-piston part-turn valve actuators work

Since they incorporate special low-friction o-rings, MAPAG double-piston part-turn valve actuators operate with no „stick - slip“. This means that the actuating shaft moves uniformly, without jerking of any kind.

Different models

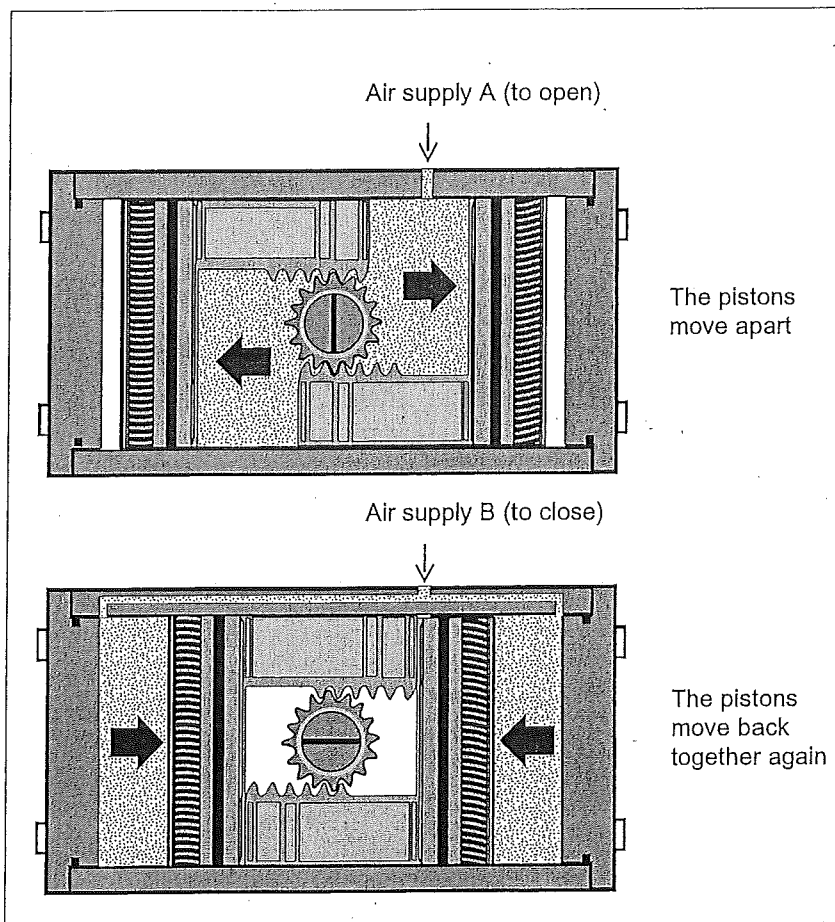
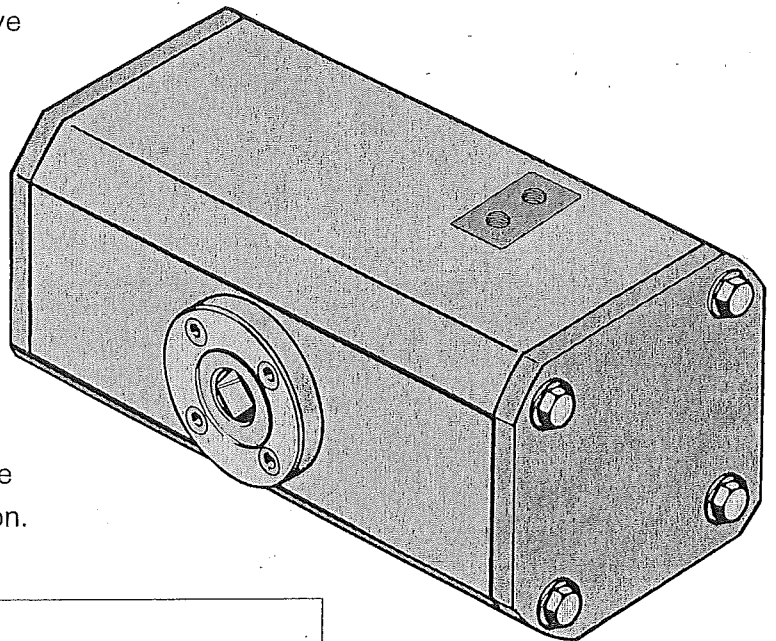
The double-piston part-turn valve actuator is available in two separate models (models A and F) in order to satisfy the different requirements made in practical application.

Model A double-piston part-turn valve actuator

Model A is what is known as the „double-acting“ version. This means that the pistons are moved in both operating directions by means of pneumatic pressure.

A three-chamber system in the valve actuator consisting of one inner chamber and two outer chambers is used when double-acting operation is required. When the pressure level in the inner chamber is increased, the pistons are forced outwards. When pressure is applied to the two outer chambers, the pistons are forced back together again.

If the energy supply is interrupted, the valve actuator stops in its current position.

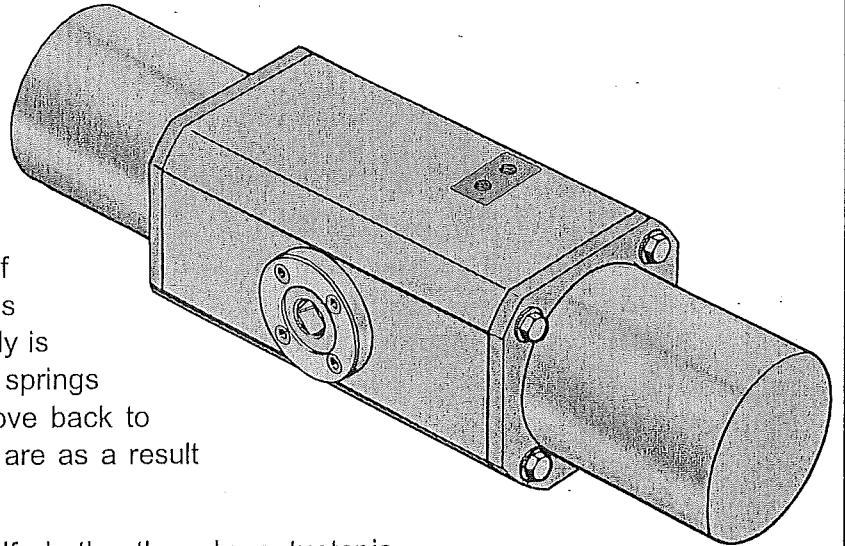


MAPAG Model A double-piston part-turn valve actuator: structure and method of operation

Model F double-piston part-turn valve actuator

Model F is what is known as the „single-acting“ version. This means that the pistons are only moved pneumatically in one direction.

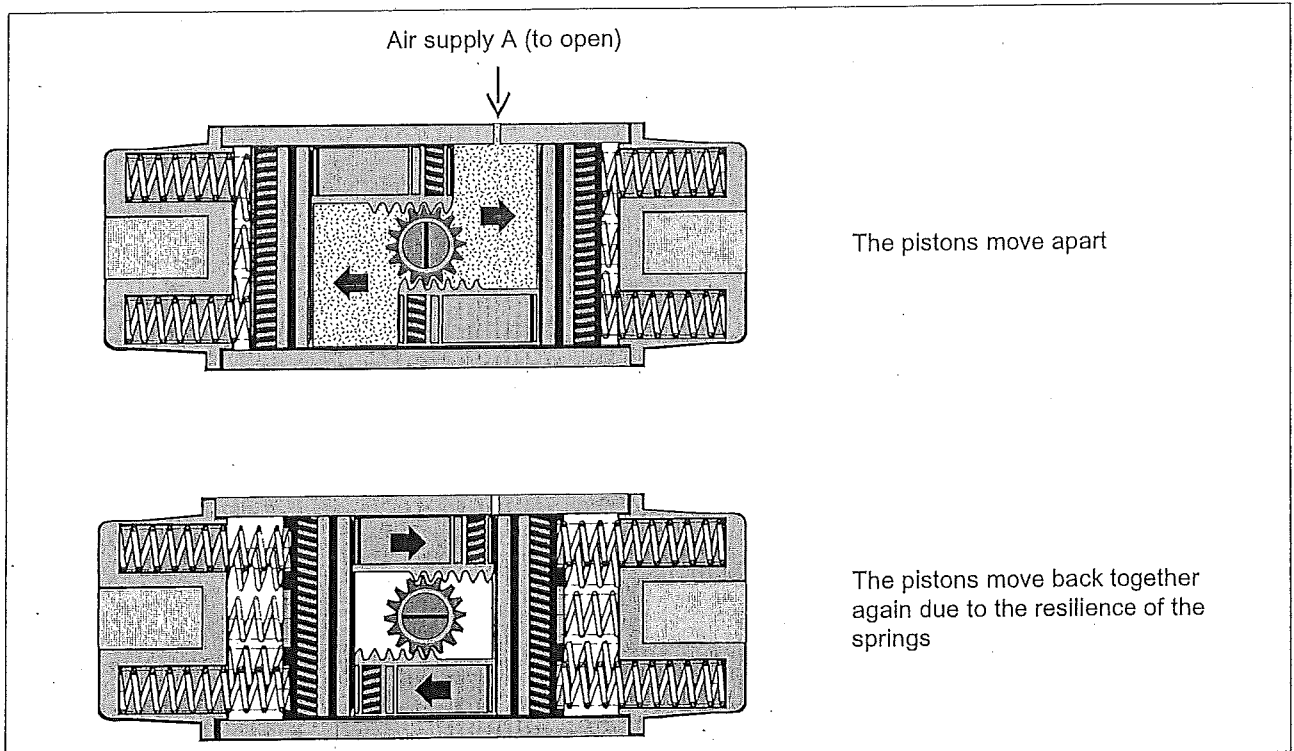
In this version, pressure is applied to the central chamber of the valve actuator. The two pistons are now moved apart. Pressure springs in the two side chambers of the valve actuator are at the same time forced together in the course of this operation. When the amount of pressure that is being applied is reduced or when the energy supply is interrupted, the resilience of the springs means that they automatically move back to their original position: the pistons are as a result forced into their end position.



You were able to specify for yourself whether the valve actuator is supposed to open or close in its end position. The end position has been set at the factory in accordance with your specifications.

Instructions for reversing the function of the end position can be found in the section on page 9 entitled „Reversing the function“.

MAPAG Model F double-piston part-turn valve actuator: structure and method of operation



The valve actuator supplied to you has been specially designed to satisfy the specific requirements. If you intend to use the valve actuator for a different purpose, please ask our experts beforehand whether the valve actuator is suitable for the demands of the application you are planning. We will be delighted to give you the necessary advice.

The valve actuators can only be used to carry out a movement amounting to 90° at the most.

The valve actuators are designed for operating temperatures of between - 20 and + 80° C. When the butterfly valves are to be heated up to temperatures that are higher than this, adapters or adapters may need to be included between the butterfly valve and the valve actuator to guarantee the necessary cooling. Our experts will be glad to advise you on this.

All installation work must be carried out by appropriately trained skilled personnel.

If you operate the valve actuator by means of a remote control, you must install an EMERGENCY STOP switch on the valve actuator.

Please make sure that you always use genuine spare parts.

One of the requirements which proper use of the valve actuator involves is that the operating, installation and maintenance personnel have read and understood this instruction manual.

We do not accept any liability either for structural alterations that are made without the express approval of the Linde AG MAPAG plant or for injuries and damage to property that are caused by improper use of the valve actuator.

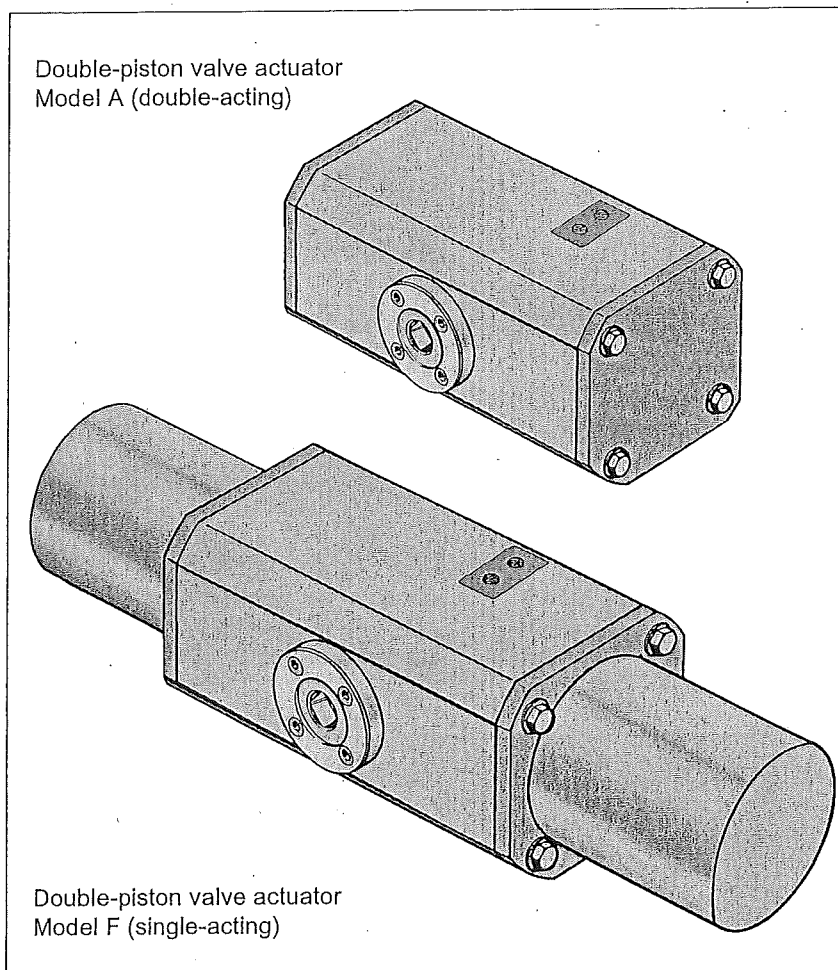
Proper use



The valve actuator is supplied in one of two possible configurations: either Model A (the double-acting configuration) or Model F (the single-acting configuration).

Configurations

Different models



The valve actuator is ready for operation when it is delivered. If you have ordered a manual emergency actuation facility, mechanical stops or Electro-pneumatic accessories, all of these parts are assembled and ready for operation when they are supplied.

A nameplate into which the model code has been embossed is attached to the valve actuator (See page 11). With the help of this combination of letters and numbers you can find detailed information in the technical documentation about the materials used to make the different components.

The safety setting FC (= failure close) or FO (= failure open) specified on the model plate is implemented as follows.

- For double-action drive units of type A, by the electro-pneumatic accessories.
- For single-action drive units of type F by the electro-pneumatic accessories and/or the fitted springs.

Before it left the MAPAG plant, the valve actuator was checked by our quality assurance department to make sure it works properly and was set for operation in accordance with your specifications.

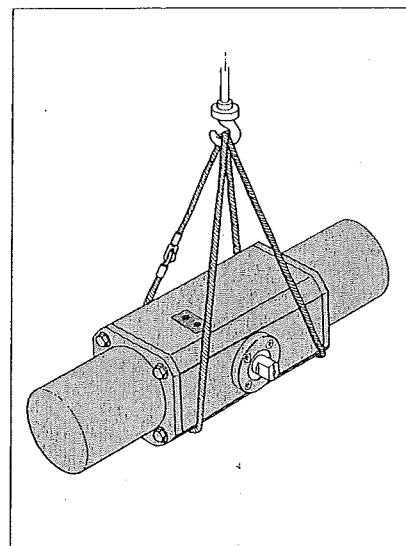
Please check the valve actuator for any transport damage after you have removed the packaging materials. If you find that any of the parts delivered have been damaged, please inform our specialists immediately.

Check that the valve actuator is working properly **before you install** it. To do this, proceed as follows:

- You may need ropes to lift the valve actuator, depending on its size and weight (see the illustration on the right).
- Connect the energy supply system.
- With Model A valve actuators, check whether the valve actuator turns the actuating shaft towards the left when you apply pressure to the central chamber.
- With Model F valve actuators, check whether the valve actuator turns the actuating shaft in accordance with your specifications when you apply pressure to the central chamber.
- Check whether the actuating shaft of the valve actuator makes a countermovement when you apply pressure to the outer chambers (Model A) or when you stop applying pressure to the central chamber (Model F). The end stop for the valve actuator has been reached after it has been turned through an angle of 90°.
- Switch the energy supply off after the function test has been completed.

If the valve actuator is working smoothly, you can fit it to the actuator shaft of the butterfly valve.

Functional test



Lifting the valve actuator with ropes

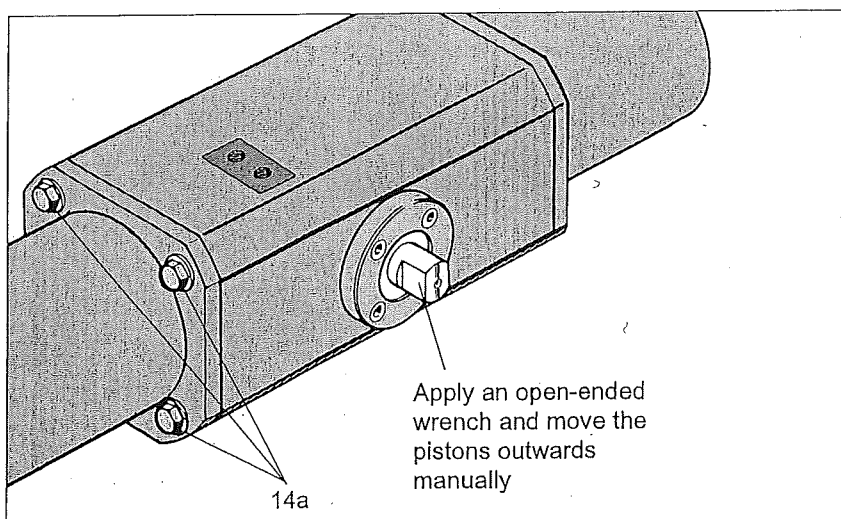
Reversing the function (only applies to Model F valve actuators)

The Model F part-turn valve actuator was set at the factory in accordance with your specifications. If there is an interruption in the energy supply, the return movement you requested (opening or closing) is therefore carried out automatically.

If you would like the return movement to carry out the opposite function, you need to reverse the right - left function of the valve actuator.

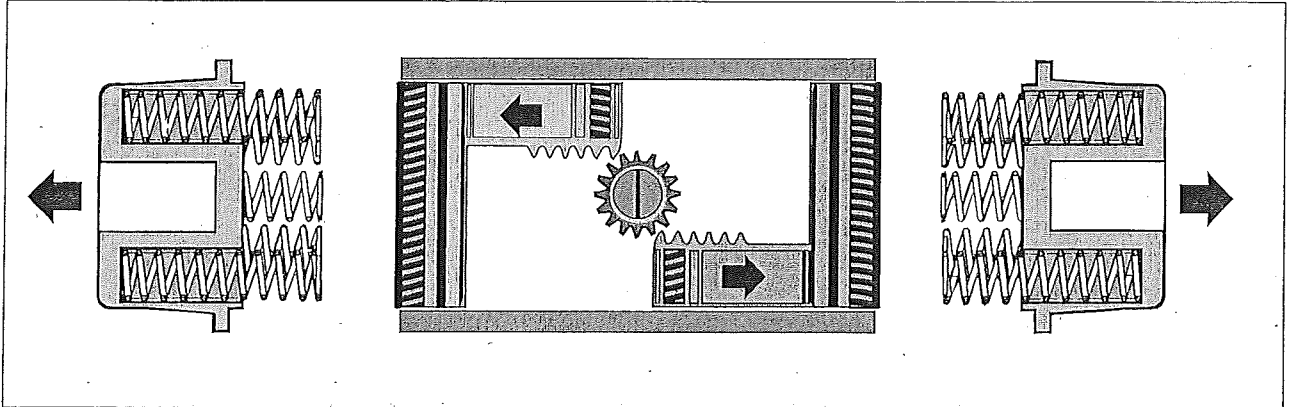
To do this, proceed as follows:

- Switch the energy supply off. Make sure that the energy supply cannot be switched on again by mistake. If the valve actuator is operated by means of a remote control, actuate the EMERGENCY STOP switch.
- Remove the valve actuator. Please read the section on page 13 entitled „Removal of the valve actuator“ for instructions about how to remove the valve actuator.
- Now undo the bolts (14a) in both end covers, so that the springs do not apply pressure to the pistons any more. The length of the bolts has been calculated so that the springs are released completely when the end covers are removed.
- Now turn the actuating shaft manually using an open-ended wrench. Push the two pistons outwards in this way until they are no longer engaged by the toothed actuating shaft.



Back of the valve actuator

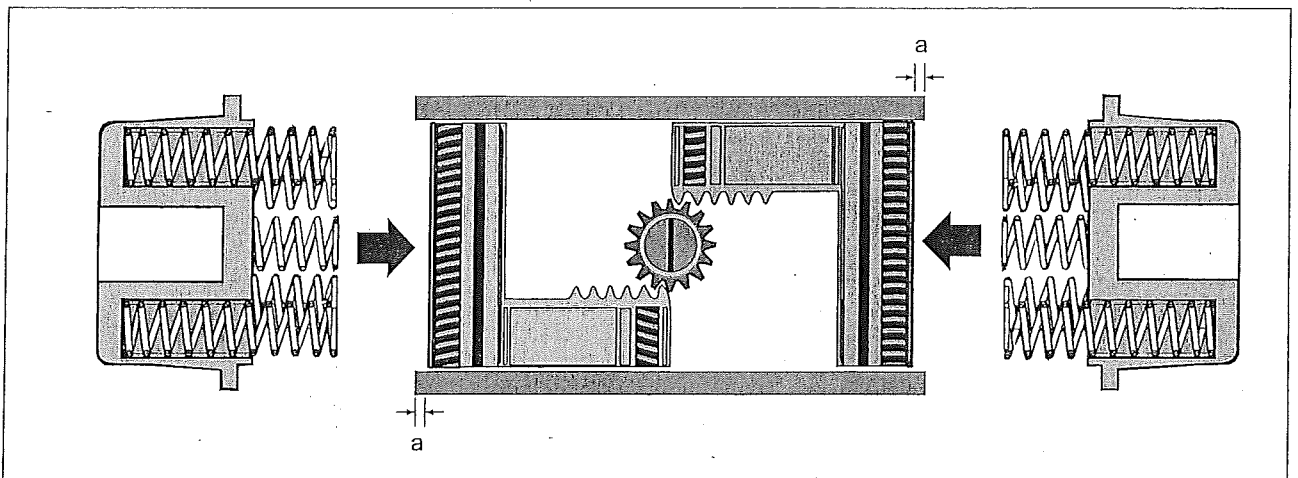
- Take the two pistons out.



Removal of the pistons

- Turn the two pistons 180° around their own axis and push both of them back into the body until they are engaged by the actuating shaft again.

Make sure you only use special MAPAG tools for this purpose. Installation instructions and ordering data can be found on page 15.



Central alignment of the pistons when they are installed again

- Align the pistons in the middle. The distances *a* (see the above illustration) must be exactly identical.
- Move the pistons inwards again manually with the help of the open-ended wrench applied to the actuating shaft.
- Now replace the springs and the two covers. Do not put the valve actuator into operation until you have tightened all the attachment bolts (14a) securely. Before you start operating the valve actuator again, you should also make sure to check that it is working properly.

1. Planning

Consider the following points before you start to install the valve actuator:

- You must install the valve actuator in such a way that it is always easily accessible. This applies in particular to a possible manual emergency actuation facility as well.
- The energy supply to valve actuators that are operated pneumatically must not be connected until the valve actuator has been installed.

2. Preparations

In the case of larger valve actuators, you will need lifting equipment in order to install the valve actuator at the required location. The valve actuator model and its size are indicated on the nameplate. You will find the weight of the valve actuator in the following table.

Size of the valve actuator	30	60	120	250	500	1000	2500	5000
Double-acting Model A	10,1	16	28	51	100	420	970	1700
Single-acting Model F	13,2	21	56	85	160	580	1250	1900

Weight figures in kg

3. Fitting

Carry out the following procedure when you are fitting the valve actuator:

- Cautiously push the actuating shaft onto the valve shaft. When you are doing this, make sure that the valve actuator comes to rest exactly and flatly against the adapter, so that no stresses can be created on the valve shaft.

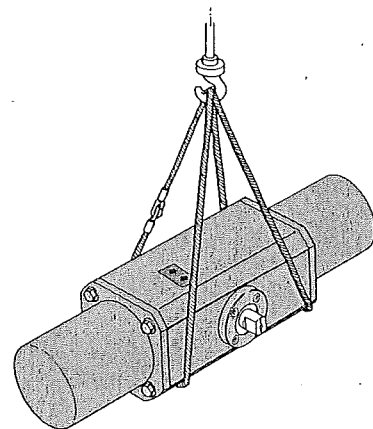
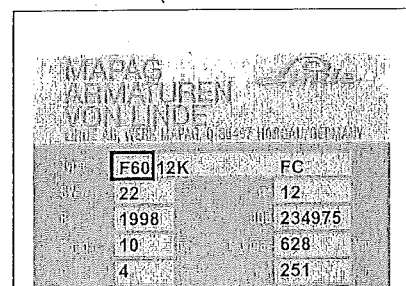
If you are fitting the valve actuator to a MAPAG butterfly valve, make sure that the groove on the actuating shaft corresponds to the position of the shut-off disc (see the illustration on the right).

If it is necessary, you can turn the actuating shaft of the valve actuator 90°. This is possible because the actuating shaft in the valve actuator has teeth all the way round it. Should you need to do this, remove the actuating shaft in accordance with the instructions given on pages 13 and 14.

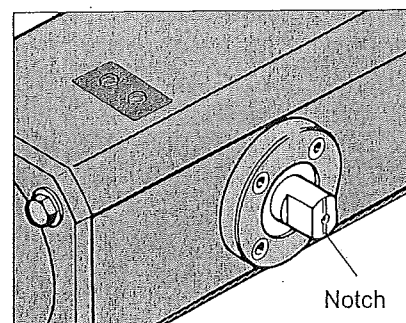
Installation



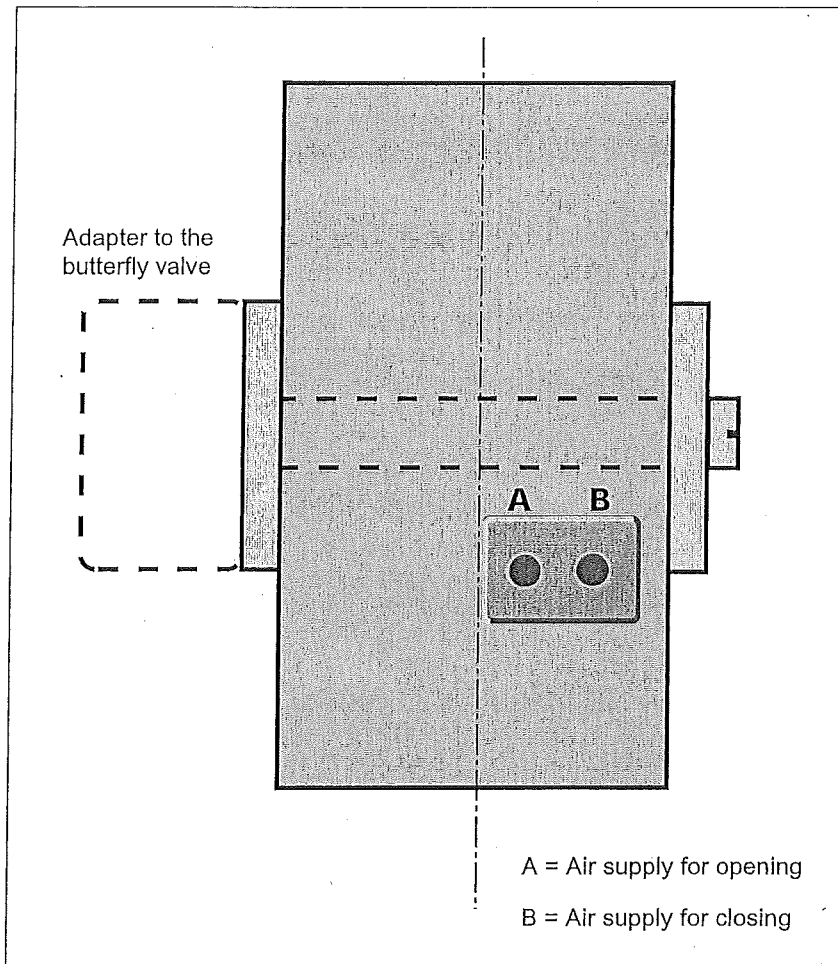
Nameplate
(Model F60 in this case)



The groove on the actuating shaft corresponds to the position of the shut-off disc



- Attach the valve actuator to the adapter with eight bolts (up to model A500: four bolts).
- Connect the energy supply in a final operation



Connection of the pneumatic supply

4. Additional equipment

There is a considerable danger of injury when any maintenance work is being carried out due to the unintentional actuation of the remote control.

If you use a remote control to operate the valve actuator, you must therefore install a device that interrupts the energy supply in the valve actuator for safety reasons (e.g. an emergency stop switch).



Preparations

If the valve actuator is installed on a pipe, the following conditions have to be met before the valve actuator is removed:

- Make sure that no trouble will be caused by removing the valve actuator.
- Check carefully whether a hot medium has been running through the pipe and whether the valve actuator has cooled down enough so that there is no further danger due to extreme temperatures.
- Check to make sure that the staff removing the valve actuator are not in any danger due to the medium that last flowed through the butterfly valve.

If you are not removing the valve actuator yourself, warn the staff who are carrying out this assignment.

Removal

Carry out the following operations in the specified order when you are removing the valve actuator:

- Switch the energy supply to the valve actuator off. To do this, actuate the EMERGENCY STOP switch for the energy supply to the valve actuator or safeguard the remote control unit in such a way that no-one can switch the energy supply back on again by mistake.
- Secure the valve actuator with ropes.
- Transport the valve actuator in such a way that it cannot move or be damaged in the course of the transport operation.

MAPAG double-piston part-turn valve actuators are hard-wearing and require very little maintenance. Make sure you always check the condition of the o-rings when completing servicing operations. You should check and if necessary replace the o-rings (7 - 9), the bearing seats (10 and 11), the bearing segments (12) and - on Model F - the springs (16) after two years at the latest.

In order to avoid lengthy stoppages when maintenance is being carried out, you should order the parts listed above in good time. You should keep o-rings and bearing seats in stock.

Removal of the valve actuator

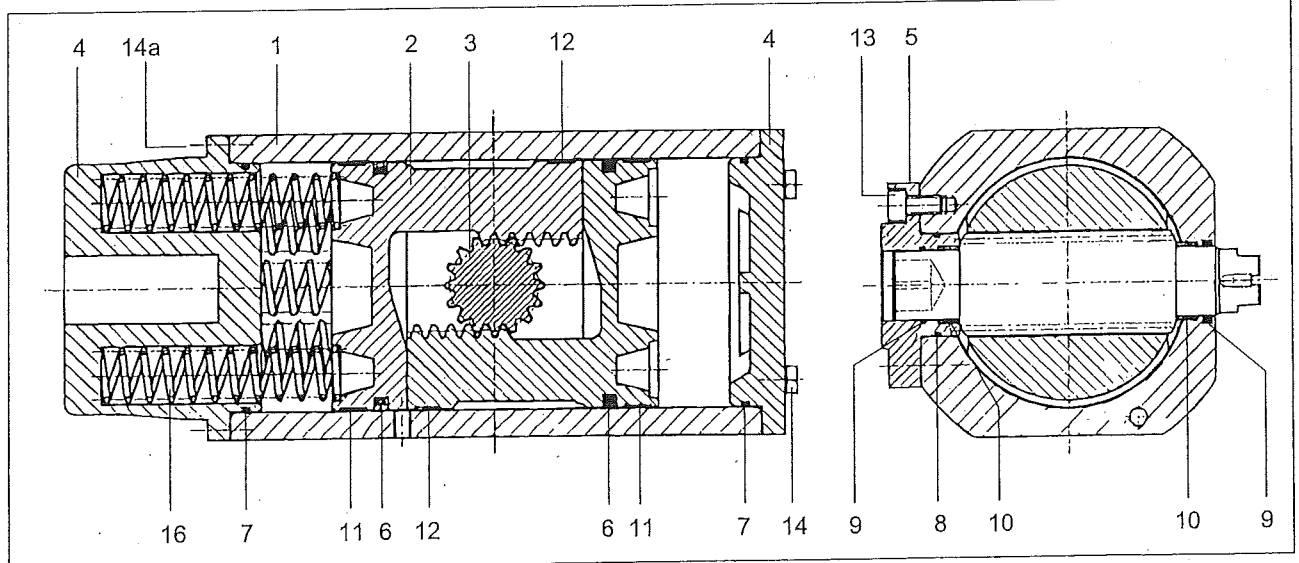
Maintenance

Please proceed as follows when you want to replace o-rings on the pistons and on the actuating shaft:

Replacement of the o-rings

1. Remove the valve actuator as outlined on page 13.
2. In the case of Model A, now remove the bolts (14) on both covers (4) and in the case of Model F, now remove the bolts (14a) on both end covers (4), so that the springs are no longer applying any pressure to the pistons. The length of the bolts has been calculated to make sure that the springs can be released completely! Replace the o-ring (7).
3. Now turn the actuating shaft manually using an open-ended wrench. Push the two pistons outwards in this way until they are no longer engaged by the toothed actuating shaft.
4. Remove both of the pistons and replace the o-rings (6), the bearing seats (11) and the bearing segments (12).
5. When the bolts (13) on the bearing flange (5) have been undone, force the actuating shaft out of the body in order to replace the o-rings (8, 8a) and (9) as well as the bearing seat (10) on the actuating shaft.

Replacement of the o-rings

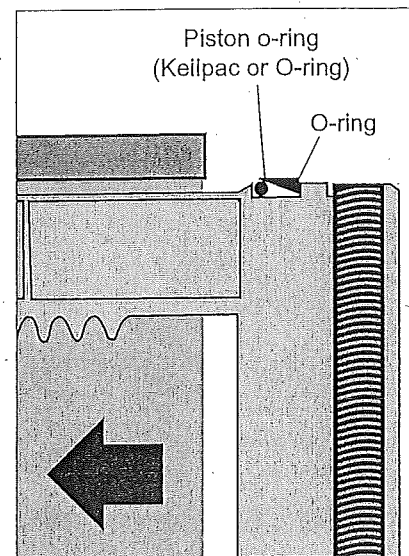


Proceed as follows when you are installing the actuating shaft and the pistons again:

Make sure you only use our special tool for installation purposes. If you do not, it is possible that the Keilpac may be damaged while it is still being fitted, so that it does not do its job properly.

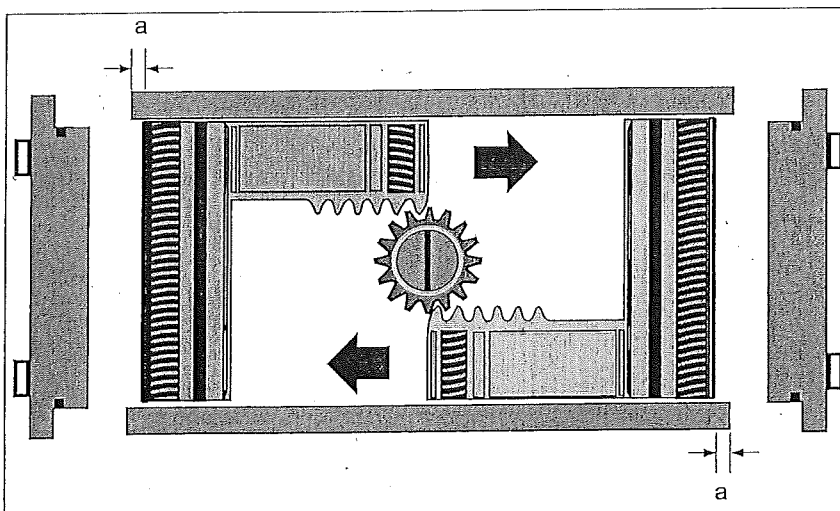
Ordering data:

Special clamp for actuator size	A/F 30	A/F 60	A/F 120	A/F 250	A/F 500
Ordering No.	446830	446860	446920	446850	446800



Pushing the piston into position

1. Equip the piston with new bearings and o-ring (see the illustration on the right). Put the special clamp around the bearing o-ring and tighten it until you reach the stop. The turning element on the clamp must point towards the teeth of the piston while you are doing this. The turning element fits exactly in the phase of the actuator body. Place the piston with the clamp on the assembled actuator body and then knock the piston out of the clamp and into the body. Turn the actuator body round and follow the same procedure with the second piston.



Refitting the pistons and the shaft

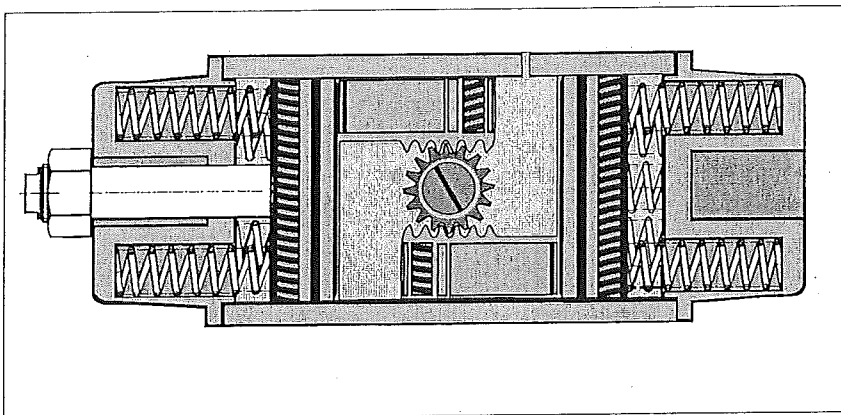
2. To align the piston, put the actuator in a horizontal position and turn the selector shaft slowly with the help of an open-ended spanner so that the pistons move apart and the selector shaft can be turned without having any further effects. While you are doing this, make sure that the pistons do not fall out again.

3. Now push both pistons inwards at the same time. The distances "a" (see the illustration above) must be identical.
4. Move the pistons inwards again manually with the help of the open-ended wrench applied to the actuating shaft.
5. Now put the two end covers (Model A) or the two spring covers and springs (Model F) back on again.
6. Do not put the valve actuator into operation until you have tightened all the attachment bolts (14/14a) securely. Before you start operating the valve actuator again, you should also make sure to check that it is working properly.
7. Now switch the energy supply back on again.

The MAPAG double-piston part-turn valve actuators are also available in a number of different functional alternatives:

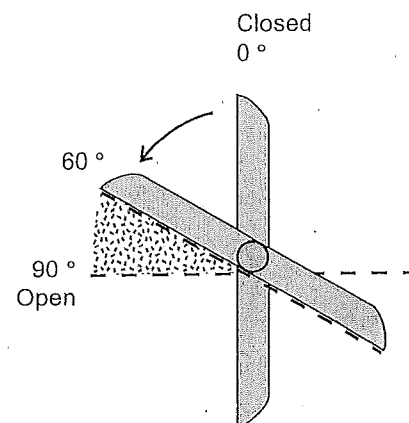
Part-turn valve actuator with an external stop

The external stop makes sure that the valve actuator does not complete a full 90° turn. This mechanical stop enables you, for example, to prevent a butterfly valve from opening entirely.



The external stop can be set individually. You can limit the angle to which the butterfly valve is opened on an infinitely variable basis from between 90° and 60°.

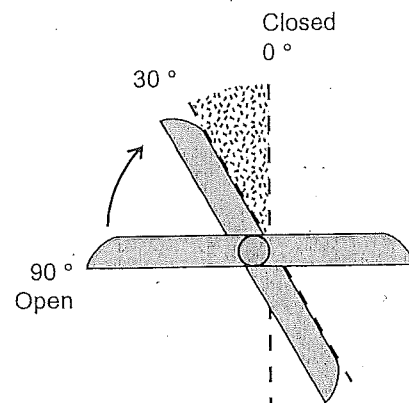
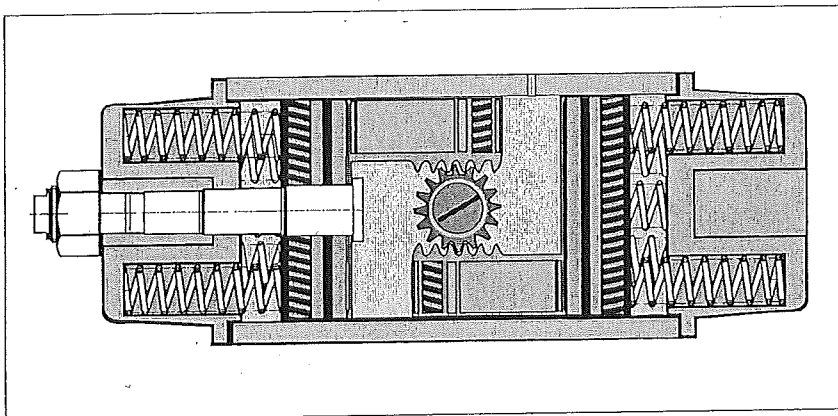
Model alternatives



Part-turn valve actuator with an external stop

Part-turn valve actuator with an internal stop

The internal stop makes sure that the pistons in the valve actuator do not close completely. This mechanical stop enables you, for example, to prevent a butterfly valve from closing entirely.

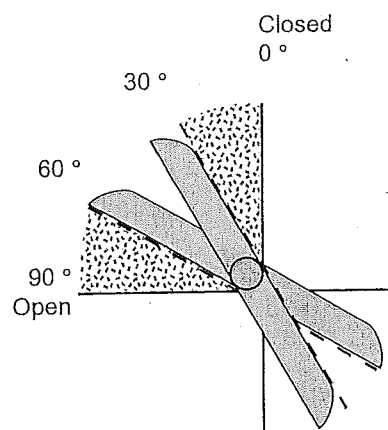
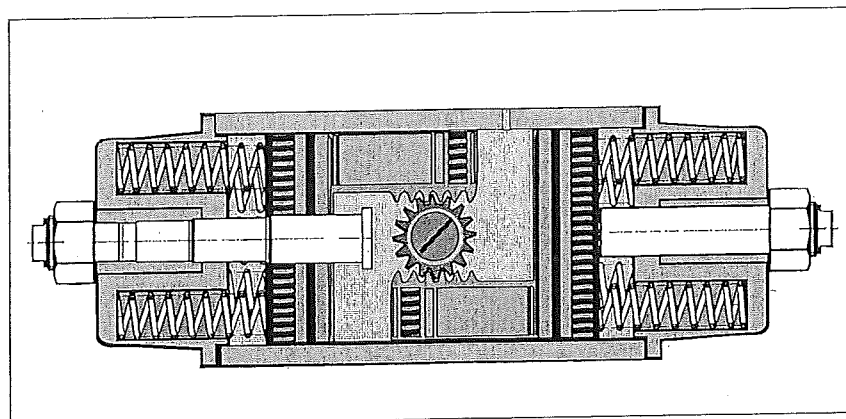


Part-turn valve actuator with an internal stop

The internal stop can also be set individually. You can adjust the open position of the shut-off disc on an infinitely variable basis between 0° and at least 30°.

Part-turn valve actuator with an internal and external stop

You can set your valve actuator to have a completely individual operating range between 0° and 90° with the help of a combined internal and external stop. This alternative is primarily advisable for applications in which the requirements on the butterfly valve vary constantly.

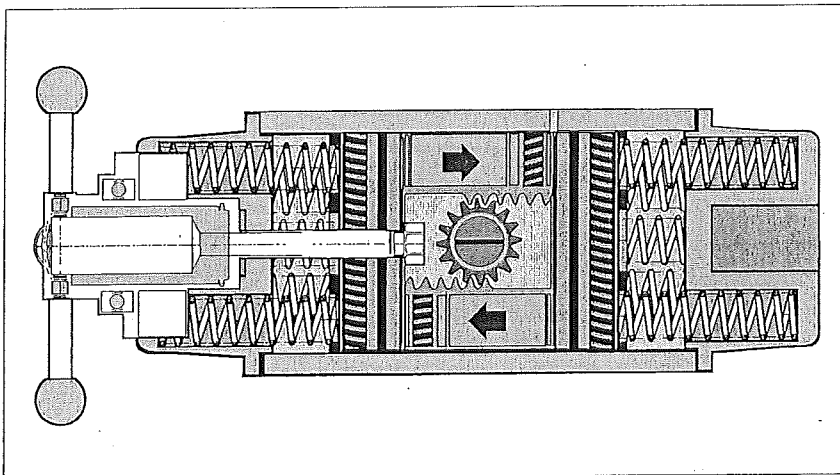


Part-turn valve actuator with an internal and external stop

Mechanical manual emergency actuation facility (up to size 500) with Model F single-acting valve actuators

You can change the position of the valve actuator manually when there is an interruption in the energy supply with the help of a manual emergency actuation facility.

The Model F single-acting part-turn valve actuator automatically takes up the end position you have chosen when there is an interruption in the energy supply. You can correct this movement again manually.



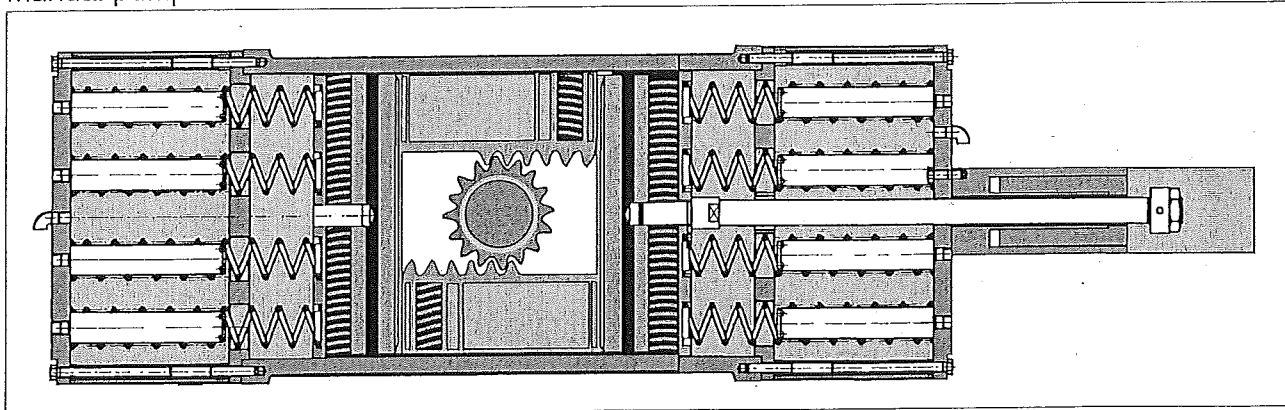
Part-turn valve actuator with a manual emergency actuation facility

Hydraulic manual emergency actuation facility (from size 1000 upwards)

The hydraulic manual emergency actuation facility consists of a hydraulic cylinder and a manual pump. It can be used for both types of valve actuator.

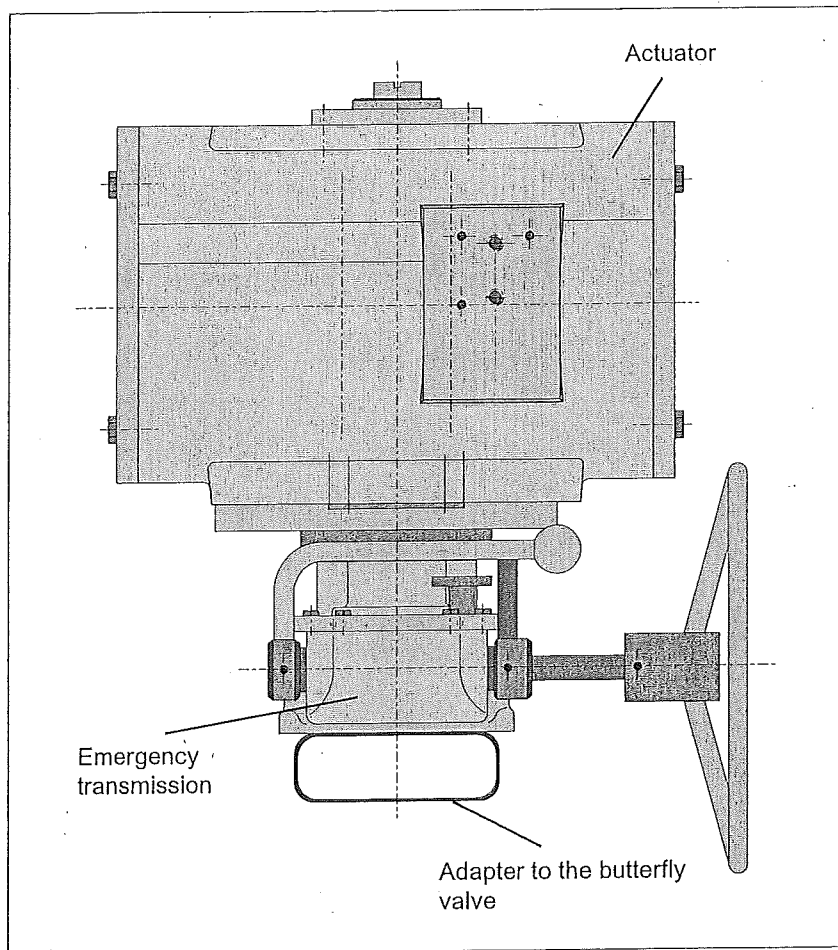
If the pneumatic supply system is interrupted, you can correct the end position of the relevant valve actuator with the help of the manual pump.

Hydraulic manual emergency actuation facility



Mechanical manual emergency actuation facility (up to size 500) with Model A double-acting valve actuators

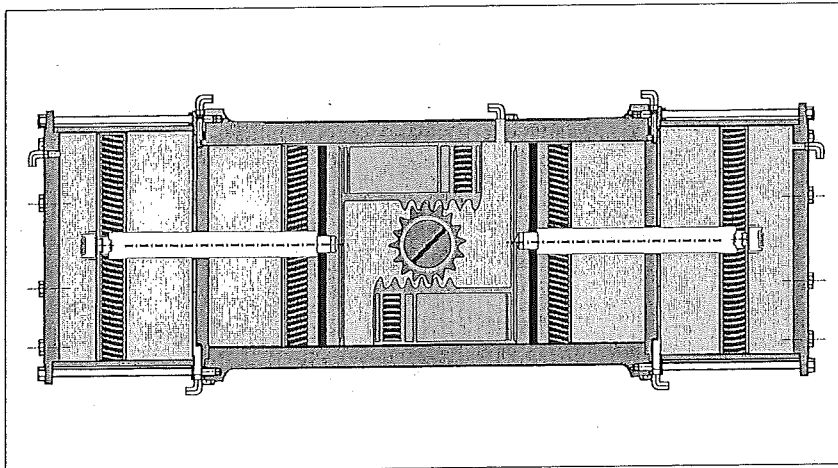
The Model A double-acting part-turn valve actuator stops in its current position if there is an interruption in the energy supply. You can open or close the valve manually.



Mechanical manual emergency actuation facility

Valve actuator with tandem cylinders

You can fit an additional cylinder on one or both sides of the part-turn valve actuator in order to increase its capacity.

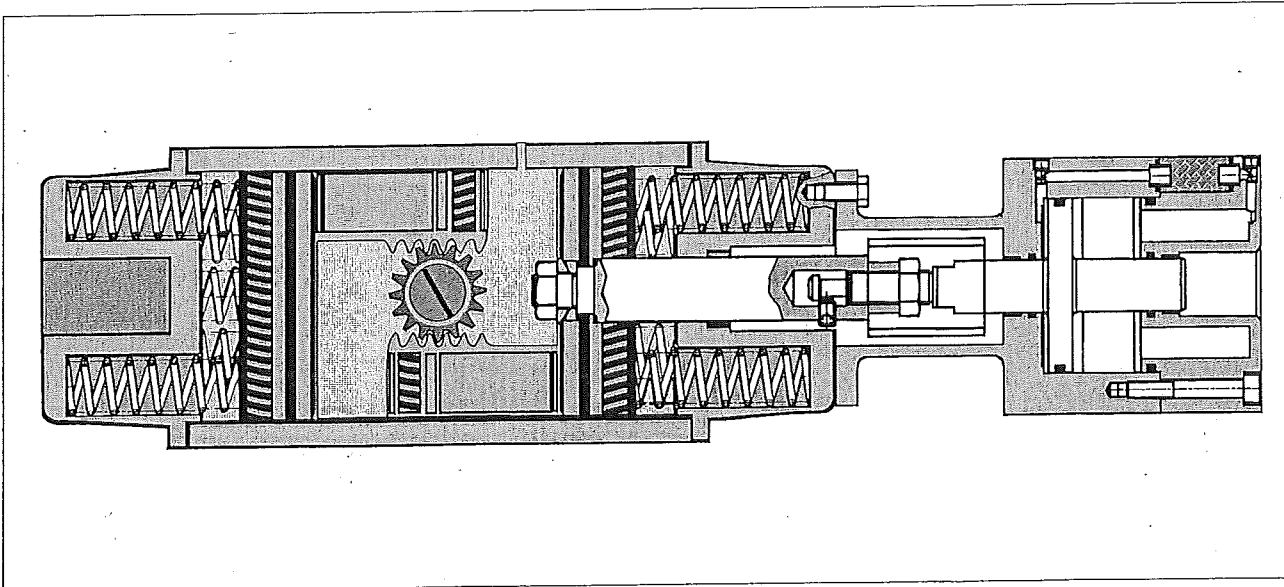


Model A part-turn valve actuator with tandem cylinders on both sides

Hydraulic end position damping

It is possible to fit a hydraulic end position damping device to the valve actuator in order to cushion the arrival of the butterfly valve at its two end positions.

Hydraulic end position damping



You can order the following auxiliary equipment for MAPAG double-piston part-turn valve actuators - to be retrofitted as well if necessary:

Auxiliary equipment

Limit switches

The limit switches we supply to you consist of an MAPAG terminal box (type: EPFN) with slot proximity switches. These limit switches are attached to the valve actuator with the help of an additional console in accordance with VDI/VDE 3845 and NAMUR. The slot proximity switches issue a signal when the valve actuator is in one of its end positions.

Control valves

You can on request be supplied with the valve actuator equipped with control valves: interface according to VDI/VDE and NAMUR and with a choice of 2/2, 3/2, 4/2, 5/2 or 5/3-port valves.

Position controllers

You can be supplied with position controllers in either a pneumatic or electro-pneumatic configuration. The position controllers can be attached to the valve actuator with the help of an additional console in accordance with VDI/VDE 3845 and NAMUR.

Most of the spare parts depend on the technical specification of your system.

Spare parts

Every time you place an order for spare parts, please indicate to us therefore not only the spare part number listed below but also the order number allocated by the Linde AG MAPAG plant under which the valve actuator was planned and supplied to you.

You can obtain the following individual parts of the valve actuator via our customer service department (we recommend that you keep the parts marked with an * in stock):

List of spare parts for the standard Model A valve actuator (double-acting)

1	Body	*	8a	O-ring
2	Piston	*	9	O-Ring
3	Actuating shaft	*	9a	O-Ring
4	End cover	*	10	Bearing seat
4a	End cover	*	10a	Bearing seat
4b	End cover	*	11	Bearing seat
5	Bearing flange	*	12	Bearing segment
5a	Bearing flange		13	Bolt
*	6	Keilpac	13a	Bolt
*	7	O-Ring	14	Bolt
*	8	O-Ring		

List of spare parts for the standard Model F valve actuator (single-acting)

1	Body	*	9	O-Ring
2	Piston	*	9a	O-Ring
3	Actuating shaft	*	10	Bearing seat
4	End cover	*	10a	Bearing seat
4a	End cover	*	11	Bearing seat
4b	End cover	*	12	Bearing segment
5	Bearing flange		13	Bolt
5a	Bearing flange		13a	Bolt
*	6	Keilpac	14	Bolt
*	7	O-Ring	14a	Bolt
*	8	O-Ring	16	Spring
*	8a	O-Ring		

Our guarantee commitments only apply if genuine spare parts are used.

Maintenance instructions for the use of actuators in explosive areas according to ATEX 94/9/EG

The mainsprings of single-acting actuators type F have to be replaced after a maximum of one million switching cycles or every two years, whatever may occur first.

When used in a corrosion-encouraging atmosphere or at the beginning of corrosion, respectively, the springs have to be replaced at an earlier stage.

Replacements:

Actuator	Spring	Item/ number
F15	410502	8-16
F30	410503	8-16
F60	410504	8-16
F120	410505	8-16
F250	410087	8-16
F500	410099	8-16
F1000	410508	8-16
F2500	410508	16-40

MAPAG ARMATUREN VON LINDE



Parts-List:

Description : Butterfly valve
 Custom-Order-No. : 4500024241
 Tag-No. : PK 40003
 MAPAG-Com.-No. : 28865
 MAPAG-Item-No. : 467555

DN : 400
 PN : 10
 Pos.-No. : 1
 Type : 400E570R010
 Drawing-No.: 464812

Date: 17.02.2005 Page 1 of 1

Pos.	Qty.	Description	It. - No.	Material
101	1	Body	464831	3.3547
103	8	Stud bold	434247	A2-70
104	8	Nut	003784	A2-70
105	1	Bulk	464840	1.4301
106	4	Screw	041173	A2-70
* 107	1	O-ring	277733	PTFE
108	1	Stud bold	444639	A2-70
201	1	Shut-off disc	462535	1.4571
401	1	Drive shaft	464844	1.4541
403	1	Pivot	464833	1.4541
* 404	1	Thrust bearing	428950	DU
* 405	1	Thrust bearing	428950	DU
411	1	Bearing bushing	464834	1.4541
412	4	Screw	276342	A2-70
413	4	Stud bold	434246	A2-70
414	4	Nut	003764	A2-70
415	4	Retaining plate	440812	A2
* 420	1	Bearing shell with collar	409619	METALOPLAST
* 424	1	Bearing bushing	411064	DU
* 425	1	Bearing bushing	411064	DU
442	2	Pin	425959	1.4301
450	1	Gland	428957	1.4571
* 451	1	Packing	412924	PTFE
452	1	Bottom ring	424617	1.4571
455	4	Nut	460995	1.4301
456	4	Disc	276270	A2
457	16	Plate spring	213588	1.4310
458	4	Stud bold	277748	A2-70
* 471	1	O-ring	413961	PTFE
501	1	Adapter	467558	1.4301
502	4	Screw	411550	A2-70
503	4	Screw	411550	A2-70
504	1	Coupling	467559	1.4305
600	1	Actuator	462884	F 250 - 90/12 -K

*= spare parts

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Linde AG Geschäftsbereich Linde Engineering Werk MAPAG

Von-Holzapfel-Strasse 4, 86497 Horgau - Telefon 08294 / 8695-0 - Fax 08294 / 8695-81, www.Linde.com

MAPAG ARMATUREN VON LINDE



Parts-List

Description : Actuator
 Custom-Order-No.: 4500024241
 Tag-No. : PK 40003
 MAPAG-Com.-No.: 28865
 MAPAG-Item-No. : 462884

Pos. : 1
 Type : F 250-90/12-K (-40°C)
 Drawing-No.: 431145

Date: 17.02.2005 Page 1 von 1

Pos.	Qty.	Description	Id. - No	Material
1	1	Casing	410064	3.2371.61-E
2	2	Piston	419820	3.2371.61
3	1	Shaft	410024	1.4021
4	2	Cap	410081	3.2371.61-E
5	1	Flange	410083	3.2371.61-E
5a	1	Flange	410049	3.2315.61-E
* 6	2	Keilpac	419768	PTFE/NBR
* 7	2	O-ring	276607	NBR
* 8	1	O-ring	276586	NBR
* 8a	1	O-ring	276588	NBR
* 9	2	O-ring	276584	NBR
* 10	2	Bearing bushing	410094	DU
* 11	2	Bearing bushing	410084	DU
* 12	2	Bearing bushing	410085	DU
13	4	Screw	321213	A2
13a	4	Screw	321213	A2
14a	8	Screw	411085	A2
16	12	Spring	410087	SPRING STEEL

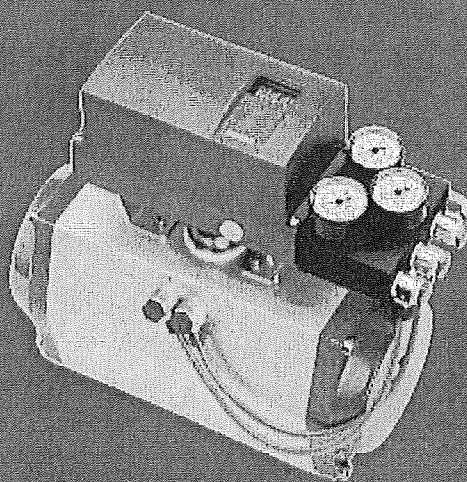
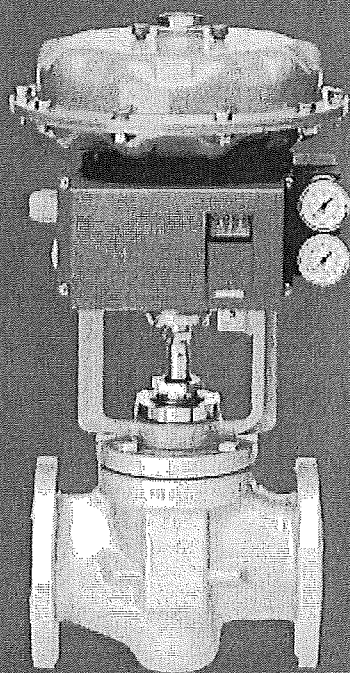
* = spare parts

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Operating Instructions Edition 05/2003



sipart ps2

Elektropneumatischer Stellungsregler
Electropneumatic Positioner
6DR5axb (a=0,1,2,3 / b=0,1,2)
(deutsch/english)

SIEMENS

SIEMENS

SIPART PS2

6DR50x0-xxxxx	6DR50x1-xxxxx	6DR50x2-xxxxx
6DR51x0-xxxxx	6DR51x1-xxxxx	6DR51x2-xxxxx
6DR52x0-xxxxx	6DR52x1-xxxxx	6DR52x2-xxxxx
6DR53x0-xxxxx	6DR53x1-xxxxx	6DR53x2-xxxxx

Ausgabe/Edition 05/2003

Betriebsanleitung Seite 3

Elektropneumatischer Stellungsregler
für Schub- und Schwenkantriebe

Operating instructions Page 43

Electropneumatic Positioner for
Linear and Rotary Actuators

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Siemens AG
Bereich Automatisierungs- und Antriebstechnik
Geschäftsgebiet Prozessinstrumentierung- und Analytik
D-76181 Karlsruhe

Haftungsausschluss

Wir haben den Inhalt der Anleitung auf Übereinstimmung mit der beschriebenen Hard- und Software geprüft. Dennoch können Abweichungen nicht ausgeschlossen werden, so dass wir für die vollständige Übereinstimmung keine Gewähr übernehmen. Die Angaben in dieser Anleitung werden regelmäßig überprüft, und notwendige Korrekturen sind in den nachfolgenden Auflagen enthalten. Für Verbesserungsvorschläge sind wir dankbar.

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Siemens AG
Bereich Automation & Drives
Geschäftsgebiet Process Instrumentation and Analytics
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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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1 Safety Information

1.1 Meaning of Terms



DANGER

indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.



CAUTION

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

NOTICE used without the safety alert symbol indicates a potential situation which, if not avoided, may result in an undesirable result or state.



NOTE

indicates a reference to a possible advantage when this recommendation is followed.

1.2 Introduction

These Operating Instructions describe the basic steps for assembly, connection, and commissioning.

These Operating Instructions do not replace the Manual for the SIPART PS2 electropneumatic positioner. The Manual contains more detailed information about assembly, function, and operation.

The Manual can be ordered under Order No.

A5E00074631 (English)

A5E00074630 (German)

from one of our Siemens offices or representatives.

Danger-free use

This device has left the factory in a perfect condition as regards safety. The notes and warnings in these Operating Instructions must be observed by the user if this state is to be maintained and hazard-free operation of the device assured.

Qualified personnel

A qualified person in the sense of these Operating Instructions is one who is familiar with the installation, commissioning and operation of the device and who has the appropriate qualifications, e.g.:

- ☐ Is trained or authorized to energize, de-energize, ground and tag circuits and equipment in accordance with established safety practices
- ☐ Is trained in the proper care of protective equipment in accordance with established safety practices
- ☐ Is trained in first aid
- ☐ In the case of devices with explosion protection: is trained or authorized to carry out work on the electric circuits of potentially explosive equipment.



WARNING

The device must only be installed and operated by qualified personnel.
 The device is designed for connection to functional or safety extra-low voltage.
 The electric safety is determined by the power supply units alone.
 High positioning forces are generated by pneumatic actuators. To prevent injury, installation and operation must be carried out under strict observation of the safety regulations.
 Reference is specifically made here to the observance of the applicable safety regulations for potentially explosive equipment.

Correct and safe operation of this device is dependent on proper transport, storage and installation as well as careful operation and maintenance.

2 Scope of Delivery of Positioner

- ☐ Positioner as ordered
- ☐ Operating Instructions, German/English (enclosed with device)
- ☐ Leaflet "Operation – a concise overview", German and English (in the device)

3 Assembly

3.1 General



DANGER

The positioner and its option modules would be supplied as separate units and in different versions. Positioners and option modules are available for operation in zones with and without an explosion hazard. These versions are marked by a special rating plate.

When combining components, make sure that only positioners and option modules can be combined that are approved for the zone where they will be used. This especially applies to safe operation of the positioner in zone in which the atmosphere might be subject to an explosion hazard (Zones 1 and 2). In that case it is imperative to use categories (2 and 3) both of the device itself and its options.



CAUTION

It is essential that you observe the following sequence during assembly to avoid injuries or mechanical damage to the positioner/extension kit:

- | | |
|--|--------------------------------------|
| 1. Mechanical fitting of positioner | See Chapter 3 (depending on version) |
| 2. Connection of electric power supply | See Chapter 5, page 54 |
| 3. Connection of pneumatic supply | See Chapter 6, page 54 |
| 4. Put into operation | See Chapter 7, page 57 |

In addition you must always ensure that no water can penetrate through an open housing or screw joint. This can occur when the SIPART PS2 cannot not be assembled and connected immediately on site.

In general the SIPART PS2 may only be operated with dry compressed air. Therefore use the usual water separator. In extreme cases, an additional drying unit may even be required. This is particularly important when the SIPART PS2 is operated at low ambient temperatures. In addition, please ensure that the purging air changeover switch (on the valve manifold, above the pneumatic terminal block) is in the position OUT.

For rotary actuators that are exposed to strong acceleration forces or vibrations, please use a sufficiently stable console (e.g. sheet thickness > 4mm with backing) and the extension kit "linear actuator" or the integrated mounting for linear actuators.

3.1.1 Information on the use of positioners in wet environments

This information is important for the assembly and operation of the SIPART PS2 positioner in wet environments (frequent and heavy rain and/or long-term tropical condensation) for which the protection type IP 65 is no longer sufficient and, in particular, when there is a danger that the water can freeze.

To prevent water from entering into the device during normal operation (e.g. through the exhaust vents) or to prevent difficulties reading the display, please avoid the following unfavorable assembly positions.

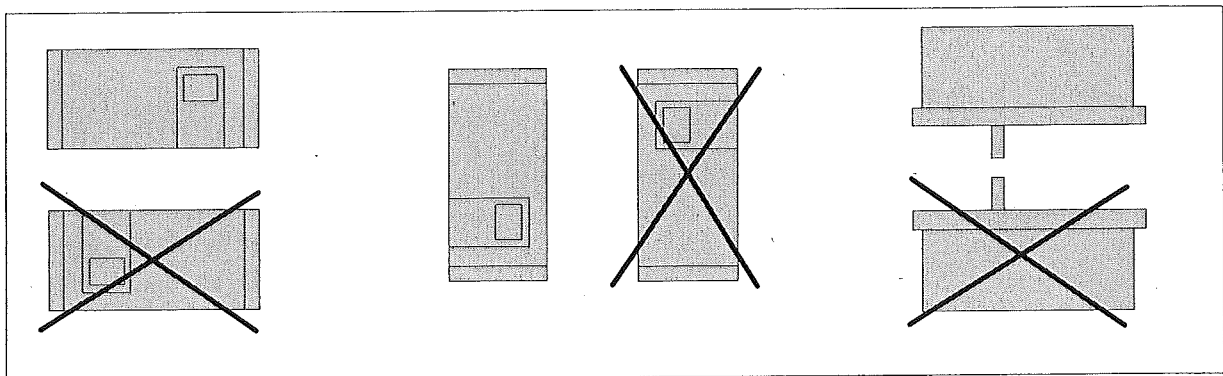


Fig. 1 Favorable and unfavorable assembly positions

If circumstances force you to operate the SIPART PS2 in an unfavorable assembly position, it is possible to prevent the penetration of water by means of additional measures.



CAUTION

Never clean the SIPART PS2 with high-pressure water cleaning apparatus because the protection type IP65 does not have sufficient protection for this.

The necessary additional measures against the penetration of water are dependent on the chosen assembly position and the following items may be required in addition:

- ☐ Screw joint with sealing ring (e.g. FESTO: CK -1 / 4-PK-6)
- ☐ Plastic tubing approx. 20 to 30 cm (e.g. FESTO: PUN- 8X1.25 SW)
- ☐ Cable ties (number and length dependent on the local conditions)

Procedure

- ☐ Arrange the piping in such a way that rain water or condensed water running down the pipes can drip off before reaching the terminal block of the SIPART PS2.
- ☐ Check the seals of the electrical connections for perfect seating.
- ☐ Check the seal in the housing cover for damage and soiling. If necessary, clean or replace.
- ☐ Mount the SIPART PS2 when possible so that the sintered bronze silencer on the underside of the housing faces downwards (vertical assembly position). If this is not possible, the silencer should be replaced by a suitable screw joint with plastic tubing.

Assembly of the screw joint with plastic tubing

- ☐ Unscrew and remove the sintered bronze silencer from the exhaust vent on the underside of the housing.
- ☐ Screw the above-mentioned screw joint into the exhaust vent.
- ☐ Mount the above-mentioned plastic tubing onto the screw joint and check for a tight fit.
- ☐ Fasten the plastic tubing with a cable tie to the fitting so that the opening is facing downwards.
- ☐ Ensure that the tubing is not kinked and that the exhaust air can flow out unhindered.

3.1.2 Information for the use of positioners that are exposed to strong acceleration forces or vibration

Fittings under heavy mechanical stresses such as from breakaway flaps, violently shaking or vibrating valves, or steam jets can be exposed to strong acceleration forces far above those specified. This can result, in extreme cases, to a shifting of the friction clutch.

For such cases the position controller equipped with a fixing device for the slip clutch with which adjustment due to the above mentioned influences can be prevented.

The setting possibility is accessible below the black knurled wheel and is recognizable from slots on the yellow wheel. The zero point adjustment and the setting possibility of the slip clutch are identified by symbols on an additional plate.

Procedure

After you have mounted the position controller and commissioned it completely, you can set the slip clutch torque as follows:

- ☐ Plug a conventional 4 mm wide screwdriver into a slot in the yellow wheel.
- ☐ Then turn the yellow wheel to the left with the screwdriver until it snaps in audibly. This increases the torque of the slip clutch.
- ☐ A fixed slip clutch is recognizable from an approx. 1 mm wide gap between the yellow and black wheel.
- ☐ If you have to make a zero point setting, e.g. after changing the drive, please reduce the torque first by turning the yellow wheel to the right stop. After the zero point setting, you can fix the slip clutch as described above.

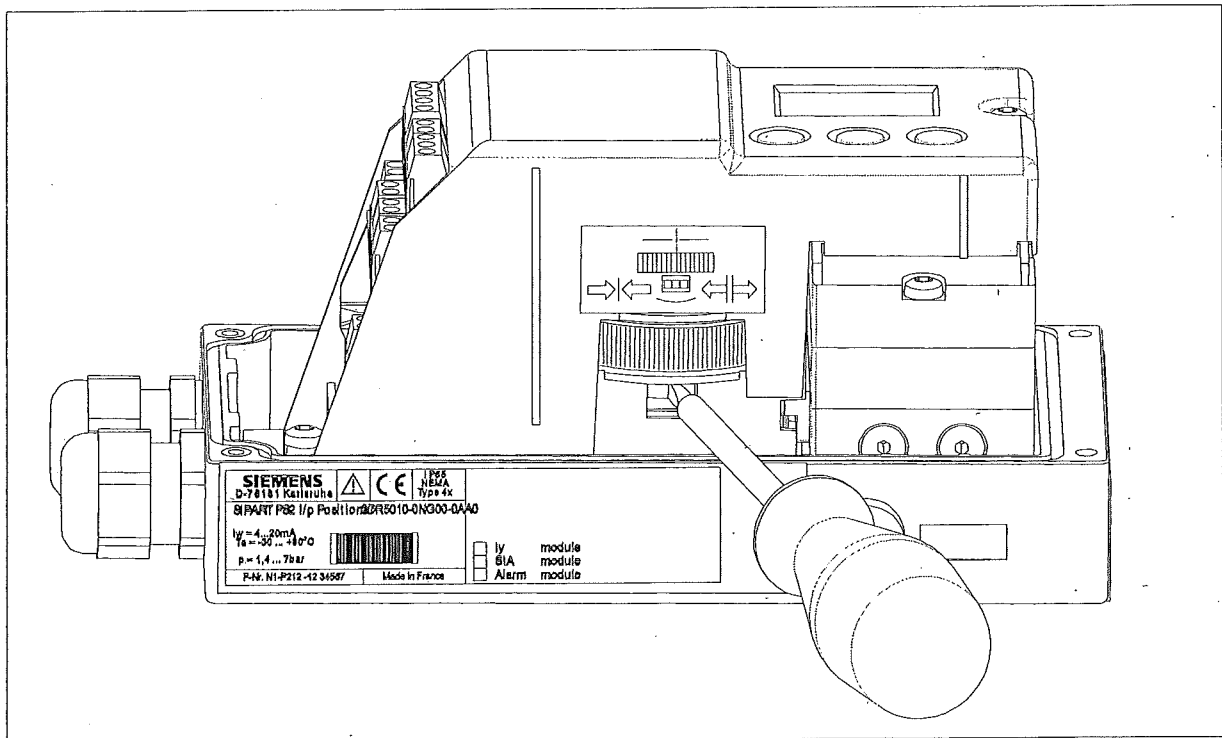


Fig. 2 Fixing device for the slip clutch

External position sensor

There are potential cases for which the above-mentioned measures are not sufficient. This could be, for example, in the presence of strong and lasting vibrations, increased or too low ambient temperatures, and in the presence of nuclear radiation.

In such cases, separate mounting of position sensor and control unit is helpful. For this, a universal component is available that is suitable for both linear and rotary actuators.

You will need the following:

- ☐ The position sensor unit (order number C73451-A430-D78). This consists of a SIPART PS2 housing with an integrated friction clutch, in-built potentiometer and various blind plugs and seals.
- ☐ The control unit, a SIPART PS2 positioner in any version.
- ☐ The EMC filter plate which is available in a set together with cable clamps and M-20 cable glands and has the order number C73451-A430-D23. The EMC filter plate must be mounted in the SIPART PS2 positioner. The Installation Instructions supplied with the EMC filter plate explains the assembly of the components.
- ☐ A three-pin cable to connect the components.

This upgrade set must also always be used for the control unit when any potentiometer (resistance value 10 kOhm) is mounted on the actuator instead of the position sensor unit C73451-A430-D78.

3.2 Extension Kit "Linear Actuator" 6DR4004-8V and 6DR4004-8L

The following are included in the *delivery of the extension kit* "Linear actuator IEC 534 (3 mm to 35 mm)" (see Figure 3 for item Nos.):

Item No.	Quantity	Designation	Remarks
1	1	NAMUR mounting bracket IEC 534	Standardized connection for mounting console with ledge, column or plane surface
2	1	Pick-up bracket	Guides the roll with driver pin and rotates the lever arm
3	2	Clamping assembly	Mounting of pick-up bracket on actuator spindle
4	1	Driver pin	Assembly with roll (5) on lever (6)
5	1	Roll	Assembly with driver pin (4) on lever (6)
6	1	NAMUR lever	For stroke range 3 mm to 35 mm For stroke ranges > 35 mm to 130 mm (special delivery), lever 6DR4004-8L is also required
7	2	U-bolt	Only for actuators with columns
8	4	Hexagon head screw	M8 x 20 DIN 933-A2
9	2	Hexagon head screw	M8 x 16 DIN 933-A2
10	6	Spring washer	A8 - DIN 127-A2
11	6	U-washer	B 5.4 - DIN 125-A2
12	2	U-washer	B 6.4 - DIN 125-A2
13	1	Spring	VD-115E 0.70x11.3x32.7x3.5
14	1	Spring washer	A6 - DIN 137A-A2
15	1	Lock washer	3.2 - DIN 6799-A2
16	3	Spring washer	A6 - DIN 127-A2
17	3	Hexagon head screw	M6 x 25 DIN 933-A2
18	1	Hexagon nut	M6 - DIN 934-A4
19	1	Square nut	M6 - DIN 557-A4
21	4	Hexagon nut	M8 - DIN 934-A4
22	1	Guide washer	6.2x9.9x15x3.5

3.2.1 Assembly Sequence

(see Figure 3, page 50)

1. Mount clamping assembly (3) with socket cap screws (17) and lock washers (16) on the actuator spindle.
2. Insert the pick-up bracket (2) into the recesses of the clamping assembly. Set the required length and screw only so tight that the pick-up bracket can still be shifted.
3. The center of the pin (4) is set to the value of the stroke range specified on the actuator or set to the next large scale value. The same value can be set later for 3.YWAY during start-up, to display the travel in mm after initialization.
4. Push the lever onto the positioner shaft as far as possible, and secure with the socket cap screw (17).
5. Fit the mounting bracket (1) with two hexagonal head screws (9), lock washer (10) and flat washer (11) on the rear of the positioner.
6. Selection of the row of holes depends on the width of the actuator yoke. The roll (5) should engage in the pick-up bracket (2) as close to the spindle as possible, but must not touch the clamping assembly.
7. Hold the positioner with the mounting bracket on the actuator such that the roll (5) is guided within the pick-up bracket (2).
8. Tighten the pick-up bracket.
9. Position the mounting parts according to the type of actuator.
 - Actuator with ledge: hexagonal head screw (8), flat washer (11) and lock washer (10).
 - Actuator with plane surface: four hexagonal head screws (8) with flat washer (11) and lock washer (10).
 - Actuator with columns: two U-bolts (7), four hexagonal nuts (21) with flat washer (11) and lock washer (10).
10. Secure positioner onto the yoke using the previously positioned mounting parts.



NOTE

Adjust the height of the positioner such that the horizontal lever position is reached as close as possible to the center of the stroke. You can use the lever scale of the actuator for orientation. It must always be guaranteed that the horizontal lever position is passed through within the stroke range.

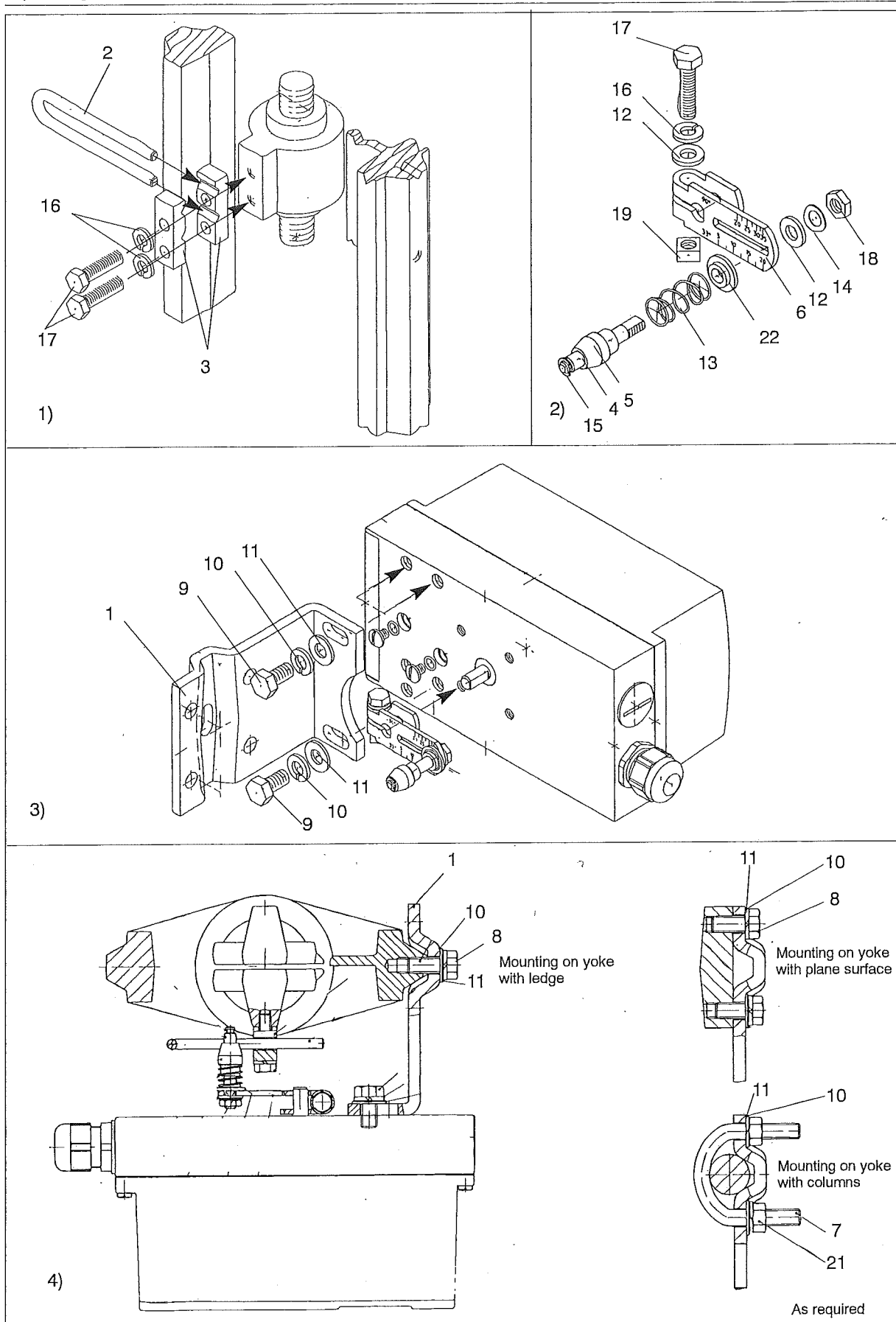


Fig. 3 Assembly sequence (linear actuator)

3.3 Extension Kit "Rotary Actuator" 6DR4004-8D

The following are included in the *delivery of the extension kit "Rotary actuator"* (see Figure 4, page 52 for item Nos.):

Item No.	Quantity	Designation	Remarks
2	1	Coupling wheel	Mounting on position feedback shaft of SIPART PS2
3	1	Driver	Mounting on end of actuator shaft
4	1	Multiple scale	Indication of actuator position, comprising 4.1 and 4.2
4.1	8	Scale	Different divisions
4.2	1	Pointer	Reference point for scale (adhesive label)
14	4	Hexagon head screw	DIN 933 – M6 x 12
15	4	Lock washer	S6
16	1	Fillister head screw	DIN 84 – M6 x 12
17	1	Washer	DIN 125 – 6.4
18	1	Hexagon socket screw	Premounted with coupling wheel
19	1	Allen key	For item 18

3.3.1 Assembly Sequence

(see Figure 4, page 52)

1. Place VDI/VDE 3845 mounting console ((9), actuator-specific, scope of supply of actuator manufacturer) onto rear of positioner and secure using hexagon head screws (14) and lock washers (15).
2. Adhere pointer (4.2) onto mounting console in the center of the centering hole.
3. Push coupling wheel (2) onto positioner axis as far as possible, pull back by about 1 mm, and tighten hexagon socket screw (18) using the supplied Allen key.
4. Place the driver (3) onto the end of the actuator shaft and secure using Fillister head screw (16) and washer (17).
5. Carefully place positioner with mounting console onto the actuator such that the pin of the coupling wheel engages in the driver.
6. Align the positioner/mounting console assembly in the center of the actuator and screw tight. (Screws not included in delivery; they are part of the actuator mounting console!)
7. Following startup as described in Section 7: Drive actuator to end position and adhere scale (4.1) onto the coupling wheel (2) according to the direction of rotation or the turning range. *The scale is self-adhesive!*

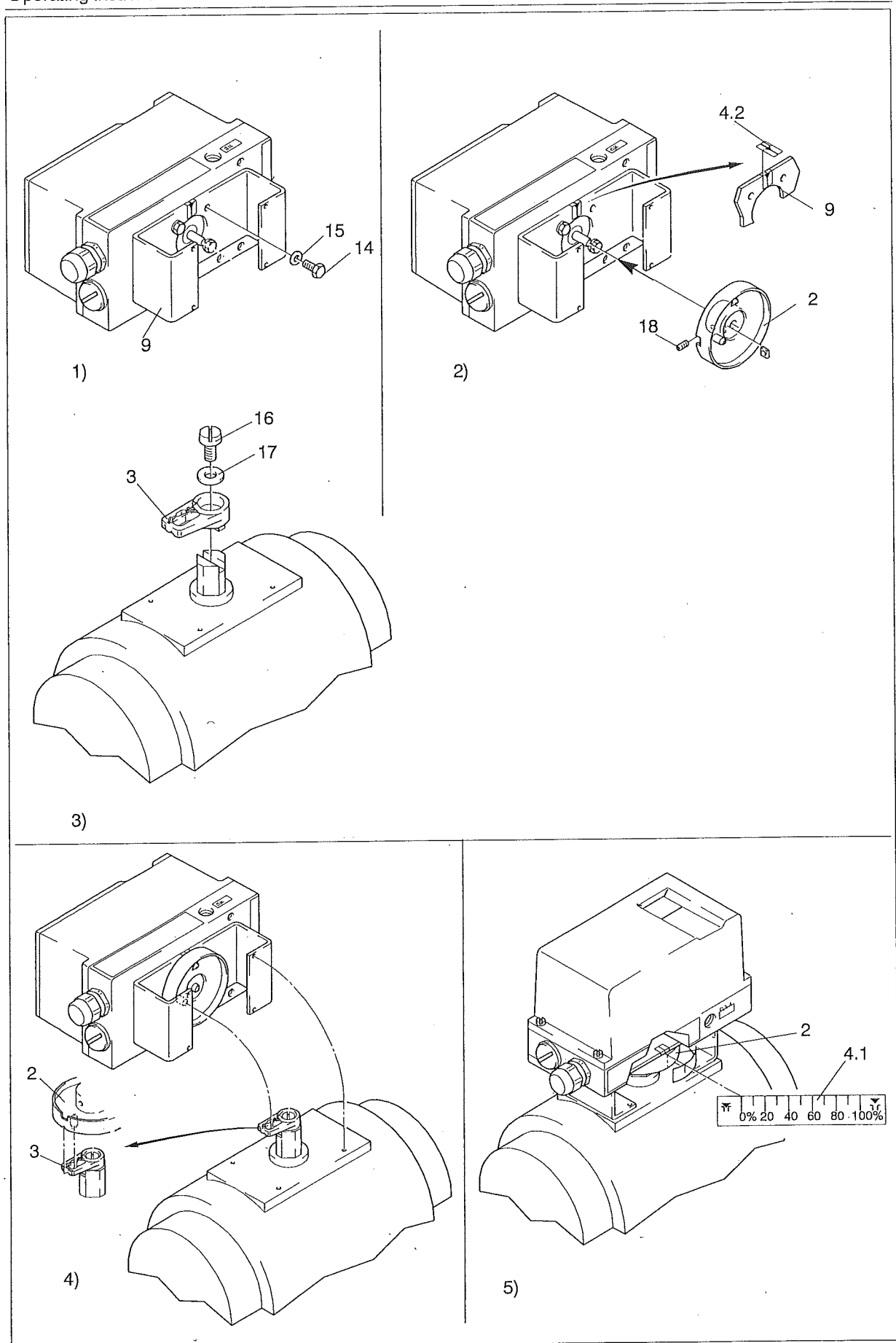


Fig. 4 Assembly sequence (rotary actuator)

4 Installation of Options

(see Figure 9, page 97)

- ☐ Unscrew housing cover.
- ☐ Unscrew module cover (1).
- ☐ **J_y module:** Insert the J_y module (3) into the lower PCB slot guide of the container, make the electrical connection with the accompanying ribbon cable (6).
- ☐ **Alarm module:** Insert the alarm module (4) into the upper PCB slot guide of the container, make the electrical connection with the accompanying ribbon cable (5).
- ☐ **SIA module** (slot-type initiator alarm module)
 1. Remove all electrical connections of the basic electronics (2).
 2. Loosen the two fixing screws (2.1) of the basic electronics.
 3. Unclip the basic electronics by carefully bending out from the four attachment points.
 4. Guide the SIA module (7) from above until the upper PCB slot guide of the container is reached.
 5. Push the SIA module approx. 3 mm to the right into the PCB slot guide of the container.
 6. Screw in the special screw (7.1) through the SIA module into the shaft of the positioner (**Torque: 2 Nm**)



CAUTION

The pins pushed into the control-gate valve bearing must be aligned shortly before contact with the special screw. When screwing-in further, the control-gate valve bearing and the special screw must be turned simultaneously so that the pins insert into the special screw. The SIA module may be damaged if you will not observe this.

7. Place the insulation cover (10) over the SIA module on one side under the seating area of the basic electronics on the container wall. The openings on the insulation cover must fit onto the corresponding studs on the container wall. By carefully bending the container walls, fit the insulation cover over the SIA module.
8. Clip the basic electronics into the four attachment points and screw down the basic electronics with the two fixing screws (2.1).
9. Make all the electrical connections between the basic electronics and options with the accompanying ribbon cables and between the basic electronics and the potentiometer with the potentiometer cable.
10. Attach the supplied module cover instead of the standard cover with the two screws.
11. Select the plates from the accompanying set of plates to correspond with those that were already present on the standard version of the module cover. Stick the selected plates onto the mounted module cover in accordance with the standard version.
12. Make all the electrical connections.

Setting the two limits:

13. Move the actuator to the first desired mechanical position.
14. Adjust the upper adjustment screw (for output terminals 41, 42) by hand until the output level changes.
15. Move the actuator to the second desired mechanical position.
16. Adjust the lower adjustment screw (for output terminals 51, 52) by hand until the output level changes.



NOTE

By rotating the adjustment screw past the level-changed value to the next level-changed value, you can set a High-Low or a Low-High switch.

5 Electric Connection

(see Figure 10 to 21, page 98 to 103)

Electric connection:	Screw terminals 2.5 mm ²
Cable inlet:	M20 x 1.5
Signal range	
Setpoint w:	4 to 20 mA With 2-wire connection
	0/4 to 20 mA With 3-wire or 4-wire connection
	Power supply U _H : 18 to 30 V

The plastic housing is metallize coated inside against high-frequency radiation. This shield is connected with the female thread jacks on the back side (see figure 5).

Please note that one of them must at least be connected to ground.

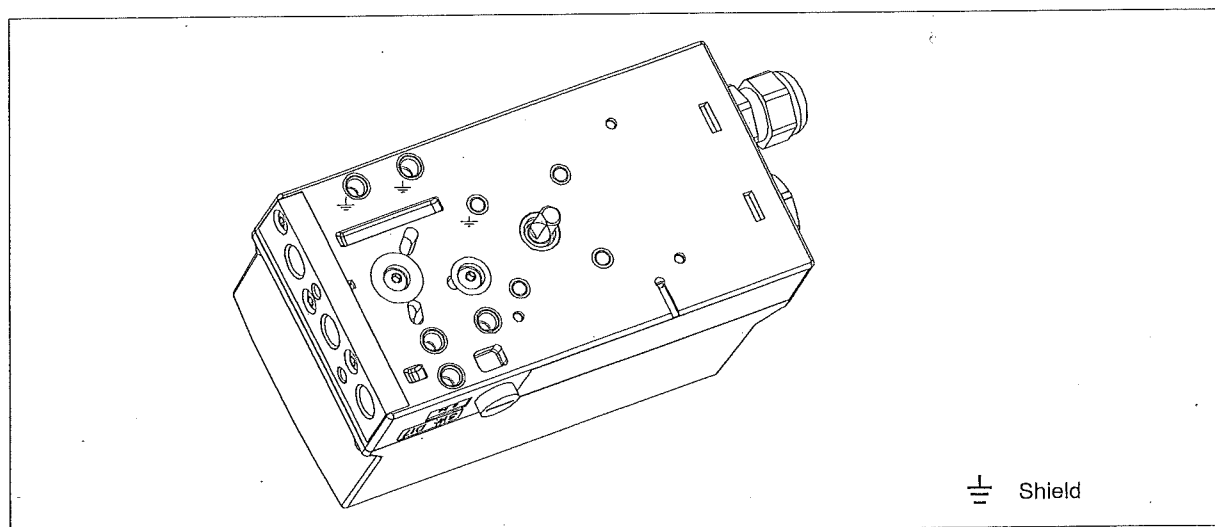


Fig. 5 Ground plate

6 Pneumatic Connection



CAUTION

If the electric supply is connected, the pneumatic supply must only be connected following assembly if the positioner is switched to the input level "P manual mode" (for the as supplied conditions, see leaflet "Operation – a concise overview").

NOTICE

Ensure that the air quality is suitable! Grease-free industrial air, particulates < 30 µm, pressure dew point 20 K below lowest ambient temperature.

The pneumatic connections are located on the right-hand side of the positioner (Figure 6).

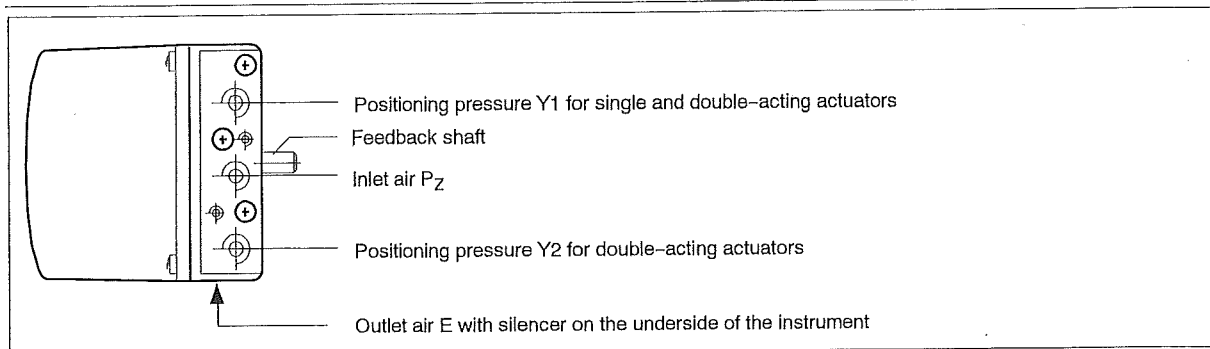


Fig. 6 Pneumatic connection

Two pneumatic connections for the integrated installation of single-acting linear actuators are located on the rear of the positioner:

- ☐ Positioning pressure Y1
- ☐ Air outlet E

These connections are locked with screws when supplied.

Outlet air E can be used to ensure a flow of dry instrument air through the pick-off area and the spring chamber to prevent corrosion.

Procedure:

- ☐ Connect manometer for inlet air pressure and positioning pressure in necessary.
- ☐ Connection via female thread G 1/4 DIN 45141:
 - PZ Inlet air 1.4 to 7 bar
 - Y1 Positioning pressure 1 for single-action and double-action actuators
 - Y2 Positioning pressure 2 for double-action actuators
 - E Exhaust output (remove silencer if necessary)
- ☐ Safety setting on failure of electric supply:
 - single-action: Y1 Vented
 - double-action: Y1 Max. positioning pressure (inlet air pressure)
 - Y2 Vented
- ☐ Connect positioning pressure Y1 or Y2 (only with double-action actuators) according to desired safety setting.
- ☐ Connect inlet air to PZ.



NOTE

Spring return actuators need sufficient high supply pressure so that the complete stroke can be travelled up to the end position of the actuator.

6.1 Purging air switchover

The purging air changeover switch above the pneumatic terminal block (Figure 7) on the valve manifold can be accessed when the housing is open. When the switch is in position IN the interior of the housing is purged with very small quantities of clean and dry instrument air. In position OUT the purging air is led directly out of the instrument.

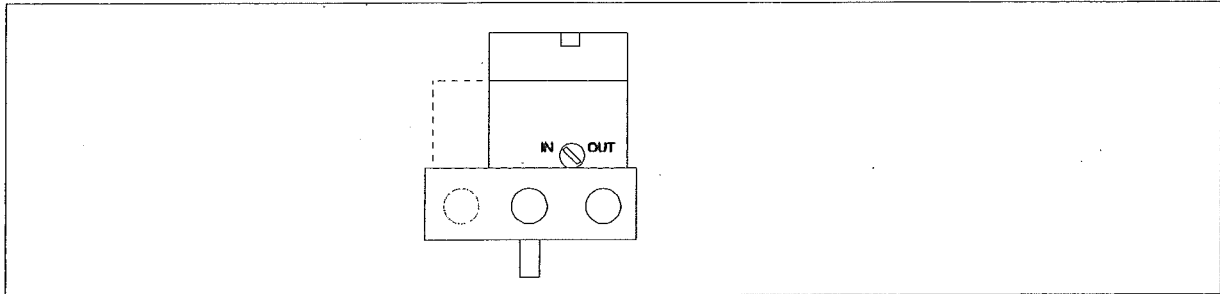


Fig. 7 Purging air changeover switch above the pneumatic terminal block, view of the device on the pneumatic connection side with the cover open

6.2 Restrictors

To increase the positioning times for fast actuators when necessary, the air flow can be reduced with the restrictors Y1 and Y2 (only for double-action valves) (Figure 8). Turning the restrictors in the clockwise direction reduces the air flow until it is shut off. To set the restrictors we recommend closing them first and then opening them again slowly (see Initialization RUN3). In case of double-action valves please note that both restrictors are set alike.

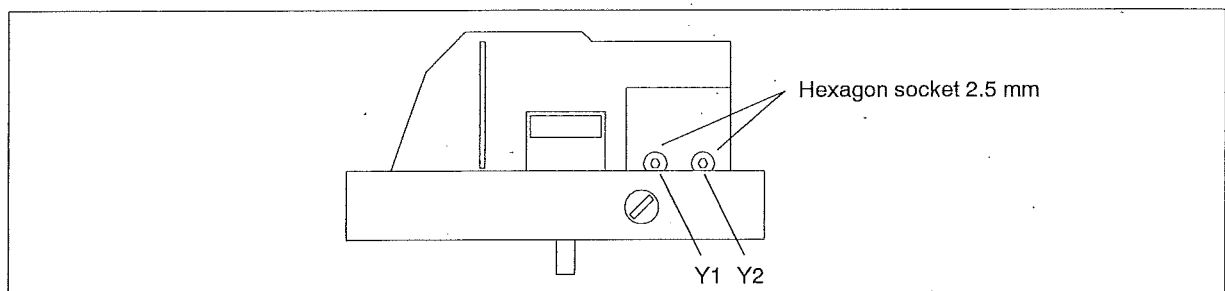


Fig. 8 Restrictors

7 Commissioning (see Leaflet "Operation – a concise overview")

Because of the numerous applications it can have, the positioner must be adapted to the actuator after assembly (initialized). This initialization can be undertaken in three different ways:

☐ Automatic initialization

The initialization is automatic. The positioner determines sequentially the direction of action, the travel or the rotational angle, the travel times of the actuator and adapts the control parameters to the dynamic behavior of the actuator.

☐ Manual initialization

The travel or the rotational angle of the actuator can be set manually; the remaining parameters are automatically determined as for automatic initialization. This function is required for soft end stops.

☐ Copying initialization data (replacing the positioner)

For devices with HART function, the initialization data of a positioner can be read out and transmitted to another positioner. Therefore it is possible to exchange a defective device without interrupting the running process by an initialization.

Before initialization, you only have to set a few parameters for the positioner. The remaining parameters are set with default values that you do not normally have to alter. If you observe the following points, you will not have any problem with commissioning.



NOTE

You can return to the previous parameter by pressing the and keys simultaneously.

7.1 Preparation for linear actuators

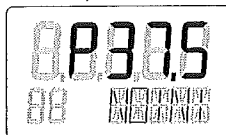
1. Mount the positioner with the appropriate mounting kit (see Chapter 3.2, page 48).

NOTICE

The position of the leverage ratio switch in the positioner is especially important and on page 95 in the Leaflet "Operation – a concise overview" point 7 of figure "View of device":

Stroke	Lever	Position of the leverage ratio switch
5 to 20 mm	short	33° (i.e. below)
25 to 35 mm	short	90° (i.e. above)
40 to 130 mm	long	90° (i.e. above)

2. Push the driver pin (4, Figure 3, (page 50) 2) on the lever (6, Figure 3, 2) to the scale position corresponding to the nominal stroke or the next highest scale position and screw the driver pin tight with the nut (18, Figure 3, 2).
3. Connect the actuator and positioner with the pneumatic cables and supply pneumatic power to the positioner (see Chapter 6, page 54).
4. Connect a suitable current or voltage source (see Figure 10, page 98 to Figure 15, page 100).
5. The positioner is now in "**P manual**" mode. On the upper line of the display, the current potentiometer voltage (P) is displayed as a percentage, e.g. "**P37.5**", and on the lower line "**NOINI**" is blinking:
Display:



6. Check that the mechanism is able to move freely over the entire setting range by moving the actuator into each final position with the and keys.




NOTE

You can move the actuator quickly by pressing the other direction key while you hold the first direction key down.


7. Now move the actuator into the horizontal position of the lever. The display should show a value between **P48.0** and **P52.0**. If that is not the case, adjust the friction clutch (8, Fig. 3) until "**P50.0**" is shown when the lever is horizontal. The more precisely you achieve that value, the more accurately the positioner can determine the displacement.

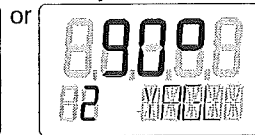
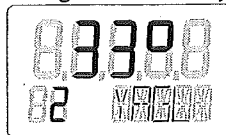
7.1.1 Automatic initialization of linear actuators

If you can move the actuator correctly, leave it in a central position, and start automatic initialization:

1. Press the mode key  for more than 5 s. This takes you into Configuration mode.
Display:




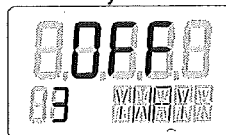
2. Switch to the second parameter by pressing the mode key  briefly.
Display:




NOTE

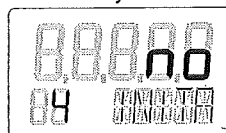
This value must match the setting of the leverage ratio switch (7, Leaflet "Operation – a concise overview") (33° or 90°)


3. Switch to the following display with the mode key :
Display:

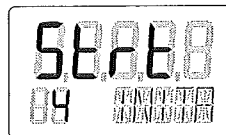


You only have to set this parameter if you want to have the calculated total stroke displayed in mm at the end of the initialization phase. To do that, select the same value in the display as the value to which you set the driver pin on the scale of the lever.

4. Switch to the following display with the mode key :
Display:



5. Start initialization by pressing the  key for more than 5 s.
Display:



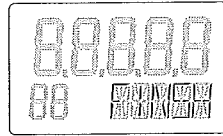
During the initialization process "**RUN1**" to "**RUN5**" appear one after the other in the lower display.



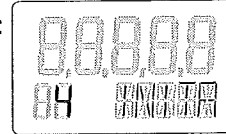
NOTE


The initialization process can take up to 15 min depending on the actuator.

Initialization is complete when the following display appears:



After you have pressed the mode key  briefly, the following display appears:



To exit **Configuration** mode press the mode key  for more than 5 s. After about 5 s, the software version is displayed. After you have released the mode key, the unit is in manual mode.


If you want to set further parameters, use the leaflet "Operation – a concise overview" or the Manual.

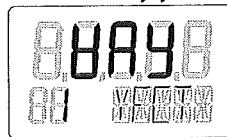
You can start reinitialization from manual or automatic mode at any time.


7.1.2 Manual initialization of linear actuators

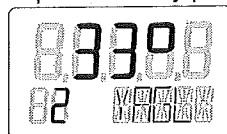
With this function, the positioner can be initialized without driving the actuator hard into the end stop. The start and end positions of the travel are set manually. The remaining steps for initialization (optimization of the control parameters) are automatically determined as for automatic initialization.

Sequence of steps for manual initialization for linear actuators

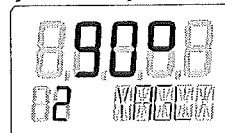
1. Carry out the preparations for linear actuators according to chapter 7.1, page 57. Ensure by driving manually over the entire travel that the displayed potentiometer setting lies within the permissible range of P5.0 and P95.0.
2. Press the mode key  for longer than 5 s. This way you will enter Configuration mode.
Display:



3. Switch to the second parameter by pressing the mode key  briefly.
Display:




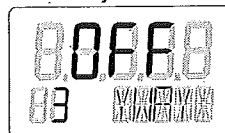
or the display




NOTE

This value must agree with the setting of the transmission ratio selector (33° or 90°).

4. Move to the following display with the mode key :
Display:



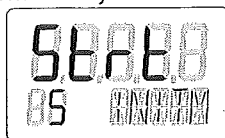
This parameter only has to be set if you wish to have the determined total stroke displayed in mm at the end of the initialization phase. To do this, select the same value in the display that you have set with the driver pin on the lever scale, or the next highest value for intermediate settings.

5. Move to the following display by pressing the mode key  twice:
Display:



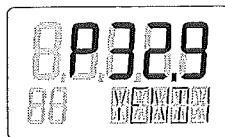
6. Start initialization by pressing the increment key for more than 5 s.

Display:




7. After 5 s, the display changes to:

Display:



(The display of the potentiometer setting is shown here and in the following as an example only).

Drive the actuator with the increment (+) and decrement (–) keys to the position that you wish to define as the first of the two end positions. Then press the mode key . In this way the current position is taken over as end position 1 and will switch to the next step.

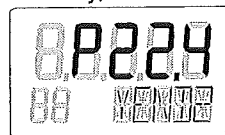
NOTE


If the message RANGE appears in the lower line, the selected end position is outside the permissible measuring range. There are several options to correct this error:

- Adjust the friction clutch until OK appears and then press the mode key once more, or
- Drive to another end position with the increment and decrement keys, or
- Interrupt the initialization by pressing the mode key. Then you have to switch to P–Manual mode and correct the travel and the position measurement according to step 1.

8. When step 7 has been completed successfully, the following display appears:

Display:



Now drive the actuator with the increment (+) and decrement (–) keys to the position that you wish to define as the second end position. Then press the mode key . The current position will now be taken over as the end position 2.

NOTE

If the message RANGE appears in the lower line, the selected end position is outside the permitted measuring range or the measuring span is too small. There several options to correct this error:

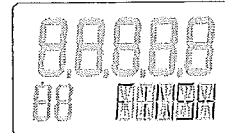
- Drive to another end position with the increment and decrement keys, or
- Interrupt the initialization by pressing the mode key. Then you have to switch to P–Manual mode and correct the travel and the position measurement according to step 1.

NOTE


If the message Set Middle appears, the lever arm must be moved to the horizontal position with the increment and decrement keys and then the mode key pressed. This sets the reference point of the sine correction for linear actuators.


9. The rest of the initialization occurs automatically. RUN1 through to RUN5 appear in the lower line of the display sequentially. When the initialization has been completed successfully, the following display appears:

Display:



In the first line, the determined stroke in mm will appear in additional if the set lever length has been entered with the parameter 3.YWAY.

After briefly pressing the mode key , 5.INITM appears once more in the lower line. This means that you are now in Configuration mode once more.

To leave Configuration mode, press the mode key  for more than 5 s. After approx. 5 seconds, the software version will be displayed. After releasing the mode key, the device will be in Manual mode.

7.2 Preparation for rotary actuators





NOTE

Especially important: Switch the leverage ratio switch (7, leaflet "Operation – a concise overview") in the positioner into position 90° (usual adjustment angle for rotary actuators).

1. Mount the positioner with the appropriate mounting kit (see Chapter 3.3, page 51).
2. Connect the actuator and positioner with the pneumatic cables and supply pneumatic power to the positioner (see Chapter 6, page 54).
3. Connect a suitable current or voltage source (see Figure 10, page 98 to Figure 15, page 100).
4. The positioner is now in "**P manual**" mode. On the upper line of the display, the current potentiometer voltage (P) is displayed as a percentage, e.g. "**P37.5**", and on the lower line "**NOINI**" is blinking:



5. Check that the mechanism is able to move freely over the entire setting range by moving the actuator into each final position with the  and  keys.




NOTE


You can move the actuator quickly by pressing the other direction key while you hold the first direction key down.

7.2.1 Automatic initialization of rotary actuators


Once you can move the actuator through its setting range correctly, leave it in a central position and start automatic initialization:

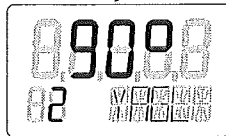
1. Press the mode key  for more than 5 s. This takes you into Configuration mode.
Display:




2. Set the parameter to "turn" with the  key:
Display:




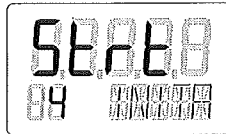
3. Switch to the second parameter by pressing the mode key  briefly.
The second parameter is set to 90° automatically.
Display:



4. Switch to the following display with the mode key :
Display:



5. Start initialization by pressing the  key for more than 5 s.
Display:



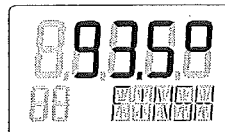
During the initialization process "RUN1" to "RUN5" appear one after the other in the lower display.



NOTE

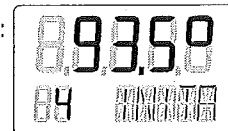
The initialization process can take up to 15 min depending on the actuator.


Initialization is complete when the following display appears:



The upper value shows the total angle of rotation of the actuator (example 93,5°).

After you have pressed the mode key  briefly, the following display appears:



To exit **Configuration** mode press the mode key  for more than 5 s. After about 5 s, the software version is displayed. After you have released the mode key, the unit is in manual mode.


If you want to set further parameters, use the leaflet "Operation – a concise overview" or the Manual.

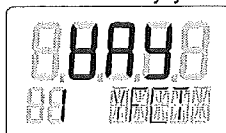
You can start reinitialization from manual or automatic mode at any time.

7.2.2 Manual initialization of rotary actuators

With this function, the positioner can be initialized without driving the actuator hard into the end stops. The start and end positions of the travel are set manually. The remaining steps for initialization (optimization of the control parameters) are automatically determined as for automatic initialization.


Sequence of steps for manual initialization for rotary actuators

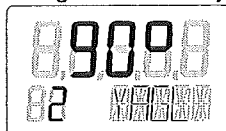
1. Carry out the preparations for rotary actuators according to chapter 7.2, page 61. Ensure by driving manually over the entire travel that the displayed potentiometer setting lies within the permissible range of P5.0 and P95.0.
2. Press the mode key  for longer than 5 s. This way you will enter Configuration mode.
Display:



3. Set the parameter YFCT to turn with the decrement key (-).
Display:




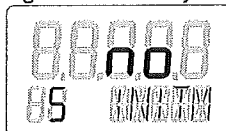
4. Switch to the second parameter by pressing the mode key  briefly.
Display:



NOTE


Ensure that the transmission ratio selector is at 90°.


5. Move to the following display by pressing the mode key  twice:
Display:



The following steps are identical to the steps 6) to 9) for the initialization of linear actuators.

After successful initialization, the determined rotation range appears in degrees on the upper display.

After pressing the mode key  briefly, 5.INITM appears in the lower display line. You are now once more in Configuration mode.

To leave Configuration mode, press the mode key  for more than 5 s. After approx. 5 seconds the software version will be displayed. After releasing the mode key, the device will be in Manual mode.

7.3 Copying initialization data (replacing the positioner)

With this function, you have the possibility to commission positioners without having to carry out the initialization procedure. This enables, for example, a positioner to be replaced on running equipment when an automatic or manual initialization cannot be carried out without interrupting the process.



NOTE

The initialization (automatic or manual) should be performed as soon as possible afterwards because only then is the positioner optimally adjusted to the mechanical and dynamic characteristics of the actuator.

The transfer of data from the positioner to be replaced to the replacement device takes place via the HART® communication interface.

To replace a positioner, the following steps must be carried out:

1. Read the device parameters and the initialization data (determined during initialization) from the positioner to be replaced with PDM or HART® Communicator and store. This step is not necessary if the device has been parameterized with PDM and the data are already saved.
2. Fix the actuator in its current position (mechanically or pneumatically).
3. Read the current position value from the display of the positioner to be replaced and note. If the electronics are defective, determine the current position by measurement of the actuator or valve.
4. Dismount the positioner. Mount the lever arm of the positioner onto the replacement device. Mount the replacement device onto the fittings. Place the transmission ratio selector at the same position as on the defective device. Read in the device data and initialization data from PDM or Handheld.
5. If the displayed current value does not agree with the noted value from the defective positioner, set the correct value with the friction clutch.
6. The positioner is now ready for operation.

The precision and the dynamic behavior could be limited in comparison to that from a correct initialization. In particular the position of the hard stops and the corresponding service data could show deviations. Therefore an initialization must be performed at the next possible opportunity.

7.4 Fault correction

Diagnostics indicator

	see	Table			
In which operating mode did the fault occur?					
• Initialization	1				
• Manual mode and automatic mode	2	3	4	5	
Under which circumstances and conditions did the fault occur?					
• Wet environment (e.g. heavy rain or constant condensation)	2				
• Vibrating fittings	2	5			
• Under impact or shock (e.g. steam jets or breakaway flaps)	5				
• Damp (wet) compressed air	2				
• Dirty (contaminated with solid particles) compressed air	2	3			
When does the fault occur?					
• Constantly (reproducibly)	1	2	3	4	
• Sporadically (not reproducible)	5				
• Usually after a certain operating period	2	3	5		

Fault description (symptoms)	Possible cause(s)	Corrective actions
<ul style="list-style-type: none"> SIPART PS2 comes to a halt in RUN 1 	<ul style="list-style-type: none"> Initialization started from the final stop and Reaction time of max. 1 min. not waited Network pressure not connected or too low 	<ul style="list-style-type: none"> Up to 1 min. waiting time required Do not start initialization from an end stop Confirm network pressure
<ul style="list-style-type: none"> SIPART PS2 comes to a halt in RUN 2 	<ul style="list-style-type: none"> Transmission ratio selector and parameter 2 (YAGL) and true stroke did not correlate Stroke on the lever incorrectly set Piezo valve(s) do not switch (see Table 2) 	<ul style="list-style-type: none"> Check settings: See leaflet: Figure Device view (7) and parameters 2 and 3 Check stroke setting on the lever see Table 2

Fault description (symptoms)	Possible cause(s)	Corrective actions
<ul style="list-style-type: none"> SIPART PS2 comes to a halt in RUN 3 	<ul style="list-style-type: none"> Actuator positioning time too long 	<ul style="list-style-type: none"> Open restrictor fully and/or set pressure PZ(1) to the highest permissible value Use booster if necessary
<ul style="list-style-type: none"> SIPART PS2 comes to a halt in RUN 5, does not reach FINISH (waiting time > 5 min) 	<ul style="list-style-type: none"> Play in the positioner, actuator, fittings system 	<ul style="list-style-type: none"> Linear actuator: Check seating of the stud screw of the coupling wheel Rotary actuator: Check seating of the lever on the positioner shaft Correct any other play between the actuator and the fittings

Table 1

Fault description (symptoms)	Possible cause(s)	Corrective actions
<ul style="list-style-type: none"> CPU test blinks in the display of the SIPART PS2 (ca. every 2 secs) Piezo valve(s) do not switch 	<ul style="list-style-type: none"> Water in the valve manifold (from wet compressed air) 	<ul style="list-style-type: none"> At the early stages the fault can be corrected by subsequent operation with dry air (when necessary, in a temperature cupboard at 50 to 70 °C) Otherwise: Repair at CSC (see page 66)
<ul style="list-style-type: none"> Actuator cannot be moved in manual or automatic mode, or only in one direction 	<ul style="list-style-type: none"> Dampness in the valve manifold 	
<ul style="list-style-type: none"> Piezo valve(s) do not switch (no soft clicking can be heard when the + or – keys are pressed in manual mode) 	<ul style="list-style-type: none"> Screw between cover hood and the valve manifold is not tight or the hood is jammed 	<ul style="list-style-type: none"> Tighten screw, or release cause of jamming when necessary
	<ul style="list-style-type: none"> Dirt (swarf, particles) in the valve manifold 	<ul style="list-style-type: none"> Repair at CSC¹⁾ or new device with integrated fine filter which can be replaced and cleaned
	<ul style="list-style-type: none"> Deposits on the contact(s) between the electronics board and the valve manifold can occur from abrasion through continuous stresses from strong vibrations 	<ul style="list-style-type: none"> Clean all contact surfaces with alcohol: when necessary bend the valve manifold contact springs back into place

Table 2

Fault description (symptoms)	Possible cause(s)	Corrective actions
<ul style="list-style-type: none"> Actuator does not move 	<ul style="list-style-type: none"> Compressed air < 1.4 bar 	<ul style="list-style-type: none"> Set inlet air pressure to > 1.4 bar
<ul style="list-style-type: none"> Piezo valve(s) do not switch (although a soft clicking can be heard when the + or – keys are pressed in manual mode) 	<ul style="list-style-type: none"> Restrictor(s) closed down (screw(s) at the right end stop) 	<ul style="list-style-type: none"> Open restrictor screw(s) (see leaflet, Figure "View of device (6)") by turning to the left
	<ul style="list-style-type: none"> Dirt in the valve manifold 	<ul style="list-style-type: none"> Repair at CSC¹⁾ or new device with integrated fine filter which can be replaced and cleaned
<ul style="list-style-type: none"> One piezo valve constantly switches in stationary automatic mode (constant setpoint) and in manual mode 	<ul style="list-style-type: none"> Pneumatic leak in the positioner, actuator system, start leak test in RUN 3 (Initialization) !!! 	<ul style="list-style-type: none"> Fix leak in the actuator and/or supply line If the actuator and supply line are intact: Repair of SIPART PS 2 at CSC¹⁾ or new device
	<ul style="list-style-type: none"> Dirt in the valve manifold (see above) 	<ul style="list-style-type: none"> See above

Table 3

Fault description (symptoms)	Possible cause(s)	Corrective actions
<ul style="list-style-type: none"> The two piezo valve constantly switch alternately in stationary automatic mode (constant setpoint), actuator oscillates around a middle point 	<ul style="list-style-type: none"> Static friction on the packing glands of the fittings or actuator too high 	<ul style="list-style-type: none"> Reduce static friction or increase dead zone of SIPART PS2 (parameter dEbA) until the oscillating movements stop.
	<ul style="list-style-type: none"> Play in the positioner, actuator, fittings system 	<ul style="list-style-type: none"> Linear actuator: Check seating of the stub screw of the coupling wheel Rotary actuator: Check seating of the lever on the positioner shaft Correct any other play between the actuator and fittings
	<ul style="list-style-type: none"> Actuator too fast 	<ul style="list-style-type: none"> Increase positioning times by means of restrictor screws If fast positioning times are required, increase dead zone (parameter dEbA) until the oscillating movements stop.
<ul style="list-style-type: none"> SIPART PS2 does not drive the valve up to the end stop (at 20 mA) 	<ul style="list-style-type: none"> Supply pressure too low Load of the supply controller or system output too low; required load potential. 	<ul style="list-style-type: none"> Increase supply pressure Intermediate burden converter Select 3/4 wire operation

Table 4

Fault description (symptoms)	Possible cause(s)	Corrective actions
<ul style="list-style-type: none"> Zero point shifts sporadically (> 3 %) 	<ul style="list-style-type: none"> Such high accelerations have occurred through impact or shock that the friction clutch has shifted (e.g. through steam jets in the steam pipelines) 	<ul style="list-style-type: none"> Shut off the cause of the shocks Reinitialize the positioner Upgrade at CSC¹⁾: mount reinforced friction clutch (order number C73451-A430-D14)
<ul style="list-style-type: none"> Device function breaks down totally: no display 	<ul style="list-style-type: none"> Insufficient electrical supply 	<ul style="list-style-type: none"> Check electrical supply
	<p>With very high continuous stresses by vibrations, the following can occur:</p> <ul style="list-style-type: none"> Screws of the electrical terminals can loosen The electrical terminals and/or electronic modules can be shaken loose 	<ul style="list-style-type: none"> Tighten screws and secure with sealing varnish Repair at CSC¹⁾ Prevention: Mount the SIPART PS2 on rubber metal

Table 5

1) CSC Address (Customer Support Center)

Siemens Production
 Automatisierung S. A. CSC
 1, chemin de la Sandlach
 B. P. 189
 F-67506 Haguenau CEDEX
 – France –

Tel. 0033-38890-6677
 Fax 0033-38890-6688
 e-mail: Hotline.ADPA1-2@khe.siemens.de

8 Certificates

The SIPART PS2 positioner with the accompanying options will be approved as standard in zone 1 as EEx ia/ib (see EC Type Examination Certificate) and for zone 2 as Ex n (see Conformity Statement).



WARNING

Since the maximum values of normal operation may be violated in the event of a fault when using the positioner and its options in zone 2, the EEx n device and its options must never be used again subsequently in zone 1.

8.1 EC Conformity Declaration

SIEMENS

EG-Konformitätserklärung
EC Declaration of Conformity

No. 1240.010-S01

Hersteller:
Manufacturer: Siemens AG

Anschrift:
Address: Östliche Rheinbrückenstr. 50, 76187 Karlsruhe
Bundesrepublik Deutschland

Produkt-
description: SIPART PS2

bezeichnung:
Product: 6DR5axb-xxxx-xxxx a = 0, 1, 2, 3, 5; b = 0, 1; c = N, E, G

Produkt-
description: 6DR4004-6J Iy - Modul 6DR4004-6G SIA - Modul

Produkt-
description: 6DR4004-6A Alarm - Modul C73451-A430-L8 EMV - Modul

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausfertigung mit den Vorschriften folgender Europäischen Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

89/336/EWG Richtlinie des Rates vom 3. Mai 1989 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit
(geändert durch 93/68/EWG, 93/88/EWG und 93/97/EWG)
Council Directive of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (amended by 93/68/EEC, 93/88/EEC and 93/97/EEC)

94/9/EG Richtlinie des Europäischen Parlaments und des Rates vom 23. März 1994 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen.
Directive of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

CE-Kennzeichnung / CE marking : 06/02

Karlsruhe, den / the 02.06.2002

Siemens AG

Erwählung Schrader: 
Name, Funktion
Name, function

Fertigung van Dycke: 
Name, Funktion
Name, function

Anhang A ist integraler Bestandteil dieser Erklärung.
Annex A is integral part of this declaration.
Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusage von Eigenschaften.
The safety declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety declaration accompanying the product shall be considered in detail.

SIEMENS

Anhang A zur EG-Konformitätserklärung
Annex A to the EC Declaration of Conformity

No. 1240.010-S01

Produkt-
bezeichnung: SIPART PS2

Produkt-
description: 6DR5axb-xxxx-xxxx a = 0, 1, 2, 3, 5; b = 0, 1; c = N, E, G

Produkt-
description: 6DR4004-6J Iy - Modul 6DR4004-6G SIA - Modul

Produkt-
description: 6DR4004-6A Alarm - Modul C73451-A430-L8 EMV - Modul

Die Konformität mit den auf Blatt 1 angeführten Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen (variantenabhängig):
Conformity to the Directives indicated on page 1 is assured through the application of the following standards (depending on versions):

Richtlinie directive	Norm Standard Reference number	Ausgabedatum Edition	a =	b =	c =
89/336/EWG	EN 61326/A1 Ann. A	1998	0, 1, 2, 3, 5	0, 1	N, E, G
94/9/EG	EN 50 014	1997	0, 2, 5	0, 1	E
94/9/EG	EN 50 020	1994	0, 2, 5	0, 1	E
94/9/EG	EN 50021	1999	0, 2, 5	0, 1	G

Zertifikate:
Certificates:

Zertifikat Certificate	Prüfbericht Nr.: Report no.:	a =	b =	c =
TÜV 00 ATEX 1654	00 Px 26800 01 Px 14510	0, 2, 5	0, 1	E
TÜV 01 ATEX 1786 X	02 YEX 142409a 02 YEX 134074	0, 2, 5	0, 1	G

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusage von Eigenschaften.
The safety declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety declaration accompanying the product shall be considered in detail.

8.2 EC Type Examination Certificate TÜV 00 ATEX 1654

TÜV CERT

Translation

EC TYPE-EXAMINATION CERTIFICATE

(1) **Equipment or Protective System intended for use in potentially explosive atmospheres: Directive 94/9/EC**

(2) **EC-Type Examination Certificate Number**

TÜV 00 ATEX 1654

(3) **Equipment:** Electropneumatic Positioner SIPART PS2 type 6DR5*** *****

(4) **Manufacturer:** Siemens AG, Automatisierungs- und Antriebstechnik (A&D),
Östliche Rheinbrückenstraße 50,
D-76187 Karlsruhe

(5) **Address:** D-76187 Karlsruhe

(6) **This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.**

(7) **The TÜV Hannover/Sachsen-Anhalt e.V., TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.**

(8) **The examination and test results are recorded in the confidential report N° 00P×26800.**

(9) **Compliance with the Essential Health and Safety Requirements has been assured by compliance with**

EN 50 014: 1997 EN 50 020: 1994

(10) **If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.**

(11) **This EC type examination certificate relates only to the design and construction of the specified equipment or protective system according to Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and placing on the market of this equipment or protective system.**

(12) **The marking of the equipment or protective system must include the following:**

(EX) **II 2 G EEx ia IIC T6 resp. EEx ib IIC T6**

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hanover, 2000-12-20

TÜV NORD

Phradel
Head of the
Certification Body

APP/CERTNORD 10-98

This certificate may only be reproduced without any change, schedule included.
Excerpts or changes shall be allowed by the TÜV Hannover/Sachsen-Anhalt e.V.

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SCHEDULE

(13)

(14) EC-TYPE EXAMINATION CERTIFICATE N° TÜV 00 ATEX 1654

(15) Description of equipment

The Electropneumatic Positioner SIPART PS2 Typ 6DR5***_****_**** is used for the control of valve resp. of flap positions of pneumatic actuators.

The Electropneumatic Positioner SIPART PS2 is an intrinsically safe apparatus that may be operated with the options listed below and that meets the requirements of category 2.

- Options:
- Alarm module 6DR4004-6A
 - SIA module 6DR4004-6G
 - ly module 6DR4004-6J
 - Card module for an external sensor (potentiometer) C73451-A430-L8

The use of the positioner fitted with the option ly module is only permissible for the temperature classes T4 – T1.

The permissible ambient temperature range in dependence of the temperature class has to be taken from the following table:

temperature class	permissible ambient temperature range
T6	-30°C to 50°C
T5	-30°C to 65°C
T4 - T1	-30°C to 80°C

Electrical Data

Basic device:

2-wire circuit without Hart

for 6DR50**_****_****
Motherboard –L250
Power supply / control current 4-20 mA in type of protection "Intrinsic Safety" EEx ia IIC EEx ib IIC series connection only for the connection to certified intrinsically safe circuits (terminals 6+ and 7/8)

Maximum values:
 $U_i = 30$ V
 $I_i = 100$ mA
 $P_i = 1$ W
effective internal capacitance: $C_i = 15$ nF
effective internal inductance: $L_i = 0,12$ mH



Schedule EC-Type Examination Certificate N° TÜV 00 ATEX 1654

2-wire circuit with Hart

for 6DR52**_****_****
Motherboard –L200
Power supply / control current 4-20 mA in type of protection "Intrinsic Safety" EEx ia IIC EEx ib IIC series connection only for the connection to certified intrinsically safe circuits (terminals 3+ and 7/8, Jumper between terminals 4/5 – 6)

Maximum values:
 $U_i = 30$ V
 $I_i = 100$ mA
 $P_i = 1$ W
effective internal capacitance: $C_i = 30$ nF
effective internal inductance: $L_i = 0,24$ mH

3/4-wire circuit with Hart

for 6DR52**_****_****
Plug-in module –L200
Power supply 18-30 V in type of protection "Intrinsic Safety" EEx ia IIC EEx ib IIC (terminals 2+ and 4/5) only for the connection to certified intrinsically safe circuits and Control current 4-20 mA (terminals 6+ and 7/8)

Maximum values:
 $U_i = 30$ V
 $I_i = 100$ mA
 $P_i = 1$ W
effective internal capacitance: $C_i = 15$ nF
effective internal inductance: $L_i = 0,12$ mH

Binary input jumpered or connected to a switch contact
Plug-in module –L200 and –L250 (terminal 9 and 10)



Schedule EC-Type Examination Certificate N° TÜV 00 ATEX 1654

Options

Alarm module type 6DR4004-6A:

Binary outputs.....

(terminals 31 and 32, terminals 41 and 42, terminals 51 and 52)

Maximum values:
 $U_i = 15,5$ V
 $I_i = 25$ mA
 $P_i = 64$ mW

safely galvanically separated from each other.

effective internal capacitance: $C_i = 5,2$ nF
The effective internal inductance is negligibly small.

Binary input.....
(terminals 11 and 12, terminals 21 and 22 (jumper))

safely galvanically separated from the binary outputs and the basic device, but can also be activated via a jumper (then no galvanic separation from the basic device)

Maximum value:
 $U_i = 25,2$ V

The effective internal inductance and capacitance is negligibly small.

SIA module type 6DR4004-6G:

Binary output (fault signalling)

(terminals 31 and 32)

Maximum values:
 $U_i = 15,5$ V
 $I_i = 25$ mA
 $P_i = 64$ mW

effective internal capacitance: $C_i = 5,2$ nF
The effective internal inductance is negligibly small.



Schedule EC-Type Examination Certificate N° TÜV 00 ATEX 1654

Binary output (slot initiator)

(terminals 41 and 42, terminals 51 and 52)

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically safe circuits

Maximum values per circuit:
 $U_i = 15,5$ V
 $I_i = 25$ mA
 $P_i = 64$ mW

effective internal capacitance: $C_i = 30$ nF
effective internal inductance: $L_i = 100$ µH

ly module type 6DR4004-6J:

For the use at temperature classes T4 – T1 only

Power output.....

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically safe circuits

Maximum values:
 $U_i = 30$ V
 $I_i = 100$ mA
 $P_i = 1$ W

effective internal capacitance: $C_i = 11$ nF
The effective internal inductance is negligibly small.

Card module for an external Sensor (potentiometer) type C73451-A430-L8:

External potentiometer.....only for the connection to certified intrinsically safe circuits

galvanically connected to the basic device

Maximum values:
 $U_o = 5$ V
 $I_o = 6$ mA
 $P_o = 30$ mW

effective outer capacitance: $C_o = 1$ µF
effective outer inductance: $L_o = 1$ mH

Note for the erection: The plastic housing of the basic device type 6DR5**0-***** has to be protected against the occurrence of hazardous electrostatic charging.



Translation

1. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 00 ATEX 1654

of the company: Siemens AG, Automatisierungs- und Antriebstechnik (A&D)
Östliche Rheinbrückenstraße 50
D-76187 Karlsruhe

In the future, the Electropneumatic positioner SIPART PS2 type 6DR5***-****-**** inclusive the modules listed below may also be manufactured according to the test documents listed in the test report.

- Options:
- Alarm module 6DR4004-6A
 - SIA module 6DR4004-6G
 - ly module 6DR4004-6J
 - Card module for an external sensor (potentiometer) C73451-A430-L8

The amendments concern the internal design of several modules and of the basic device and some electrical data are changed, as well.

All other data apply unchanged for this 1. Supplement. These data are repeated in the following.

The use of the positioner fitted with the option ly module is only permissible for the temperature classes T4...T1.

The permissible ambient temperature range in dependence of the temperature class has to be taken from the following table:

temperature class	permissible ambient temperature range
T6	-30°C to 50°C
T5	-30°C to 65°C
T4...T1	-30°C to 80°C

Electrical Data

Basic device:

2-wire circuit without Hart
for 6DR50***-****-****
Motherboard -L250
Power supply /
control current 4-20 mA
series connection
(terminals 6+ and 7/8)

in type of protection "Intrinsic Safety" EEx ia IIC
EEx ib IIC
only for the connection to certified intrinsically safe circuits

Maximum values:
U_i = 30 V
I_i = 100 mA
P_i = 1 W



Schedule EC-Type Examination Certificate N° TÜV 00 ATEX 1654

(16) Test documents are listed in the test report No.: 00P-x26800.

(17) Special conditions for safe use
none

(18) Essential Health and Safety Requirements
no additional ones



1. Supplement to EC Type-Examination Certificate No. TÜV 00 ATEX 1654

effective internal capacitance: $C_i = 22 \text{ nF}$
effective internal inductance: $L_i = 0,12 \text{ mH}$

2-wire circuit with Hart

for 6DR52***,****,****

Motherboard -L200

Power supply /

control current 4-20 mA

series connection

(terminals 3+ and 7/8)

Jumper between terminals 4/5 - 6)

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically
safe circuits

Maximum values:

$U_i = 30 \text{ V}$

$I_i = 100 \text{ mA}$

$P_i = 1 \text{ W}$

effective internal capacitance: $C_i = 7 \text{ nF}$
effective internal inductance: $L_i = 0,24 \text{ mH}$

3/4-wire circuit with Hart

for 6DR52***,****,****

Plug-in module -L200

Power supply 18-30 V

(terminals 2+ and 4/5)

and

Control current 4-20 mA

(terminals 6+ and 7/8)

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically
safe circuits

Maximum values:

$U_i = 30 \text{ V}$

$I_i = 100 \text{ mA}$

$P_i = 1 \text{ W}$

effective internal capacitance: $C_i = 22 \text{ nF}$
effective internal inductance: $L_i = 0,12 \text{ mH}$

Binary input

Plug-in module -L200 and -L250

(terminal 9 and 10)

jumpered or connected to a switch contact



1. Supplement to EC Type-Examination Certificate No. TÜV 00 ATEX 1654

Options

Alarm module type 6DR4004-6A:

Binary outputs

(terminals 31 and 32,
terminals 41 and 42,
terminals 51 and 52)

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically
safe circuits

Maximum values:

$U_i = 15,5 \text{ V}$

$I_i = 25 \text{ mA}$

$P_i = 64 \text{ mW}$

safely galvanically separated
from each other.

effective internal capacitance: $C_i = 5,2 \text{ nF}$
The effective internal inductance is negligibly
small.

Binary input

(terminals 11 and 12,
terminals 21 and 22 (jumper))

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically
safe circuits

safely galvanically separated

from the binary outputs

and the basic device,

but can also be activated via

a jumper (then no galvanic

separation from the

basic device)

Maximum value:

$U_i = 25,2 \text{ V}$

The effective internal inductance and
capacitance is negligibly small.

SIA module type 6DR4004-6G:

Binary output (fault signalling)

(terminals 31 and 32)

in type of protection "Intrinsic Safety" EEx ia IIC
only for the connection to certified intrinsically
safe circuits

Maximum values:

$U_i = 15,5 \text{ V}$

$I_i = 25 \text{ mA}$

$P_i = 64 \text{ mW}$

effective internal capacitance: $C_i = 5,2 \text{ nF}$
The effective internal inductance is negligibly
small.



1. Supplement to EC Type-Examination Certificate No. TÜV 00 ATEX 1654

(16) Test documents are listed in the test report N° 01 PX 14510.

(17) Special conditions for safe use
none

(18) Essential Health and Safety Requirements
no additional ones

Hannover, 2001-07-27

TÜV Hannover/Sachsen-Anhalt o.V.
TUV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

[Signature]
Head of the
Certification Body



1. Supplement to EC Type-Examination Certificate No. TÜV 00 ATEX 1654

Binary output (slot initiator) in type of protection "Intrinsic Safety" EEx ia IIC
(terminals 41 and 42, EEx ib IIC
terminals 51 and 52) only for the connection to certified intrinsically
safe circuits

Maximum values per circuit:

$U_i = 15,5 \text{ V}$
 $I_i = 25 \text{ mA}$
 $P_i = 64 \text{ mW}$

effective internal capacitance: $C_i = 41 \text{ nF}$
effective internal inductance: $L_i = 100 \text{ µH}$

ly module type 6DR4004-6J:

For the use at temperature classes T4 – T1 only

Power output in type of protection "Intrinsic Safety" EEx ia IIC
(terminals 61 and 62) only for the connection to certified intrinsically
safe circuits

Maximum values:
 $U_i = 30 \text{ V}$
 $I_i = 100 \text{ mA}$
 $P_i = 1 \text{ W}$

effective internal capacitance: $C_i = 11 \text{ nF}$
The effective internal inductance is negligibly
small.

Card module for an external Sensor (potentiometer) type C73451-A430-L8:

External potentiometer in type of protection "Intrinsic Safety" EEx ia IIC
galvanically connected to EEx ib IIC
the basic device

Maximum values:
 $U_o = 5 \text{ V}$
 $I_o = 100 \text{ mA}$
 $P_o = 33 \text{ mW}$

effective outer capacitance: $C_o = 1 \text{ µF}$
effective outer inductance: $L_o = 1 \text{ mH}$

Note for the erection: The plastic housing of the basic device type 6DR5**0-***** has to
be protected against the occurrence of hazardous electrostatic charging.

Translation

2. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 00 ATEX 1654



of the company: Siemens AG, Automatisierungs- und Antriebstechnik (A&D)
Östliche Rheinbrückenstraße 50
D-76187 Karlsruhe

The electropneumatic positioners of the series SIPART PS2 have been extended by a basic device provided with profibus connection. The type designation of this basic device is 6DR55**.

- Options:
- Alarm module 6DR4004-6A
 - SIA module 6DR4004-6G
 - ly module 6DR4004-6J
 - Card module for an external sensor (potentiometer) C73451-A430-LB

Additional some little modifications were realised at the enclosure, the Alarm module and the ly module.

All other data apply unchanged for this 2. Supplement.

Electrical Data

Basic device:

Profibus device

for 6DR55**.....

motherboard -A5E00095037

Bus circuit

In type of protection "Intrinsic Safety" resp. EEx ia IIC
only for the connection to certified intrinsically safe circuits

Maximum values:

	FISCO power supply	Barrier
	pas group IIC or IIB	pasgroup IIC or IIB
U _i	17.5 V	24 V
I _i	380 mA	200 mA
P _i	5.32 W	1.2 W

The effective internal capacitance is negligibly small.
effective internal inductance L_i = 8 mH

Binary input..... jumpered or connected to a switch contact
(terminal 9 and 10)

galvanially connected with the bus circuit



2. Supplement to EC Type-Examination Certificate No. TÜV 00 ATEX 1654

Safe input (terminals 81 and 82) in type of protection "Intrinsic Safety" resp. EEx ia IIC
galvanially separated from the bus circuit and the binary input only for the connection to certified intrinsically safe circuits

Maximum values:
U_i = 30 V
I_i = 100 mA
P_i = 1 W

The effective internal capacitance and inductance is negligibly small.

Option

Card module for an external Sensor (potentiometer) type C73451-A430-LB:

External potentiometer.....In type of protection "Intrinsic Safety" resp. EEx ia IIC
galvanically connected to the basic device

Maximum values when supplied by the above mentioned basic device (profibus version):
U_e = 5 V
I_e = 75 mA, static
I_e = 160 mA, temporary
P_e = 120 mW

effective outer capacitance: C_e = 1 µF
effective outer inductance: L_e = 1 mH

Test documents are listed in the test report N° 02 YEX 142409a.

TÜV Hannover/Sachverständigenamt e.V.
TÜV CERT-Zertifizierungsgesellschaft
Am TÜV 1
D-30619 Hannover

[Signature]

Head of the
Certification Body

Hannover, 2002-04-12



Translation

3. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 00 ATEX 1654

of the company: Siemens AG, Automatisierungs- und Antriebstechnik (A&D)
Östliche Rheinbrückenstraße 50
D-76187 Karlsruhe

In the future, the electropneumatic positioners of the series SIPART PS2 may also be manufactured according to the test documents listed in the test report.

The amendments concern the internal design.

The electrical data and all other data apply unchanged for this supplement.

Test documents are listed in the test report N° 03 YEX 550376.

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover
Tel.: 0511 985-1470
Fax: 0511 985-4955

Hannover, 2003-02-25

Head of the
Certification Body

page 1/1

8.3 Conformity Statement TÜV 01 ATEX 1786 X



Translation

STATEMENT OF CONFORMITY

- (1)
- (2) Equipment or Protective System intended for use in potentially explosive atmospheres - Directive 94/9/EC
- (3) Test certificate number



TÜV 01 ATEX 1786 X

- (4) Equipment: Electropneumatic Positioner SIPART PS2 type 6DR5axb-xGxxx-xxxx (a= 0, 2, 5; b = 0, 1) with options
- (5) Manufacturer: Siemens AG, Automatisierungs- und Antriebstechnik (A&D)
- (6) Address: Östliche Rheinbrückenstraße 50
D-76187 Karlsruhe
- (7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT Certification Body N° 0032, notified body in accordance with Article 9 of the Council Directive 94/9/EC of March 23, 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in confidential report N° 02 YEX 134074.
- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50021:1999
- (10) If the sign "X" is placed after the certification number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This statement of conformity certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.
- (12) The marking of the equipment or protective system shall include the following:

II.3 G EEx nA L [L] IIC T6

TÜV Hannover/Sachsen-Anhalt a.V.
TÜV CERT Certification Body
Am TÜV 1
D-30519 Hannover



Hannover, 2002-06-04

TÜV NORD CERT

Head of the
Certification Body

TÜV CERT A4 07.01 10.000 L6

This statement of conformity may only be reproduced without any change, schedule included.
Excerpts or changes shall be allowed by the TÜV NORD CERT GmbH & Co. KG

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SCHEDULE

(13)

(14) STATEMENT OF CONFORMITY N° TÜV 01 ATEX 1786 X

(15) Description of equipment

The Electropneumatic Positioner SIPART PS2 Typ 6DR55axb-xGxx-xxxx (a= 0, 2, 5; b = 0, 1) is used for the control of valve resp. of flap positions of pneumatic actuators.

The Electropneumatic Positioner SIPART PS2 is a non-sparking apparatus that internally generates its energy limited circuits. The positioner meets the requirements of category 3.

Options: Alarm module 6DR4004-6A
SIA module 6DR4004-6G
ly module 6DR4004-6J
Card module for an external sensor (potentiometer) C73451-A430-L8

The use of the positioner fitted with the option ly module is only permissible for the temperature classes T4 – T1.

The permissible ambient temperature range in dependence of the temperature class has to be taken from the following table:

temperature class	permissible ambient temperature range
T6	-30°C to 50°C
T5	-30°C to 65°C
T4 - T1	-30°C to 80°C

Electrical Data

Basic device:

2-wire circuit without Hart for 6DR50xx-xxxx-xxxx motherboard –L250

Power supply / control current 4-20 mA for the connection to circuits with the following series connection (terminals 6+ and 7/8) maximum values in normal operation:

$$U_n \leq 30 \text{ V}$$

$$I_n \leq 100 \text{ mA}$$



Schedule Statement of Conformity No. TÜV 01 ATEX 1786 X

2-wire circuit with Hart for 6DR52xx-xxxx-xxxx motherboard –L200

Power supply / control current 4-20 mA for the connection to circuits with the following series connection (terminals 3+ and 7/8) maximum values in normal operation:

$$U_n \leq 30 \text{ V}$$

$$I_n \leq 100 \text{ mA}$$

3/4-wire circuit with Hart for 6DR52xx-xxxx-xxxx motherboard –L200

Power supply 18-30 V for the connection to circuits with the following (terminals 2+ and 4/5) maximum values in normal operation:

$$U_n \leq 30 \text{ V}$$

$$I_n \leq 100 \text{ mA}$$

Profibus device for 6DR55xx-xxxx-xxxx motherboard –A5E00095037

Bus circuit for the connection to circuits with the following maximum values in normal operation:

$$U_n \leq 32 \text{ V}$$

Safe input for the connection to circuits with the following (terminals 81 and 82) maximum values in normal operation:

$$U_n \leq 30 \text{ V}$$

$$I_n \leq 100 \text{ mA}$$

All Basic devices

Binary Input jumped or connected to a switch contact (terminal 9 and 10)



Schedule Statement of Conformity No. TÜV 01 ATEX 1786 X



Schedule Statement of Conformity No. TÜV 01 ATEX 1786 X

Options

Alarm module type 6DR4004-6A:

Binary outputs for the connection to circuits with the following maximum values in normal operation:

(3 outputs, terminals 31 and 32, terminals 41 and 42, terminals 51 and 52)

$$U_n \leq 15,5 \text{ V}$$

Binary input for the connection to circuits with the following maximum values in normal operation:

(terminals 11 and 12, terminals 21 and 22 (jumper))

$$U_n \leq 25,2 \text{ V}$$

SIA module type 6DR4004-6G:

Binary output (fault signalling) for the connection to circuits with the following maximum values in normal operation:

(terminals 31 and 32)

$$U_n \leq 15,5 \text{ V}$$
$$P_n \leq 64 \text{ mW}$$

Binary output (slot initiator) for the connection to circuits with the following maximum values in normal operation:

(2 outputs, terminals 41 and 42, terminals 51 and 52)

$$U_n \leq 15,5 \text{ V}$$
$$P_n \leq 64 \text{ mW}$$

ly module type 6DR4004-6J:

For the use at temperature classes T4 – T1 only

Power output for the connection to circuits with the following maximum values in normal operation:

(terminals 61 and 62)

$$U_n \leq 30 \text{ V}$$
$$I_n \leq 100 \text{ mA}$$
$$P_n \leq 1 \text{ W}$$

Card module for an external Sensor (potentiometer) type C73451-A430-L8:

External potentiometer in protection concept "Energy Limitation" nL IIC

galvanically connected to the basic device.

Maximum values:

$$U_o = 5 \text{ V}$$
$$I_o = 75 \text{ mA}$$
$$P_o = 120 \text{ mW}$$

effective outer capacitance: $C_o = 1 \mu\text{F}$

effective outer inductance: $L_o = 1 \text{ mH}$

(16) Test documents are listed in the test report N° 02 YEX 134074.

(17) Special conditions for safe use

The electropneumatic positioners SPART PS2 have to be erected in such a way that the plastic window is only exposed to a low level of hazard of mechanical damage.

The connecting and disconnecting of the not energy limited circuits to the terminals and the plugging resp. unplugging of the internal plug- and socket connectors under voltage, as well, is only permitted during installation, for maintenance or for repair purposes.

Note: The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes is assessed as unlikely in zone 2.

(18) Essential Health and Safety Requirements

no additional ones

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page 5/5

8.4 FM – Approval Report



FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: 781 762 4300 F: 781 762 9375 www.fmglobal.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

6DR5abc-defgh-01A). Electropneumatic Positioner SIPART PS2.

IS / I / 1 / ABCD / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C - A5E00065622D; Entity; Type 4X
I / 1 / AEx Ib IIC / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C - A5E00065622D; Entity; Type 4X
NI / I / 2 / ABCD / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C; Type 4X
NI / I / 2 / IIC / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C; Type 4X

Entity/Nonincendive Field Wiring Parameters:

Assembly	Terminals	V _{max} (V)	I _{max} (mA)	P _{max} (W)	CI (nF)	LI (μH)
Basic Board	6 & 7/8	30	100	1.0	22	120
Basic Board	3 & 7/8	30	100	1.0	7	240
Basic Board	2 & 4/5; 6 & 7/8	30	100	1.0	30	120
Alarm Module	31 & 32; 41 & 42; 51 & 52	15.5	25	0.064	5.7	2.6
Alarm Module	11 & 12	25.2	155	3.9	0	0
SIA Module	31 & 32	15.5	20	0.064	5.7	2.6
SIA Module	41 & 42; 51 & 52	15.5	20	0.064	71	100
Ly Module	61 & 62	30	100	1.0	11	4.2
Assembly	Terminals	U _o (V)	I _o (mA)	P _o (mW)	C _o (μF)	L _o (mH)
Card Module	1-4	5	100	33	1.0	1.0

- a = Communications option 0 or 2.
b = Function 1 or 2.
c = Housing material 0 or 1.
d = Friction clutch option 0 or 1.
e = Explosion protection option E or G.
f = Electric/Pneumatic thread option G, N, M or P.
g = Limit switch option 0, 1 or 2.



h = Module option 0, 1, 2 or 3.

l = Language of documentation A or B.

j = Mounted pressure gauge block option 0, 1, 2, 3 or 4.

6DR55ab-cdefg-0hAl, Electropneumatic Positioner SIPART PS2.

IS / I / 1 / ABCD / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C - A5E00065622AA; Entity; FISCO;

I / 1 / AEx Ib IIC / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C - A5E00065622AA; Entity; FISCO;

NI / I / 2 / ABCD / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C;

NI / I / 2 / IIC / T6 Ta=50°C; T5 Ta=65°C; T4 Ta=80°C; Type 4X

Entity/Nonincendive Field Wiring Parameters:

Assembly	Terminals	V _{max} (V)	I _{max} (mA)	P _I (W)	C _I (nF)	L _I (μH)
Basic Board	6 & 7	24	200	1.2	0	8.0
Basic Board	81 & 82	30	100	1.0	0	0
Alarm Module	31 & 32; 41 & 42; 51 & 52	15.5	25	0.064	5.7	2.6
Alarm Module	11 & 12	25.2	155	3.9	0	0
SIA Module	31 & 32	15.5	20	0.064	5.7	2.6
SIA Module	41 & 42; 51 & 52	15.5	20	0.064	71	100
Ly Module	61 & 62	30	100	1.0	11	4.2
Assembly	Terminals	U _o (V)	I _o (mA)	P _o (mW)	C _o (μF)	L _o (mH)
Card Module	1-4	5	112	120	1.0	1.0

FISCO Parameters:

Assembly	Terminals	V _{max} (V)	I _{max} (mA)	P _I (W)	C _I (nF)	L _I (μH)
Basic Board	6 & 7	17.5	380	5.32	0	8.0

a = Function 1 or 2.

b = Housing material 0 or 1.

c = Friction clutch option 0 or 1.

d = Explosion protection option E or G.

e = Electric/Pneumatic thread option G, N, M or P.

f = Limit switch option 0, 1 or 2.

g = Module option 0, 1, 2 or 3.

h = Language of documentation A or B.

i = Mounted pressure gauge block option 0, 1, 2, 3 or 4.

Equipment Ratings:

Intrinsically Safe for use in Class I, Division 1, Groups A, B, C and D and Class I, Zone 1, Group IIC in accordance with Entity/FISCO requirements and the applicable Control Drawing; Nonincendive for use in Class I, Division 2, Groups A, B, C and D and Class I, Zone 2, Group IIC in accordance with Nonincendive Field Wiring Requirements and the applicable Control Drawing; Indoor and outdoor, Type 4X Hazardous (Classified) Locations

Approved for:

Siemens AG - A&D PI TQ 2
Oestliche Rheinbrueckenstr. 50
Postfach 21 12 62
D-76181 Karlsruhe, Germany

FM Approvals HLC 8/02

3010184
Page 2 of 3

An FM Global Enterprise



This certifies that the equipment described has been found to comply with the following FM Approval Standards and other documents:

Class 3600	1998
Class 3610	1999
Class 3611	1999
Class 3810	1989
NEMA 250	1991

Original Project ID: 3010184

FM Approval Granted: August 29, 2001

Subsequent Revision Reports / Date FM Approval Amended

Report Number	Date	Report Number	Date
3013969	October 18, 2002		
3016206	February 28, 2003		

FM Global Technologies LLC

A handwritten signature in cursive script, reading "David W. Styrcula".

David W. Styrcula
Technical Team Manager



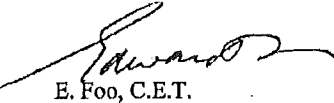
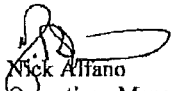
3/4/03
Date

FM Approvals HLC 8/02

3010184
Page 3 of 3

An Enterprise

8.5 CSA certificate

 CSA INTERNATIONAL	
<h1>Certificate of Compliance</h1>	
Certificate: 1233781	Master Contract: 185289 (LR 104225)
Project: 1416186	Date Issued: March 21, 2003
Issued to:	SIEMENS AG Dept. A & D PITG2 Oestl Rheinbrueckenstr 50 76187 Karlsruhe GERMANY Attention: Mr. Eugen Schnitzius
<p><i>The products listed below are eligible to bear the CSA Mark shown</i></p>	
	Issued by:  E. Foo, C.E.T.
	Authorized by:  Nick Altano Operations Manager
<u>PRODUCTS</u>	
CLASS 2258 04	PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations
Class I, Zone 1; Ex ib IIC: Class I, Division 1, Groups A, B, C, D:	
<ul style="list-style-type: none">- Electropneumatic Positioner Model SIPART PS2, types 6DR50xx-xExxx and 6DR52xx-xExxx. Intrinsically Safe with Entity Parameters, Temperature Codes and maximum Ambient Temperatures per Installation Dwg A5E00065622D. Enclosure Type 4X.- Electropneumatic Positioner Model SIPART PS2, type 6DR55xx-xExxx. Intrinsically Safe with Entity/FISCO Parameters, Temperature Codes and maximum Ambient Temperatures per Installation Dwg A5E00065622AA. Enclosure Type 4X.	
<small>DQD 507WD 2002/04/30</small>	



Certificate: 1233781 Master Contract: 185289 (LR 104225)
 Project: 1416186 Date: March 21, 2003

CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations

Class I, Zone 2, Group IIC;
 Class I, Division 2, Groups A, B, C, D:

- Electropneumatic Positioner Model SIPART PS2, types 6DR50xx-xExxx and 6DR52xx-xExxx. Wiring connection via conduits when Certified barriers not used. Temperature Codes and maximum Ambient Temperatures per Installation Dwg ASE00065622D. Enclosure Type 4X.

- Electropneumatic Positioner Model SIPART PS2, type 6DR55xx-xExxx. Wiring connection via conduits when Entry/FISCO Parameters not used. Temperature Codes and maximum Ambient Temperatures per Installation Dwg ASE00065622AA. Enclosure Type 4X.

APPLICABLE REQUIREMENTS

- CAN/CSA-E79-0-95 - Electrical Apparatus for Explosive Gas Atmospheres-Part 0: General Requirements
- CAN/CSA-E79-11-95 - Electrical Apparatus for Explosive Gas Atmospheres-Part 11: Intrinsic Safety "i"
- CSA Std C22.2 No.142-M1987 - Process Control Equipment
- CAN/CSA-C22.2 No.157-92 - Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
- CSA Std C22.2 No. 213-M1987 - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
- CAN/CSA-C22.2 No. 94-M91 - Special Purpose Enclosures

MARKINGS

- Submitter's name, trade name and/or CSA Master Contract 185289;
- Model designations;
- CSA Monogram;
- Serial number or date code;
- Hazardous Locations designations;
- Special purpose enclosure designation, TYPE 4X;
- Caution markings, "WARNING: Handle Instrument to avoid electrostatic charge" appear in a visible manner on polymeric enclosure and "Install per Control Dwg ASE00065622D or ASE00065622AA".

LOD-SITWD-20020420



Supplement to Certificate of Compliance

Certificate: 1233781 Master Contract: 185289 (LR 104225)

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
1416186	Mar. 21, 2003	Update to cover report revision per FM Revision Report J.I. 3016206
1375342	Nov. 26, 2002	Update to include similar model 6DR55xx-xExx
1233781	Dec. 18, 2001	Original Certification

LOD-SITWD-20020420

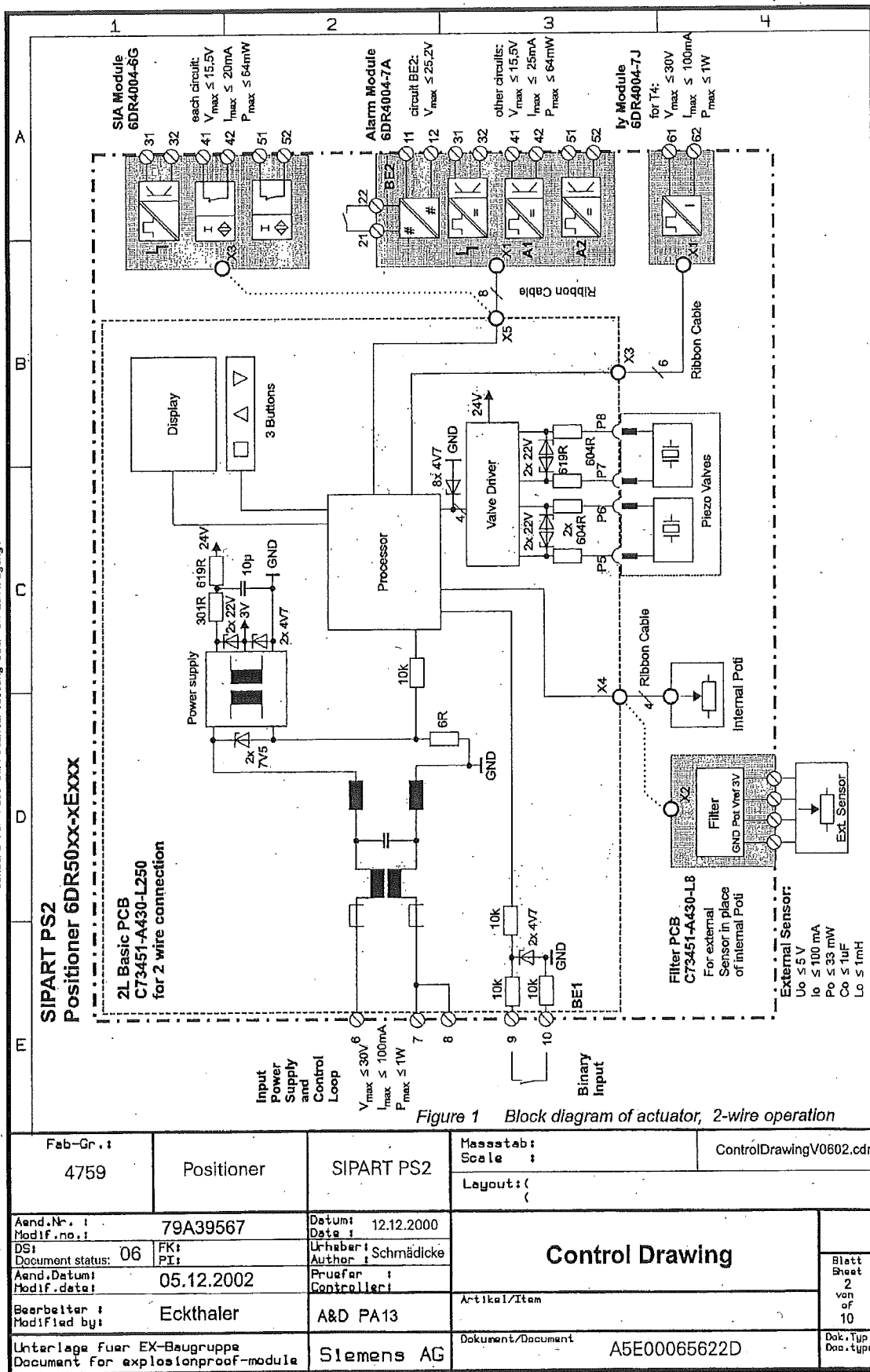
8.6 Control Drawing A5E00065622D

CAD	1	2	3	4																						
<p>Proprietary data, company confidential. All rights reserved. Tous droits réservés. Toute réimpression ou utilisation non autorisée sans la permission écrite de la Siemens est formellement interdite. Confidencial y todo derecho de propiedad. No se permite la explotación económica ni la transformación de esta obra. Queda permitida la impresión en su totalidad. Copyright © 2002 by Siemens AG. Alle Rechte vorbehalten.</p>	<p>DESCRIPTION</p> <p>General - The electropneumatic positioner SIPART PS2 acts as a coupling module between electrical controllers or control systems and pneumatic actuators. The positioner is available for single-action or double-action actuators.</p> <p>The device type 6DR50xx-xExxx can operate in 2-wire-mode and type 6DR52xx-xExxx can operate additionally in 4-wire-mode. (The 'x' in the model key stand for sub-variants). They are powered by 4...20mA current loop or 24V supply voltage and have a power consumption of less than 160 mW.</p> <p>The base units 6DR50xx-xExxx or 6DR52xx-xExxx can be equipped with the following options:</p> <ul style="list-style-type: none"> > ly-module 6DR4004-7J (analog position feedback) > Alarm-module type 6DR4004-7A (electronic limit monitors, fault output, binary input) > SIA-module type 6DR4004-6G (Inductive limit switch and fault output) > Filter PCB type C73451-A430-L8 (for external potentiometer) 																									
	<p>The positioners SIPART PS2 type 6DR50xx-xExxx and 6DR52xx-xExxx are suitable for hazardous locations:</p> <p>Intrinsically safe: Class I Div 1 Groups A, B, C, D Class I Zone 1 AEx(FM) Ex(CSA) Ib IIC Indoor and outdoor (NEMA 4X)</p> <p>Division 2: Class I Div 2 Groups A, B, C, D Class I Zone 2 Group IIC Indoor and outdoor (NEMA 4X)</p> <p>Temperature classes: T6 @ Ta = -30°C ... +50°C T5 @ Ta = -30°C ... +65°C T4 @ Ta = -30°C ... +80°C</p>																									
<p>Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts ist ohne schriftliche Genehmigung der Siemens AG. Die Weitergabe oder die Vervielfältigung dieser Unterlage ist ohne schriftliche Genehmigung der Siemens AG. Die Weitergabe oder die Vervielfältigung dieser Unterlage ist ohne schriftliche Genehmigung der Siemens AG.</p>	<p>Notes</p> <ol style="list-style-type: none"> 1. Approved associated apparatus or approved barrier must be installed in accordance with manufacturer instructions. 2. Approved associated apparatus or approved barrier must meet the following requirements: $U_o \leq U_{i,max}$ and $I_o \leq I_{i,max}$ and $P_o \leq P_{i,max}$ and $C_a > C_i + C_{cable}$ and $L_a > L_i + L_{cable}$ 3. The maximum non-hazardous area voltage must not exceed 250 V. 4. The installation must be in accordance with the National Electrical Code NFPA 70, Article 504, 505, and ANSI/ISA-Rp 12.6. 5. The screen must be connected to earth potential in accordance with ANSI/ISA-Rp. 12.6. 6. Caution: Use only supply wires suitable for 5 °C above surrounding temperature. 7. Warning: Substitution of components may impair intrinsic safety. 8. For division 2 installations, without the use of conduit, Associated Nonincendive Field Wiring Apparatus is required for connection to the power supply. 9. No barrier is required for division 2 / zone 2 installation. Equipment must be wired per the NEC Division 2 / zone 2 wiring methods. 10. Diameter of cable for delivered cable gland is 6 to 12mm 																									
	<table border="1"> <tr> <td>Fab-Gr.: 4759</td> <td>Positioner</td> <td>SIPART PS2</td> <td>Massstab: Scale : Layout: (</td> <td>ControlDrawingV0602.odr</td> </tr> <tr> <td colspan="2">Aend.Nr.: Modif.no.: DS: Document status: 06</td> <td>FK: PI: Author: Schmädicke</td> <td colspan="2" rowspan="2"> <p align="center">Control Drawing</p> </td> </tr> <tr> <td colspan="2">Aend.Datum: Modif.date: 05.12.2002</td> <td>Pruefer: Controller:</td> </tr> <tr> <td colspan="2">Bearbeiter: Modified by: Eckthaler</td> <td>A&D PA13</td> <td>Artikel/Item</td> <td>Blatt Sheet 1 von of 10</td> </tr> <tr> <td colspan="2">Unterlage fuer EX-Baugruppe Document for explosionproof-module</td> <td>Siemens AG</td> <td>Dokument/Document</td> <td>A5E00065622D</td> </tr> </table>				Fab-Gr.: 4759	Positioner	SIPART PS2	Massstab: Scale : Layout: (ControlDrawingV0602.odr	Aend.Nr.: Modif.no.: DS: Document status: 06		FK: PI: Author: Schmädicke	<p align="center">Control Drawing</p>		Aend.Datum: Modif.date: 05.12.2002		Pruefer: Controller:	Bearbeiter: Modified by: Eckthaler		A&D PA13	Artikel/Item	Blatt Sheet 1 von of 10	Unterlage fuer EX-Baugruppe Document for explosionproof-module		Siemens AG	Dokument/Document
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Bearbeiter: Modified by: Eckthaler		A&D PA13	Artikel/Item	Blatt Sheet 1 von of 10																						
Unterlage fuer EX-Baugruppe Document for explosionproof-module		Siemens AG	Dokument/Document	A5E00065622D																						

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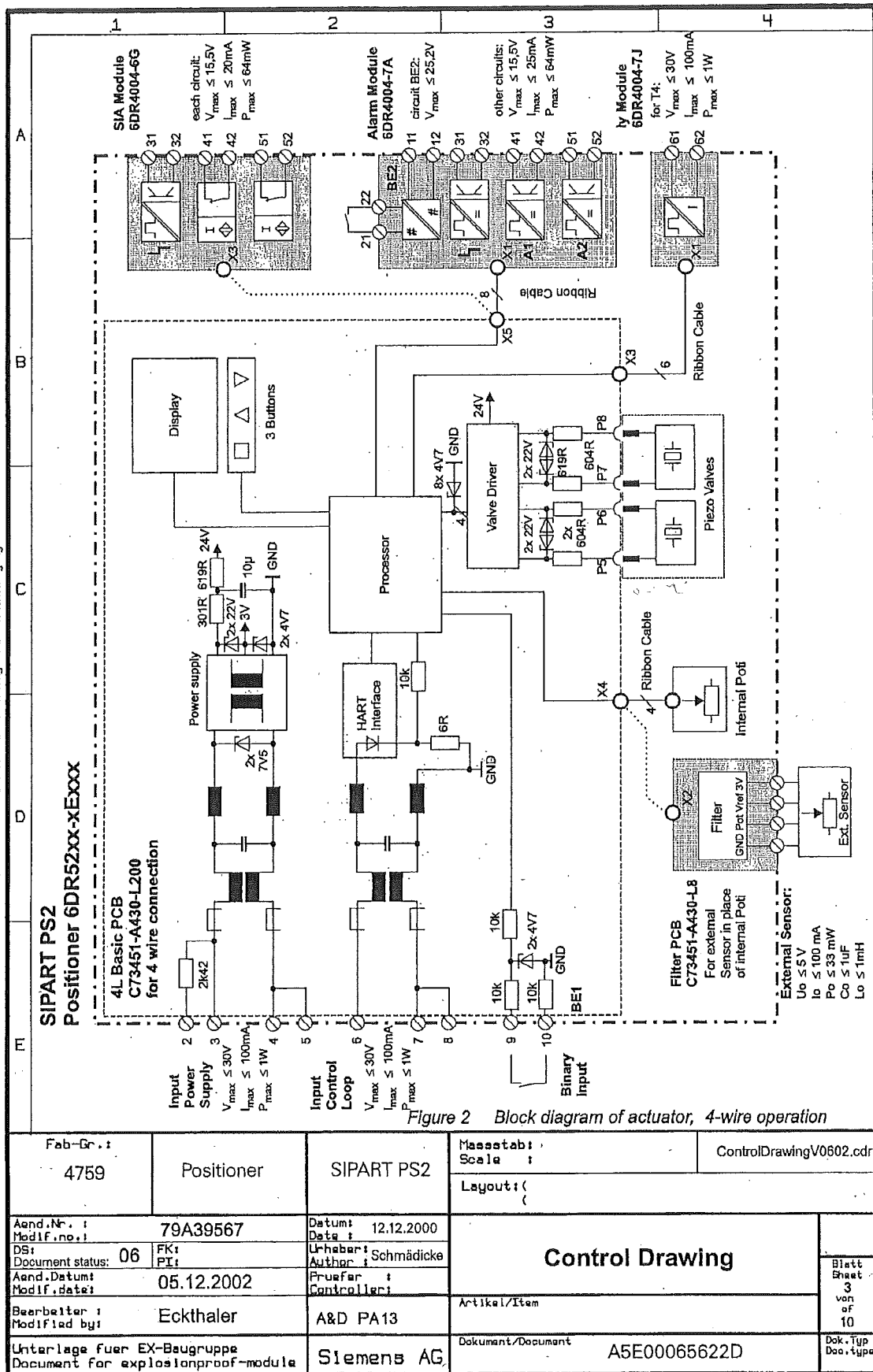
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	1	2	3	4																												
A	Base Unit (or basic Instrument) type 6DR50xx-xExxx Notice Only certified, intrinsically safe electric circuits must be connected as auxiliary power, control and																															
B																																
C	Figure 3 2-wire connection basic instrument 6DR50xx-xExxx (auxiliary power from the signal current) (2-wire system) With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values: $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ Effective internal capacitance: $C_i = 22 \text{ nF}$ Effective internal inductance: $L_i = 0.12 \text{ mH}$ Binary input circuit (terminals 9 and 10) connected by jumper, or connection to switching contact.																															
D	For Division 2 application: $V_{\text{max}} = 30 \text{ V}$ $I_{\text{max}} = 100 \text{ mA}$ Binary Input circuit: Maximum output: $V_i = 5 \text{ V}$, $I_i = 0,25 \text{ mA}$ (terminals 9 and 10) - Nonincendive field wiring: Only connection with approved barrier. Parameters are the same as intrinsically safe.																															
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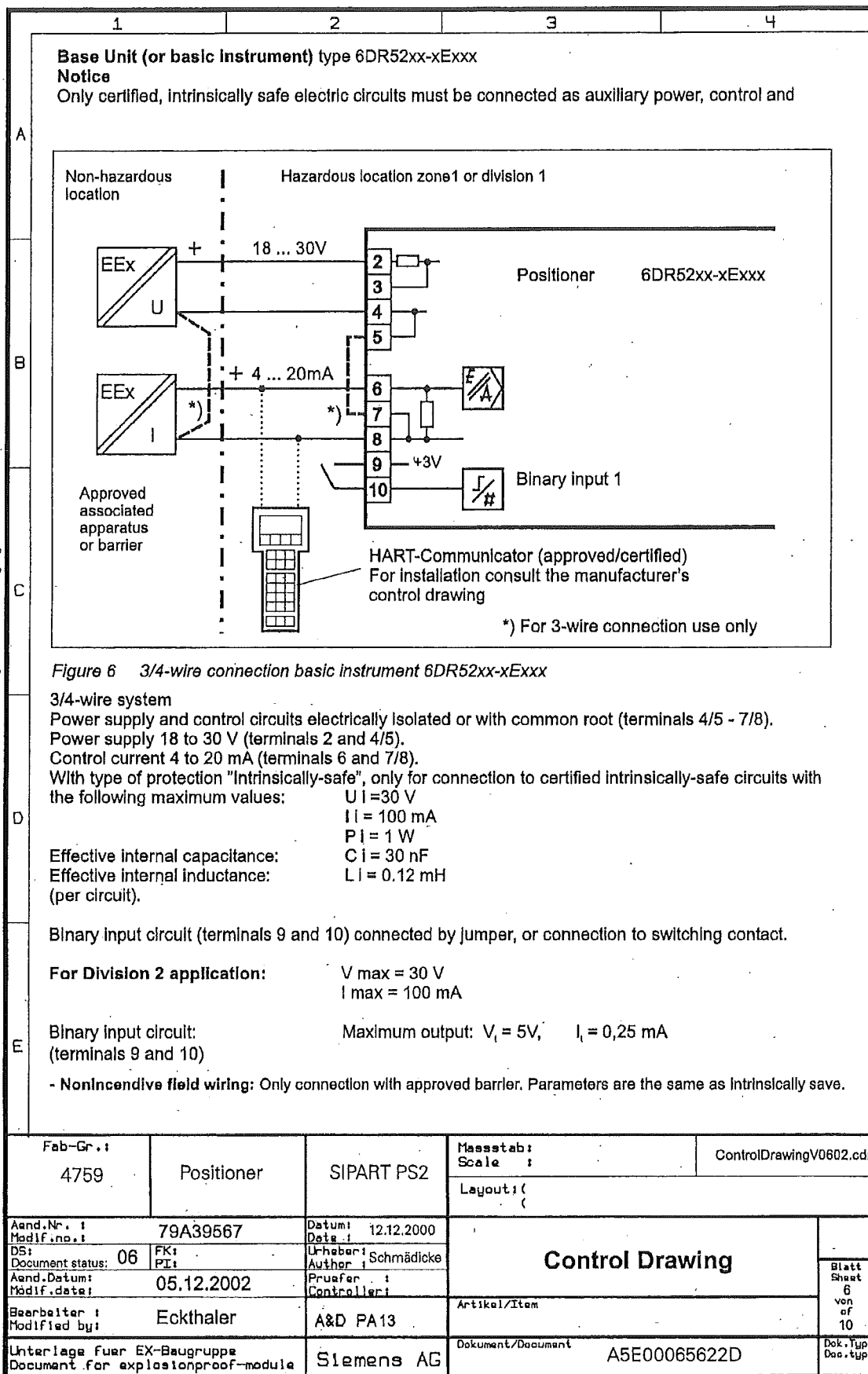
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A	Base Unit (or basic Instrument) type 6DR52xx-xExxx Notice Only certified, intrinsically safe electric circuits must be connected as auxiliary power, control and																																																									
	Figure 5 2-wire connection basic instrument 6DR52xx-xExxx (auxiliary power from the signal current)																																																									
	2-wire system Power supply and control circuits connected in series, 4 to 20 mA (terminals 3 and 7/8; jumpers across terminals 4/5-6) With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values: $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ Effective internal capacitance: $C_i = 7 \text{ nF}$ Effective internal inductance: $L_i = 0.24 \text{ mH}$																																																									
	Binary Input circuit (terminals 9 and 10) connected by jumper, or connection to switching contact.																																																									
D	For Division 2 application: $V_{\text{max}} = 30 \text{ V}$ $I_{\text{max}} = 100 \text{ mA}$																																																									
	Binary input circuit: Maximum output: $V_i = 5 \text{ V}$, $I_i = 0.25 \text{ mA}$ (terminals 9 and 10)																																																									
E	- NonIncendive field wiring: Only connection with approved barrier. Parameters are the same as intrinsically safe.																																																									
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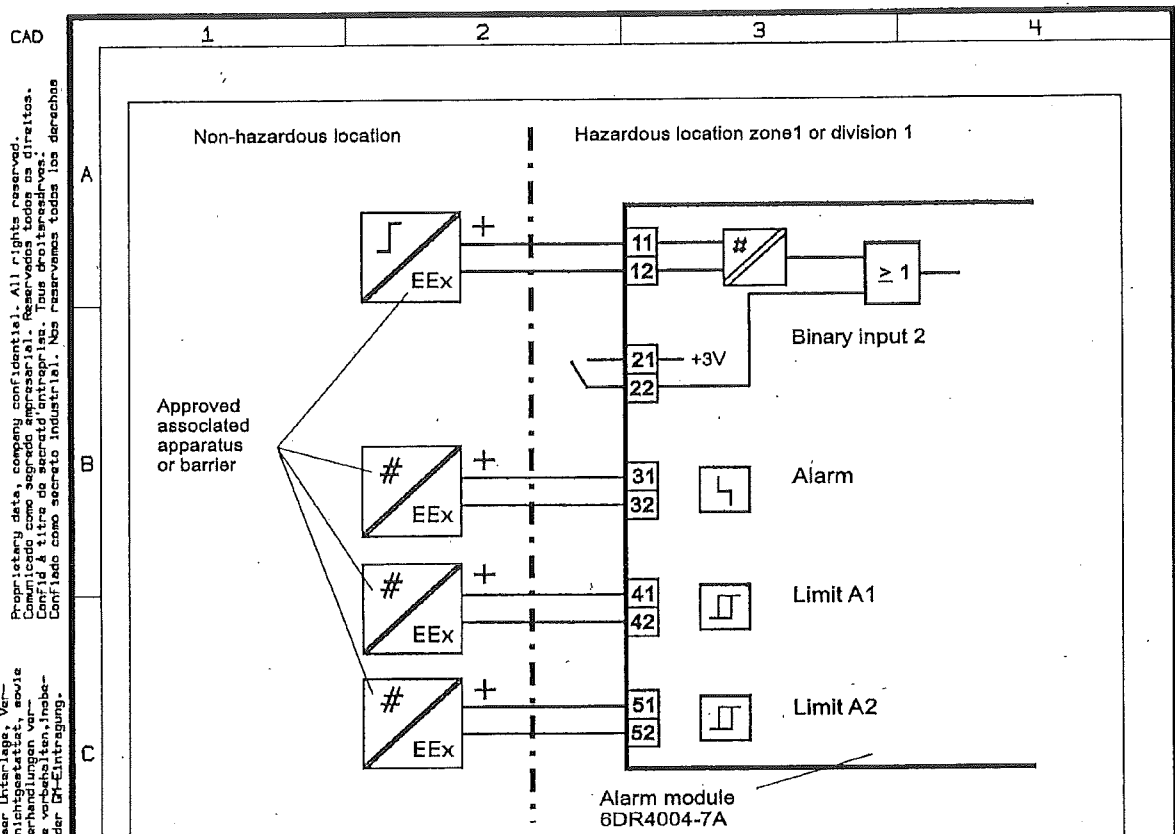


Figure 7 Alarm module 6DR4004-7A

Binary output circuits:
(terminals 31/32,
41/42,
51/52)

With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values:
 $U_i = 15,5V$, $I_i = 25mA$, $P_i = 64mW$,
 Effective internal capacitance: $C_i = 5,7 nF$
 Effective internal inductance: $L_i = 2,6\mu H$

Binary input circuit

With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values:
 $U_i = 25,2V$, $I_i = 155mA$, $P_i = 3,9W$,
 Effective internal capacitance: $C_i = 0$
 Effective internal inductance: $L_i = 0$

for Division 2 application:

$V_{max} = 15,5 V$

Binary output circuits:
(terminals 31/32, 41/42, 51/52)

$V_{max} = 25,2 V$

Binary input circuit

connected by jumper, or connection to switching contact.
 Maximum output: $V_i = 5V$, $I_i = 0,01 mA$

- Nonincendive field wiring: Only connection with approved barrier. Parameters are the same as intrinsically safe.

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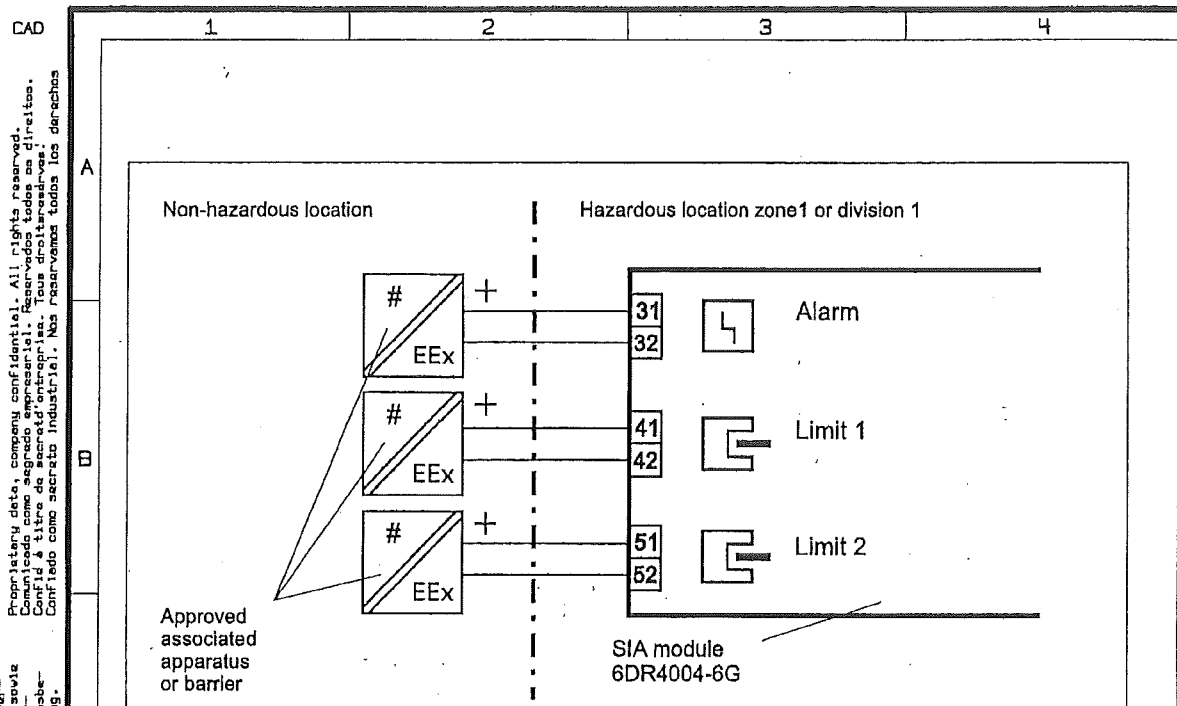


Figure 8 SIA module 6DR4004-6G

Binary output circuit

With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values:
 $U_i = 15,5V$ $I_i = 20mA$, $P_i = 64mW$

Effective internal capacitance: $C_i = 5.7 nF$
 Effective internal inductance: $L_i = 2,6\mu H$

Binary output circuits (terminals 41 and 42)

With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values:
 $U_i = 15,5V$ $I_i = 20mA$, $P_i = 64mW$

Effective internal capacitance: $C_i = 71 nF$
 Effective internal inductance: $L_i = 100\mu H$

for Division 2 application:

Binary output circuit

$V_{max} = 15,5V$
 $P_i = 64mW$

Binary output circuits (terminals 41 and 42)

$V_{max} = 15,5V$
 $P_i = 64mW$

- Nonincendive field wiring: Only connection with approved barrier. Parameters are the same as intrinsically safe.

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A	<p>Notice</p>																															
B	<p>Figure 9 Iy module 6DR4004-7J</p>																															
C	<p>Output circuit, 4 to 20 mA</p> <p>With type of protection "Intrinsically-safe", only for connection to certified intrinsically-safe circuits with the following maximum values:</p> <p>Temperature class T4: $U_i = 30\text{ V}$ $I_i = 100\text{ mA}$ $P_i = 1\text{ W}$</p> <p>Effective internal capacitance: $C_i = 11\text{ nF}$ Effective internal inductance: $L_i = 4,2\mu\text{H}$</p>																															
D	<p>For Division 2 application:</p> <p>Temperature class T4: $V_{\text{max}} = 30\text{ V}$ $I_{\text{max}} = 100\text{ mA}$</p> <p>- NonIncendive field wiring: NonIncendive Parameters are the same As intrinsically safe.</p>																															
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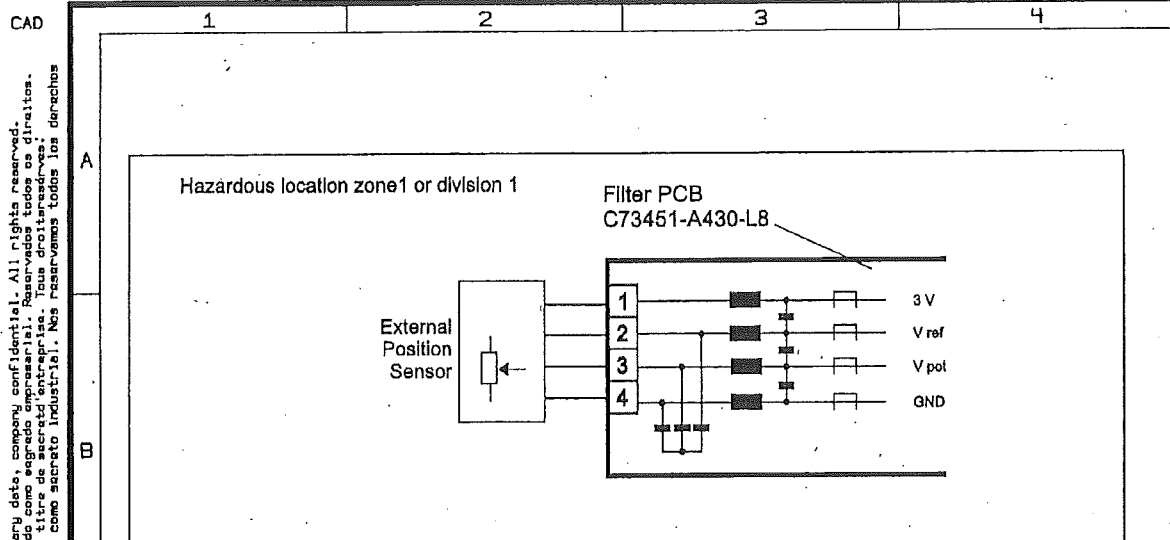


Figure 10 Filter PCB C73451-A430-L8

terminals 1 to 4:

for the connection of a passive potentiometer or of a position sensor.

Maximum values:

$U_o \leq 5V$

$I_o \leq 100mA$

$P_o \leq 33mW$

max. allowed capacitance:

$C_A \leq 1\mu F$

max. allowed inductance:

$L_A \leq 1mH$

for Division 2 application:

Maximum values:

$U_{oc} \leq 5V$

$I_{sc} \leq 100mA$

$P_o \leq 33mW$

max. allowed capacitance:

$C_A \leq 1\mu F$

max. allowed inductance:

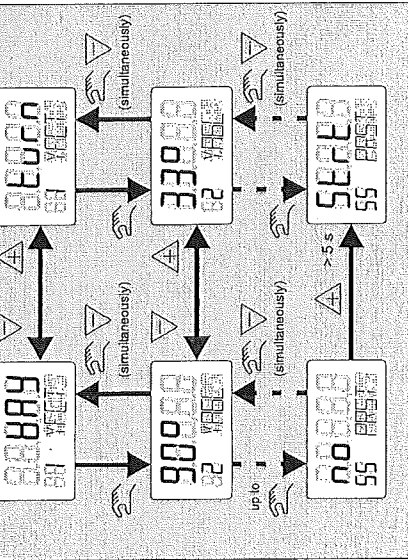
$L_A \leq 1mH$

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Automatic initial start-up (starting with factory setting)

Step	Meaning
1.) Part-turn actuator	
Linear actuator	
2.)	<p>△ Press for > 5 s</p> <p>Remaining steps carried out automatically</p>
3.)	<p>Direction of action is determined</p>
4.)	<p>Checking of travel and adjustment of zero and stroke (from stop to stop)</p>
5.)	<p>Determination and Display of positioning time down (dxx.x), up (uxx.x) Stop with </p> <p>Pressing the key initiates leakage measurement</p>
6.)	<p>Determination of minimum increment length</p>
7.)	<p>Optimization of transient response</p>
8.)	<p>Initialization terminated successfully (travel in mm for linear actuators) (angle of rotation for part-turn actuators)</p>

Continue using:

(The gray values in the top display line are examples)

Automatic initial start-up (starting with factory setting)

Step	Meaning
1.) Part-turn actuator	<div> </div>
Linear actuator	<div> </div>
2.)	<div> </div> <p>△ Press for > 5 s</p> <p>Remaining steps carried out automatically</p>
3.)	<div> </div> <p>Direction of action is determined</p>
4.)	<div> </div> <p>Checking of travel and adjustment of zero and stroke (from stop to stop)</p>
5.)	<div> </div> <p>Determination and Display of positioning time down (dxx.x), up (uxx.x) Stop with </p> <p>Pressing the key initiates leakage measurement</p>
6.)	<div> </div> <p>Determination of minimum increment length</p>
7.)	<div> </div> <p>Optimization of transient response</p>
8.)	<div> </div> <p>Initialization terminated successfully (travel in mm for linear actuators) (angle of rotation for part-turn actuators)</p>

Continue using:

Continue using:

Possible messages		
Display	Meaning	Measures
	Actuator does not move	Acknowledge message using
		Check restrictor (6) and open, if necessary Drive actuator to working range using Restart initialization
	Down tolerance band violated	Change gearing (7) Continue using or adjust sliding clutch up to display
	Once the slipping clutch has been adjusted	then only Continue using Linear actuator: Set pick-up lever into vertical position using Continue using
	Up tolerance band violated	Acknowledge message using Set the next highest travel value on the lever Restart initialization Additionally possible with rotary actuators: Adjust using up to display:
	Up/down span violated	Continue using Acknowledge message using Set the next lowest travel value on the lever Restart initialization
	Actuator does not move Positioning time is possible to adjust	Adjust positioning time using restrictor(s) Continue using or

See Manual for further messages

Parameter name	Display	Function	Parameter values	Unit	Factory setting	Customer setting
1.YFCT	01 YFCT	Type of actuator	turn (part-turn actuator) WAY (linear actuator) LWAY (linear actuator without sine correction) ncSt (part-turn actuator with NCS) -ncSt (ditto, inv. direction of action) ncSL (linear actuator with NCS)		WAY	
2.YAGL ¹⁾	02 YAGL	Rated angle of rotation of feedback Set transmission ratio selector (7) appropriately (see view of device)	90° 33°	Degrees	33°	
2) 3.YWAY	03 YWAY	Stroke range (optional setting) When used, the value must correspond with the set of the leverage ratio on the actuator Driver pin must be set to the value of the actuator travel or, if this value is not scaled, to the next larger scale value.	OFF 5 10 15 20 (short lever 33°) 25 30 35 (short lever 90°) 40 50 60 70 90 110 130 (long lever 90°)	mm	OFF	
4.INITA	04 INITA	Initialization (automatically)	noIn no / ###.# Srt		no	
5.INITM	05 INITM	Initialization (manually)	noIn no / ###.# Srt		no	
6.SCUR	06 SCUR	Current range of setpoint 0 to 20 mA 4 to 20 mA	0 MA 4 MA		4 MA	
7.SDIR	07 SDIR	Setpoint direction rising falling	rISE FALL		rISE	
8.SPRA	08 SPRA	Setpoint for start of split range	0,0 to 100,0	%	0,0	
9.SPRE	09 SPRE	Setpoint for end of split range	0,0 to 100,0	%	100	
10.TSUP	10 TSUP	Setpoint ramp up	Auto 0 to 400	s	0	
11.TSDO	11 TSDO	Setpoint ramp down	0 to 400	s	0	
12.SFCT	12 SFCT	Setpoint function Linear Equal-percentage 1:25, 1:33, 1:50 Inverse equal-percentage 1:25, 1:33, 1:50 Freely adjustable	Lin 1- 25 1- 33 1- 50 n1- 25 n1- 33 n1- 50 FrEE		Lin	
13.SL0 14.SL1 usw. bis 32.SL19 33.SL20	03 SL00 (example)	Setpoint turning point at 0% 5% to 95% 100%	0,0 to 100,0	%	0,0 5,0 etc. to 95,0 100,0	
34.DEBA	04 DEBA	Dead zone of controller	Auto 0,1 to 10,0	%	Auto	
35.YA	05 YA	Start of manipulated variable limiting	0,0 to 100,0	%	0,0	
36.YE	06 YE	End of manipulated variable limiting	0,0 to 100,0	%	100,0	
37.YNRM	07 YNRM	Standardization of manipulated variable To mech. travel To flow	MPOS FLOW		MPOS	
38.YDIR	08 YDIR	Direction of manipulated variable for display Rising Falling	rISE FALL		rISE	
39.YCLS	09 YCLS	Tight closing with manipulated variable Without Top only Bottom only Top and bottom	no uP do uP do		no	
40.YCDO	10 YCDO	Value for tight closing, bottom	0,0 to 100,0	%	0,5	
41.YCUP	11 YCUP	Value for tight closing, top	0,0 to 100,0	%	99,5	
42.BIN1 ⁴⁾	12 BIN1	Function of BI 1 None Only message Block configuring Block configuring and manual Drive valve to position up Drive valve to position down Block movement	OFF on bLoc1 bLoc2 uP doWn StoP NO contact -on -uP -doWn -StoP NC contact		OFF	
43.BIN2 ⁴⁾	13 BIN2	Function of BI 2 None Only message Drive valve to position up Drive valve to position down Block movement	OFF on uP doWn StoP NO contact -on -uP -doWn -StoP NC contact		OFF	
44.AFCT ⁵⁾	14 AFCT	Alarm function Without A1=min, A2=max A1=min, A2=min A1=max, A2=max	OFF normal fl, nR fl, n, nR nR, nR inverted -fl, nR -fl, n, nR -nR, nR		OFF	
45.A1	15 A1	Response threshold of alarm 1	0,0 to 100,0	%	10,0	
46.A2	16 A2	Response threshold of alarm 2	0,0 to 100,0	%	90,0	
47.YFCT ⁵⁾	17 YFCT	Function of alarm output on fault Fault + not automatic Fault + not automatic + BI ("+" means logical OR operation)	normal fl, nR fl, n, nR nR, nR inverted -fl, nR -fl, n, nR -nR, nR		fl	
48.YTIM	18 YTIM	Monitoring time for fault message "control deviation"	Auto 0 to 100	s	Auto	
49.YLIM	19 YLIM	Response threshold for fault message "control deviation"	Auto 0,0 to 100,0	%	Auto	
50.YSTRK	20 YSTRK	Limit for stroke integral	OFF 1 to 1,00E9		OFF	
51.YDCHG	21 YDCHG	Limit for direction change	OFF 1 to 1,00E9		OFF	
52.YZERO	22 YZERO	Limit for end stop monitoring, bottom	OFF 0,0 to 100,0	%	OFF	
53.YOPEN	23 YOPEN	Limit for end stop monitoring, top	OFF 0,0 to 100,0	%	OFF	
54.YDEBA	24 YDEBA	Limit for dead zone monitoring	OFF 0,0 to 10,0	%	OFF	
55.PRST	25 PRST	Preset (factory setting) "no" nothing activated "Srt" start of factory setting after pressing key for 5 s "oCAY" display following successful factory setting CAUTION: preset results in "NO INIT"	no Srt oCAY			

1) If "turn" is selected, you cannot set 33°

2) Parameter does not appear if 1.YFCT=turn has been selected

3) Turning points only appear with selection 12.SFCT = FrEE

4) NC contact means: action with opened switch or Low level

NO contact means: action with closed switch or High level

5) Normal means: High level without fault

Inverted means: Low level without fault

Anhang Appendix

Einbau der Optionen Installation of options

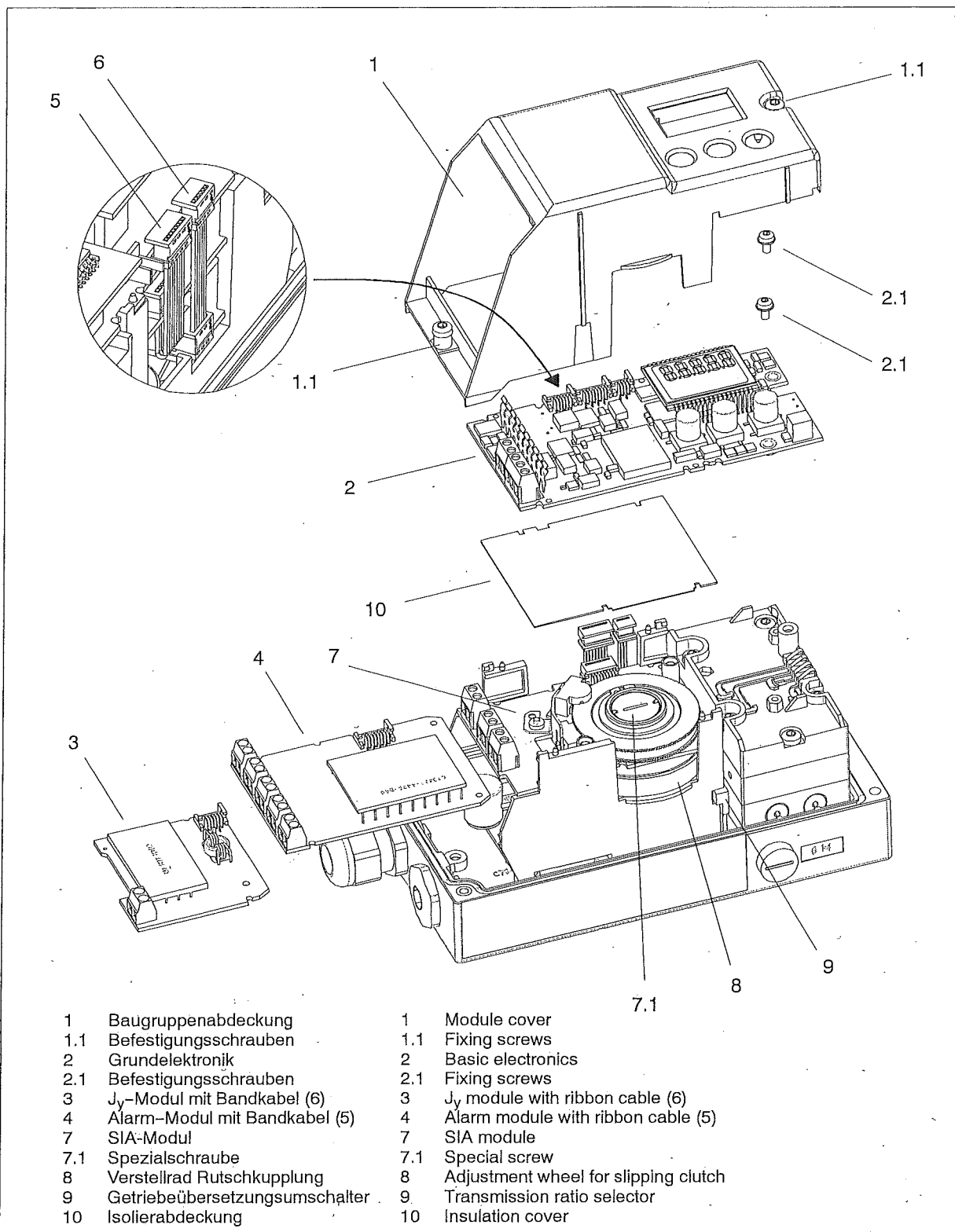


Bild 9 Einbau der Optionsmodule

Fig. 9 Installation of options

Elektrischer Anschluss Grundgerät Electric connection of basic device

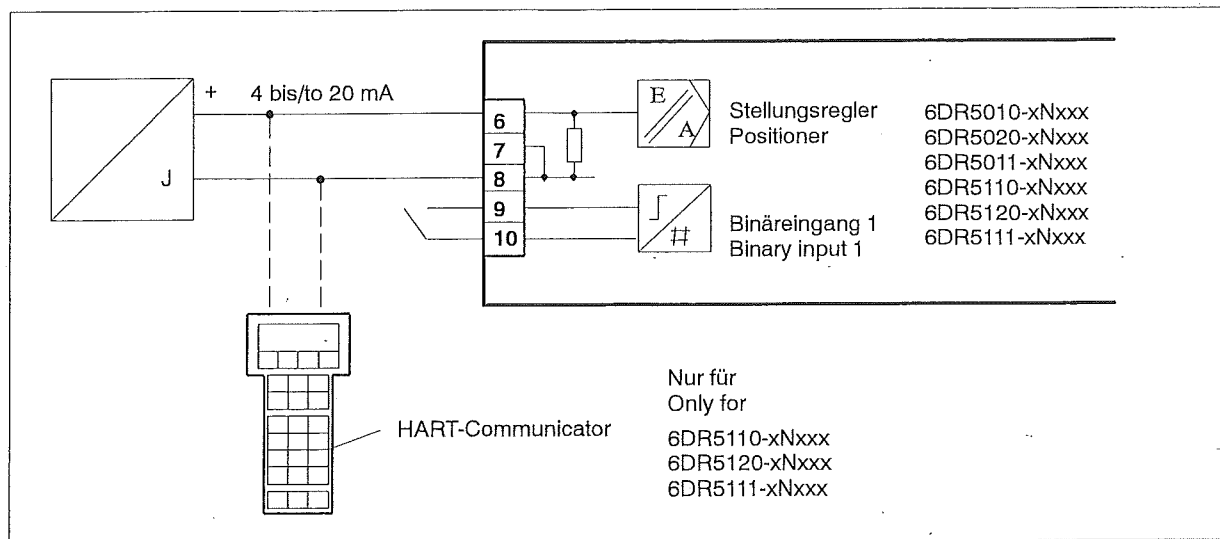


Bild 10 2-Leiteranschluss **nicht** Ex

Fig. 10 2-wire connection **not** explosion-proof

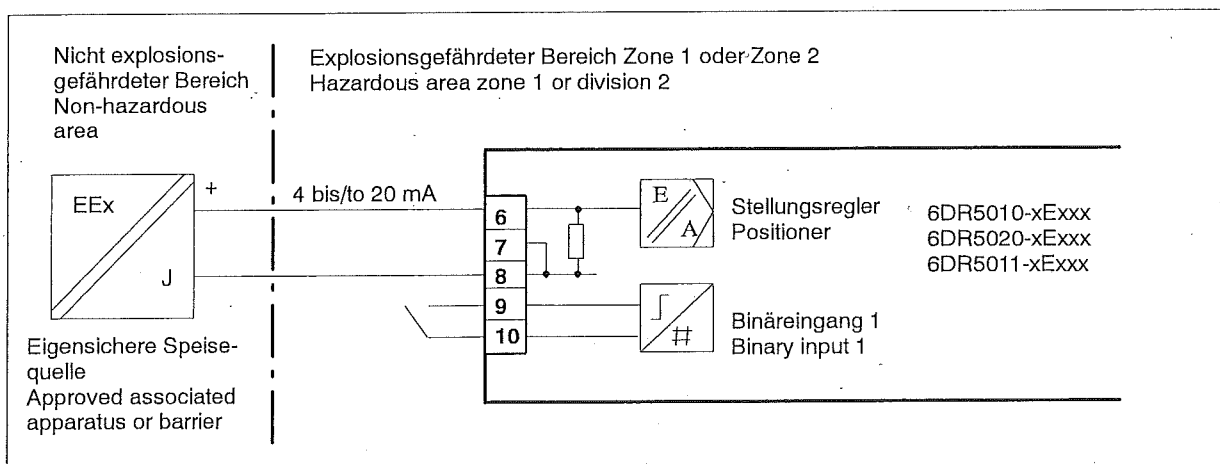


Bild 11 2-Leiteranschluss, EEx i, EEx n

Fig. 11 2-wire connection, EEx i, EEx n

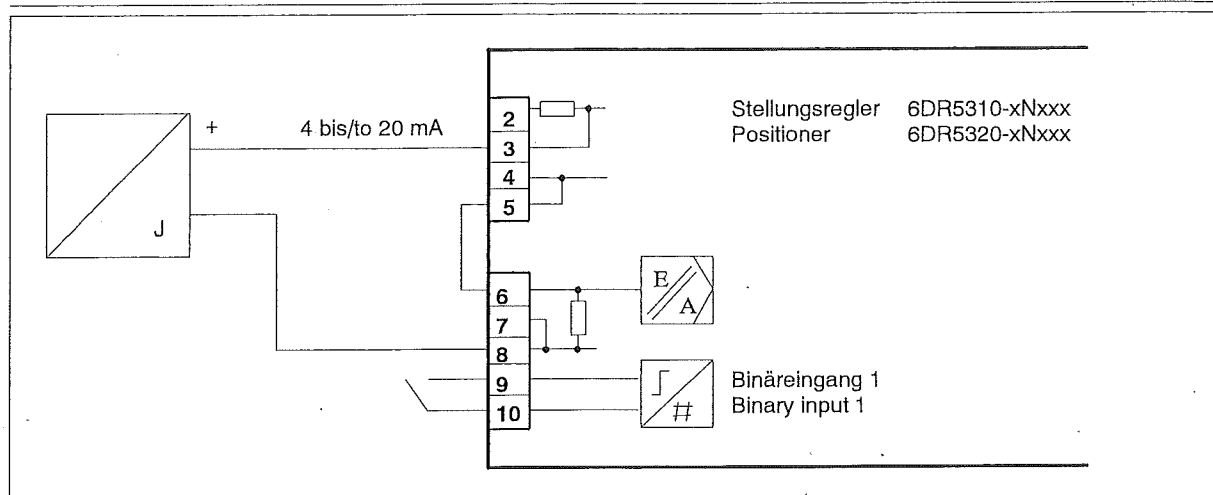


Bild 12 2-Leiteranschluss, nicht Ex

Fig. 12 2-wire connection, not explosion-proof

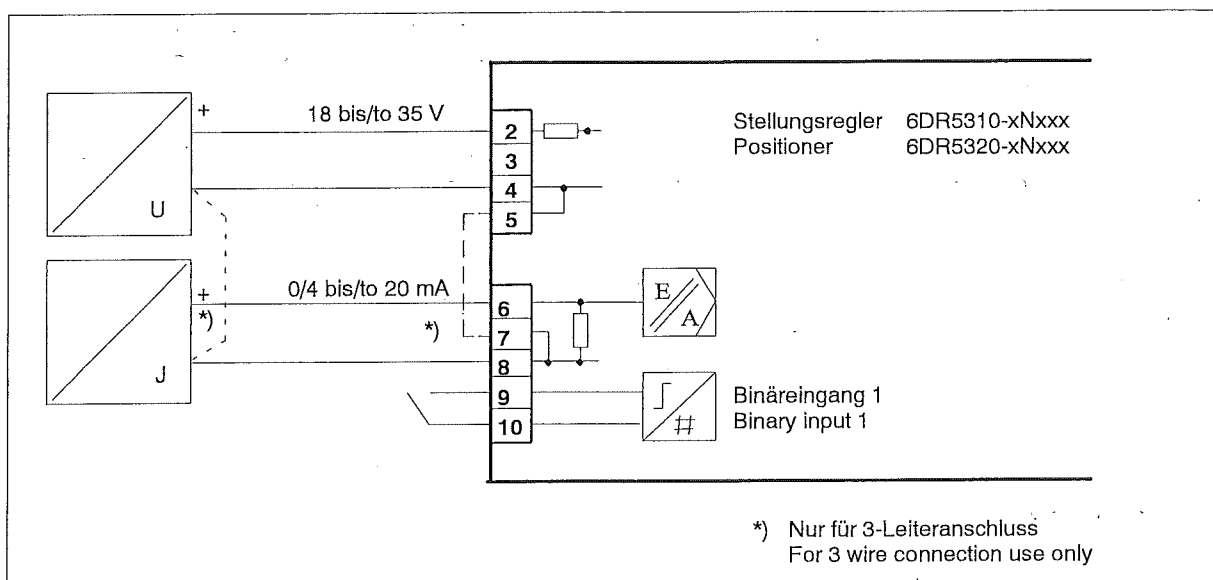


Bild 13 3/4-Leiteranschluss, nicht Ex

Fig. 13 3/4-wire connection, not explosion-proof

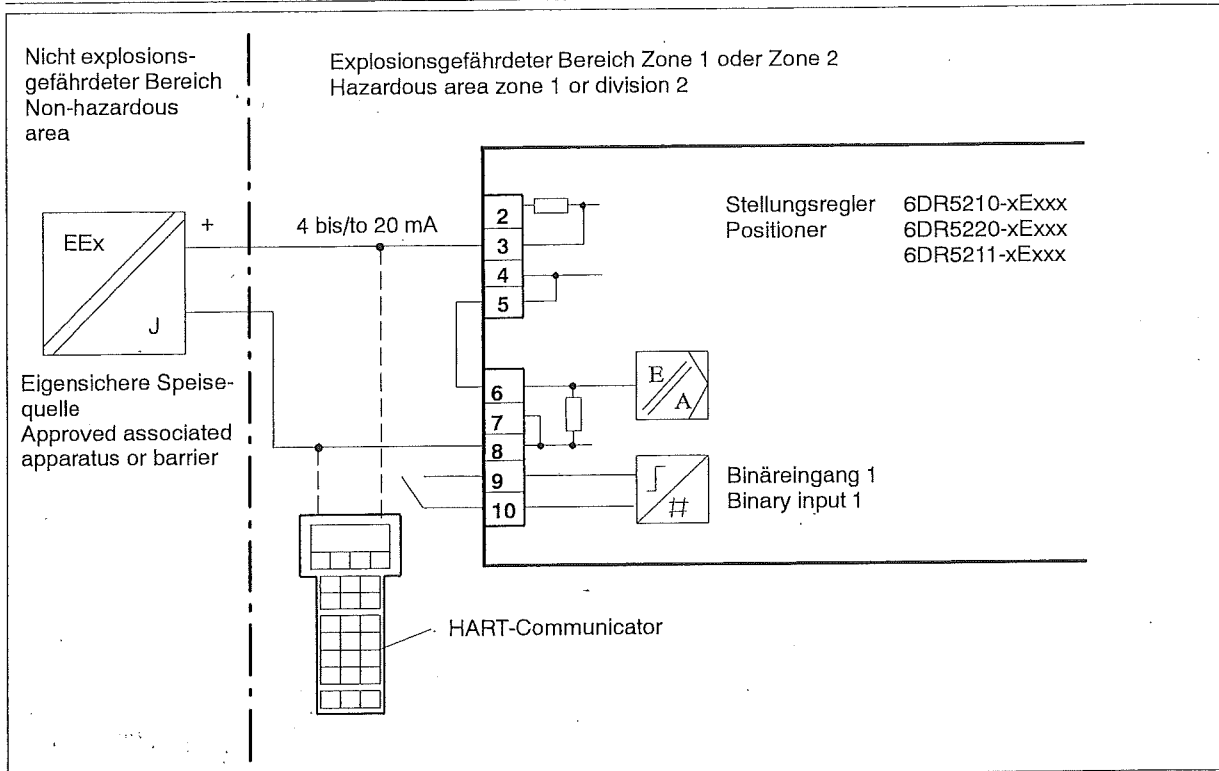


Bild 14 2-Leiteranschluss, EEx i, EEx n

Fig. 14 2-wire connection, EEx i, EEx n

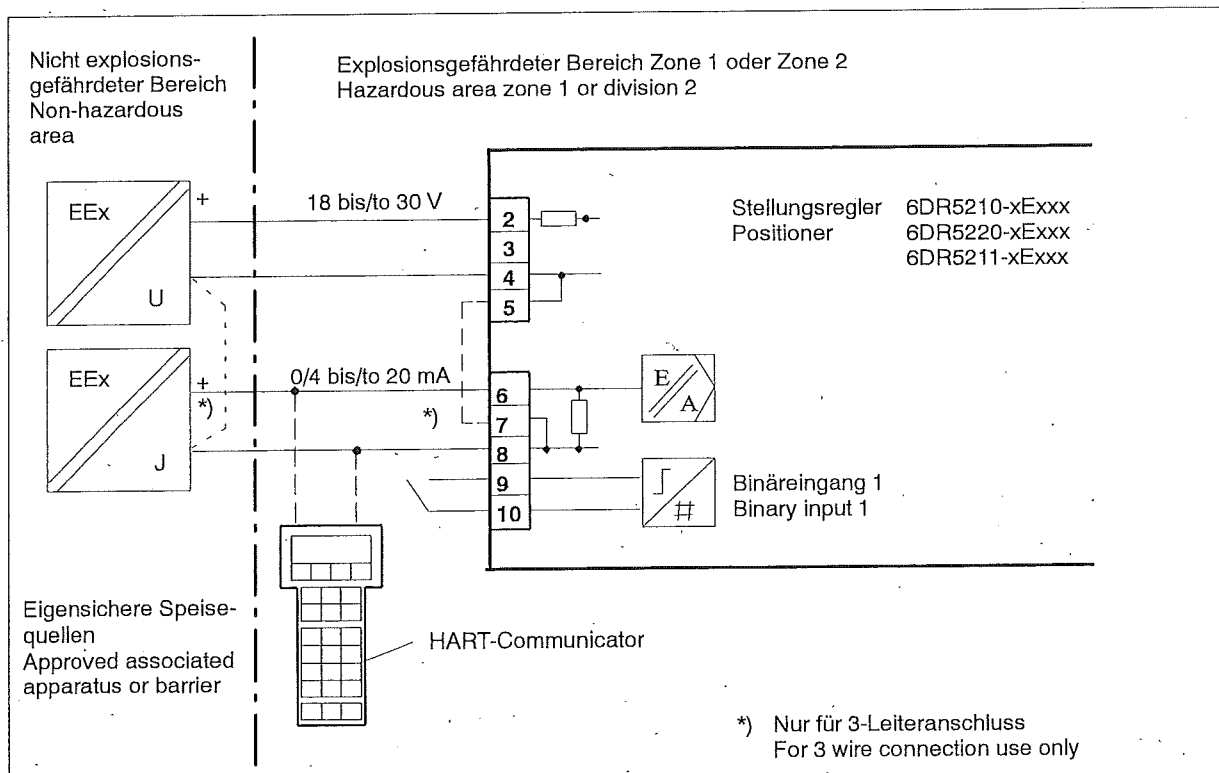


Bild 15 3/4-Leiteranschluss, EEx i, EEx n

Fig. 15 3/4-wire connection, EEx i, EEx n

Elektrischer Anschluss Optionen
Electric connection of options

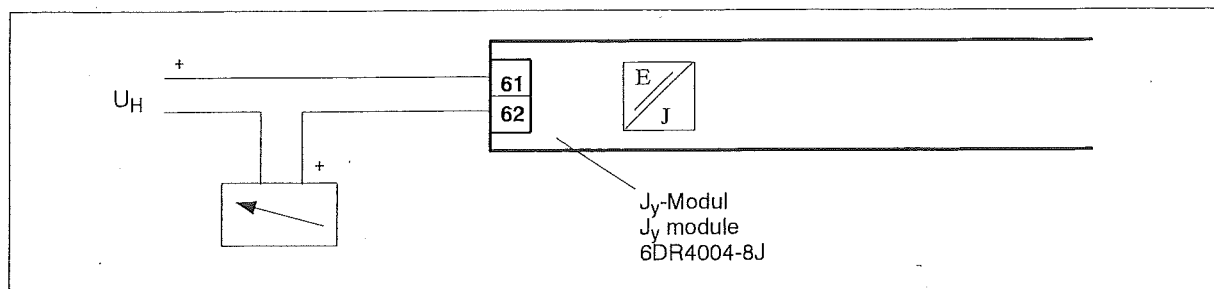


Bild 16 J_y-Modul, **nicht** Ex

Fig. 16 J_y module, **not** explosion-proof

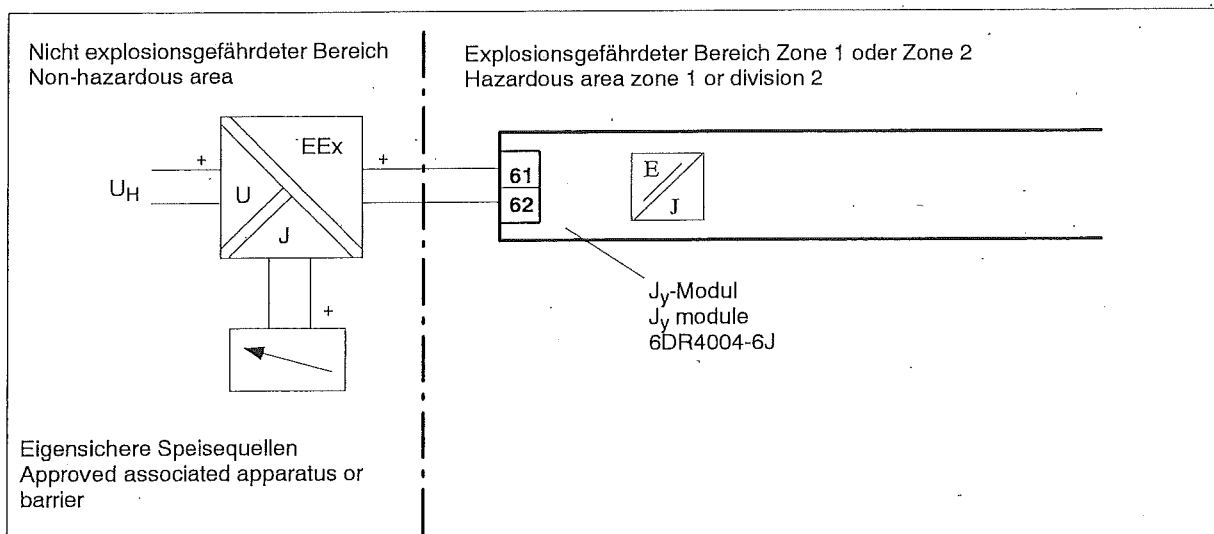


Bild 17 J_y-Modul, EEx i, EEx n

Fig. 17 J_y module, EEx i, EEx n

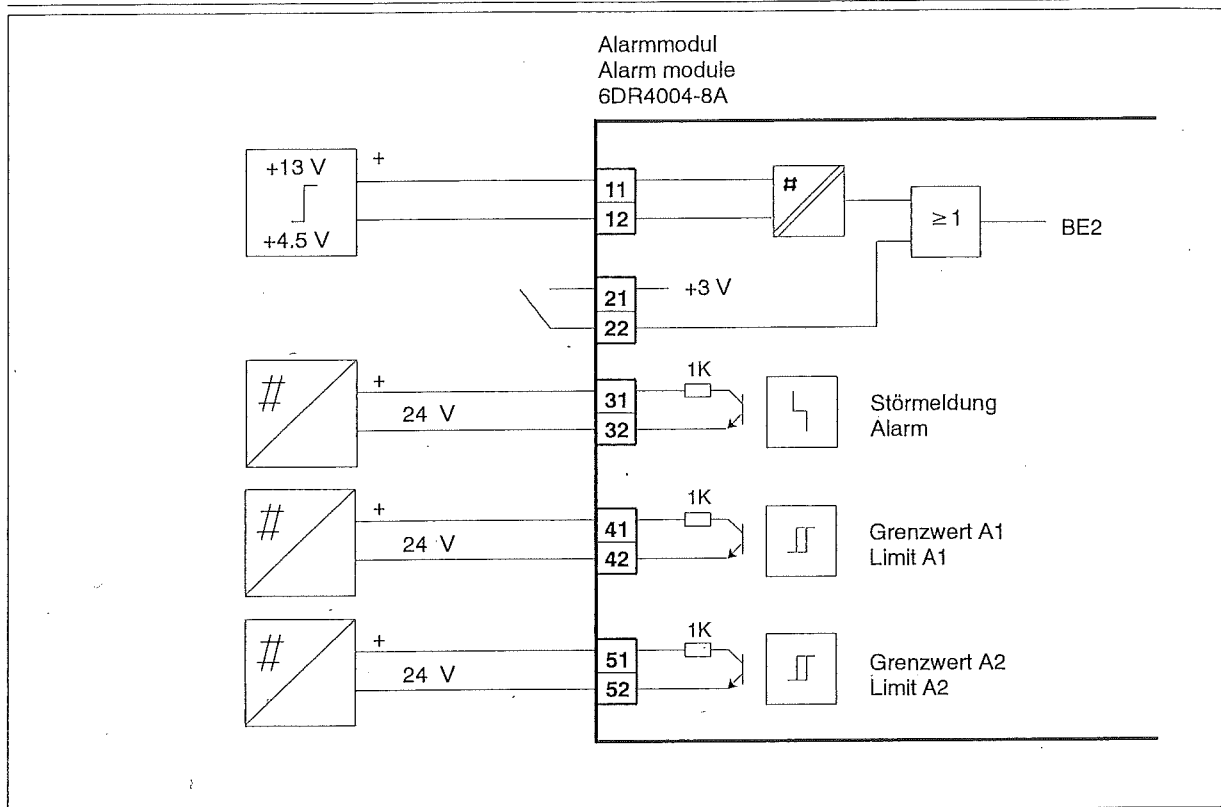


Bild 18 Alarmmodul, **nicht** Ex

Fig. 18 Alarm module, **not** explosion-proof

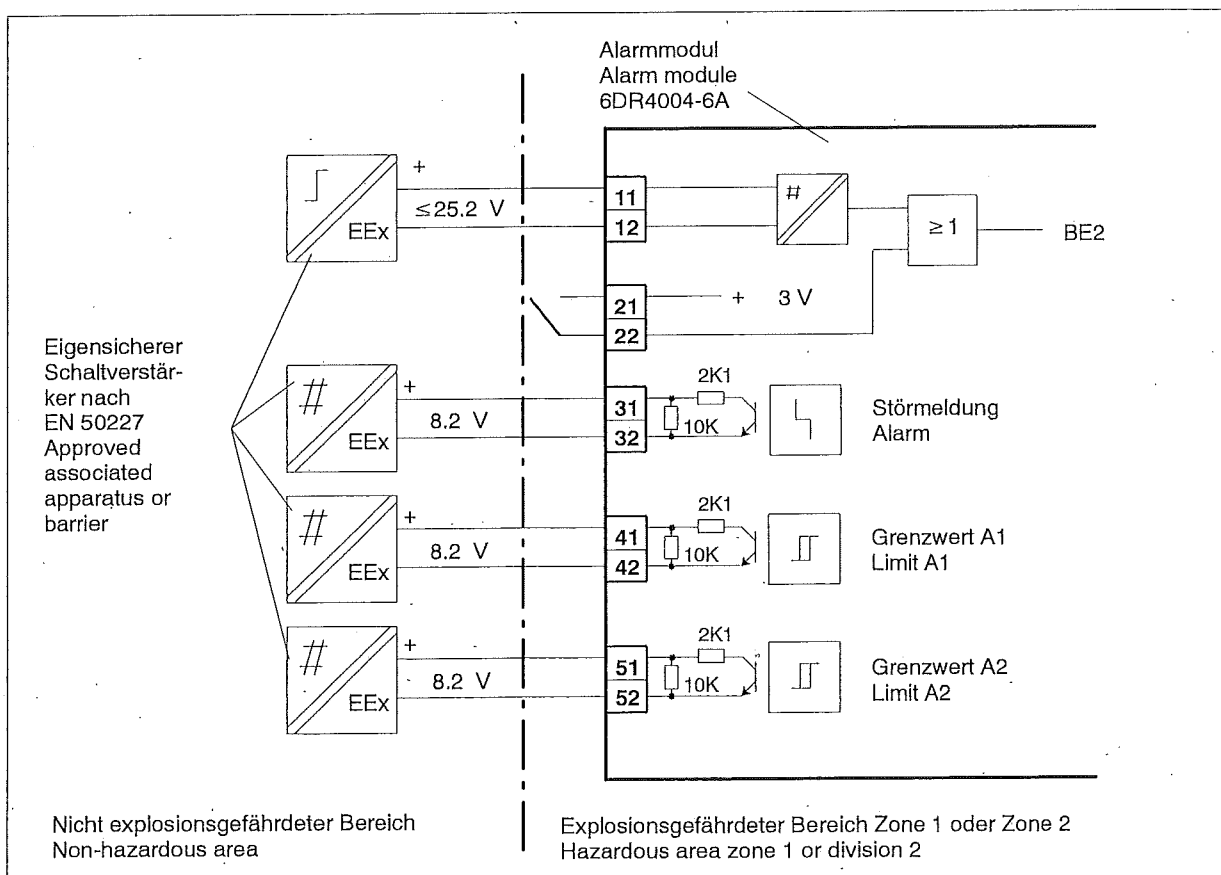


Bild 19 Alarmmodul, EEx i, EEx n

Fig. 19 Alarm module, EEx i, EEx n

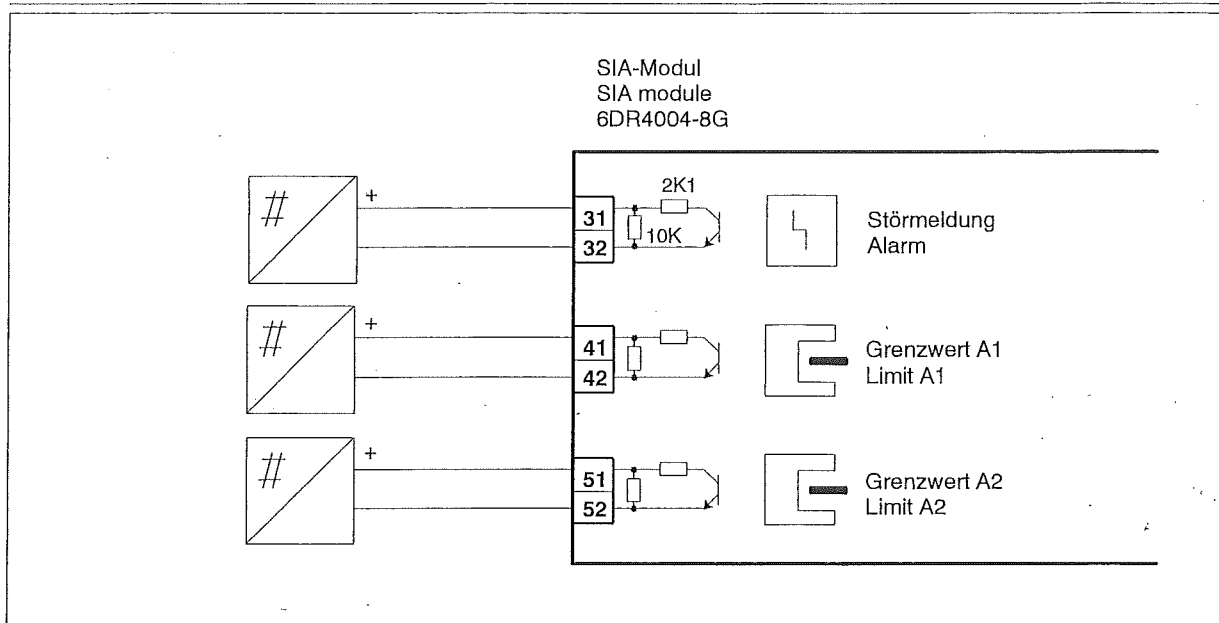


Bild 20 SIA-Modul, **nicht** Ex

Fig. 20 SIA module, **not** explosion-proof

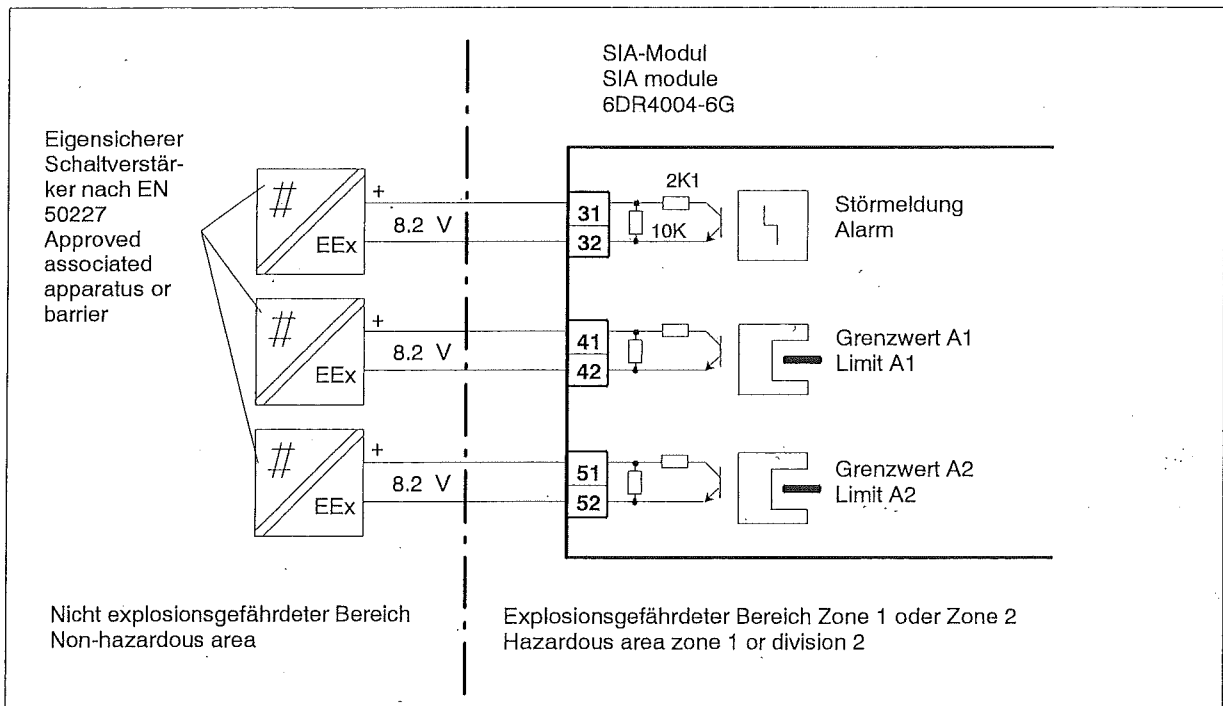


Bild 21 SIA-Modul, EEx i, EEx n

Fig. 21 SIA module, EEx i, EEx n

Hebel NAMUR NAMUR lever

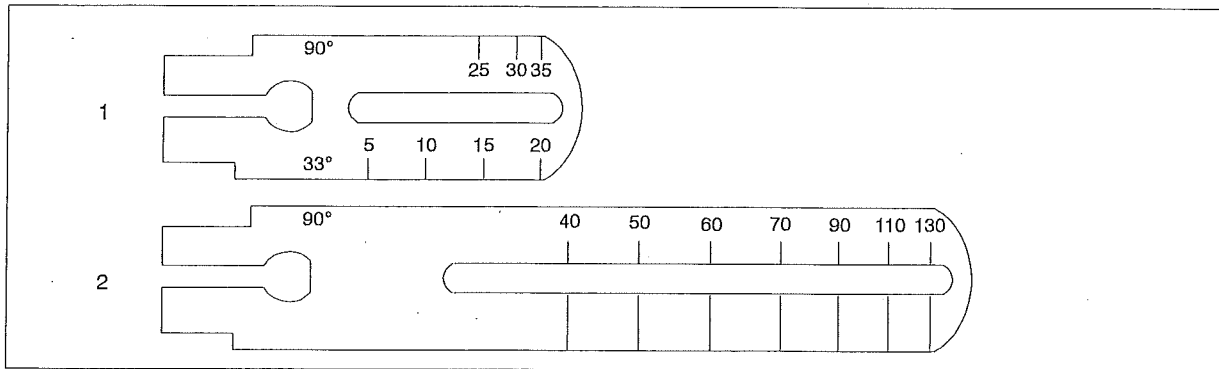


Bild 22 Hebel NAMUR 3 mm bis 35 mm (1), Hebel NAMUR > 35 mm bis 130 mm (2)

Fig. 22 NAMUR lever 3 mm to 35 mm (1), NAMUR lever > 35 mm to 130 mm (2)

Maßbilder Dimension drawings

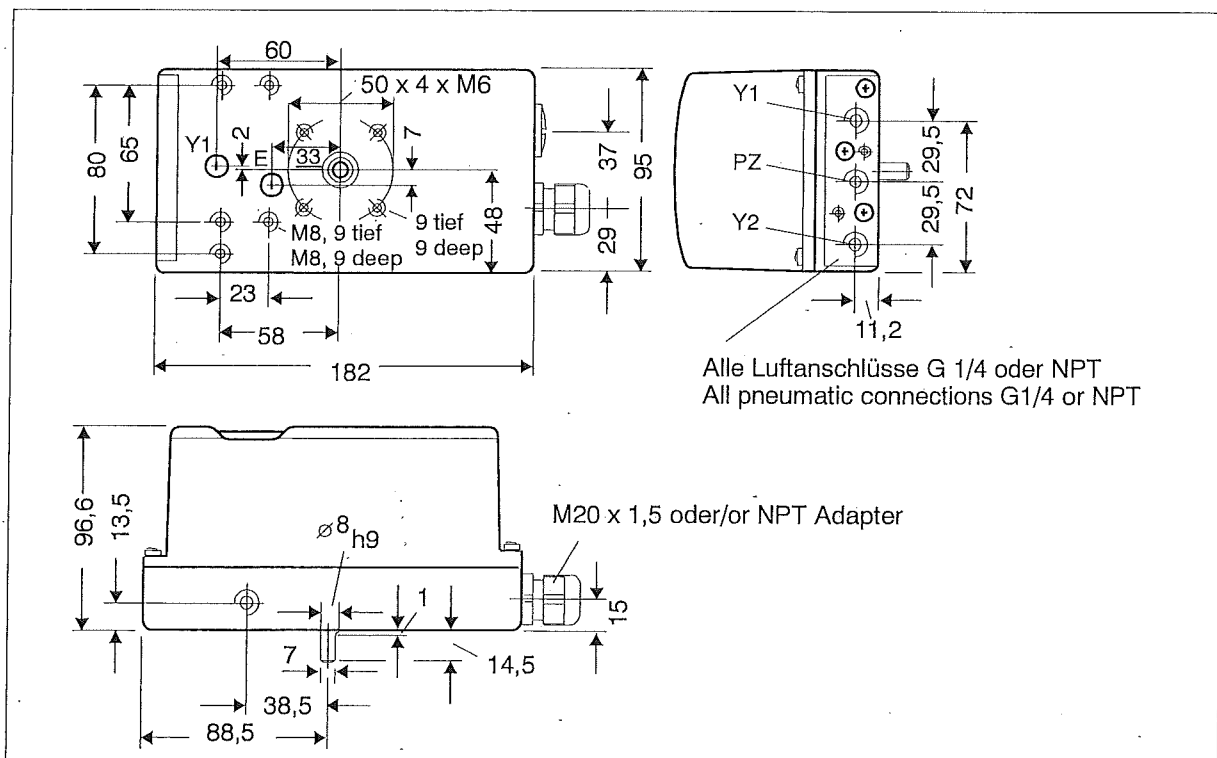


Bild 23 Maßbild Ausführung Kunststoffgehäuse

Fig. 23 Dimension drawing of plastic housing version

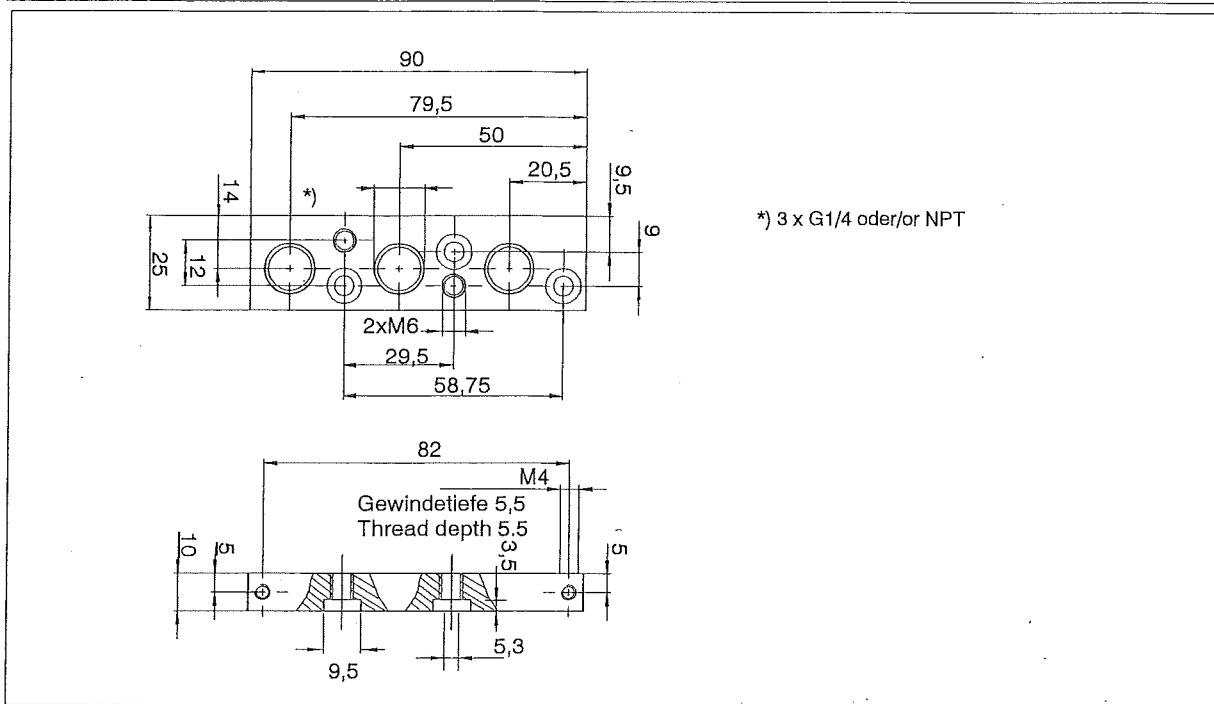


Bild 24 Maßbild Anschlussleiste für Kunststoffgehäuse

Fig. 24 Dimension drawing of terminal block for plastic housing

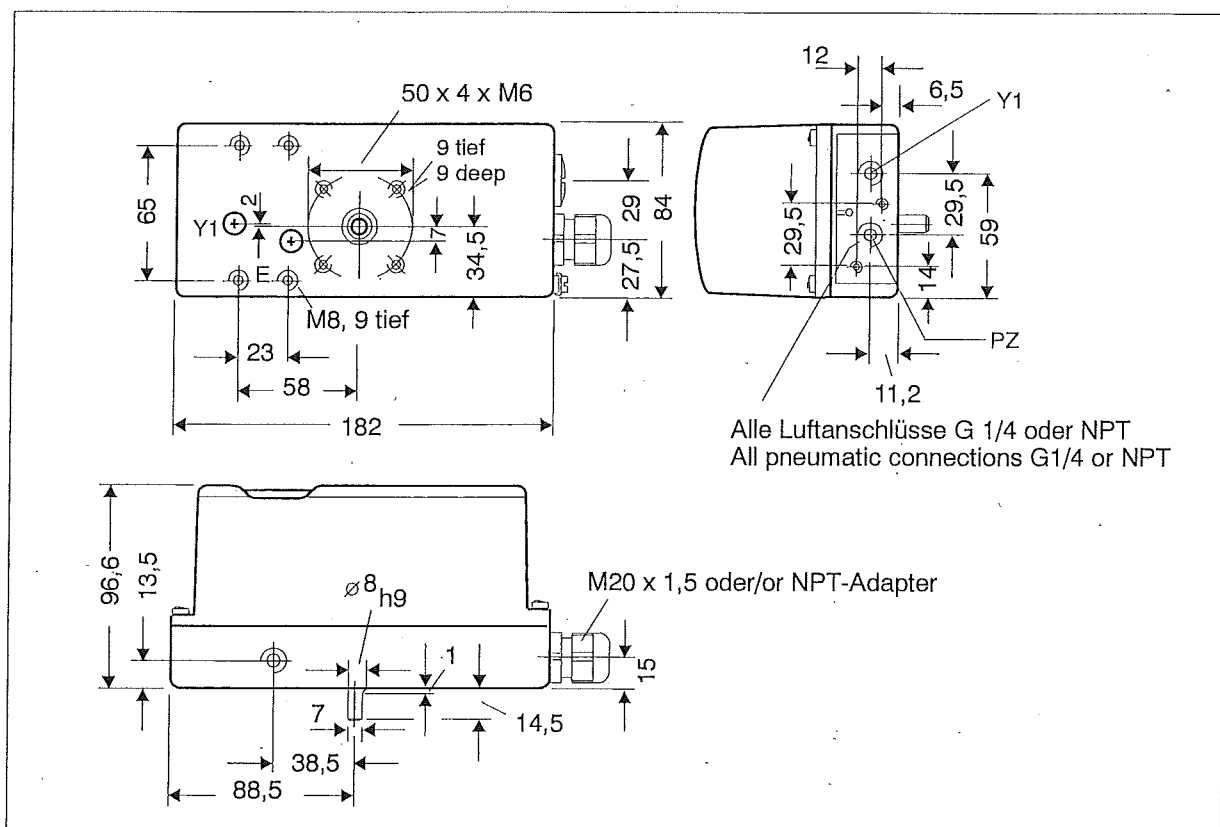
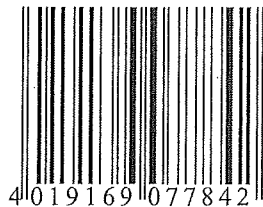


Bild 25 Maßbild Ausführung Metallgehäuse

Fig. 25 Dimension drawing of metal housing version



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