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1. Safety instructions

STEPHAN machines are constructed for effective and safe use in the food and processing industry.

Conditions for the successful and safe operation of these machines are that:

· The machine is installed and commissioned only by appropriately trained personnel.

· The enclosed operation and maintenance instructions for the machine are followed exactly and maintained under all circumstances.

· Any person working with the machine should be thoroughly acquainted with the health and safety instructions.

1.1 Correct usage

· STEPHAN machines are intended for mechanical and industrial manufacture of products according to the procedures indicated and the specifications detailed for the machine and peripheral equipment supplied.

the following are not permitted:

· Operation and maintenance of the machine by unauthorised and not properly trained personnel.

· Inappropriate or improper use of the machine.

· Alteration of safety devices such as switches, locks, covers, guards, seals etc., or making them inoperative.

· Contravention of local safety and accident prevention regulations.

1.2 Explanation of symbols and signs

A number of signs are used in these operating instructions which must be observed under all circumstances in order to avoid risks to personnel and machines.
These signs have the following symbols:

DANGER
Sign which, when ignored, can lead to injury.

WARNING
Sign which, when ignored, can lead to damage to the machine.

NOTE
Notes and advice on working with the machine.

1.3 General working safetyt

Improper operation of the machine can lead to personal injury, damage to the machine and interruptions to the production process.

The management responsible must therefore ensure that operating personnel are properly trained and that only qualified and authorised personnel work on machine.

SAFETY LOCKING DEVICES
Mechanical and electrical safety devices located on the cover and in the discharging and emptying area prevent anyone from reaching into the machine while it is running. These safety devices must under no circumstances be made inoperative.

OILS, LUBRICANTS AND COOLANTS
Some of these agents endanger personal health and the environment. Only materials recognised as being physiologically safe should be used. Selection and use of these materials depends entirely on the management, although STEPHAN can make recommendations with respect to the materials used.

PRESSURE VESSEL REGULATIONS
If pressure vessels are installed, they are subject to regular inspections according to the pressure vessel regulations. If necessary, the vessel may need to be tested in the location where the machine is to be installed. All inspection certificates must be stored carefully. All working and inspection instructions in the pressure vessel regulations must be observed.

SAFETY VALVE
If the STEPHAN machine works with overpressure, the safety valve is protected in the works so that the permissible pressure cannot be exceeded. The valve is fitted with a lead seal so that the release pressure cannot be adjusted. Manipulating the valve can lead to fatal injuries. Removal of the lead seal also invalidates the guarantee.Material drained from the safety valve must be disposed of properly and safely.

SAFETY AWARENESS
- Management must ensure that operating and maintenance personnel are thoroughly acquainted with all safety instructions and that all safety instructions are actually observed. The operating instructions should be readily available for reference in the workplace.
- All working procedures which reduce safety at the machine must be avoided.
- Operators are obliged to announce at once every alteration to the machine which reduces its safety.
- The machine's safety can be reduced by:
* reconfiguration or alteration of the machine
* use of accessories other than those provided by STEPHAN- use of non-original replacement and wearing parts

1.4 Operation

Operators must be thoroughly trained in handling the machine and its processes.

CONCEALED KNIVES, CUTTING RINGS, FEED SCREWS, ETC.
Do not reach into full or partially full machine bowls or funnels, as there is risk of injury from concealed sharp-edged cutting tools and machine parts.

TECHNICAL LIMITING VALUES
Observe the limiting values for the technical machine data specified.

1.5 Maintenance and repairs

All maintenance and repair work may only be carried out by specially trained personnel..

PLACING THE MACHINE OUT OF OPERATION
- Switch off the main switch before maintenance and repair work to prevent it from being switched on inadvertently. This applies to all work on the switch cabinet and peripheral units.
- For steam installations the steam supply must be switched off and must be secured before re-starting. The machine and all pipelines must be depressurised.
- For hydraulic systems with an accumulator the system must be depressurised at the accumulator release valve.
- For pneumatic systems, the system must be depressurised and the stop valve closed.

ELECTRIC SYSTEMS
All electrical work must only be carried out by qualified electricians. The general and specific accident prevention regulations must be observed during electrical repair work.

SAFETY DEVICES
When dismantling safety devices for repair and maintenance work, the machine must be placed out of operation. The safety devices must be connected again immediately after completion of repair and maintenance work and checked for perfect operation.

COMMISSIONING
The operation of the safety devices must be checked before commissioning the machine.

It should be checked that the work tools are properly attached and that there are no foreign bodies in the machine, as loose parts in the machine can damage the work tools and motor shaft

MOTOR PROTECTION IP 54 AND SWITCH CABINET PROTECTION IP54
Washing the motor or switch cabinet with pressurised water or cleaning agent is not permitted.

1.6 Service and guarantee

INVALIDATION OF GUARANTEESTEPHAN
will accept no responsibility or guarantee claims for damage caused by:
· not observing the operating instructions,
· improper operation and maintenance of the machine and its peripheral equipment,
· technical and functional modifications carried out without consulting STEPHAN,
· use of parts other than original STEPHAN parts and accessories,
· disconnecting, dismounting or otherwise making safety devices inoperative.

REPLACEMENT PARTS
A stock of the most important replacement and wearing parts at the machine's location is important for its continual operation.

ORDERING REPLACEMENT PARTS
STEPHAN require the following information to process replacement parts orders:
· machine type from the cover of the operating instructions
· machine number from the machine type plate[e.g. K 720.000]
· order numberin the replacement parts list in the operating instructions

This information avoids the need for any further questions from our Service Department and speeds up delivery.

We will be pleased to assist you with any questions on your machine

A. Stephan und Söhne GmbH & Co.
Serviceabteilung Stephanplatz 2 31789 Hameln

Telephon: 05151/5830 Fax: 05151/583110
Email: Vertrieb@stephan-germany.com Service@stephan-germany.com

2. Preface

The Combicut TC 850 is a robust and durable multipurpose machine for the industry and production technology, that is to say, this machine type may be used in almost all areas of food production, depending on configuration.

The vast number of available equipment allows many different variants. For this reason, we are not able to discuss your particular application in this manual.

We will, however, describe the basic machine and the available equipment in this operating manual.

Our technical advisors will recommend to you the most economic equipment for your product.

Those described variants which are not part of your machine have not been ordered and / or are not required for your product.

Should you have questions about your machine or the equipment which are not answered by this operating manual, or wish to enquire about the manufacture of a particular product, please get in touch with one of our technical advisors for your technical area:

A.Stephan und Söhne GmbH & Co., Hameln Tel. 051 51 / 583-0 or get in touch with one of our dealers.

2.1 Please bear in mind the following points:

This operating manual is intended to be read, understood and followed in every detail by those who are responsible for, and work with, the Combicut TC 850.

In particular, the general safety precautions on the colored pages at the front should be observed.

The complete documentation should always be kept at the place of installation of the Combicut TC 850.

Only with full knowledge of the operating manual can mistakes of the multipurpose machine be prevented and a trouble-free operation guaranteed. Thus it is most important that the responsible persons are really familiar with this operating manual.

Please read these operating instructions through thoroughly before starting the machine, as we accept no liability for damage and operating errors which result from the non-observation of these operating instructions.

If, however, problems should ever arise, please get in touch with our customer service and spares department or with one of our dealers, who will gladly assist you [see address list on last page).

These operating instructions apply only to the product range Combicut TC 850.

3. Technical data

Machine-type	Combicut TC 850
Customer	
Comm.-no.	727.082
Wiring-diagram-no.	
Year of construction	2002

3.1 Machine data TC 850

Drum contens	l	approx. 850
Max. filling	kg	approx. 600
Batch size, normal	kg	approx. 550
Product temperature	°C	up to 105°
Working overpressure	bar	-1 / 0,5
Guide values for the steam connection		
Steam production	kg/h	780
Initial steam pressure	bar	6-8
Steam pressure on the machine	bar	2.0 to 3.5

3.2 Energy consumption

Total consumption	**KW**	**143**

Motor	**Type**	**WK 280 M8/4**
	No.	6363305
Operating voltage (threephace AC)	V / Hz	400 / 50
	KW	90 / 110
	A	170 / 195
	rpm	1500 / 3000

Water consumption	l/min	7
Cooling water inlet	°C	approx. 20
Cooling water outlet	°C	approx. 40
Extra slow speed (for drive of the main motor shaft by means of the extended shaft end with coupling and V-belt)	**Type**	**R67DV 132 S4**
	No.	01.307063.1201.0001.01
	rpm	115
	KW	5.5
	A	11.0
Gear motor (for mixing baffle)	**Type**	**KF 107 DV 160 L8/4/ BM/ HR**
	No.	01.3070662501.0001X02
	rpm	24
	KW	5.5/10.0
	A	18.1/20.0
Hydraulic unit (for operating the motor shaft brake and inlet and outlet slides)	**Type**	**HST-102-A-3-S/E-00-65**
	KW	1.5
	A	3.7
Max. permissible pressure	bar	135
Vacuum unit	**Type**	**ELMO-F2BV5110-OKC20-68**
	No.	D810308307-004
Evacuation capacity 117 cbm/h	mbar	at 150
	KW	4.0
	A	9.9
Water dosing device		
Flow-capacity (1 liter impulses)	l/min	200
Charging balance	**Type**	**KAF 84 DV 112 M4/8 MG**
	KW	4.0
	A	8.7

Cooling system (pump)	Type	NM 053 SF 02 S12B
	KW	7.5
	A	14.5

3.3 Electric

Supply voltage / frequency	V / Hz	400 / 50
Control voltage	V	24 DC
Fuse protection at 400 V (slow-blow)	A	270

3.4 Installation propopsal Combicut TC 850

Installation propopsal 2001.5.04/1 d

Flow sheet 2001.5.04/2 c

3.5 Area of application and intended usage

The Combicut TC 850 is exclusively designed for the mixing, chopping, slicing, emulsifying and heat treatment of products.

The Motor performance and the Implements must be compatible with the process and the product to be processed; the technical limit values of the machine should not be exceeded. (See ” Machine data TC 850” on page 9.)

Any other application of the machine is illegitimate. The manufacturer accepts no liability for any damage resulting therefrom.

3.6 Summary

The Combicut TC 850 is combining the latest technical findings with years of experience of STEPHAN with regard to construction and mechanical engineering.

All components proved successful for years in practice and were constantly improved by regular tests.

Before leaving the factory, all machines are inspected thoroughly in order to guarantee high reliability and a long life.

The STEPHAN Combicut Combicut TC 850 is used wherever stable and non-perishable emulsions and dispersions shall be produced.

This compact installation can be employed for a whole variety of processes not only in the chemical-pharmaceutical field but also for the preparation of foodstuffs. The machine being completely made of stainless steel corresponds to all rules of hygiene and product requirements.

The switch board is provided with a free programmable control. By means of an operation terminal the plant can be programmed easily and within a short time.

The STEPHAN Combict Combicut TC 850 is robust, easy to handle and can be adapted easily to varying recipes and processes.

4. Set-up and starting

What to do first..	...and then carry out and double check!
Due to its own weight and low-vibration operation, the machine may be installed without additional fastening. The adjustable rubber feet of the Combicut enable compensation for slightly uneven floors.	However, it requires a firm surface to stand on.
Before starting up, you should check that the supply voltage conforms to the operating voltage specified on the Combicut rating plate. The stipulated fuse protection must be provided.	 All electrical work is only to be carried out by a qualified electrician.
Connect the feed pipes.	 Check pipes for leaks. Check the steam piping particularly carefully.
Remove all loose parts from the machine.	 Loose parts flying about in the machine may damage the implements and the motor shaft.

4.1 Rotational direction check

The direction of rotation check has already been carried out during test running before the delivery of the Combicut. Should, on new installation, a drive have a direction of rotation different to that given in the table below, the polarity of the phase supply must be reversed.

All electrical work is only to be carried out by a qualified electrician.

The motor connections are only to be altered if, after the replacement of a motor, gear or pump, the direction of rotation requires correction according to the following table.

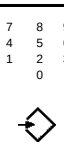
To check rotational direction, disconnect the implement holder from the main motor shaft, close and lock the lid. Only start individual drives for a short time. In the following table, rotational direction is always with respect to the view from above the machine.

Drive	Where to test?	Direction of rotation	Arrow towards
Main motor	Spin plate beneath the bowl floor	Towards the right	End shield
Gear motor	Beneath the connecting flange	Towards the left "mix" Toward the right "empty"	Ventilation flap
Vacuum pump	Motor ventilator fan	Towards the right	Ventilation flap
Hydraulics	Motor ventilator fan	Towards the right	Ventilation flap

4.2 Function testing and test run

The basic functions of the Combicut have been factory tested. In order to ensure, however, that no damage has arisen during transport or installation, a test run of the machine should be carried out shortly after its setting-up.

We emphasis once more that only persons properly familiar with the functioning of the machine are permitted to operate the Combicut

What to do first..	...and then carry out and double check!
Attach working insert to motor shaft, put on cap nut and tighten with spanner.	 The working insert must be absolutely securely mounted.
Two third fill the bowl with warm water (ca. 50°C / 122°F).	 The Combicut requires headroom for perfect product processing, i.e., the bowl must not be filled beyond **2/3** capacity.
Close and lock the lid.	
Manually select 400 mbar vacuum pressure on the OP control unit. pabs = 400 mbar = 60% vacuum.	 (See " Manual operation and input of nominal values" on page 20.)
Switch on the vacuum pump.	 Read off the vacuum pressure from the OP display. The vacuum pump switches off automatically once the selected vacuum has been achieved.
Switch on the mixing baffle motor..	 The vacuum test is passed if the vacuum loses less than 50 mbar over 5 minutes, with the machine running.
Check that the functioning of the steam valves and	
the water valves correspond to the description of the OP function keys.	
Open the aeration valve.	 Pressure in the machine will be released.
Switch off the mixing baffle.	
Open discharge .	 Place evacuation or standard wagon at disposal. 
	 Check the vacuum manometer to ensure that the machine is no longer under pressure before opening the machine lid.

What to do first..	...and then carry out and double check!
Unlock and open the lid.	 Always wear protective safety gloves if surfaces are hot.

4.3 Installation and starting work Microcut

What to do first..	...and then carry out and double check!
The machine is placed where it is intended to operate, and the electrical supply lines are connected following the circuit diagram (in the switch box).	All electrical work is only to be carried out by a qualified electrician.
Remove all loose parts from the machine.	 Loose parts flying about in the machine may damage the tools and the motor shaft.

The direction-of-rotation check has already been carried out during test running before the delivery of the Microcut . Should, on new installation, a drive have a direction of rotation different to that given in the table below, the polarity of the phase supply must be reversed.

All electrical work is only to be carried out by a qualified electrician.

Only briefly start the motor. In the following table, direction of rotation is always with respect to the view from above the machine.

Drive	Where to test?	Direction of rotation
Main motor	Look into the funnel from above	Towards the right

The machine should be thoroughly rinsed with hot water, with the motor running, after wich it is fully operational and may be put into use.

4.4 Starting-up the hydraulic system

The hydraulic system must only be started up by our installation engineers or similarly qualified specialists.
Detailed instructions . (See ” Maintenance of the hydraulic system” on page 42.)

Rapid alteration between pressurizing and de-pressurizing is to be avoided because:

- the associated pressure waves damage seals
- may burst pipes and hoses
- and may damage important functional parts.

The working pressure of the hydraulic system is 120 bar / 1700 PSI.
This high pressure is hazardous. Hydraulic fluid may be expelled through the minutest fissures in the hydraulic system and cause injuries.
The safety precautions must be observed exactly, even for examination of the hydraulic system. All work on the hydraulic system must be carried out with the machine depressurized.
Connections must not be loosened or tightened on an hydraulic system which is under pressure. Without fail, the motor must first be shut off and the pressure released.

5. Operating the machine

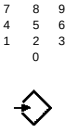
5.1 Implement fitting

There is a risk of injury when handling sharp blades and implements.

What should happen	What to do	Key	The result!
Reduce excess pressure/vacuum	Open aeration valve.		The machine is not under pressure.
Open container	Unlock toggle seals Open lid.		Lid is open
Implement fitting	Attach working insert to motor shaft, put on cap nut and tighten with spanner. Dismounting takes place in reverse order		Implements are ready for use.

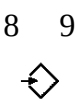
5.2 Loading the machine.

The, OP requires headroom for perfect product processing, i.e., **the bowl must not be filled beyond 2/3 capacity.**

What should happen	What to do	Key	The result!
Reduce excess pressure/vacuum	Open aeration valve.		Machine is de-pressurized.
Loading the machine via inlet slide.	Open the inlet slide. First fill the liquid and then the solid compenents.		Inlet slide is open.
	Close the inlet slide.		Inlet slide is close.
Loading via measuring hopper or a hose from a separate container.	Fill hopper or container.		
	Enter vacuum pressure on the control panel of the OP control device (the required value is to be determined by trial). (See ” Manual operation and input of nominal values” on page 20.)		
	Switch on the vacuum system.		The machine is ready to be loaded.
Loading the machine manuel	Open hand-valve.		

What should happen	What to do	Key	The result!
Loading with charging unit.	Put the charging wagon into the charging unit.		
	Charging programmable control.		

5.3 Mechanical and thermal product treatment.

What should happen	What to do	Key	The result!
Process product mechanically, i.e. slice, cut, mix, stir, emulsify, etc.	Switch on mixing baffle		
	Select main motor revs. at the OP. (See ” Manual operation and input of nominal values” on page 20.)		
	Switch on main motor		
Thermal product processing	Select temperature at the OP. (See ” Manual operation and input of nominal values” on page 20.)		All thermal processes should be carried out with the mixing baffle running on the main motor to ensure optimal heat transfer.
	Switch on mixing baffle		
	Switch on main motor		

What should happen	What to do	Key	The result!
Direct product heating.	Open aeration valve or		Excess pressure is thus kept low in the container. The vacuum is switched off or the aeration valve closed once 70°C/158°F is reached.
	Switch on the vacuum system.		
	Open steam jet nozzles		The function is switched off auto-matically once the pre-selected temperature has been reached.
Direct product cooling.	Pre-select amount of cooling water at the OP. (See ” Manual operation and input of nominal values” on page 20.)	7 8 9 	
	Open steam nozzle water valve		

5.4 Emptying the machine

If work is done under pressure or vacuum conditions you must equalize pressure via the aeration valve. Check the vacuum manometer to ensure that the machine is no longer under pressure before opening the machine lid.

What should happen	What to do	Key	The result!
Emptying via discharge valve.	Open aeration valve.		Machine is de-pressurized.
	Place evacuation or standard wagon at disposal. Open outlet slide.		

6. Daily cleaning and maintenance

Cleaning, disinfection and sterilization are basic requirements of every process in the food production industry and technology. Additionally, thorough cleaning extends the life of the machine and in particular the seals considerably. Complete instructions for the cleaning and disinfection processes are to be found in the technical appendix. (See ” Cleaning and disinfection” on page 47.)

After production has been ended, cleaning the Combicut should should restore it to a germ-free condition ready for use. The frequency and intensity of cleaning and disinfection required depend fundamentally on the degree of contamination arising from the production process.

6.1 Cleaning procedure Combicut

Cleaning may be carried out manually with scrubbing brushes or with the assistance of machine functions according to the following table. High pressure hoses should not be used.

What to do first..	...and then carry out and double check!
Fill bowl to 2/3 full with warm water and add neutral detergent with disinfectant action. Switch to manual mode and select a temperature of 50°C at the OP. (See ” Manual operation and input of nominal values” on page 20.)	Fatty contamination is removed by water temperatures over the melting point of fat (50°C).
Switch on mixing baffle to mix.	During the removal of protein-containing dirt with water over 60°C, coagulated protein may burn in on surfaces and should therefore quickly be removed with the appropriate cleaning materials.
Switch on main motor at low revs. to start with and then run for ca. 2-3 minutes.	
Switch on the vacuum pump.	
Open discharge valve. Rinse with clean water.	Place evacuation or standard wagon at disposal.
Remove working insert from the motor shaft and clean implements separately. Clean the drill holes of the working insert should be cleaned with a bottle brush. Remove lid seal from the lid nut, clean and replace.	Take care when handling blades and implements. Never put bare hands into a full bowl. Concealed blades carry a high risk of cuts and injury.
The safety valve should be cleaned daily, to prevent accumulation of product residues. To clean the valve carefully unpressurized with water or air, it may be lightly aerated manually or unscrewed.	Damage or removal must not occur to the leading which maintains the release pressure settings.

What to do first..	...and then carry out and double check!
If necessary, the casing and drive of the emptying valve may be separated by releasing the locking clamps and cleaned manually.	
Lacquered machine parts should be cleaned with a sponge and mild soapy water.	 Never spray down motor, motor casing, switching cabinet etc., with water or cleaning solutions.
Use only a dry cloth to clean the hydraulic equipment.	 Electric and hydraulic equipment should only ever be cleaned dryly.

6.2 Maintenance work for 8 hour operation Maintenance work

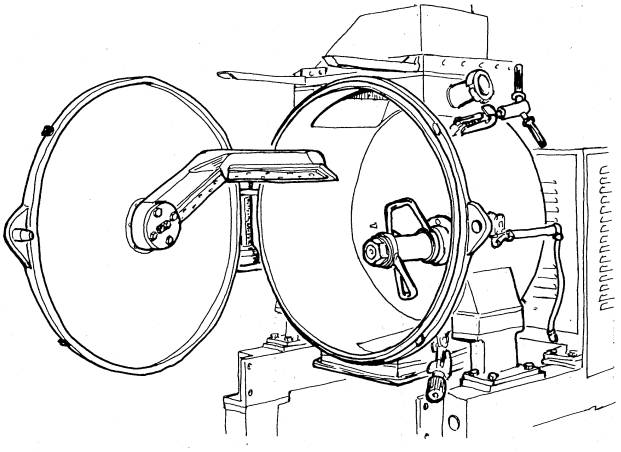
When?	Where?	What to check...	...and what to do.	Page
Daily	**Bowl and lid**	Seals and running sleeves in lid and bowl rims	replace damaged seals clean running sleeves and replace them if wear is noticeable on the upper surface.	40
	Implements	Implements must be sharp and undamaged, if not,	they should be replaced.	
	Gear motors all aggregates	Check lubricant at inspection window	if necessary refill with lubricant.	41
	Pneumatics	Condensation water	check for contamination.	32
	Shaft seals	of the mixing baffle motor and the main motor	lubricate once daily and after every cleaning	
	Safety valve	must be free moving and not encrusted with product residues to function perfectly.	Check freedom of movement by manual operation. If the safety valve has been released it must be cleaned immediately.	31
Weekly	**Hydraulics**	Oil level	if necessary fill up with hydraulic fluid	42
	Pneumatics		Fill up oiler	32
Every 6 months	**Steam Unit**	Check steam filter for dirt.		HIDDEN
Yearly	**Hydraulics**	Condition of hydraulic fluid	Change hydraulic fluid	42
Every 2 years	**Gear motor**	Oil change intervals	Change lubricant	41

7. Machine description

7.1 General

All parts of the Combicut TC 850 which come into contact with food products are of non-rust stainless steel or other physiologically harmless material.

Main motor with brake device, hydraulic aggregate, terminal box and central greasing device are mounted in a frame made of stainless steel profiles. The entire equipment is protected by stainless steel sheeting and can be reached through a flap installed at the rear.



The main motor and the drum both resting on antivibration elements are flanged to each other. The motor directly drives the working insert with its shaft reaching inside the drum.

The drum and cover walls are scraped by means of a mixing baffle which is driven by a gear shaft reaching through the cover. By changing the sense of rotation of the mixing baffle emptying of the drum can be accelerated.

Above and beneath the drum one inlet and one outlet slide is situated. Operation is made hydraulically according to control pulses by the switch board.

Charging of the drum is either made by means of a funnel situated over the inlet slide where the charging appropriately is made by means of a charging unit or on the other hand by means of fixed connections for flour, water, fat etc. provided at a hood instead of the funnel. During operation material can be taken out of the drum by means of the sample valve .

The anti-vibration elements bearing motor and drum as well as the rubber feet guarantee a quiet and almost vibration-free running.

7.2 Machine frame

The machine frame is made of welded rectangular hollow sections, the motor fastening is a steel plate screwed on a U-sectioned frame.

The frame is completely made by stainless steel sections which can be delivered in two constructions: Either surface sand blasted- polished or unpolished.

The motor plate is a hot-dip galvavized steel plate, painted on with DD-lacquer.

The machine frame is covered with a stainless steel coverin the region of the motor. This cover is fixed on the machine frame with screws.

The frame can adjusted horizontal and vertical on special machine bearing plates, which due to their rubber/metal construction ease vibrations, protect the floor and need not be fastened to the floor.

Each machine bearing plate is continuously adjustable in height by means of a threaded spind le.

For transportation special transportation frames with steerable transportation rolls are made available by Fa. A. Stephan u. Söhne GmbH & Co. The transportation of the machine on even and good bearing floor is possible without any problems.

7.3 Drum

The drum is manufactured to conform to German pressurized bowl regulations. The lid is secured to the bowl by toggle seals for safety. The seal between bowl and lid is by means of a specially designed silicon-rubber washer. In these conditions, the bowl is vacuum fast and, depending on specification, pressure fast.

The drum made of solid stainless steel is seated on anti-vibration elements and with its bottom flanged to the main motor. An axial face seal in the bottom of the drum secures sealing against the motor shaft.

For charging an inlet slide or an inlet valve and for discharge an outlet slide or an outlet valve is provided. Beside the inlet slide (or the inlet valve) there is the option of dosing openings with pneumatically operated disc valves.

For drums working with overpressure a bottom seating valve is flanged at the bottom of the drum. It is adjusted to a certain pressure, protected against misadjusting and prevents excessivoverpressure in the drum.

As safety device a safety pressure gauge with a membrane pressure transmitter is mounted in the drum wall which transmits an electric control pulse only when there is no pressure in the drum. In case of overpressure all opening functions of the drum are locked. Release only after pressure compensation by the ventilation valve.

Inlet and outlet slides for drums working with overpressure are locked hydraulically against opening.

The drum may only be charged with up to 2/3 of its contents.

The machine can only be switched on if the lid is completely fastened since the lid safety switch mounted beneath the lid torsion of the bowl blocks all processing functions when the lid is open. This safety switch must not be removed.

7.3.1 Measuring connections

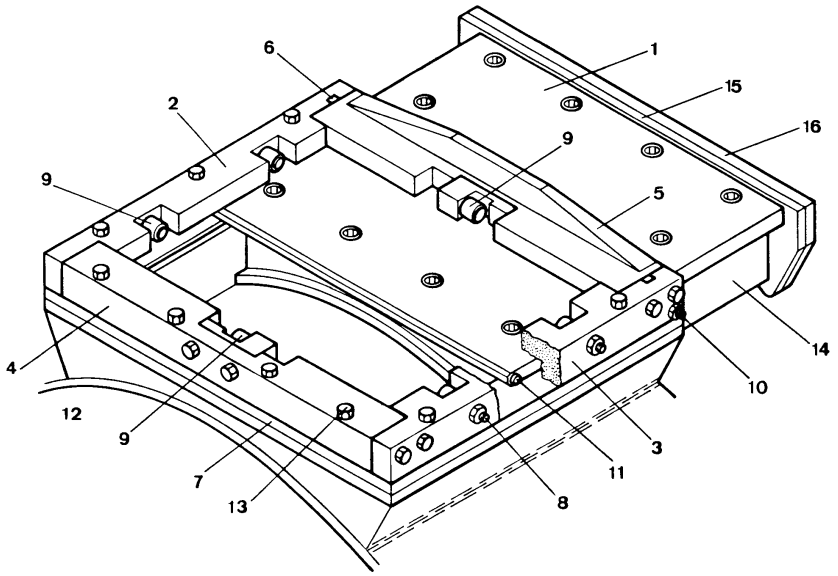
The number and size of the measuring connections depends on the order. With machines that can operate with excess pressure, measuring valves are equipped with pneumatically controlled disc valves. Products may be sucked in by the vacuum in the bowl.

For safety reasons, machines that can operate under excess pressure must not be fitted with hand-operated measuring valves.

With automatically product-fed processes, the measuring ducts must be connected to the storage containers by the customer.

7.4 Inlet- slide

7.4.1 Inlet slide



1	Slide plate	**9**	Roll, compl.
2	Slide guide, right	**10**	Set screw
3	Slide guide, left	**11**	Guide bolt
4	Front guide	**12**	Drum
5	Central guide	**13**	Hexagon screw
6	Insert for central guide	**14**	Slide case
7	Slide frame	**15**	Sealing plate
8	Eccenter bolt	**16**	Front plate

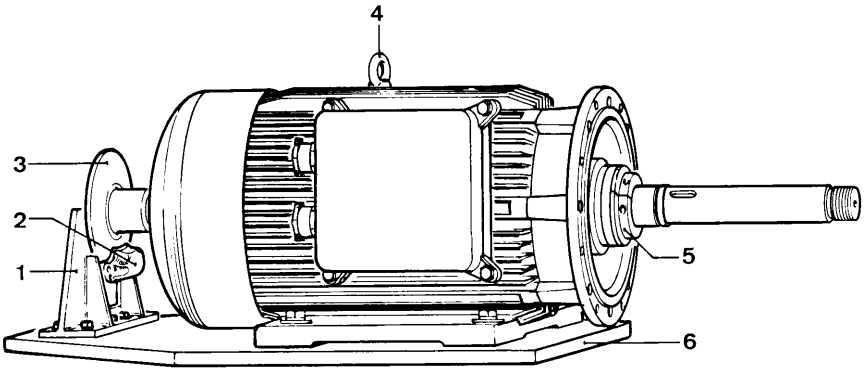
The slide plate (1) is screwed to slide case (14) and front plate (16). It slide between slide frame (7) and eccenter bolt (8) with roll, complete (9) and is guided sideways with guide bolt (11) and set screws (10).

If necessary roll complete (9) can be elevanted by turning the eccentric roll bolt (8).

Should the regulating range be insufficient, the roll complete (9) must be exchanged. The lateral clearance is adjustable through set screws (10).

7.5 Motor

7.5.1 Main motor



1	Saddle support bracket	**4**	Eye bolt
2	Saddle	**5**	Labyrinth seal
3	Brake disc	**6**	Motor plate

The AC motor in flange/foot design is mounted on its motor plate and with front side flange to the drum. Drum and motor plate are mounted on anti-vibration elements to absorb impact pressure. An eye bolt on the upper portion of the stator eases transportation with lifting devices.

Motor protection IP 54.
Washing the motor or switch cabinet with pressurised water or cleaning agent is not permitted.

Stator winding: Isolation class F/H with humidity protection impregnation.

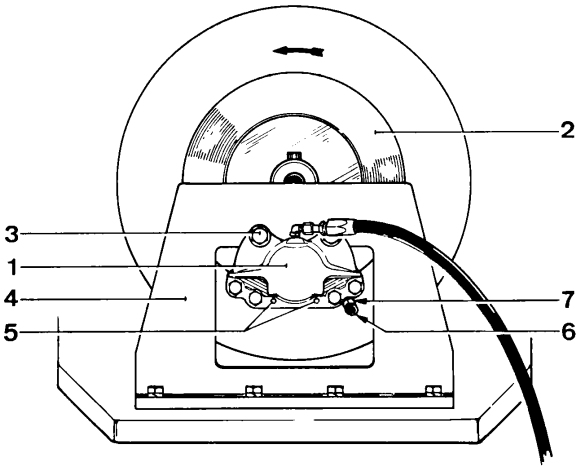
Three temperature feelers (145°C) in motor winding. When temperature is exceeded, thermistor relays switch off the motor control voltage and with it the motor.

Both motor bearings are serviced by the automatically operating central greasing device.

Direction of rotation: left-turning, when viewing from rear towards brake disc (rotation direction arrow on fan bushing).

Loose parts flying about in the machine may damage the tools and the motor shaft.

7.5.2 Disc brake for main motor



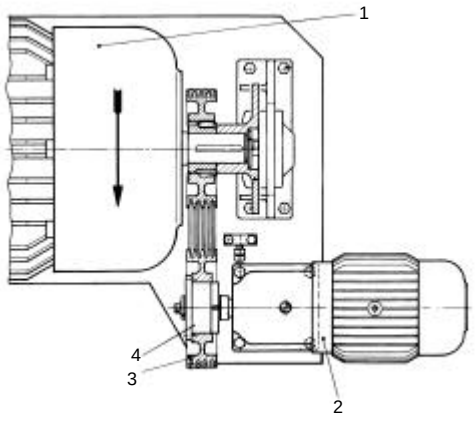
The disc brake consists of saddle (pos.1) and brake disc (pos.2). The brake disc is mounted on the second shaft end of the main motor and is secured through a fitting key and adjusting screw. The saddle embraces the disc brake with a pinces movement from underneath and is tightened to the saddle support bracket with 2 hexagonal screws (pos.3). Each housing half is equipped with a cylinder. The complete brake linings (lining and plate) are axially movable and installed in from of the pistons so that are pressed against the disc brake.

When opening the drum lid, the hydraulic valve is actuated. The hydraulic oil which flows through a butterfly relief valve into the brake cylinder, presses the brake lining, by means of pistons, from both sides against the disc brake.

By adjusting the butterfly relief valve, the reaction speed of the brake is changed.

When closing the drum lid, the hydraulic valve is moved back in its resting position. The brake pressure drops to zero, and the brake lining is released from the disc brake.

7.5.3 Crawling speed drive for main motor



For working processes with extremely slow processing speed a crawling speed device is provided. The main motor (pos.1) is drive by an additional gear motor (pos.2) by means of a toothed belt drive.

If desired, the gear motor can be delivered with 2 speeds of the driving motor.

The freewheel (pos.4) being incorporated in the V-belt pulley (pos. 3) allows a drive by means of the gear motor while when switching on the main motor the drive between gear and main motor is interrupted.

This function is only ensured if the freewheel was mounted in the right sense of rotation and the direction of rotation of the main motor is correct.

7.5.4 Gear motor

Safety lock
The gear cannot be switched on when the cover is open.
The geared motor cuts out immediately when the lid is opened.

The gear is flange-mounted directly below the tank. The gear shaft simultaneously functions as receptacle for the work inserts.

Tools or auxiliary equipment must never be left lying in the machine; otherwise the gear shaft will be put at risk when the gear is started up.

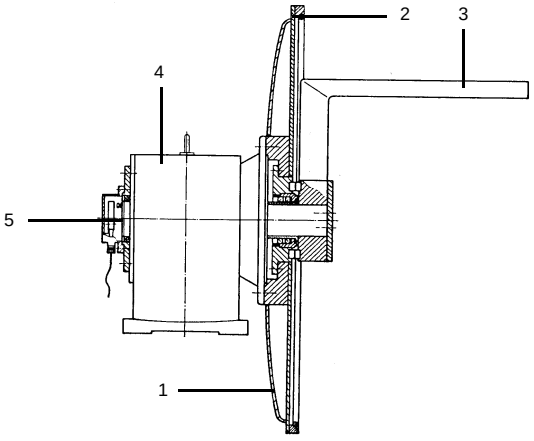
7.6 Cover

The cover is connected to the drum wall with hinges and locked with three quick fasteners. Lid and drum are sealed with a silicone gasket placed in the drum collar. When ordering this gasket,indicate its thickness.

Gaskets are available with a thickness of 13, 14, 15 and 16 mm.

On its outer side, in the middle of the cover, the gear motor for the mixing baffle is mounted. The shaft of the gear motor is located in the hub sealed off against the lid hub and the mixing baffle on the inside of the cover.

When closed, cover and drum are additionally aligned by a "cover nose" which engages into the guiding strip of the drum. "cover nose" and cover hinge actuate, each of them, a limit switch to open and close the cover. The control current in both limit switches is interrupted while the cover is open. This arrangement stops all functions for safety reasons.



Pos. 1 Cover

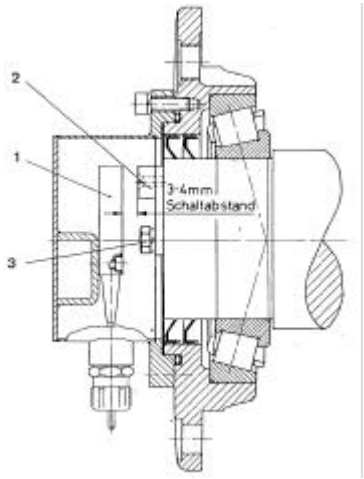
Pos. 2 Cover seal

Pos. 3 Mixing baffle

Pos. 4 Gear motor

Pos. 5 Positioning selector switch

7.6.1 Positionning selector switch



The lid can be opened only when the mixing baffle, after switch off, stops in certain position. Furthermore, the mixing baffle should not stop in the vicinity of inlet or outlet slides in order not to impair loading and discharging.

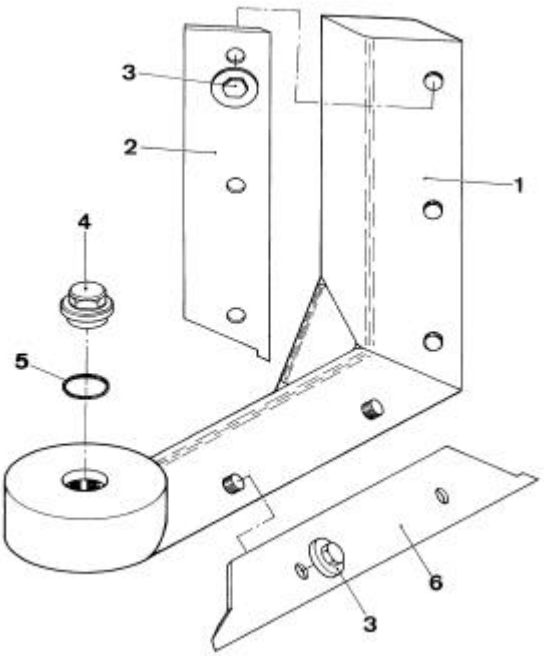
This task is done by an adjustable positioning selector switch. A magnetic limit switch (pos. 2) is actuated by a switch magnet (pos. 3) mounted on the free end of the gear motor shaft. The switch off position can easily by adjusting the hexagon screw (pos. 6).

Actuation of this magnetic limit switch -after the mixing baffle has bee switches off manually or by program control- starts a time relay in the control cabinet which turns off the gear motor at the end of the desired time.

Simultaneously, the brake is actuated and keeps the mixing baffle in position.

The ideal switch off position, at the end of the "mixing" process when looking towards the closed lid, is the 10 o'clock position of the hourhand of a clock.

7.7 Mixing baffle



The mixing baffle, positioned and driven in the center of the lid, consists of an angular arm with welded- on hub and screwed- on scrapers with holding strips.

During the mixing cycle, the material is scraped off drumm wall and lid wall and fed again to the processing center.

During the discharge cycle, the inclined position of the drum scraper assists in an additional pressure of material against the drum wall. This effect is taken advantage of to press viscous material through the outlet opening when discharging.

Elongated holes in the plastic scrapers enable an adjustment of the scraper edges so as to touch lid and drum wall. The mixing baffle is secured to the gear shaft with a holding plate and hexagon screws, or cap nut.

To remove the mixing baffle, the two screws protected against loosening by a mutual safety plate, are being removed and the mixing baffle can be pulled away from multi-spine notches of the drive shaft.

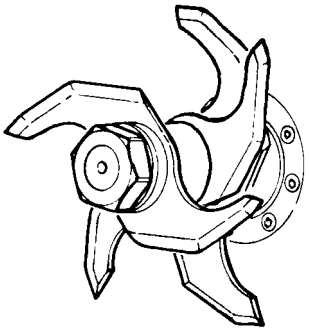
When reassembling, a new safety plate should be used which, after tightening the screw, is being forged to one each section of the hexagon head.

7.8 Processing inserts

The processing inserts are made of stannles steel and designed in shape and size according to motor output, drum shape and working function.

CAUTION!
Switch on machine only when processing insert is secured!

Kneading blades



Special insert with increased mixing qualities for special doughs.

The onesided grinding assists the material transport in the direction of the mixing baffle hub.
Mounting sequence:

1. kneading blade
2. distance ring
3. kneading blade
4. distance ring
5. kneading blade
6. pressure ring
7. special hexagon nut

Three connecting pins guarantee a slip-free power transmission. They are separately screwed into the driving bush of the sliding ring seal and into the distance rings.

7.9 Safety features

Prevention of	Prevention by
Excess pressure in bowl	Safety pressure controle valve
Opening of measuring or emptying valves due to excess pressure in bowl	Manometer with switching contact Pressure measurement convertor - SPS (Measuring and emptying valves lock automatically at bowl pressures >0.)
Excess pressure in double shell	Safety valve / 2 bar excess pressure

Prevention of	Prevention by
Opening of measuring or emptying valves at temperatures > 95°C/200°F in the bowl	Temperature sensor with two precision resistors Resistor 1 in "set value control" safety circuit (at a temperature > 95°C/200°F in the bowl, measuring and emptying valves will lock automatically.) Resistor 2 in SPC (Monitoring of the safety circuit and heating element shut-off when nominal values are exceeded)
Switching on of processing functions when lid is open	Limit switch in bowl hinge; pressing of "lid closed" key

7.10 Safety valve

The excess pressure valve mounted on the lid is factory set to prevent the permissible pressure in the interior of the bowl being exceeded. Alteration of the release pressure is prevented by leading. The valve must be kept clear of product residues and condensation.Check the proper functioning of the valve before starting process by carefully opening it manually. The valve must be unscrewed carefully and cleaned daily and immediately after it is released. When doing so, ensure no damage occurs to the leading which preserves the release pressure settings.

Alterations to the safety valve may cause serious injury. In addition, the removal of the leading will render void the warranty. The medium passing out of the valve requires particular and non-hazardous removal.

7.11 Hydraulic unit

The hydraulic unit produces the pressure required to move the hydraulic drive.

The unit consists of:

- the container for hydraulic fluid (capacity: 2 Liters)
- the hydraulic pump with drive (flow volume ca. 1,13 l/min)
- the manometers
- the control unit with 4/3 - distributing valve (electronic control).
-

The working pressure of the hydraulic system is 120 bar / 1700 PSI.
This high pressure is hazardous. Hydraulic fluid may be expelled through the minutest fissures in the hydraulic system and cause injuries.
The safety precautions must be observed exactly, even for examination of the hydraulic system. All work on the hydraulic system must be carried out with the machine depressurized.
Connections must not be loosened or tightened on a hydraulic system which is under pressure. Without fail, the motor must first be shut off and the pressure released.

7.12 Pneumatic

The pneumatic equipment Combicut TC 850 consists of:

- the maintenance unit
- some 5/2-distributing control valve
- pneumatically controlled valves, depending on manufacture for product control, cleaning, steam and water supply.

7.12.1 Pneumatic maintenance unit

The maintenance unit removes impurities of the pressurized air and maintains constant working pressure. It thus protects sliding surfaces and seals from dust, condensation etc., and prevents interruptions to operation due to pressure fluctuations in the supply circuit.

The maintenance unit consist of:

- the pressure regulator valve
- a filter (40 mm medium pore size)
- the automatic condensation outlet
- an oiler

The pressure regulator valve maintains working pressure independent of pressure fluctuations in the supply and the air consumption thoroughly constant. The filter cleans the circulating air of solid particles and moisture droplets. The automatic condensation outlet provides a constant, self-operating emptying of the collected condensation. The oiler adds a fine oil mist to the pressurized air to increase operational safety and the life of the pneumatic parts, e.g. valves.

7.13 Vacuum system

The vacuum system prevents or reduces air intrusion into the product and oxidation, and enables the flash cooling of the product.

The components of the vacuum system are:

- the vacuum dome with aeration and vacuum valve
- the vacuum control with pressure measurement convertor switches the vacuum pump off when the preselected pressure is reached. The vacuum pump switches on again as soon as the selected pressure is exceeded by 50 mbar.
- the vacuum regulator with pressure measurement convertor and regulator valve maintains the preselected vacuum constant by forcing air into the suction pipe. The forced air supply is electronically controlled via a corner type valve.
- the condenser with condensation reservoir
- the vacuum pump produces the vacuum by means of a liquid ring. The rotating liquid ring sucks in gas, compresses to slightly over atmospheric pressure and forces the pressure together with a part of the liquid through the pressure tube. This lost liquid must continually be replaced.

Water (free from foreign bodies) at a temperature of 5°-15°C (41°-59°F) should be supplied to the vacuum pump as the operating liquid. The operating liquid conducts away the heat due to compression and lubricates the axial face seal.

Low pressure in the suction pipe and higher temperatures lower suction performance as does counter-pressure in the vacuum pump (pabs>1,1 bar)

Do not allow the pump to run when dry.

7.14 Water measuring device

The water measuring device enables a precise application of the water required via the steam nozzles in the bowl base. The system usually contains an inductive flow meter with a serially connected ballcock for reduction of water pressure. The amount of water required may be preselected by entering it at the OP control panel.

7.15 Electronic equipment

The electronic equipment conforms to VDE-regulations 0113 and IEC 204-1. The switch cabinet and the machine are wired ready to be connected and conform to protection type IP 54.

Pressure spraying of the motor or the switch cabinet with water or cleaning solution is not permissible.

The main connection to the switch cabinet must be laid and connected by a locally authorized electrician according to the wiring diagram.

The delivery and installation of the motor, control and pneumatic piping is included in the delivery of the machine.

Operation of the machine is contrlled by an individually equipped control panel. The range of controls can be seen from wiring diagram and parts list.

Hardware-, software plan and program disc are included in the devlivery of the machine and are in the switch cabinet.

All motors and transformaters are protected by fuse with a protective motor switch with thermal slow release.

The release strom can tuned in at the protctive motor switch.

7.15.1 Control

Control is manual by means of the OP control panel and a touch keyboard. Control may also be by a machine program. If so, the machine will be delivered with SPRO software.

Stored programmable control (SPC)

For stored programmable control, the construction of the device and the wiring are independent of the desired program. The transducing contacts and actuating connectors provided on the machine are connected to the connection plugs of the device.

The desired control program is written to the program memory with a programming device. This program sets out the order in which the transducing contacts are read, the logical operations governing their connection (AND, OR), how the resulting values are addressed to the output terminals and thus how the actuation connectors are switched on or off as the case may be. A program change will not affect the wiring but merely the contents of the program memory. This flexibility is the most significant advantage of stored programmable control.

An SPC system includes an automation system, transducing sensors and amplifiers or signal lamps as the case may be, as well as a control device if necessary.

The automation system consists of a central module with processor and program memory, the input and output modules, the bus system and the power supply module. The voltage from the transducing sensors is switched to the input module. In the central module, the processor implements the program in memory and simultaneously reads the individual ports of the device for voltages. According to these conditions, the processor directs the output module to switch voltage to the corresponding connections. The connected devices or signal lamps will be switched on or off accordingly.

The "Simatic" control buffer battery must be replaced when the main switch is on. The battery has a life of approx. 5 years at 25°C /77°F. If uninterrupted, buffer time is at least 1 year at 25°C /77°F.

SPRO process control

The SPRO software package is designed for automatic process control with flexible programmed control and ease of adjustment to changed process conditions.

The following operating modes are available:

- Manual operation
- Automatic operation
- Programmed operation
- CIP

The selection, input and start of an automatic program are by means of the buttons and touch keys of the operating panel (OP).

What is displayed (LED and LCD display):

- Initial status
- Current program number
- Step number
- Step time
- the variables, nominal and actual values

The LCD display makes it very simple to write and review programs.

- No specialist programming skills are required.
- Up to 20 application programs (each with up to 25 steps) may be programmed in the RAM program memory. Step time may be up to 999 seconds.
- The inbuilt buffer battery preserves these programs if the power supply is cut.
- An EPROM-memory module contains the system and machine program.

The SPRO software package with the OP control panel operates with the following hardware:

- "Simatic" S 95 U and control panel OP/C
- "Simatic" S 100 U with CPU 103 and control panel OP/C
- "Simatic" S 115 U with CPU 942 - 944 with control panel OP/C

Function keys of the OP

The OP has 16 keys with integral LEDs. Those keys with LEDs are marked with text and symbols for machine functions according to order.

The inbuilt buffer battery of the OP is monitored continually. Should the voltage level drop, the following message appears on the display: "SPC battery empty"

Motor or limit switch interruptions produce messages on the display of the OP. After the problems have been solved, the messages may be cleared by pressing the ACK key of the OP.

The Touch keyboard 2005

For machines with more than 15 manual functions, an additional touch keyboard 2005 is built in. This keyboard has 22 keys with integral LEDs and 2 keys without LEDs. The keys without LEDs are dedicated to the start and stop functions. The keys with LEDs are marked with text and symbols for machine functions according to the commission. To commence or end a function, the function key should be pressed simultaneously with the start or stop key.

When the "Test" LED is flashing, the main switch of the machine must not be switched off since this will erase the data of the production programs.

8. Fault repair

All repair work is only to be carried out by the appropriately trained specialists, who should observe both the general and specific accident prevention regulations. This particularly applies to all electrical work referred to in the following fault repair tables.
(See “5. Maintenance and repair, safety instructions)

8.1 Faults in the drive motors

Faults	Possible reasons	Repair
Motor will not start	Supply is not connected or wrongly connected, e.g., a loose contact	Check voltage across supply and correct. Remedy loose contact.
	Fuse has blown	install new fuse (of correct rating).
	Motor protector has operated	Allow motor to cool, switch on motor protector check motor protector settings.
	Motor protector will not switch. Control is faulty	call in specialists to test and repair.
Motor starts with difficulty	Motor is designed for delta connection but is star connected	Check and correct the control of motor protector.
	Voltage or frequency vary greatly from nominal values, at least on starting. *(See ” Machine data” on page 7.)*	Correct switching.
Fuses blow or the motor protector cuts out immediately	Winding is faulty	Motor must be sent for repair
	Short circuit in motor or wiring	Remove short circuit
	Motor has short to frame or interturn short circuit	call in specialists to test and repair.
Motor runs in wrong direction	Motor is wrongly connected. *(See ” Rotational direction check” on page 14.)*	Exchange phases.
	Motor is wrongly switched.	call in specialists to test and repair.

Faults	Possible reasons	Repair
Motor overheats (only verifiable by measurement)	Mains voltage deviates by more than 5% from motor nominal voltage. *(See " Machine data" on page 7.)* Higher voltages are particularly unsuitable for high polarity motors, since their no-load current is close to the nominal current even at normal voltages.	provide correct mains voltage.
	Motor is delta connected but designed for star connection	Install switching correctly
	Motor overloads	Reduce motor over-load by lesser loads.
	Nominal operating time is exceeded.	observe permissible operating time.
	Nominal duty type is exceeded. If for example the motor overheats because of too frequent switching, it is not sufficient to use a larger motor, since the same conditions will occur.	Restrict operation to the prescribed conditions of operation. Consult Stephan servicing personnel to determine the appropriate drive.
	Cooling air mass is too low, e.g., the cooling air paths are blocked.	ensure unimpeded access and exit for cooling air. Clean cooling fins
	Cooling air has warmed up.	provide fresh air, repair aerator.
Motor growls	Motor is wrongly connected.	call in specialists to test and correct.

8.2 Faults in the hydraulic system

To avoid accidents, the following basic conditions must be observed for all work on the hydraulic system All work on the hydraulic system is only to be carried out be appropriately trained specialists.The hydraulic system must not be under pressure, hydraulic accumulators must be empty and moving loads secured.

Faults	Possible reasons	Repair
Hydraulics produce no or insufficient pressure	Hydraulic motor runs in wrong direction. (See ” Rotational direction check” on page 14.)	Exchange phases.
	Short circuit via faulty valve or faulty Cylinder/ pivot drive	Replacement of faulty components
	Oil level in hydraulic reservoir too low	if necessary fill up with hydraulic fluid
	Contaminated hydraulic fluid	Change hydraulic fluid, if necessary clean and re-fill.
	Air in the hydraulic fluid	Remove air from system
	Contamination in the hydraulic system e.g. blocked filter.	Change filter
	Pressure settings too low	Change pressure settings on the pressure limit valve and check with the manometer
	Faulty pump or connection	change faulty part
Hydraulics produce pressure, but the cylinder/pivot drive doesn’t function	Check whether relevant magnetic valve is being operated.	Check function, if necessary by emergency manual operation
	The corresponding valve is electrically operated and has no function.	Check whether the pistons can be moved by emergency manual operation. If so, the magnetic coil or the valve must be replaced.
	Check whether the motion of the cylinder/pivot drive is hindered by mechanical impediment or too high load.	
accumulator operation: after loading operation, the pressure in the system falls very quickly although no function is being operated.	Check that the initial gas pressure in the accumulator conforms to the required initial gas pressure (this value is printed on the outside of the accumulator; if unreadable there consult the circuit diagram).	Initial gas pressure may be measured without special tools as follows: release hydraulic pressure slowly whist observing the manometer. The manometer falls continually as the pressure is reduced until the initial pressure is reached. Here it falls suddenly back to 0 despite pressure being still available in the system.
	At the prescribed accumulator pressure, check whether the system has a leak.	Check the connections and hose fittings first, then the hydraulic circuits must be deactivated and examined section by section.
The pump will not start, although there is no pressure in the system	Check manometric switch for main pressure	call in specialists to test and repair.

Faults	Possible reasons	Repair
The pump will not switch off, although pressure is produced	Check manometric switch for main pressure	call in specialists to test and repair.
	Check pressure limit valve	The pressure set should be at least 10% above that of the manometric switch.

8.3 Faults in the Vacuum pumps

Faults	Possible reasons	Repair
Pump won´t run	Pump has rusted fast after long disuse.	carefully turn the fan blade or loosen the coupler.
	Pump motor is affected. (See ” Faults in the drive motors” on page 36.)	call in specialists to test and repair.
Pump runs with difficulty	Sealing water volume is too great	Reduce water volume
Pump sucks poorly	Sealing water volume is too great	Reduce water volume
	Pump is dirty	Clean pump, possibly remove foreign bodies
	Return valve sticks	Clean or replace return valve

8.4 Faults in the electronic equipment

Faults	Possible reasons	Repair
Plant won’t switch	main switch is switched off	switch the main switch on
	safety limit switch is switched on	close the lid
	operating voltage is wrong	test the operating voltage
	control fuse is damaged	replace control fuse
	“Simatic“ control buffer battery is empty	replace the battery (See ” Maskinen betjenes via OP17” on page 18.)
Error message on the OP display	motors or limit switch faults	After solving the problems clear the display by pressing the ACK key of the OP
OP message “ SPC battery empty“	“Simatic“ control buffer battery is empty	replace the battery (See ” Maskinen betjenes via OP17” on page 18.)
Functions won’t switch	excess-current cut-out works	reset excess current cut-out; call in specialists to test and repair the plant.

9. Maintenance

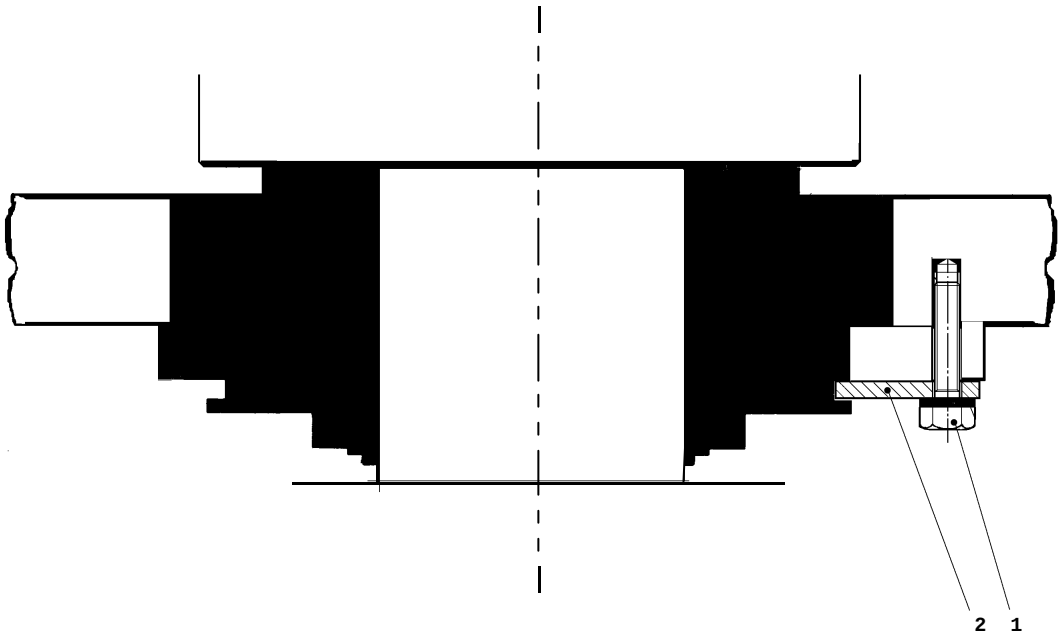
9.1 Changing the seals

Since the machine may run under vacuum and excess pressure conditions, the pressure chamber must always be hermetically sealable. Therefore, the seals must be checked and cleaned daily.

Damaged seals must be replaced immediately.

The sealing between cover and bowl is provided by a silicone seal being placed on the bowl rim. In case of a spare order it is absolutely necessary to state the thickness of this seal. The seals are available in a thickness of 13, 14, 15 and 16 mm.

9.2 Changing the axial face seal



Disassembly of the axial face seal

- Remove implements
- Unscrew hexagon nut Pos. 1
- Unscrew click Pos. 2
- Unscrew the complete axial face seal (use supplied assembly key)

Installation and operation

Clean the housing and the shaft carefully. Sharp edges in the housing and the shaft can damage auxiliary seals.

The axial face seal is supplied as a pressure-proof unit which is ready for assembly. It should only be removed from its packaging immediately before installation. Remove packaging material, if necessary, and make sure that the seal has not been damaged during transportation, by inspecting them visually.

Lubricate all auxiliary seals and all edges of bores, grooves and steps with an appropriate lubricant.

Only grease recognised as being physiologically safe should be used
Do not use mineral oils or greases for auxiliary seals made of EP rubber (EPDM), but only soapy water, glycerin or glycol.

Push the axial face seal unit carefully over the shaft until it has reached the right position. Pay attention that bore “A” lies above the center of the shaft.

Mounting takes place in reverse order. (See illustration on page 40)

Avoid dry-running of the seal.
Fill and vent quech circuit with absolutely clean fluid.(5-10° degree of hardness)

During the first half hour after commencement of operation special attention should be paid to:

- temperature in the coolant outlet max. 60 °C [140 F°]
- luid level in the vessel
- unusual noises
- leakage
- sealing pressure 1 bar [14 PSI] higher than the normal product pressure

Maintenance and operation

A slight leakage is required to ensure proper function. If the loss of flushing medium exceeds 0,5 l/h the mechanical seal should be exchanged by an expert.

The fluid level must be controlled every day. Refill with clean fluid, if necessary.

Exchange flushing medium every six months. Pay attention to unusual pollution.

9.3 Changing the lubricant of the gear motor

The gear motor is provided with the required amount of lubricant at the factory. Required maintenance of the mixing baffle gear is limited to regular lubricant checking at the inspection window and changing the lubricant approx. every 2 years.

The frequency of lubricant changes depend upon the operating temperature, operating hours, and operating conditions. Under adverse operating conditions such as high humidity, and large temperature fluctuations, shorter intervals between changes are advisable.

We recommend gear, circulation or bearing luboil to DIN 51517 part 3 ISO VG 220 for ambient temperatures of 0-40°C (32-104°F).

Rolling bearings with grease filling should have the grease changed at the same time. Grease must be inserted to fill one third of the space between the rolling bodies for fast running bearings - motors and gearbox inputs, and to fill two thirds for slow running bearings - in gears and gear transmission outputs.

9.4 Maintenance of the hydraulic system

Both the functional parts and the hydraulic fluid should be maintained regularly, in order to prevent unexpected interruption to operation.

Regularly check the functional efficiency of hydraulic pumps and motors, working cylinders, regulators and maintenance-requiring elements such as filters and sieves.

Alterations to the settings of the hydraulic system may only be performed by specialists familiar with the operation of the system.
The most rigorous safety precautions are to be observed when examining high-pressure hydraulic systems. Connections must not be loosened or tightened on a hydraulic system which is under pressure.

9.4.1 Changing the hydraulic fluid

The pressure fluid should be first changed after ca. 50-100 operational hours. All further fluid changes should be made at intervals of ca. 1500 operational hours. Under adverse operating conditions such as e.g. high humidity or dust levels and large temperature fluctuations, shorter intervals between changes are advisable. Do not mix different types of hydraulic fluid.

Only use hydraulic fluids of viscosities to ISO VG 68 according to DIN 51519. Furthermore, they must be compatible with use in the food products industry and conform to the regulations USDA/FDA-H-1.
Appropriate hydraulic oil: e.g. Gargoyle Arctic SHC 226

9.4.2 Recommissioning of the hydraulic system

The first run of the machine will be performed by our specialist installation engineers after repair or maintenance work. The following should be observed:

9.4.3 Starting the hydraulic system

Check that the direction of rotation of the motor corresponds to the directional arrow on the pump (viewed from above) by short on/off jogging of the motor. If the direction is correct, run the E-motor. The pump should start without pressure.

As the system is starting, check the hydraulic oil level in the reservoir and if necessary refill immediately.

Allow the system to run for five minutes. The pump must run shortly after starting without cavitation noises.

9.4.4 Deairing the system

Run the system under pressure and move each cylinder and hydromotor back and forth several times by operating single directional control valves. Hydromotors will deaerate themselves, cylinders will be filed and partially deaerated.

Finally deair each cylinder separately. To do so, loosen the uppermost connection or screw joint of the cylinder and move the cylinder back and forth until no more foamy oil is expelled. Then re-close the connection or screw joint.

The hydraulic system is perfectly air-free when there is no more foam in the oil reservoir, the system runs without unusual noises and the piston rods and motors etc. make no jerking movements.

After deairing switch off the system for ca. 30 minutes to release air from the reservoir. Check all screw joints and flanges are fast.

Without fail, check the oil level in the reservoir throughout the entire deairing procedure and if necessary refill immediately

9.5 Vacuum pump lubrication

Under normal operating conditions, after approximately 10,000 hours of operation (max. 2 1/2 years), the deep-groove ball bearing and neighboring greased areas should be cleaned of old grease and other crud. Also, the bearing and adjoining greased areas in the Nilos-ring, bearing cap and end shield should be regreased.

Sorts of grease:	Micro-gel anti-friction Aero Shell Grease 16 or equivalent lubricating grease DIN 51825/DIN 51502-KTC E 2 R (lubricating grease from a synthetic oil basis).
Grease packing:	approx. half of the free space in the deep groove bearing and
	approx. 2/3 of the neighboring greased space in the Nilos-ring, bearing cap and end shield.
	Avoid mixing various types of grease together.

9.6 Feed pump

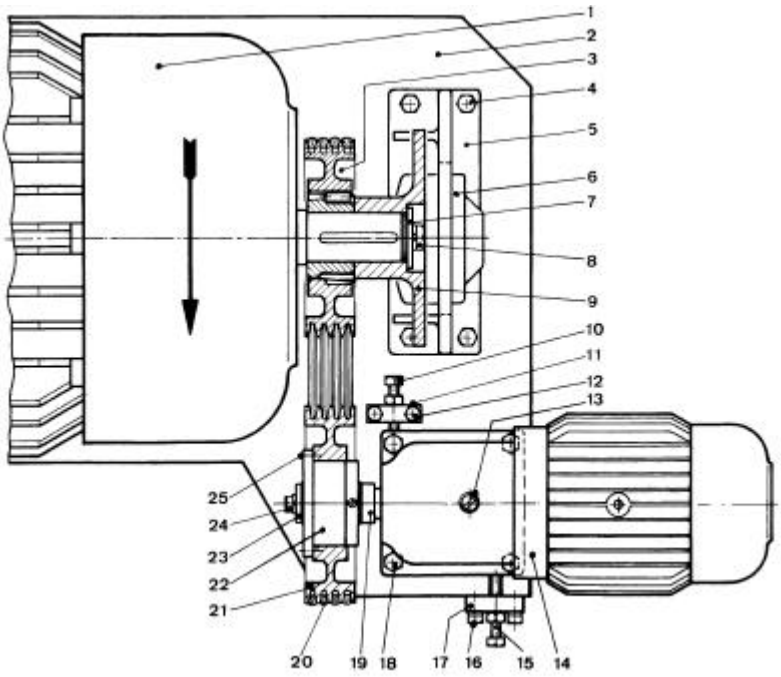
Exenter shaft seal

The rotary piston drive pump comes standard-equipped with an Exenter axial face seal. Material mating has been tuned to the system.

The individual parts of the shaft sealing as well as the displacer nuts are sealed with washed O-rings, so that no pumping medium can penetrate the thread and gear area.

Further information about the maintenance of feed pumps can be found in the instruction manual under "Rotary piston drive pump" in the Appendix.

9.7 Crawling speed drive for main motor



Maintenance of V-belt drive

Check tension of V-belt regularly and, if necessary, adjust the tension. In case of exact V-belt tension, the V-belts between the pulleys can be pressed down for about 10 to 15 mm by thumb press. After having adjusted the tension, the ranged-in assembly of the both pulleys is to be checked by means of a ruler and adjusted, if necessary.The tightening and counter tightening is made by means of the hexagon screws (pos.10 bzw. 15).

Maintenance of the gear motor

After every 12.000 working hours, after 6 years at the latest, the gear lubricant is to be exchanged and the B-side motor bearing to be removed, cleaned and to be filled for a half with rolling bearing grease.

The outlet screw below the motor flange and the vent screw on the upper side of the gear are to be unscrewed to let off the waste lubricant.

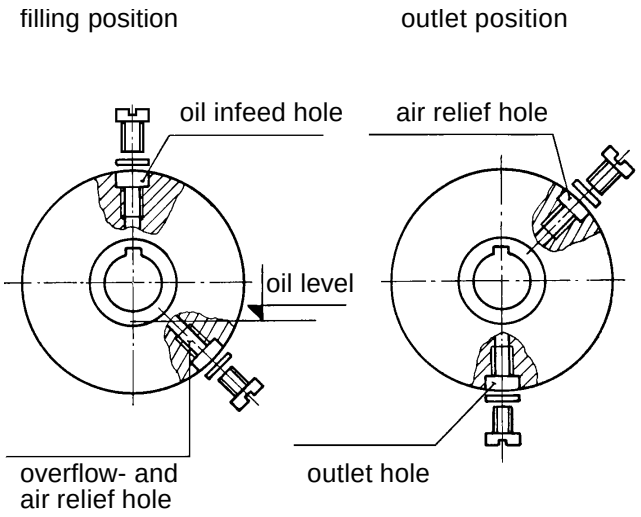
After screwing in of the outlet screw, 800 cm3 gear lubricant is filled in through the boring of the vent screw.

Screw in and tighten vent screw.

Maintenance freewheel

For the operation the freewheel requires a partial filling with thin-bodied oil corresponding to the list on page 3. In no case oil with additives like molybdenum disulphine, graphite or similar may be used.

Every 1.000 working hours, the oil level has to be controlled and refilled, if necessary.



After every 2.000 working hours, an oil exchange has to be made:

1- Remove both locking screws from the cover.

2- Put one boring vertically downwards and let waste oil off.

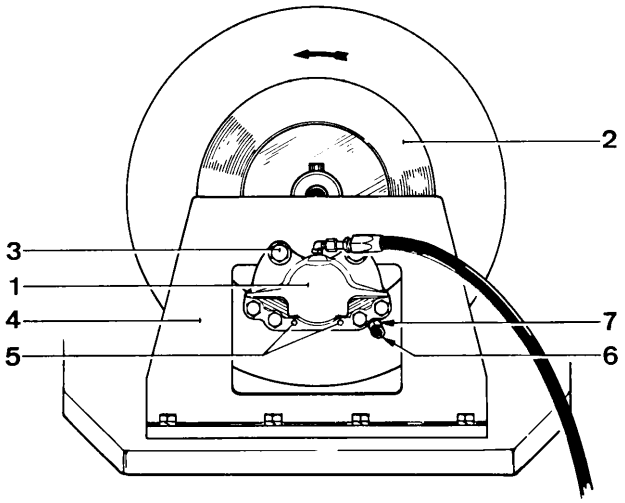
3- Fill freewheel with liquid flushing oil, screw in locking screws and let it run for some minutes.

4- Remove both locking screws and let flushing oil off.

5- Fill in new oil through the vertically upward positioned inlet boring until the oil runs out of the overflow and air relief hole, offset by 135°.

6- Let excess oil run off and lock both borings absolutely tight by means of the locking screws, using copper-asbestos sealing rings.

9.8 Disc brake for main motor



EXCHANGE OF BRAKE LINING:

1.Unscrew saddle (pos.1) byloosening the two hexagon screws (pos.3) and remove downwards from the support bracket (pos.4).

2.Drive out both threaded pins (pos.5) from saddle (pos.1).

3.Remove brake lining upwards.

4.Insert new brake lining, drive in threaded pins and fix saddle.

HINT:

The new, thicker brake linings can be pressed back by hand so far that they fit over the brake disc. The wear of lining and brake disc is adjusted automatically.

BLEEDING:

When filling the hydraulic system for the first time, after exchanging the hydraulic hose or in case air gets into the brake system, the following has to be done to bleed the system:

1.Remove protecting cap (pos.6) and loosed bleeder screw (pos.7) by 1/2 to 1 revolution.

2.Insert plastic hose on bleeder screw and divert into container or similar.

3.Open butterfly relief valve.

4.Turn on hydraulic system (control panel main switch "ON").

5.Open drum lid (head for the hydraulic valve).

Hydraulic oil with air bubbles emerges from the bleedes screw and is collected in the container. When airfree oil emerges, the bleeding process is finished by tightening the bleeder scre. Remove plastic hose and put protective cap back.

10. Cleaning and disinfection

The purpose of cleaning and disinfection is to break infection chains in the operation.

- Cleaning deprives microorganisms of their breeding medium by removing dirt (including food remains).
- Disinfection inactivates or reduces the number of microorganisms that cause rotting or poisoning of foodstuffs.

10.1 Stages of the cleaning and disinfection process

The precondition for an effective disinfection is always a thorough cleaning. Only in exceptional cases and slightly soiled areas may a combined disinfection and cleaning be carried out, for example with a mixture of aldehydes and surface-active quarternary (mineral) compounds.

In general, the cleaning and disinfection process follows the following stages:

- Precleaning with 40 to 50°C warm water for removal of the worst of the dirt.
- Cleaning with a cleaning solution heated to 60 to 80°C.
- Intermediate rinsing with warm water to remove cleaning solution and dirt-remains
- Disinfection.
- Rinsing with microbially pure water to remove remaining disinfectant.

10.1.1 Factors affecting the effectiveness of cleaning

The effectiveness of a cleaning process depends on the type of cleaning solution, the type of dirt and that of the surfaces to be cleaned, as well as the effective temperature, effective time and the relevant cleaning procedure.

The cleaning procedure appropriate to your machine has been described in the first part of the operating instructions. (See "Daily cleaning and maintenance" on page 15.)

Cleaning solutions

Water: The cleaning power of water may be fundamentally increased by numerous factors such as high temperature, pressure, efficient time, mechanical dissolution of dirt or through the addition of cleaning solutions.

During the removal of protein-containing dirt with water over 60°C, coagulated protein may burn in on surfaces and should therefore quickly be removed with the appropriate cleaning materials.

Alkaline cleaning solutions: Soda lye, phosphates, Sodium hydroxide silicate. Soda lye has a strong cleaning action against high-protein dirt and is therefore preferable for use in protein production processes (meat, cheese etc.) The disadvantage of soda lye is its poor ability to emulsify fat. The weaker alkaline reacting silicates have a better emulsifying capability.

Acid cleaning solutions: are predominantly used for the removal of mineral deposits (calc or scale, milk scale, beer scale etc.) Acids such as hydrochloric acid, tartaric acid, citric acid transform non-water soluble salts into a soluble and rinsible state.

Commercial cleaning solutions apart from their cleaning effects usually also contain foam inhibitors, complexing agents and tensides.

10.2 Disinfection

The most important requirement of a disinfectant for use in a food production process is that it be toxicologically harmless at the required level of dilution.

In addition, the following conditions must be met:

- Fatty contamination is only removed by water temperatures over the melting point of fat (50°C).
- The disinfectant at the level of dilution employed must effect a rapid and irreversible destruction of the microorganisms which have the most damaging effects on the foodstuff produced.
- The efficiency should not be fundamentally affected by the technological process (degree of contamination, type of contamination, pH level, temperature).
- Tolerance of materials and cost efficiency
- Currently, predominantly halogens (active chloride, iodine agents), hydrogen peroxide, peracetic acid, quaternary ammonium compounds and aldehydes are used as disinfectants.

10.2.1 Factors affecting the effectiveness of the disinfection process

A variety of factors play a role in the disinfection process and not only affect the duration and effectiveness of the whole process but also strengthen or weaken each other as the case may be.

Efficient time

The functioning of a disinfectant involves an exponential, rather than sudden, inactivation or extinction of microorganisms. The longer the disinfectant has to work, the better will be the disinfection result. Disinfection of the hands generally requires 0.5 to 3 minutes, while the disinfection of surfaces requires 1 to 6 hours.

Initial germ level

The necessary efficient time to achieve a particular disinfection result is lengthened by the extent of the initial germ level.

Concentration

The speed of germ killing can be fundamentally increased by the use of a higher concentration of the disinfectant. The use of higher concentrations is limited by problems of toxicity on use, the increased danger of affecting foodstuffs (see safety precautions below) as well as the increased corrosive effect on metals.

Temperature

An increase in temperature promotes while a temperature reduction lowers the anti-microbial effectiveness. Some disinfectants, such as peracetic acid or some iodine products are less affected by temperature changes than other media and may therefore also be used at low temperatures.

Protein errors

The disinfectants react not only with the organic components of microorganisms, but also with organic contaminants, in particular with protein chains. The action of certain disinfectants such as chlorine products and iodine products is particularly strongly affected.

Always observe the manufacturer´s usage and safety instructions when using cleaning and disinfecting agents! Misuse may cause: serious damage to health, increased residues in foodstuffs and corrosion of the machine.

10.2.2 Disinfection procedure

Fluid preparations of the disinfectant may be applied to surfaces manually with a cloth or with the support of a brush (scouring disinfection), or mechanically, with or without pressure.

Removable short pipe lengths, valves, hoses or other small parts (implements, blades, seals) may be filled with the disinfectant solution in use or immersed in the solution. (Filling and immersion disinfection).

11. Replacement and spare parts

The installation and use of non-Stephan parts may reduce the safety and functioning of the machine. We accept no liability for any resulting damage or injury.

When taking orders for spares, we require the following information:
1. the machine type = Combicut TC 850,
2. the order number=727.082,
3. module, description and order number from the spares lists.
These data reduce the need for inquiries by our customer services and speed up delivery. You should store replacements in readiness.

11.1 List of spare parts Combicut TC 850

Pos. No.	Qty.	Description	Dimensions	Part No.
		Construction and Materials		
		Stationary		
	1	machine frame		3A2651-01
	1	machine case		3L0057-21
	1	terminal box	800*460*210 V2A	3H2233-04
	4	machine food	S 220-6 NI	3S4016-06
	4	machine food	S150/6	3S4016-01
	4	bolt	79*15/M24 SW70 V2A	3K0191-05
	4	disc w. theaded pin	79*15/M24*20 SW70 V2A	3K0191-02
	4	disc		3K0190-02
	2	soft rubber seal, per meter	120*60* 320 55shore	3S4002-07
	2	soft rubber seal, per meter	100*60* 370 45shore	3S4002-04
	1	angle bracket	40*5*35	3M2640-08
	1	mounting plate	130*5*490	3L4426-18
	2	limit switch	DU-11 AV	3Q6011-03
		Main motor		
	1	main motor WK280-8/4-400WASS	400V 50HZ	3C0400-07
	1	t-piece, no. 80602	1/4"	3N4006-02
	1	saddle support bracket	310	3M2025-18
	1	2/2-way-straight-way valve,	514 DN20 V4A	3P0000-33
	1	motor plate	820*25*1060	3L4456-01
	1	socket cock	3/4"	3P1010-05
	1	labyrinth seal	92*185*25 ALU	3K1105-05
	1	Strömungswachter		3P4022-10
		Crawling speed drive for main motor		
	1	gear motor	230/400V-50HZ 5,5 KW	3C2035-03
	1	free-wheel clv 35 f2-d2 ls	CLV 50 F2-D2 LS	3H2110-04
	1	V-belt pully		3K0724-05
	1	V-belt pully		3K0724-06
	1	V-belt	FO-ZXPA 1500LW	3S4001-04
		Axial face seal		
	1	axial face seal	GDD-85-31077 USDA	3I0312-04
	1	flange	M170*2	3K1004-02
	1	o-ring	2-168 / 2,62*183,82	3I0004-25
	1	o-ring	2-261 / 5,33*253,37	3I0006-37
	1	o-ring	2-237 / 85,32 * 92,38 * 3,53	3I0006-16
		Knife		
	1	nut for motor shaft	M72*4 LH SW105	3K0042-05
	3	four-cut double knife		3D0109-04
	1	disc		3K1123-07
	2	distance ring		3K0567-26
	1	pressure ring		3K0310-42
	1	pressure ring		3K0310-45
	1	o-ring		3I0006-27
		Gear motor		
	1	gear motor KF107 DV160 L8/4 BM/HR	400V 50HZ	3C2179-20
	1	motor hood		3L0013-29
	1	switch cover	129*75 BU R1/2 V2A	3M2222-08
	1	o-ring	2-172	3I0004-29
	1	o-ring	2-348	3I0008-10
	1	o-ring	2-369	3I0008-29

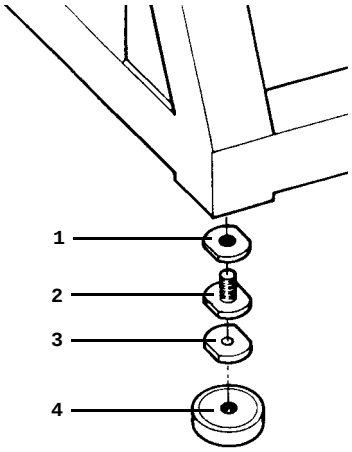
Pos. No.	Qty.	Description	Dimensions	Part No.
	1	o-ring	2-171	3I0004-28
	1	o-ring	2-236	3I0006-15
	1	holding strip 47*25*6 tc 300.03-131	47*30*6 BOHR.12	3L4829-01
	1	threaded fitting, 90 degrees, 3/8", 5351	F.3/8ZOLL 90° R1/2	3Q0080-61
	2	bolt	M10*1	3K2546-02
	1	locking screw	M16*40	3K2006-25
	1	sheet steel angle		3L0818-10
	1	switch magnet, t 67 n	T-67N	3Q6005-03
	1	magnet switch	MAK-1313L	3Q6004-01
	2	seal ring, copper	16*22*1,5	3I0140-08
	1	axial face seal,	GDD-140-31770	3I0318-07
	1	flange	M200*2	3K1004-04
		Mixing baffle		
	1	mixing baffle		3D2124-08
	1	mixing baffle/Mischflügel		3D1000-01
	1	disc	62,0*200,0*15,0	3K0200-36
	1	cap nut hexagon	M30*2 / 58*99*45	3K0042-10
	1	o-ring	2-238 / 3,53*88,49	3I0006-17
	1	scraper for drum	SIMONA	3L5008-05
	1	scraper for cover	SIMONA	3L5008-07
	7	cap nut hexagon	M24*1,5 SW36 V2A	3K0040-12
		Drum, cover		
	1	drum TC850	EINL./AUSL	3B0442-07
	2	limit switch, du 11 zw	DU-11ZW M.NASE	3Q6011-08
		Outlet slide		
	8	roll bolt, exec. 2		3K2586-03
	8	roll, complete		3K0701-02
	1	guide rail		3L4030-17
	1	guide rail		3L4030-07
	1	front rail		3L4025-09
	1	slide frame		3I2018-25
	1	insert for slide rail		3I2037-05
	1	slide rail		3L4027-52
	1	slide case		3E2050-09
	2	distance sleeve	392*25*609	3K0400-09
	1	sealing plate		3I2061-05
	1	front plate	CC 600.02-122	3L4611-08
	1	pillow block	CC 600.02-108	3M2004-06
	1	switch element	CC 600.08-10	3M2626-25
	1	bolt	CC 600.02-112	3K2522-18
	2	hinge bolt	TC 300.08-17	3K2040-03
	1	hinge pillow block	CC 600.08-20	3M2006-15
	1	hinge piece	CC 600.08-19	3L2020-16
	1	hydraulic cylinder	ZCSOST40/28-500M16*1,	3H0056-04
	2	guide bolt	M 16x50, DIN 912	3K2520-02
	2	limit switch	SN U1 AH	3Q6011-09
	1	pilot controlled cheek valve	RH2 G05	3P0002-16
	1	scraper	Auslass	3L1000-02
		Inlet slide		
	1	slide guide, left		3L4205-07
	1	slide guide, right		3L4210-07
	1	central guide		3L4027-03
	1	insert		3I2035-14
	1	front guide		3L4201-08
	2	pillow block f. roll bolt		3M2015-05

Pos. No.	Qty.	Description	Dimensions	Part No.
	6	roll bolt, exec. 3	CC 600.02-45	3K2586-03
	6	roll	CC 600.02-150	3K0701-02
	1	slide plate		3L4401-11
	1	slide case		3E2050-01
	2	guide bolt		3K2520-02
	1	slide frame with groove		3I2014-19
	1	sealing plate		3I2060-04
	2	distance sleeve		3K0400-09
	1	front plate		3L4610-20
	1	switch element		3M2626-05
	1	sliding piece		3M2618-04
	1	pillow block		3M2004-06
	1	bolt		3K2522-18
	1	support		3M2665-01
	1	hinge pillow block		3M2006-15
	2	hinge bolt		3K2040-03
	1	slide rail		3L4027-50
	2	limit switch	SN U1 AH	3Q6011-09
	1	hydraulic cylinder	ZCSOST 40/28-500	3H0056-04
	2	swivelling screw fitting	SWVE 10 SM	3N4315-30
	1	hinge piece		3L2020-16
	2	straight stud standpipe "S"	GE10-SR R 1/4"	3N4306-25
	1	pilot controlled cheek valve	RH 2 G05 211	3P0002-16
	1	straight stud standpipe	EVGE-10-L Red	3N4307-03
	1	equal tee	T-10-L	3N4324-04
	1	scraper	Einlass	3L1000-01
		Dosierstutzen DN 50		
	1	o-ring	2-149	3I0004-13
	1	o-ring	2-136	3I0004-08
		Dosierstutzen DN 65		
	1	o-ring	2-153	3I0004-16
	1	o-ring	2-232	3I0006-13
		Vacuum connection DN 150		
	1	Bottom seat valve	LÖ/LS DN 150	3P0009-60
	1	sealing ring	DN 25	3I0130-04
		Temperature probe		
	1	temperature probe	W 99 512.8 PT100	3Q2011-03
	1	disc	24,5*36 SIMONA	3K0204-30
		Steam nozzles		
	7	Valve plate with thread		3K2604-20
	14	o-ring	2-133	3I0004-07
	7	Valve housing		3K1308-01
	7	Valve cover		3K1330-03
	1	Condensate drain	BP 23-3/4"	3H4100-08
	1	2/2-straight way valve	554 DN 40 Schweißausführung	3P0000-36
	1	sealing ring G	DN 32	3I0130-05
		Cover		
	1	cover	TC 850	3B6411-22
	1	cover axle with head	40*39,5*510 V2A	3K2425-05
	1	cover seal, round	16*1190 45SHORE SILIK	3I0100-38
	1	centering pin	30*60 V2A	3M2018-02
	1	securing plate	41,0*110*25 RCH1000	3K0713-03
	2	plate	31*7,5*40 POLYAMID	3L4426-08
	1	bolt	16*100 V2A	3K2530-01
	1	handle	25*110 POLYAMID SCHW.	3K0455-06

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	Bottom seat valve	LÖ/LS DN65/65	3P0009-02
	1	o-ring	2-150	3I0004-57
	1	Proximity switch	102247 10-220V	3Q6006-21
		Safety valve		
	1	safety valve	DN 65/0,5 BAR	3P0665-05
	1	reducing nipple	DN 100	3N4140-50
	1	bow	DN100V2A	3N4150-11
	1	o-ring	2-149	3I0004-13
	1	Manometer		3P4005-01
	1	o-ring	2-226	3I0006-10
		Hydraulic		
	1	hydraulic unit HST-102-A-3-S/E-00	4*A,2*4/3,1*4/2,2*R-V	3H0044-08
	4	rubber foot	M6*50*42 black	3M4055-08
	4	ring	57*20 V2A	3K0304-02
		Pneumatic		
	1	pneumatic filter regulator	LFR 1/2-S-B	3P4340-18
	1	cp-valve terminal-A	10P-14-8B-MP-R-Y-8C	3P0070-52
		Execution with cover		
	1	solid separator	DN150/DN150/DN50/DN32	3M1052-26
	1	seal	DN 150	3I0136-13
	1	cover f. solid separator	DM250*70	3K4220-02
	1	cover seal, round	13,0*177 50SHORE	3I0100-21
	1	straight	12M6*55 A2 DIN 7	3S0277-11
	1	cylindrical pin	12* 36 V2A	3K2222-02
	1	threaded pin	M 5* 8 A2 DIN 553	3S0170-01
	1	eye bolt	M12* 65 A2	3S0140-13
	1	seal ring G	DN 32	3I0130-05
	1	2/2-way-straight-way valve	514 DN15 V2A	3P0000-32
	0	2/2-way-straight-way valve	514 DN32 V2A	3P0000-35
	1	contact manometer		3P4002-04
	1	seal	DN 150	3I0133-12
	1	Druckmessumformer	4AP30-242/64	3P4006-04
	1	Sterilluftfilterkerze		3P2025-01
	1	Scheibenventil handbetätigt	DN 50 K/M-G	3P0004-97
		Thermostatic cooling water regulation		
	1	Watervalve	V74T61-10	3P0012-03
	1	Ball valve		3P1010-06
		Tubular condensator		
	1	tubular condensator	DM 355x2425	3H4122-05
	4	rubber-metal buffer	100x40 Nr. 51410040	3S4003-02
	2	Sealing ring G	DN 50	3I0130-07
	1	rod probe	DC11-RAGR2A1	3Q2036-01
	1	Niveau caliper	FMC 420	3Q2040-20
	1	Disc valve LÖ/FS	DN 50 K/M-G	3P0004-17
	2	Level rod	DN 15 NR. 6012	3P0019-02
	2	Sealing ring G	DN 20	3I0130-03
	2	Sealing ring G	DN 32	3I0130-05
	1	2/2-way-straight-way valve		3P0000-13
	2	sealing	Bis 250°	3I0150-38
		Exhaust vapours tube		
	2	Sealing	DN 150	3I0139-12
	1	Extension compensating member PN10	DN 150	3N4197-06
	3	Sealing ring G	DN 32	3I0130-05
	1	Safety valve	0,8 Bar	3P0001-50
		Vacuum bypass valve		

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	Ball valve	DN 50	3P0060-22
	2	sealing ring G	DN 50	3I0130-07
		Water, lost		
	2	2/2-way-straight-way valve	554 DN 15	3P0000-32
	2	Non return valve	RD 10-L 2 Bar	3P0002-82
	2	Flow detector compact		3P4022-10
	1	Pressure with manometer		3P0017-30
		Vacuum pump		
	1	Vacuum pump 2BV5 110-OKC 20-7	230/400V 50HZ	3H0001-20
	1	Fluid separator		3H0001-96
	1	2/2-way-straight-way valve	554 DN 50	3P0000-37
	1	2/2-way-straight-way valve	514	3P0000-04
	1	Valve lift stopper	T: 1101/000/Z02	3P0000-90
		Discharging pump		
	1	Excenter spiral pump	NM 053	P00001-944
	3	Disc valve LÖ/FS	DN 25 S-S	3P0004-59
	3	Seal ring G	DN 25	3I0130-04
	3	Temperature probe	W99 512.10 2 *PT100	3Q2011-01
	1	Pressure transformer	0-16 Bar 4AP-30.242	3P4006-14
	1	photoelectric barrier	24V DC	3Q4090-02
	1	Sealing frame	4x366x862	3S0246-06
	3	Seal ring G	DN 100	3I0130-11
	2	Discharge tube	DN 100	3M0410-12
	1	Cone stud	DN 100	3N4110-11
	1	Seal ring G	DN 80	3I0130-09
	1	Cone stud	DN 80	3N4110-09
		Steam regulation		
	1	Regulating valve LÖ/FS KVS	DN 40	3P0062-26
	2	Seal	Bis 250°	3I0150-36
	1	Pressure transformer	4 AP 30-242	3P4006-10
	1	Shut-off valve		3P1035-02
	1	Water purifier		3P0025-04
		Asscesoires		
	1	box spanner	SW160 V2A	3G6008-03
	1	box spanner sw 17 v2a cc 600.00-140	SW17 V2A	3G6010-12
	1	bihehagonal head bolt	SW105	3H6013-03
	1	drilling jig	TC 200-1400	7VBOHR-01
	1	sharpening stone, 150*20*10	C320-04VG	3H6018-01
	2	scraper, big construction 2234		3H6000-02
	1	double ring spanner	SW 60	3H6004-02
	1	double ring spanner	SW36 VERZ.	3H6004-12
	1	hook wrench TYPE 90/155	NW25-100	3H6010-02
	1	box spanner with pegs for axial face sealing	GLRD 140 ST	3G6009-06

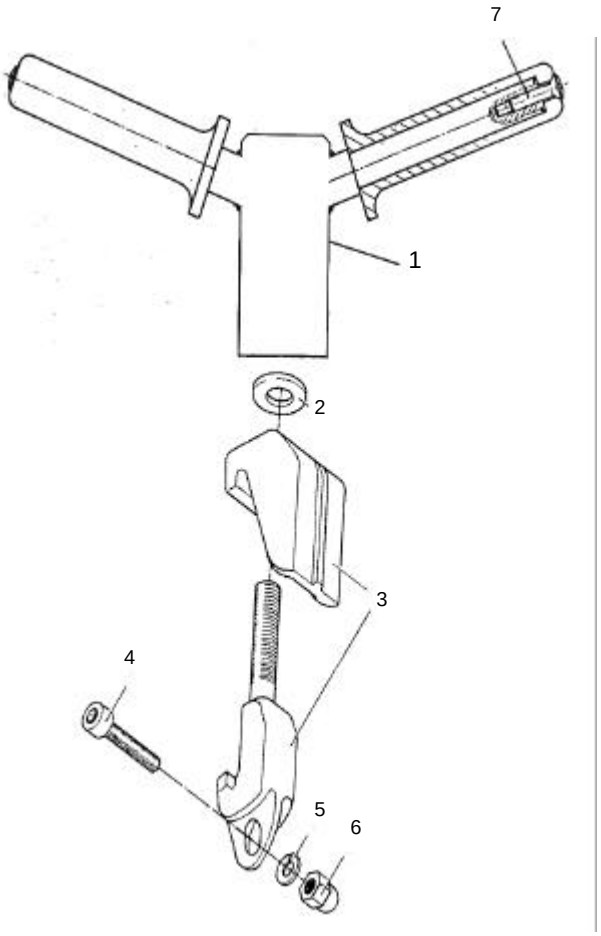
11.2 Machine foot



Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	disc with theaded pin, vm1800.01-11	79*15/M24*20 SW70 V2A	3K0191-02
2	1	bolt	79*15/M24 SW70 V2A	3K0191-05
3	1	disc, vm1800.01-13		3K0190-02
4	1	machine food	S150/6 - M24*150	3S4016-01
	1	machine food	S220-6Ni M24*220	3S4016-06

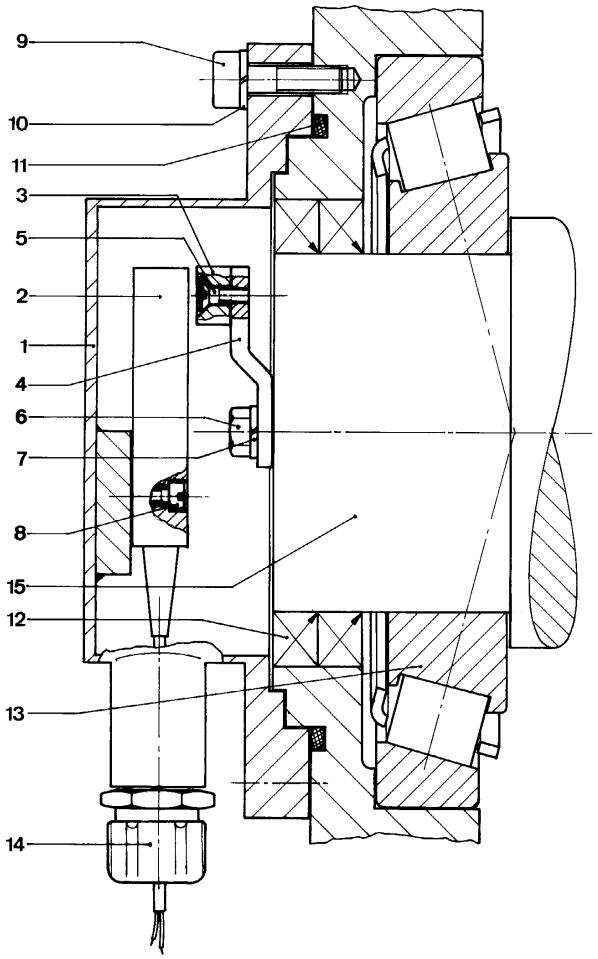
When ordering, please give us the position no. and the nomonal with (DN.) !

11.3 Cover lock



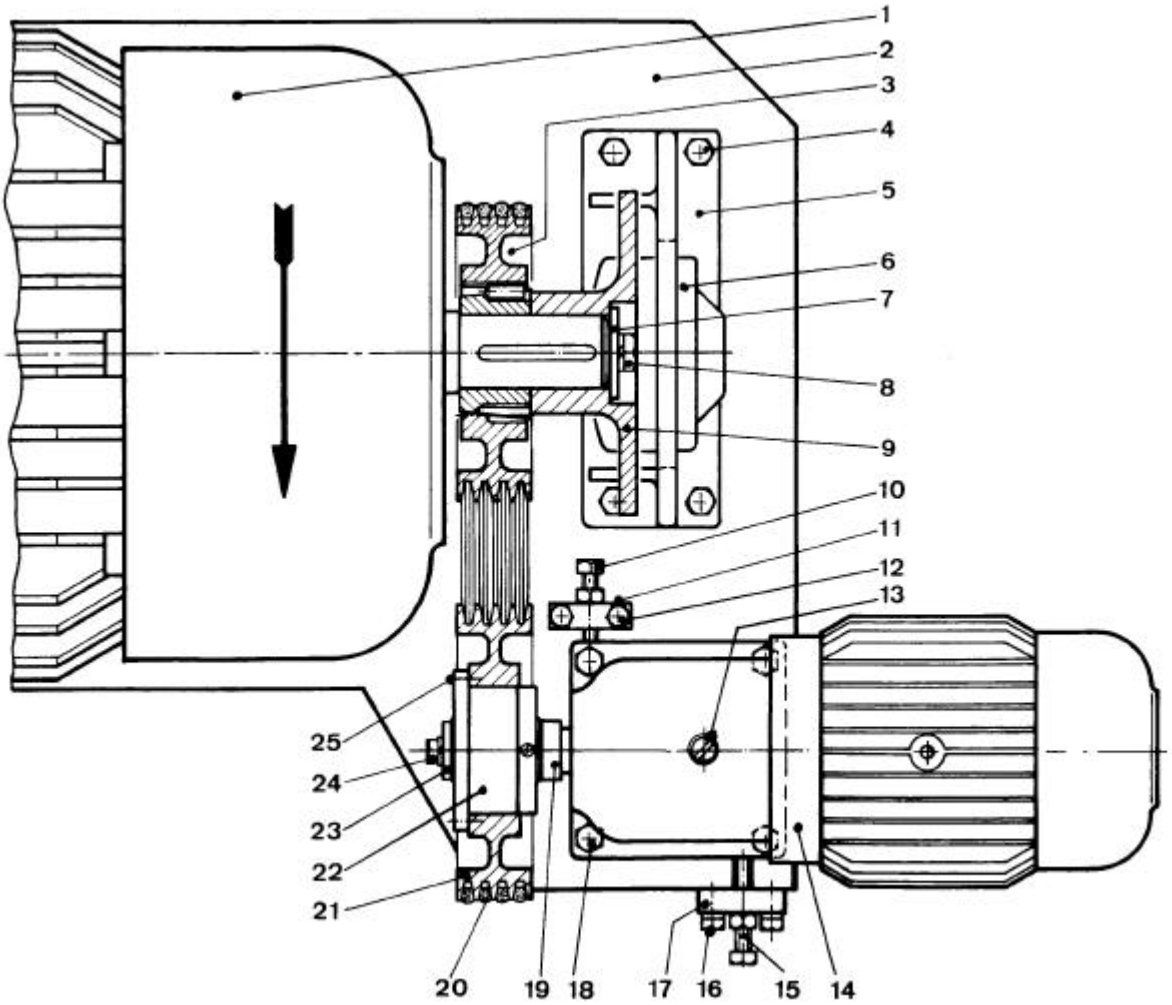
Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	locking lever, complete	M 20	3G0030-02
2	1	disc	21*45*5	3K0202-45
3	1	clamp locking	M20/65*90	3S0153-10
4	1	inner socket head	M12*50 DIN912 A2	3S0065-05
5	1	spring washer	B12 DIN127 A2	3S0246-06
6	1	cap nut	21*45*5	3S0216-03
7	1	countersunk screw	M6*25 DIN964	3S0093-04

11.4 Positioning selector switch



Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	switch housing	TC 300.03-95	3M2222-08
2	1	magnetic limit switch	MAK-1313 L	3Q6004-01
3	1	switch magnet	T 67 N	3Q6005-03
4	1	strip	TC 300.03-106	3L0818-04
5	1	countersunk screw	M 4x14,DIN 963,A2	3S0091-03
6	1	hexagon screw	M 8x16,DIN 933,A2	3S0003-01
7	1	spring washer	B 8,DIN 127,A2	3S0246-04
8	2	socket head cap screw	M 4x16,DIN 84,A2	3S0041-04
9	4	socket head cap screw	M 8x25,DIN 912,A2	3S0063-03
10	4	spring washer	B 8,DIN 127,A2	3S0246-04
11	1	o-ring	2-348,S 604-70	3I0008-10
12	1	shaft sealing ring	AS 75x95x10, DIN 3760 NB	-
13	1	taper roller bearing	30215, DIN 720	-
14	1	screw unit	3/8", Nr.5331	3Q0080-61
15	1	drive shaft	-	-

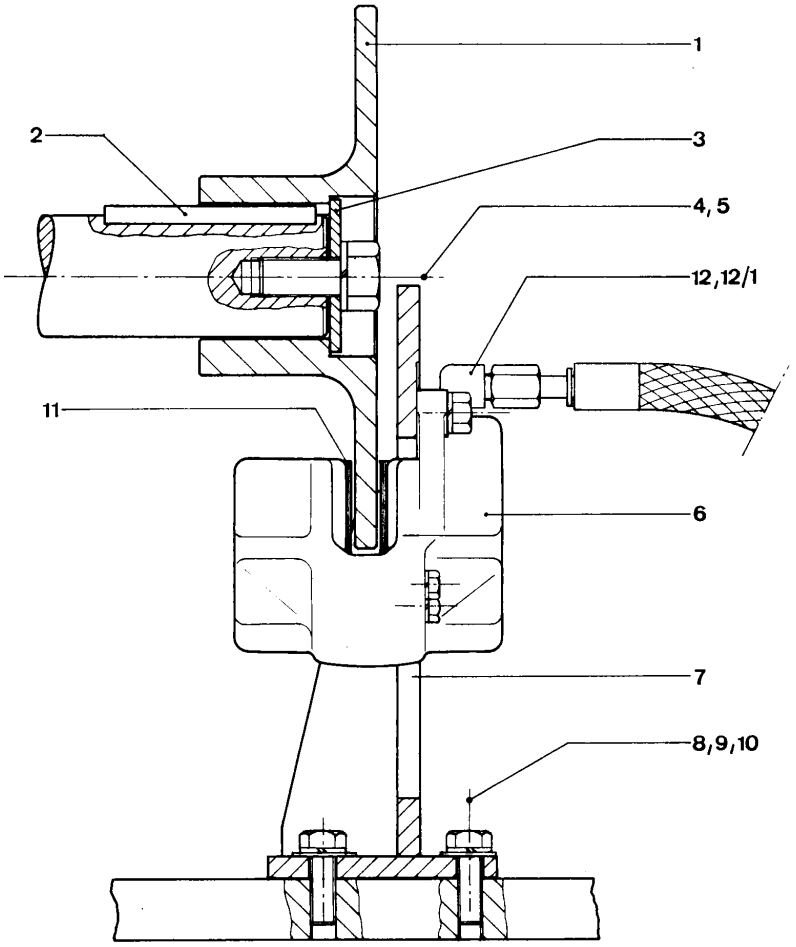
11.5 Crawling speed drive for main motor



Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	main motor	-	-
2	1	motor mounting plate	CC 600.01-68	3L4456-02
3		V-belt pully	4*SPA 13	3K0724-01
4		hexagon screw	M 12x30, DIN 933, A2	3S0005-03
5		disc brake	CC 600.08-25	3M2025-18
6		saddle sopport bracket	Nr. 13.2571-0017.3	3H0081-01
7		lock washer	-	3K0200-07
8		hexagon screw	M 12x60,DIN 933, A2	-
9		brake disc	CC 600.04-23	3K4643-03
10		hexagon screw	M 12x40, DIN 933, A2	-
11		tensionong device	TC 300.01-51	3L2025-04
12		hexagon screw	M 10x45, DIN 931, A2	-
13		rubber belt	ø 11,5x6	-
14		gear motor	r72 dt 100 i4 b3	3C2035-02

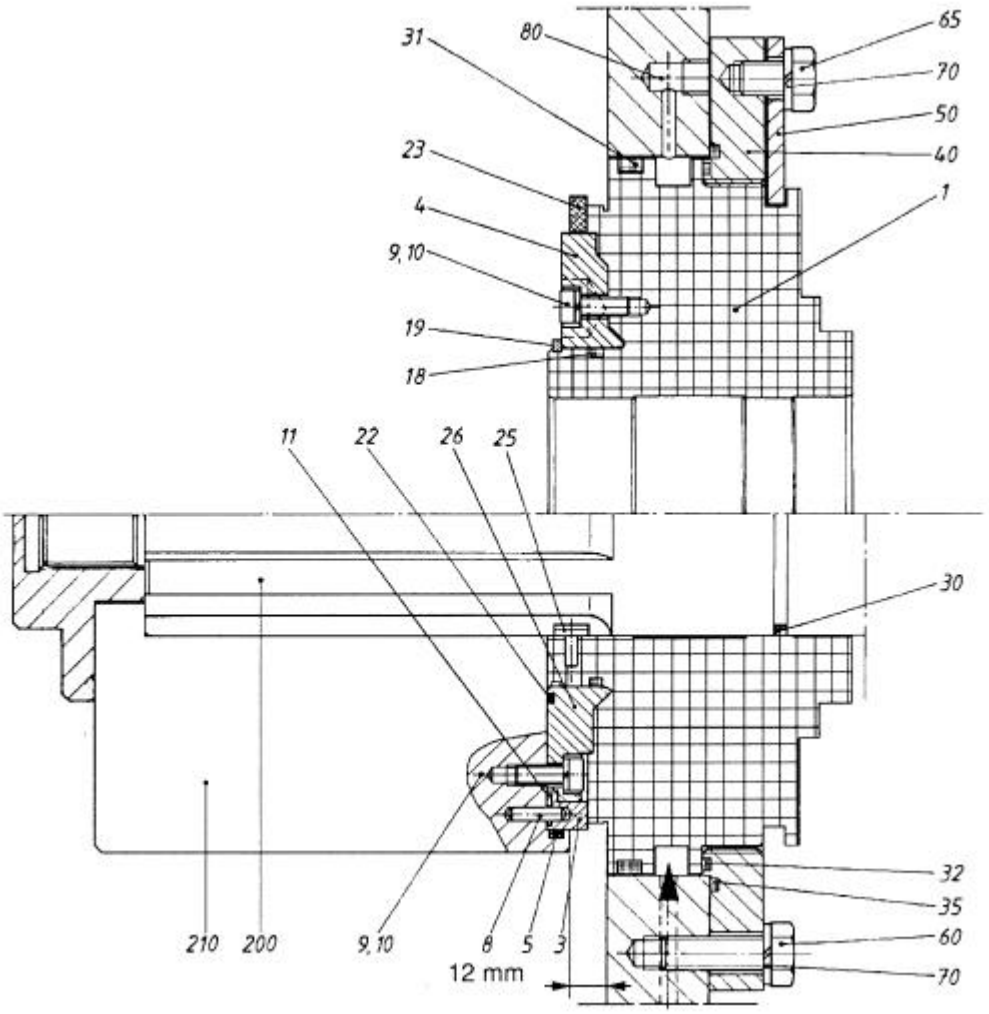
Pos. No.	Qty.	Description	Dimensions	Part No.
15		hexagon screw	M 12x70, DIN 933, A2	3S0005-10
16		hexagon screw	M 10x35, DIN 933, A2	3S0004-04
17		counter tensioning device	TC 300.01-52	3L2025-02
18		hexagon screw	M 10x55, DIN 931	-
19		distance sleeve	CC 600.04-27	3K0530-35
20		V-belt	SPA13, 1500mm	3S4001-03
21		V-belt pully	4*SPA13	3S4006-01
22		freewheel	CLV 35 F2-D2 left	3H2110-02
23		locking plate	CC 600.04-26	3K0200-47
24		hexagon screw	M 12x40, DIN 933, A2	3S0005-05
25		socket head cap screw	M 6x25, DIN 912/10.9; A2	3S0062-04

11.6 Disc brake for main motor



Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	brake disc	CC 600.04-23	3K4643-03
2	1	feather key	CC 600.04-18	3L2001-01
3	1	locking washer	20,3*79*6	3K0200-07
4	1	spring washer	M 12x25, DIN 916, A2	3S0246-09
5	1	hexagon screw	M20*45, DIN933, A2	3S0008-01
6	1	saddle for disc brake	Nr.13.2571-0017.3	3H0081-01
7	1	saddle support bracket	CC 600.08-25	3M2025-18
8	1	hexagon screw	M 12x40, DIN 933	3S0005-05
9	1	spring washer	B 12, DIN 127, A2	3S0246-06
10	1	washer	A 13, DIN 125, A2	3S0230-07
11	1	spare brake lining	Nr.13.0460-6020.2	3H0081-02
12	1	male stud elbow fitting	WE 6 LR-1/8"	3N4305-01
12/1	1	cutting ring	D 6-LL	3I0215-01

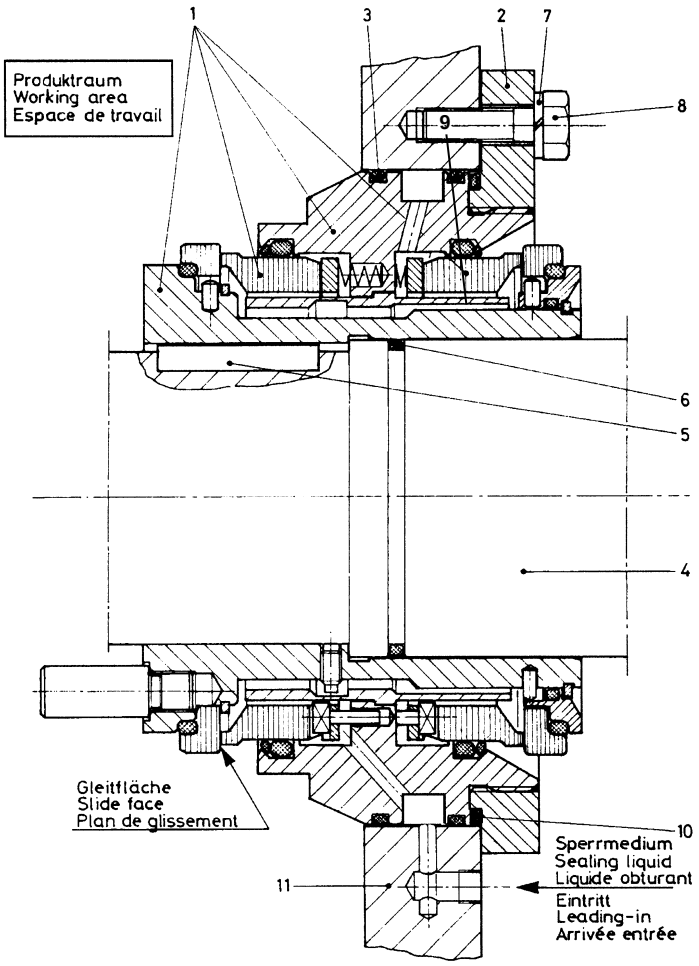
11.7 Axial Face seal - GDD-140-33751/KF106



Pos. 1 to 32 only be ordered completely. Order-No: 3I0318-07

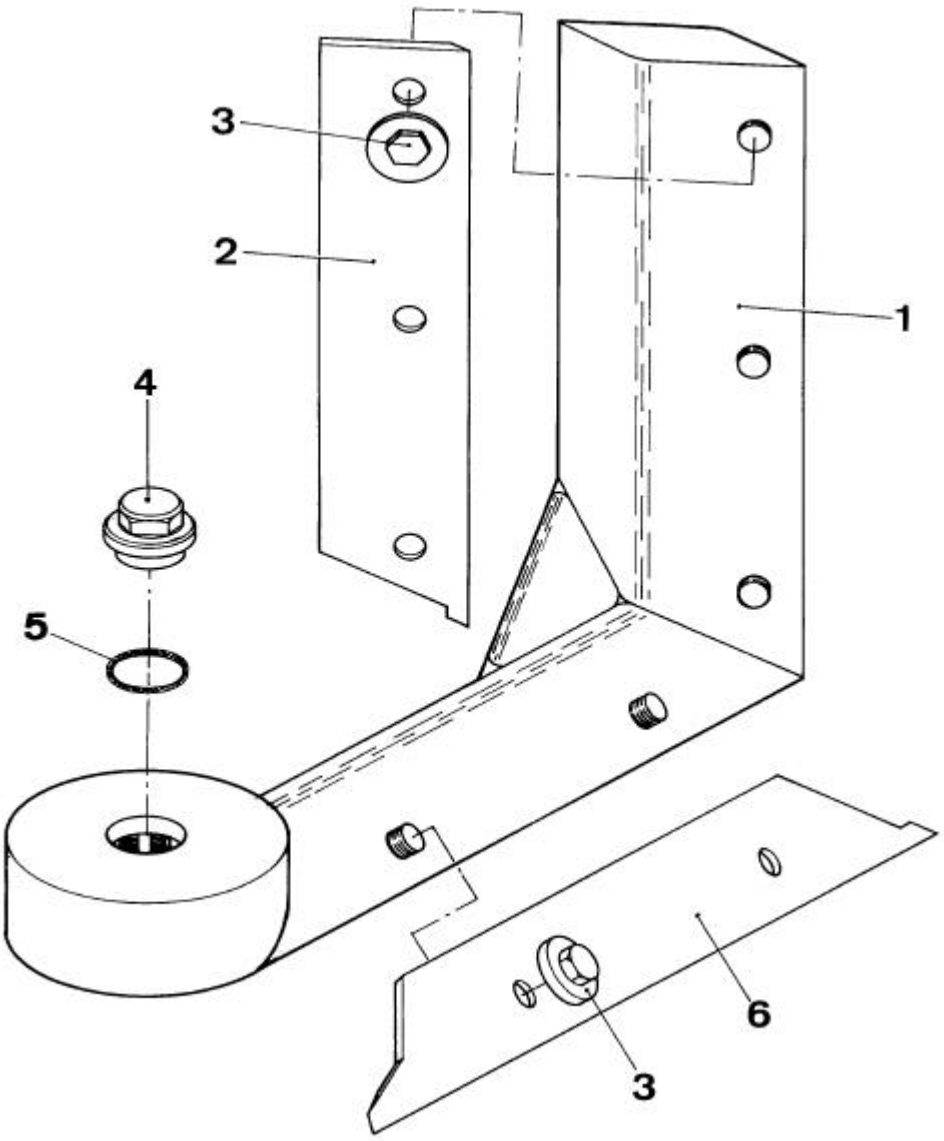
Pos. No.	Qty.	Description	Dimensions	Part No.
		Axial face seal compl..	GDD-140-31770	**3I0318-07**
	1	Box spanner	-	**3G6006-05**
30	**1**	o-ring 2-236	3,53*82,14	**3I0006-15**
31	**1**	o-ring 2-369	5,33*202,57	**3I0008-29**
32	**1**	o-ring 2-171	2,62*202,87	**3I0004-28**
35	**1**	o-ring 2-2-172	2,62*209,22	**3I0004-29**
40	**1**	flange		**3K1004-04**
50	**1**	plate		**3L4829-01**
60	**4**	hexagon screw	M10*30	**3S0004-03**
65	**1**	hexagon screw	M10*20	**3S0004-01**
70	**5**	spring washer	B10	**3S0246-05**
80	**2**	screw fitting	M10*1	**3N4305-10**
200		gear shaft		
210		mixing baffle		

11.8 Axial face seal main motor - GDD-085-31077



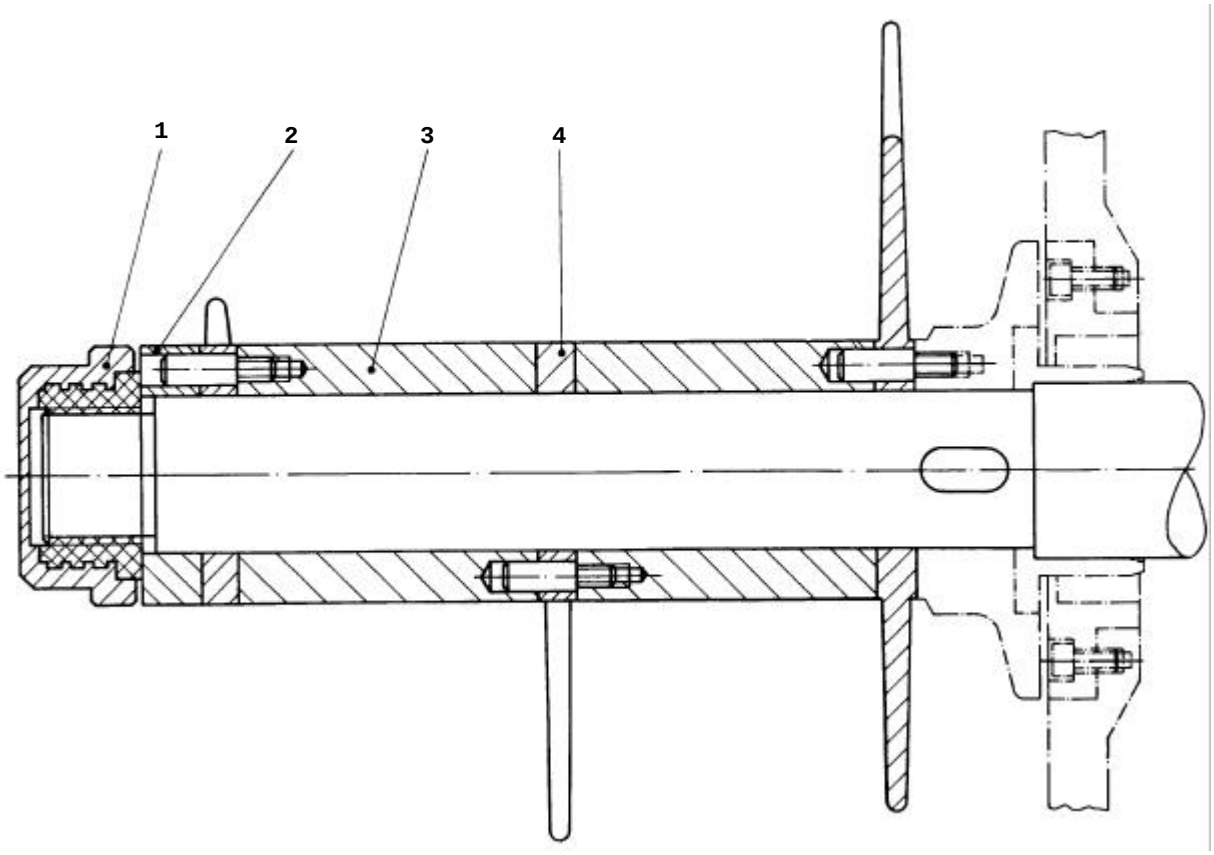
Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	axial face seal	GDD-085-31077	3I0312-04
2	1	flange	M170*230*17	3K1004-02
3	1	o-ring	2-168 / 2,62*183,82	3I0004-25
4	1	main motor shaft		-
5	1	feather key	22*11,1*45 A2	3L2001-17
6	1	o-ring	2-237 / 3,53*85,32	3I0006-16
7		lock washer	B10, DIN127, A2	3S0246-05
8		hexagon head cap screw	M10*35, DIN933, A2	3S0004-04
9	1	o-ring	2-168 / 2,62*183,82	3I0004-25
10	1	o-ring	2-161 / 3,53*171,04	3I0006-37
11	1	drum	-	-
	2	flow monitor contact	EFK1-1008HK028PS G1/4"	3P4022-10
	2	return check valve	RD10-L 2bar	3P0002-82
	1	pressure reducer with manometer	1/2"	3P0017-30
	1	angle seat globe valve 2/2 way	Typ 554 DN15 V4A	3P0000-32

11.9 Mixing baffle



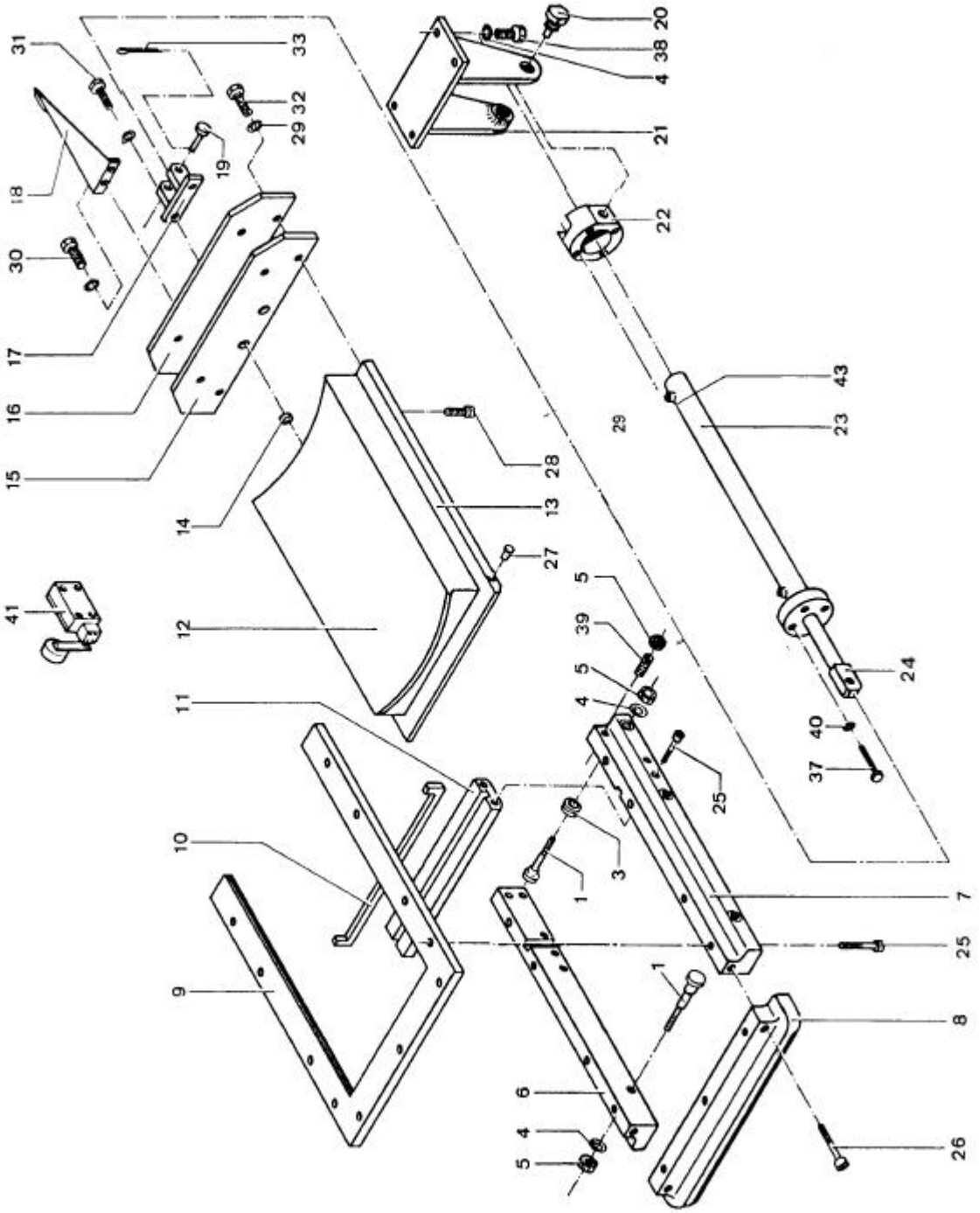
Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	mixing baffle	TC 850	3D2124-08
2	1	scraper for drum	SIMONA	3L5008-05
3	7	cap nut hexagon	M24*1,5 SW36 V2A	3K0040-12
4	1	cap nut hexagon	M30*2 / 58*99*45	3K0042-10
5	1	o-ring	2-238 / 3,53*88,49	3I0006-17
6	1	scraper for cover	SIMONA	3L5008-07

11.10 Processing inserts



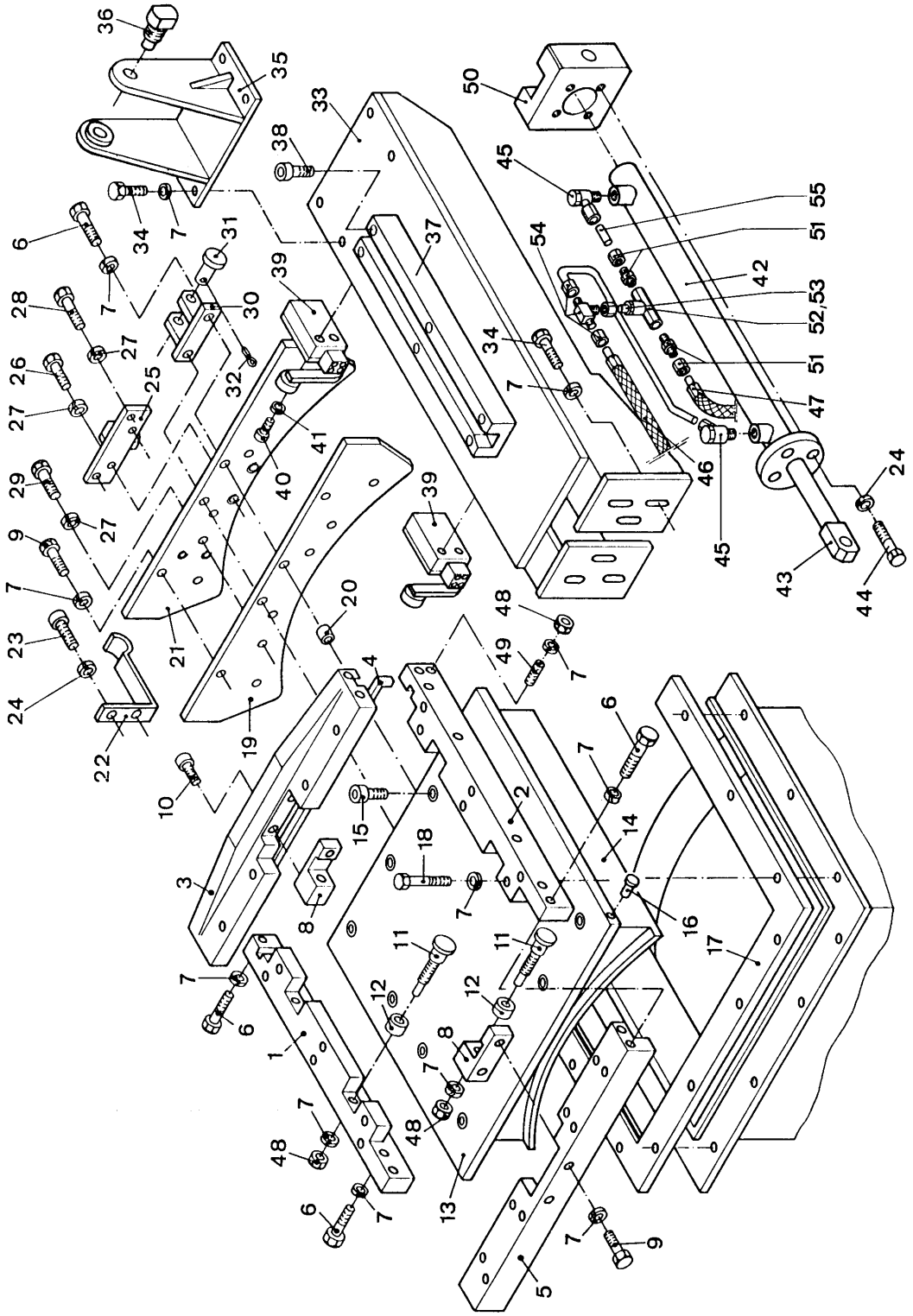
Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	nut for motor shaft	M72*4 LH SW105	3K0042-05
2	1	pressure ring	85*135*36	3K0310-42
3	2	distance ring	85*135*185	3K0567-26
4	3	four-cut double knife	R248*8	3D0109-04

11.11 Outlet slide



Pos. No.	Qty.	Description	Dimensions	Part No.
1	8	roll bolt, exec. 2		3K2586-03
3	8	roll, complete		3K0701-02
4	6	spring washer	B 12, DIN 127	3S0246-06
5	6	hexagon nut	M 12, DIN 934	3S0200-07
6	1	guide rail		3L4030-17
7	1	guide rail		3L4030-07
8	1	front rail		3L4025-09
9	1	slide frame		3I2018-25
10	1	insert for slide rail		3I2037-05
11	1	slide rail		3L4027-52
12	1	slide case		3E2050-09
14	2	distance sleeve	392*25*609	3K0400-09
15	1	sealing plate		3I2061-05
16	1	front plate	CC 600.02-122	3L4611-08
17	1	pillow block	CC 600.02-108	3M2004-06
18	1	switch element	CC 600.08-10	3M2626-25
19	1	bolt	CC 600.02-112	3K2522-18
20	2	hinge bolt	TC 300.08-17	3K2040-03
21	1	hinge pillow block	CC 600.08-20	3M2006-15
22	1	hinge piece	CC 600.08-19	3L2020-16
23	1	hydraulic cylinder	ZCSOST40/28-500M16*1,	3H0056-04
24	1	piston rod eye	LDK 40/28	-
25	19	socket head cap screw	BBA 18	3S0067-05
26	2	socket head cap screw	M 16x70, DIN 912	3S0067-03
27	2	guide bolt	M 16x50, DIN 912	3K2520-02
28	11	socket head cap screw	CC 600.02-18	3S0025-01
29	2	spring washer	M 12x25, DIN 912	3S0246-04
30	2	hexagon screw	B 8, A2, DIN 127	3S0003-03
31	2	hexagon screw	M 8x25, A2, DIN 933	-
32	6	hexagon screw	M 12x55, A2, DIN 933	-
33	1	pin	5 x 50, A2, DIN 94	3S0262-07
37	4	hexagon screw	M 10x50, A2, DIN 933	-
38	6	hexagon screw	M 12x35, A2, DIN 933	3S0005-04
39	2	set screw	M 12x45, Ms, DIN 551	3S0166-02
40	4	spring washer	B 10, A2, DIN 127	3S0246-05
41	2	limit switch	SN U1 AH	3Q6011-09
	1	Rückschlagventil	RH2 G05	3P0002-16
	1	Abstreifer	Auslass	3L1000-02

11.12 Inlet slide



Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	slide guide, left		3L4205-07
2	1	slide guide, right		3L4210-07
3	1	central guide		3L4027-03
4	1	insert		3I2035-14
5	1	front guide		3L4201-08
6	10	hexagon screw	M 12x50, DIN 931	3S0015-01
7	44	spring washer	B 12, DIN 127	3S0246-06
8	2	pillow block f. roll bolt		3M2015-05
9	4	hexagon screw	M 12x40, DIN 933	3S0005-05
10	2	socket head cap screw	M 12x35, DIN 912	3S0065-03
11	6	roll bolt, exec. 3	CC 600.02-45	3K2586-03
12	6	roll	CC 600.02-150	3K0701-02
13	1	slide plate		3L4401-11
14	1	slide case		3E2050-01
15	12	socket head cap screw	M 10x20, DIN 912	3S0064-01
16	2	guide bolt		3K2520-02
17	1	slide frame with groove		3I2014-19
18	10	hexagon screw	M 12x70, DIN 931	-
19	1	sealing plate		3I2060-04
20	2	distance sleeve		3K0400-09
21	1	front plate		3L4610-20
22	1	switch element		3M2626-05
23	2	hexagon screw	M 8x20, DIN 933	3S0003-02
24	6	spring washer	B 8, DIN 127	3S0246-04
25	1	sliding piece		3M2618-04
26	2	hexagon screw	M 10x25, DIN 933	3S0004-02
27	10	spring washer	B 10, DIN 127	3S0246-05
28	2	hexagon screw	M 10x50, DIN 931	-
29	4	hexagon screw	M 10x40, DIN 931	-
30	1	pillow block		3M2004-06
31	1	bolt		3K2522-18
32	1	pin	5x50, DIN 94	3S0262-07
33	1	support		3M2665-01
34	10	hexagon screw	M 12x30, DIN 933	3S0005-03
35	1	hinge pillow block		3M2006-15
36	2	hinge bolt		3K2040-03
37	1	slide rail		3L4027-50
38	6	socket head cap screw	M 10x50, DIN 912	3S0064-06
39	2	limit switch	SN U1 AH	3Q6011-09
40	4	slotted cheese head screw	M 6x20, DIN 84	3S0043-02
41	4	spring washer	B 6, DIN 127	3S0246-03
42	1	hydraulic cylinder	ZCSOST 40/28-500	3H0056-04
43	1	piston rod eye	BBA 12	3S2060-01
44	4	hexagon screw	M 8x40, DIN 933	-
45	2	swivelling screw fitting	SWVE 10 SM	3N4315-30
46	1	hydraulic tube		-
47	1	hydraulic tube		-
48	8	hexagon screw	M 12, DIN 934	3S0200-07
49	2	set screw Ms	M 12x45, DIN 551	3S0166-02
50	1	hinge piece		3L2020-16
51	2	straight stud standpipe "S"	GE10-SR R 1/4"	3N4306-25
52	1	pilot controlled cheek valve	RH 2 G05 211	3P0002-16
53	1	straight stud standpipe	EVGE-10-L Red	3N4307-03

Pos. No.	Qty.	Description	Dimensions	Part No.
54	1	equal tee	T-10-L	3N4324-04
55		tube	10x1.5	3N0050-03

11.13 Angle Seat Valve Type 514

Description

Pneumatically operated oblique pattern seat valve designed to control and isolate inert and corrosive liquids and gases. Suitable for high working temperatures and working pressures.

Construction

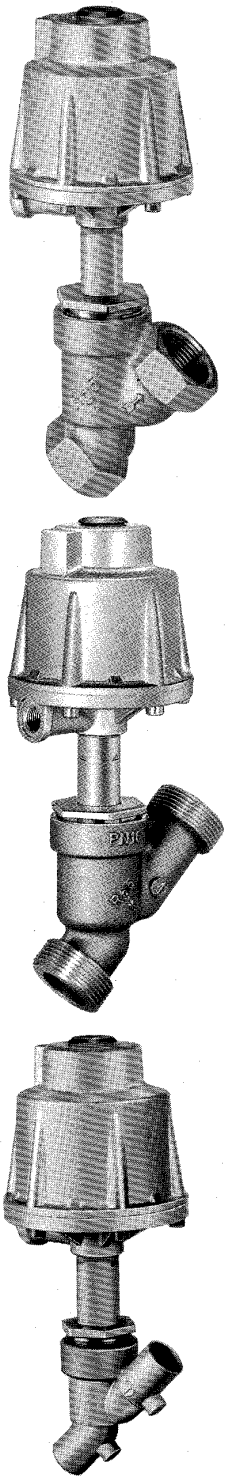
The valve is operated by a robust and maintenance-free piston actuator which ensures excellent performance. The connection for the control medium can be rotated through 360°. The control medium can be any inert gas.

The angle seat body offers good flow characteristics and resistance to contamination. The valve plug is flexibly mounted on the spindle in order to ensure tight shut off. In actuators 0, 1, 2 and 5 the pressure is against the valve seat so that when the valve is in a closed position there is no pressure on the packing. The self-adjusting spindle seal provides a long service life. The packing is protected against contamination damage by a wiper ring fitted as standard.

The materials of those parts in contact with the working medium can be suited to the application.

Advantages

- Shorter installation dimensions due to cast bronze body with male threads
- Good flow characteristics due to the angle seat body
- Suitable for extreme working temperatures and pressures
- Maintenance-free actuator
- Extensive range of accessories
- Proven design and construction



Working Medium

Max. permissible pressure of the working medium: 35 bar (see table)

Max. permissible temperature of the working medium: 180 °C

Control Medium

Max. control pressure: 10 bar

Max. permissible temperature of control medium: 80 °C

Filling volume:
Actuator 0 and 3: 0.05 Nl
Actuator 1 and 4: 0.125 Nl
Actuator 5: 0.248 Nl
Actuator 2: 0.625 Nl

Nominal Diameter (mm)	Body configuration d = straight through	Working pressure (bar) control function 1 Actuator 0 Piston ∅ 50 mm	Actuator 3 Piston ∅ 50 mm	Actuator 1 Piston ∅ 70 mm	Actuator 4 Piston ∅ 70 mm	Actuator 5 Piston ∅ 100 mm	Actuator 2 Piston ∅ 120 mm	K_v-Value (m^3/h)	Control pressure (bar)	Mass (kg) Actuator 0 + 3	Actuator 1 + 4	Actuator 5	Actuator 2
15	D	12	10	35	10	–	–	5.4	4–10	0.9	1.4	–	–
20	D	6	10	20	10	–	35	10.0	4–10	1.1	1.6	–	–
25	D	2.5	10	10	10	–	30	15.2	4–10	1.3	1.8	–	–
32	D	–	–	7	10	10	10	23.0	4–10	–	2.4	3.7	4.6
40	D	–	–	4.5	10	10	10	41.0	4–10	–	2.7	4.6	5.5
50	D	–	–	3	10	7	10	71.0	4–10	–	3.4	5.5	6.4
65	D	–	–	–	–	–	7	108.0	4–10	–	–	–	8.5
80	D	–	–	–	–	–	5	160.0	4–10	–	–	–	9.6

All pressure values are stated as gauge pressures. It should be noted that bronze valve bodies, when in pipe systems according to DIN, are only suitable up to PN 16 max., stainless steel up to PN 25.

Connection

	Ref. no.
Threaded sockets BSP	1
Threaded spigots	9*
Welded spigot ends	60

* Only available in cast bronze

Valve Body Material

		Ref. no.
Cast bronze	RG	9
Stainless steel	1.4408	37
Stainless steel	1.4581	38*

* only available with welded spigot ends from DN 15–50

Seat Seal Material

		Ref. no.
Teflon	PTFE	5

Control Function

	Ref. no.
Normally closed	1
Normally open	2

Actuator Size

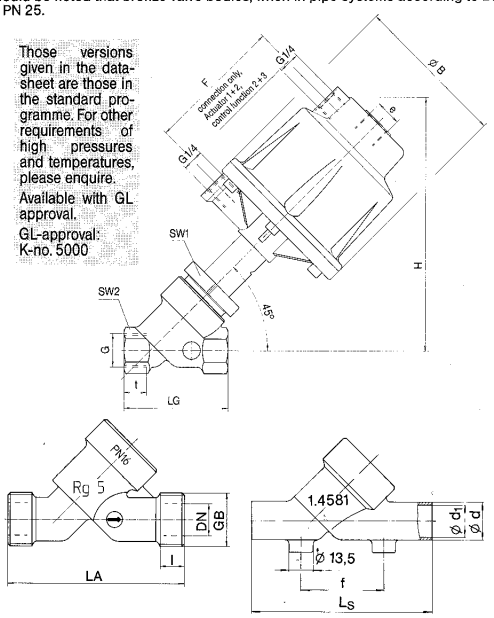
	Ref. no.
Actuator 0 ∅ 50	0**
Actuator 1 ∅ 70	1**
Actuator 2 ∅ 120	2**
Actuator 5 ∅ 100	5**
Actuator 3 ∅ 50	3
Actuator 4 ∅ 70	4

** Preferred flow direction with incompressible liquid media to avoid "water hammer"

Those versions given in the data-sheet are those in the standard programme. For other requirements of high pressures and temperatures, please enquire.

Available with GL approval.

GL-approval: K-no. 5000



Body with welded spigots

DN	LS	f	s	∅ d_1
15	100	46	3.2	18.1
20	108	50	3.2	23.7
25	112	56	4.0	29.7
32	137	83	4.0	38.4
40	146	86	4.0	44.3
50	160	100	5.2	55.1

Body with threaded spigots

DN	GB	l	LA
15	G ¾	12	90
20	G 1	15	110
25	G 1¼	15	118

Body with threaded sockets

DN	LG	G	SW1		$SW2_{RG}$	$SW2_{/A}$		t_{RG}	$t_{/A}$
15	65	G½	36	hexagonal	27	25	hexagonal	15	12
20	75	G¾	41		32	31		16.3	14
25	90	G 1	46		41	39		19	15
32	110	G1¼	55	octagonal	50	48	octagonal	21.4	17
40	120	G1½	60		55	55		21.4	17
50	150	G 2	75		70	66		25.7	18.5
65	190	G2½	95		85	-		24	-
80	220	G 3	110		100	-		27	-

DN	Actuator 0 + 3 H	B	e	Actuator 1 + 4 H	B	F	e	Actuator 5 H	B	F	e	Actuator 2 H	B	F	e
15	151	70	M 16x1	154	96	85.5	M 16x1	–	–	–	–	–	–	–	–
20	156	70		154				–	–	–	–	231	164	223	M 22x1,5
25	163	70		173				–	–	–	–	231			
32	–	–		180				243	140	117	M 22x1,5	258			
40	–	–		187				250				260			
50	–	–		195				261				268			
65	–	–		205				–	–	–	–	275			
80	–	–		226				–	–	–	–	288			

Ordering Example

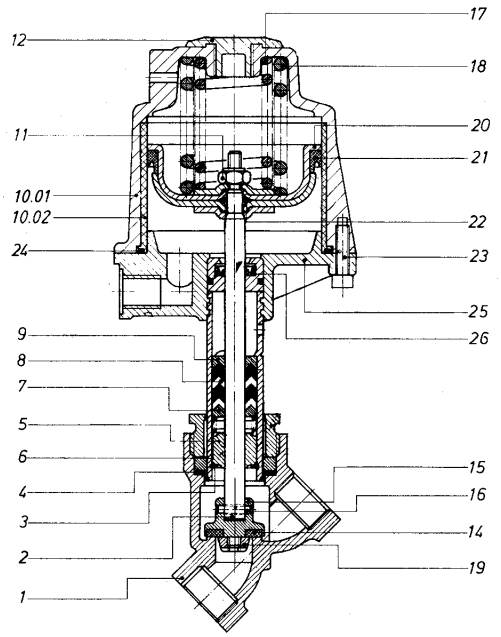
	514	15	D	1	9	5	1	1	5000
Type	514								
Size (mm)		15							
Body configuration (straight through)			D						
Connection (ref. no.)				1					
Valve body material (ref. no.)					9				
Seat seal material (ref. nc.)						5			
Control function (ref. no.)							1		
Actuator size (ref. no.)								1	
GL-Certification (additional K-ref. no.)									5000

Ordering Information
(Pilot valves see types 320–324)

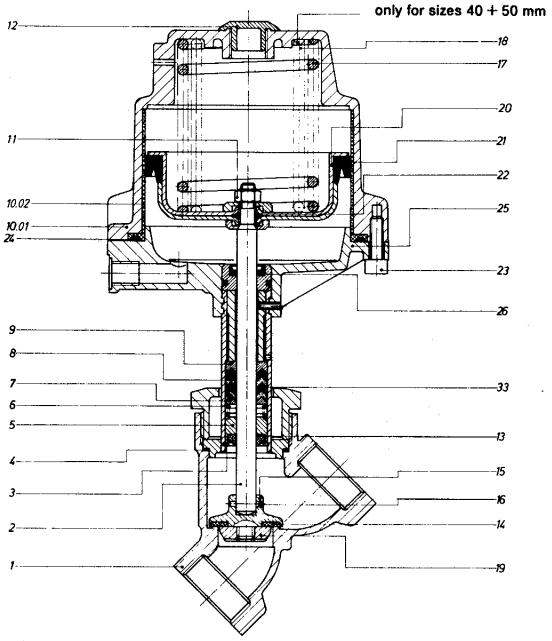
Wherever possible please give following details:

1. Working pressure
2. Working medium and temperature
3. Control medium
4. Control pressure min., max.

Actuator sizes 0, 1, 3, and 4



Actuator size 2



1.	Valve body	10.	Actuator cover	19.	Retaining nut
2.	Spindle	10.01	Sleeve	20.	Piston assembly
3.	Circlip	11.	Lock nut	20.1	Cover
4.	Gasket	12.	Cap	20.2	Pressure disc
5.	Guide bush	14.	Seat seal	21.	Lip ring
6.	Spring	15.	Plug	22.	O-ring
7.	Support ring	16.	Pin	23.	Socket head screw
8.	Packing ring PTFE	17.	Spring	24.	O-ring
9.	Compression ring	18.	Spring	25.	Actuator base assembly
				26.	Lip ring
				33.	Packing ring (elastomere)

Note: When ordering spare parts please state precise details from the valve type label.

Sealing set for 2/2-way-valve		
Size	Connecting dimensions	Order No.:
DN 15	R 1/2"	3I0210-20
DN 20	R 3/4"	3I0210-21
DN 25	R 1"	3I0210-25
DN 32	R 1 1/4"	3I0210-22
DN 40	R 1 1/2"	3I0210-23
DN 50	R 1 3/4"	3I0210-30
DN 65	R 2"	-
DN 80	R 3"	-

I. Assembly

1. To insert spindle seals into actuator base assembly.

Insert compression ring (9), packing rings (8) and (33), support ring (7), complete guide bush (5) and spring (6), into the actuator base assembly (25) and (26) in the specified sequence and secure with circlip (3).

2. To assemble spindle

Insert the seat seal (14) into the plug (15) and secure with retaining nut (19). Secure plug (15) onto spindle (2) with pin (16). **Caution:** Valve head should be flexible on spindle.

3. To insert spindle and fit piston

Slide the spindle assembly, with twisting movements, through the spindle seals. Position the piston assembly (20) complete with lip ring (21) and O-ring (22) over the spindle (22) and secure with lock nut (11).

4. To assemble actuator

Place the springs (17) over the piston (20). Grease the sliding surface of the cover (10), insert the O-ring (24) into the groove on the face of the sleeve (10.02). Place the cover (10.01) over the spring and piston assembly. Utilising a fly-press clamp the actuator cover assembly (10) to the actuator base assembly (25), ensuring that the O-ring (24) is located within the groove, and secure with socket head screw (23).

5. Valve assembly

Insert gasket (4) into the valve body (1). Place the actuator assembly over the valve body and pressurise the actuator to lift the gasket off the valve seat. Position the actuator with the control connection in the required direction and secure the actuator assembly to the valve body assembly with the retaining nut.
Dismantling is done in the reverse sequence.
Caution: Dismantling of the actuator must be undertaken utilising a fly-press as the actuator cover is under spring tension.

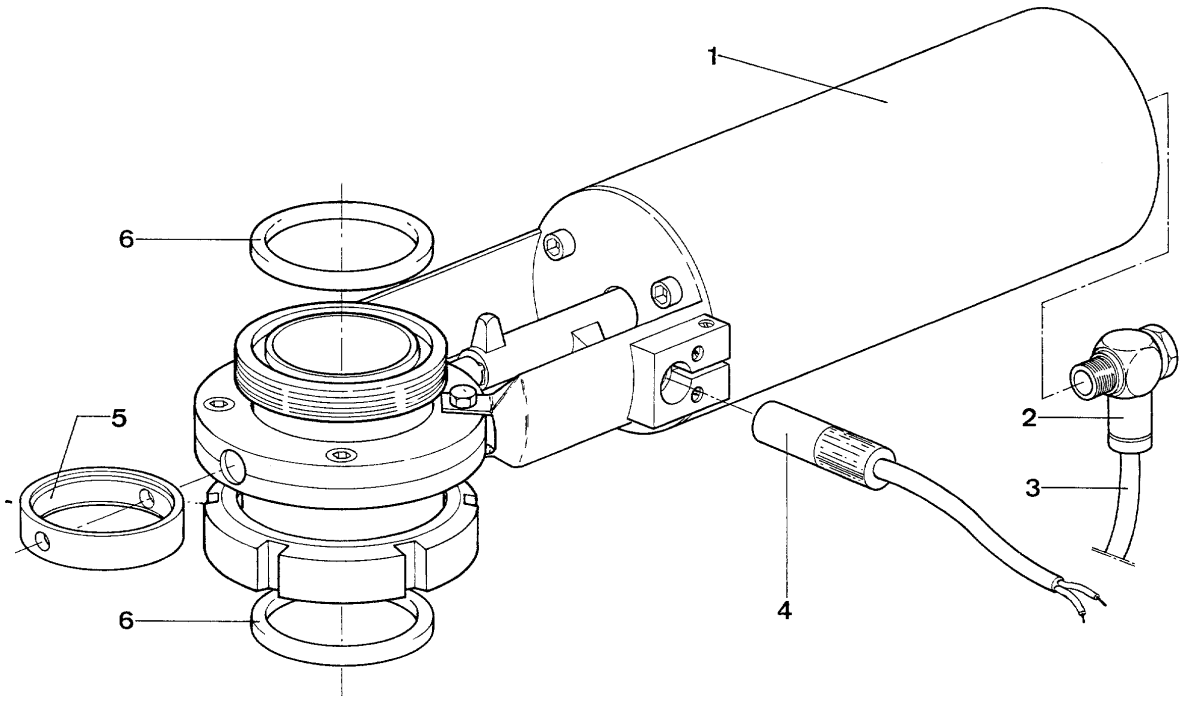
II. Operating Instructions

1. Mounting position:	The valve can be fitted in any position.
2. Flow:	An arrow indicates the flow direction which must be adhered to.
3. Working pressure:	The maximum permissible working pressure is shown on the type label and must not be exceeded.
4. Control pressure:	The minimum and maximum control pressures are shown on the type label and must be adhered to.
5. Cleaning:	The valve is easy to clean by loosening the retaining nut and removing the actuator assembly from the body.

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	2/2-way-straight-way valve	Typ 514 DN50 V2A	3P0000-00
	1	2/2-way straight-way valve,	Typ 514 R 1/2"	3P0000-01
	1	2/2-way straight-way valve	Typ 514/20D6038511 DN20	3P0000-02
	1	2/2-way valve r 1/1, stainless steel	Typ 514/25D6034511 DN25 V2A/PTFE	3P0000-03
	1	2/2-way-straight-way valve	Typ 514 R 3/4"	3P0000-04
	1	2/2-way straight-way valve	Typ 514 R 3/4" R-Guss verchromt	3P0000-06
	1	2/2-way-straight-way valve	Typ 514 DN20 V2A	3P0000-07
	1	2/2-way straight-way valve	Typ 514 1Z R-Guss verchromt	3P0000-08
	1	2/2-way straight-way valve	Typ 514 R 1 1/4" R-Guss verchromt	3P0000-09
	1	2/2-way-straight-way valve	Typ 514 R 1 1/4" V2A	3P0000-10
	1	2/2-way-straight-way valve	Typ 514 DN32 V2A	3P0000-11
	1	2/2-way-straight-way valve	Typ 514 R 1 1/2" R-Guss verchromt	3P0000-12
	1	2/2-way-straight-way valve	Typ 514 R 1 1/2" DN40 V2A	3P0000-13
	1	2/2-way-straight-way valve	Typ 514/15/D DN 15 V2A	3P0000-27
	1	2/2-way-straight-way valve	Typ 514 R 1/2" V2A	3P0000-28

When ordering, please give us the position no. and the nomonal with (DN...)!

11.14 Butterfly valve with pneumatic actuator



Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	butterfly valve with pneumatic actuator	DN 65	3P0004-09
2	1	svivelling fitting	1/8"	3N4315-01
3	1	pneumatic hose	160.06.00-90	3N0153-01
4	1	approx. switch	BES M12 MC PSC 40 F S04G 002	3Q6006-53
5	1	Seal - red	58.33.476/53 - DN 65	3I0137-08
6	1	seal ring G	DN 65	3I0130-08

11.15 Pneumatic control valve type 241-1

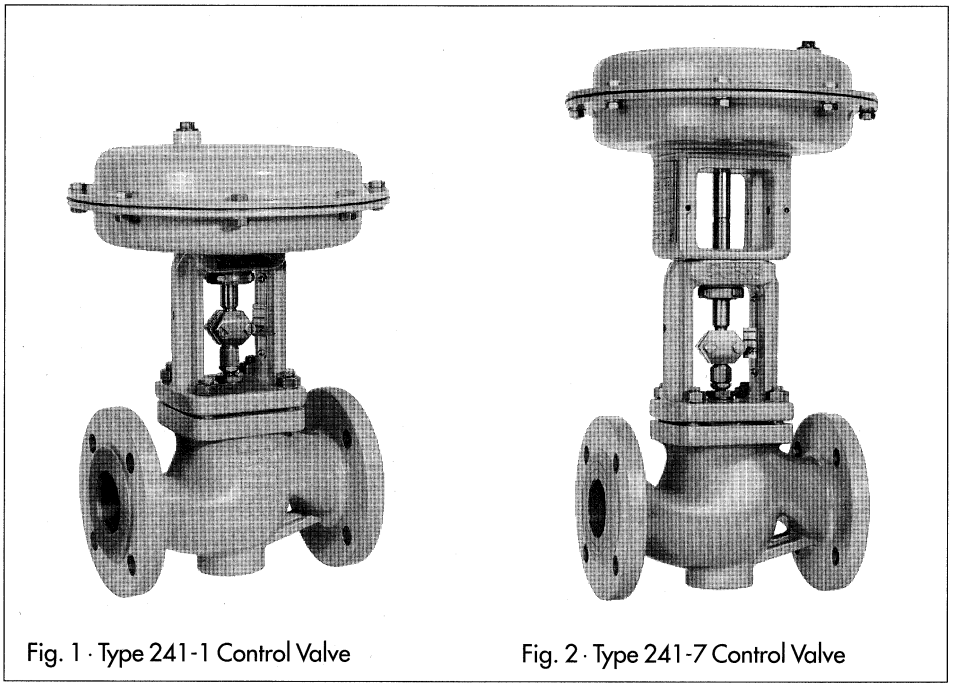


Fig. 1 · Type 241-1 Control Valve

Fig. 2 · Type 241-7 Control Valve

1. Design and principle of operation

The Type 241-1 and Type 241-7 Pneumatic Control Valves each consist of a single-seated Type 241 Globe Valve and either a Type 271 or Type 3277 Pneumatic Actuator (second for integral positioner attachment).

Because of their modular-assembly design, the actuators can be exchanged, and the standard version can be retrofitted to a version with either an extension bonnet (insulating section) or bellows seal bonnet (metal bellows seal).

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	pneumatic control valve type 241-1	KVS 6.3 / DN25 / 1,4-2,3bar / PN40	3P0062-05
	1	pneumatic control valve type 241-1	KVS 0.23 / DN15 / 0,2-1bar / PN25/40	3P0062-20
	1	pneumatic control valve type 241-1	KVS 0.63 / DN15 / 0,2-1bar / PN25/40	3P0062-19
	1	pneumatic control valve type 241-1	KVS 10 / DN40 / 0,0-4bar / PN25/40	3P0062-21
	1	pneumatic control valve type 241-1	KVS 25 / DN25 / 1,4-2,3bar / PN40	3P0062-25

When ordering, please give us the part no. and the nominal width (DN...)!

The process medium flows through the valve in the direction indicated by the arrow. In this process, the closure member, valve plug (3), is adjusted in response to signal pressure changes (bench range) acting on the diaphragm of the actuator. The valve plug (3) and attached actuator stem (8.1) are connected via the stem connector (7) and sealed by means of a spring-loaded PTFE V ring packing (4.2).

Depending on how the compression springs are arranged in the actuator (top or bottom, resp.), the spring force opens or closes the valve whenever pressure on the diaphragm is reduced or the air supply fails. There are two **fail-safe actions:**

- **Actuator stem "extends"**
- **Actuator stem "retracts"**

Depending on the valve action, the valve opens (flow-to-open) or closes (flow-to-close), resp. as increasing signal pressure overcomes the force exerted by the springs.

For the valve version having a **micro-trim element**, this element is installed in the valve body instead of the usual seat/plug combination.

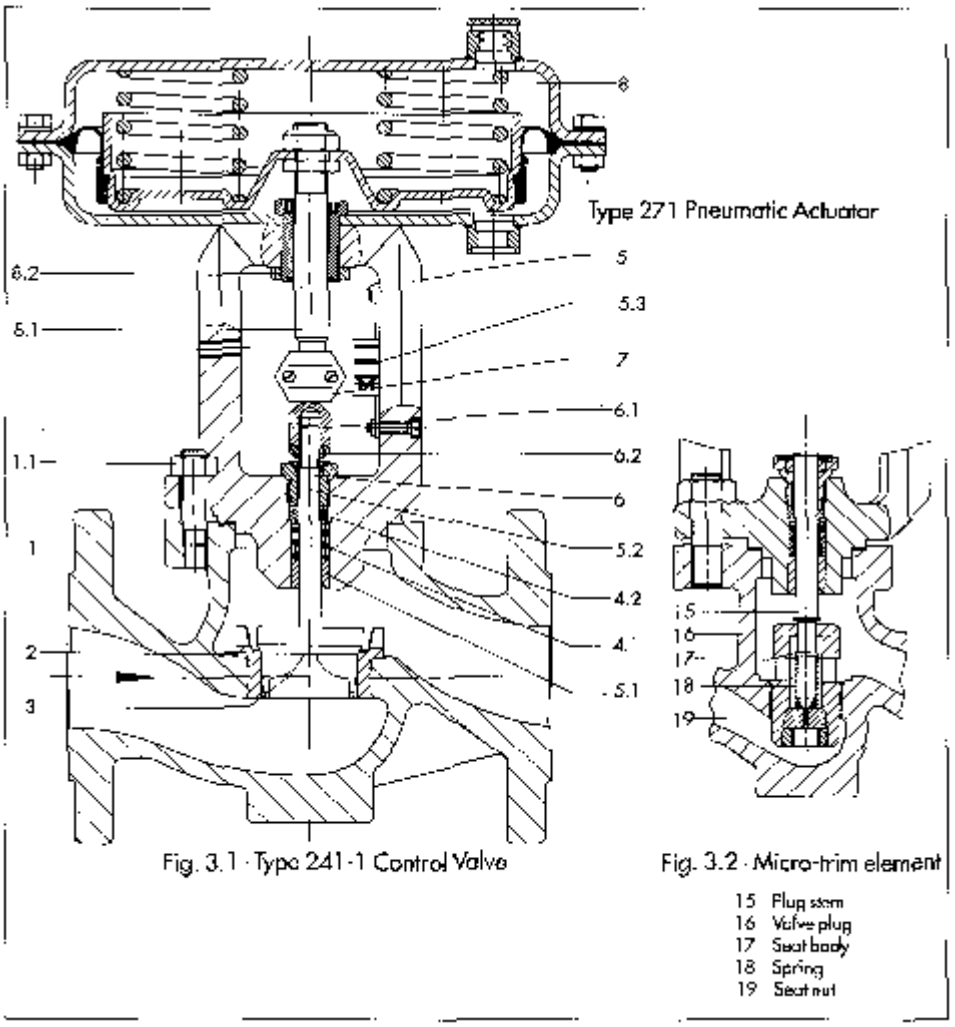


Fig. 3.1 · Type 241-1 Control Valve

Fig. 3.2 · Micro-trim element

15 Plug stem
16 Valve plug
17 Seat body
18 Spring
19 Seat nut

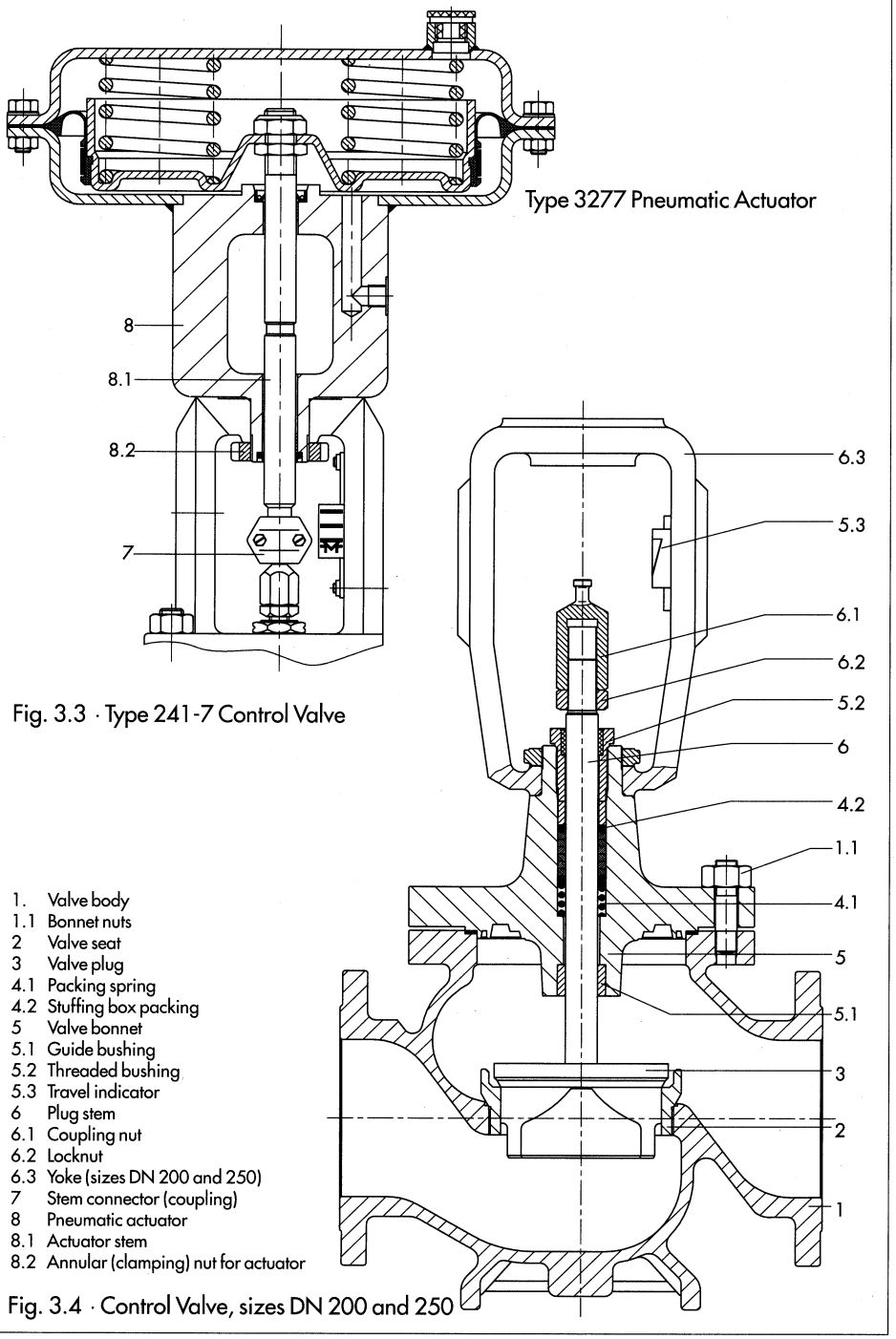


Fig. 3.3 · Type 241-7 Control Valve

1. Valve body
1.1 Bonnet nuts
2 Valve seat
3 Valve plug
4.1 Packing spring
4.2 Stuffing box packing
5 Valve bonnet
5.1 Guide bushing
5.2 Threaded bushing
5.3 Travel indicator
6 Plug stem
6.1 Coupling nut
6.2 Locknut
6.3 Yoke (sizes DN 200 and 250)
7 Stem connector (coupling)
8 Pneumatic actuator
8.1 Actuator stem
8.2 Annular (clamping) nut for actuator

Fig. 3.4 · Control Valve, sizes DN 200 and 250

1.1 Exchanging the actuators

Instead of the standard actuator version, a model with an additional handwheel can be mounted to the valve. In addition, electrically operated actuators can be attached as well.

Pneumatic actuator models exhibiting different sizes can be used in place of the standard pneumatic actuator (with or without handwheel drive).

If the travel range of the actuator is larger than that of the valve, the actuator spring assembly will be pre-loaded ex-factory, ensuring that the travels correlate as they should.

2. Assembling/disassembling the valve and actuator; adjustments (Fig. 3)

If the valve and actuator have not been pre-assembled at the factory or if a different (or larger) version is to be used instead of the original model, proceed as instructed below:

NOTE

When disassembling actuator version "Actuator stem extends" and, in particular, using a version with pre-loaded actuator springs, always apply pressure to the bottom loading pressure connection before disassembling the actuator!

Loosen both the locknut (6.2) and the coupling nut (6.1) on the valve. Press the valve plug with the attached plug stem firmly in the seat ring. Then, turn down both the coupling and the locknut.

Remove the clamps of the stem connector (7) and the annular nut (8.2) on the actuator (8). Slide the annular nut over the plug stem.

Place the actuator on the valve bonnet (5), and thread tight using the annular nut (8.2). On the actuator's nameplate, read both the bench range (or pre-loaded range) and the actuator action (e.g., 0.2 to 1 bar and "Actuator stem extends").

The lower value of the signal range corresponds to the lower-range value (start) to be adjusted. The upper value corresponds to the upper-range value (end) to be adjusted.

Version: Actuator stem "extends":
Apply the loading pressure which corresponds to the lower-range value (e.g., 0.2 bar) to the bottom diaphragm chamber.

Version: Actuator stem "retracts":
Apply the loading pressure which corresponds to the upper-range value (e.g., 1 bar) to the top diaphragm chamber.

Manually turn the coupling nut (6.1) until it contacts the actuator stem (8.1). Then, turn a quarter revolution further, and retain the position using the locknut (6.2).

Attach the stem connector clamps (7), and tightly screw together. Align the travel indicator scale (5.3) in line with the coupling tip.

2.1 Pre-loading the springs for actuator action: Actuator stem "extends"

In order to obtain increased thrusts for these actuators, up to 25 % (actuator effective areas 80 to 240 cm^2 = 12.5 %) of their travel or signal pressure span can be pre-loaded when adjusting the actuator springs.

If a pre-tension of, for example, 12.5 % is desired for a signal range between 0.2 and 1 bar, the signal range is shifted upward 0.1 bar from 0.3 to 1.1 bar (here, 0.1 bar corresponds to 12.5 %).

In the adjustment procedure of the valve, the lower-range value is now to be adjusted to 0.3 bar as required.

Always mark the new signal range from 0.3 to 1.1 bar as the pre-loaded signal range on the nameplate!

2.2 Pre-loaded actuator springs ex-factory

An adhesive label identifies actuators which have been pre-loaded (without the attached valve) by the manufacturer. Moreover, such a case can easily be seen by three extended bolts and nuts (Fig. 5) on the bottom diaphragm case. These bolts and nuts allow the pre-tensioned actuator springs to be uniformly released, in a criss-cross pattern, when disassembling the actuator.

3. Installation

3.1 Mounting position

There is no prescribed mounting position. However, for valves sizes DN 100 or above, install the actuator vertically upright in order to facilitate any maintenance required.

Always install the valve free of stress! If necessary, support piping near the process connections. Never attach the braces to the valve or actuator!

Thoroughly flush the pipe prior to installing the valve.

3.2 Loading pressure connection

For actuator action "Actuator stem extends", connect the loading pressure to the bottom diaphragm case. For actuator action "Actuator stem retracts", connect it to the top case.

NOTE: For Type 3277 Linear Actuator (for integral positioner attachment), the bottom loading pressure connection is located laterally on the yoke which is attached to the bottom diaphragm case.

3.3 Strainer, bypass line

We recommend that a SAMSON strainer (Strainer Type 2) be installed upstream of the valve body.

To enable maintenance without disrupting operation, good practice calls for a shut-off valve to be installed both upstream of the strainer and downstream of the valve. In addition, a bypass line is recommended.

3.4 Bellows test connection (Fig. 8)

For the bellows seal version, a test (inspection) connection (G 1/8) is located at the top flange, used to inspect and monitor the effectiveness of the bellows sealing. We recommend especially for liquids and steams that a suitable leakage indicator (e.g., contact-making pressure gauge, runoff in an open tank or inspection glass) be connected.

4. Operation

4.1 Reversing the actuator action (Figs. 4 and 5)

When disassembling the control valve, first remove pressure from the corresponding section of the plant. Recommendation: Drain the pipe, and remove the valve.

If the actuator action need be reversed, proceed as instructed below:

Separate the actuator (8) from the valve. For this purpose, perform the following for actuator action: Actuator stem "extends": First apply a pressure which exceeds the lower-range value to the actuator (see nameplate).

Loosen the coupling clamps connecting the actuator stem and the plug stem, and unthread the annular nut (8.2). Lift the actuator off the valve.

4.1.1 Reversing the actuator action from Actuator stem "*extends*" to "*retracts*"

Unscrew the hexagonal bolts and nuts (8.10) connecting both diaphragm cases.

Take special care with actuators whose springs have been pre-loaded at the factory! [Distinguished by the extended bolts and nuts on the bottom diaphragm case.)

To proceed, first unturn the short bolts, then, slowly and uniformly and, in a criss cross pattern, loosen the long bolts and nuts until the actuator springs are relieved of tension.

Lift off the top diaphragm case.

Remove the actuator springs (8.3). Pull the actuator stem (8.1), diaphragm plate (8.7) and diaphragm (8.4) out of the bottom diaphragm case (8.6). Unthread the upper nut (8.8), counter holding the other lower nut (8.9) and not damaging the diaphragm stem. Turn over the diaphragm plate along with the diaphragm, and thread on the nut again. Apply lubricant to the actuator stem (order no.: 8150-0043). Place the diaphragm plate in the top diaphragm case (8.5), install the actuator springs (8.3), and slide the bottom diaphragm case (8.6) over the actuator stem (8.1). Bolt together both diaphragm cases again.

For the Type 271 Pneumatic Actuator, screw the vent plug (9) out of the top diaphragm case (8.5) and into the bottom diaphragm case (8.6).

For the Type 3277 Pneumatic Actuator for integral positioner attachment, screw the vent plug (9) out of the top diaphragm case.

The actuator springs, now pressing upward against the diaphragm, open the valve by way of the actuator stem (8.1) and the attached valve plug. The loading pressure is introduced to the top diaphragm chamber via the top loading pressure connection (10). If the signal pressure increases, it closes the valve, overpowering the force exerted by the actuator springs.

Mount the actuator to the valve as instructed in section 2.

4.1.2 Reversing the actuator action from Actuator stem "retracts" to "extends"

Unscrew the hexagonal nuts and bolts connecting both diaphragm cases. Lift off the top diaphragm case.

Pull the actuator stem (8.1), diaphragm plate (8.7) and diaphragm (8.4) out of the bottom diaphragm case (8.6). Remove the actuator springs (8.3). Unthread the upper nut (8.8), counter holding the other lower nut (8.9) and not damaging the actuator stem.

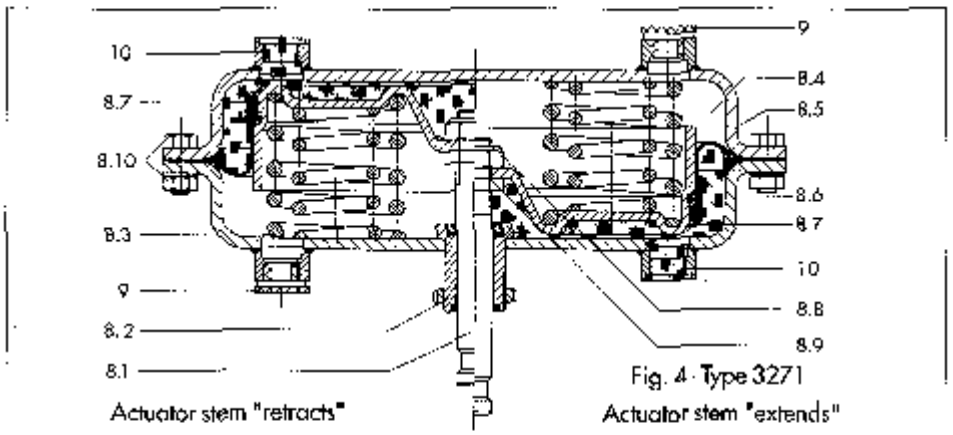
Turn over the diaphragm plate along with the diaphragm, and thread on the nut again. Push the actuator stem (8.1) through the bottom diaphragm case (8.6), and install the actuator spring (8.3). Attach the top diaphragm case (8.5). Bolt together both diaphragm cases again. Unscrew the vent plug (9) and screw into the top diaphragm case (8.5) (Type 271 Linear Actuator). For the Type 3277 Pneumatic Actuator, screw a vent plug in the top diaphragm case.

The actuator springs, now pressing downward against the diaphragm, close the valve by way of the actuator stem and the plug

stem. The loading pressure is introduced to the bottom diaphragm case via the bottom loading pressure connection. If the signal pressure increases, it opens the valve, overpowering the force exerted by the actuator springs. Mount actuator to the valve as instructed in section 2.

Further details regarding the pneumatic actuator can be found in the following "Mounting and operating instructions":

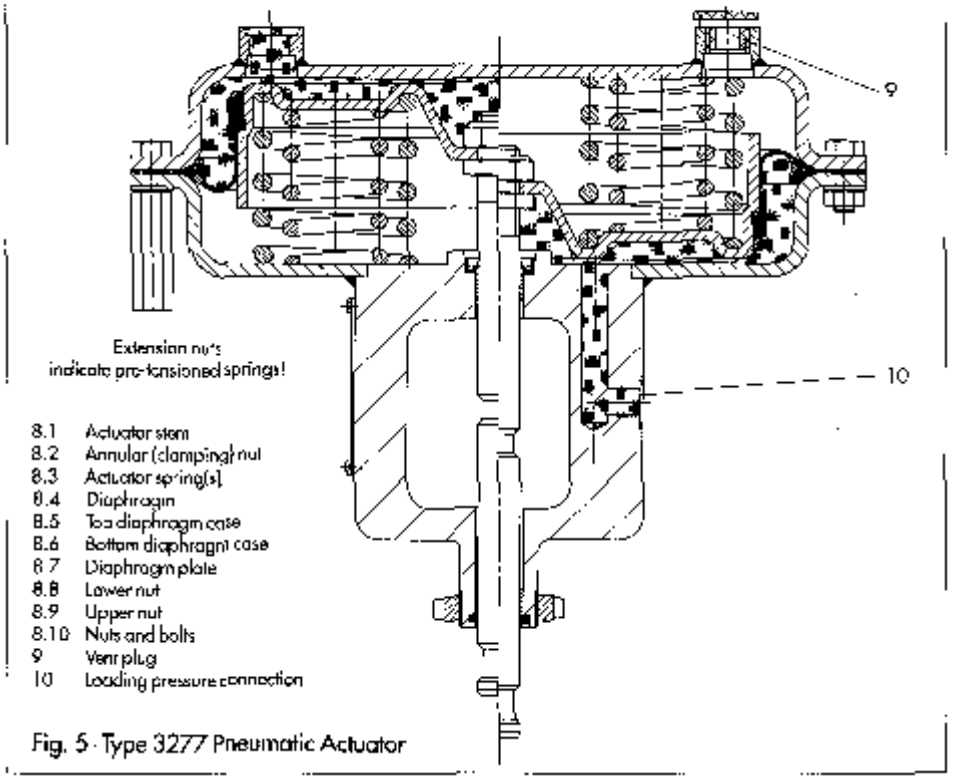
- **EB 8310 E** (Type 3271 Pneumatic Actuator)
- **EB 8311 E** (Type 3277 Linear Actuator for integral positioner attachment).



Actuator stem "retracts"

Actuator stem "extends"

Fig. 4 · Type 3271



8.1 Actuator stem
8.2 Annular (clamping) nut
8.3 Actuator spring(s)
8.4 Diaphragm
8.5 Top diaphragm case
8.6 Bottom diaphragm case
8.7 Diaphragm plate
8.8 Lower nut
8.9 Upper nut
8.10 Nuts and bolts
9 Vent plug
10 Loading pressure connection

Fig. 5 · Type 3277 Pneumatic Actuator

5. Faults and how to correct

If external leakage occurs, the cause may be contributable to a faulty stuffing box or, as regards the bellows version, also a defective metal bellows.
If the valve does not tightly seal, impervious shut-off can be impaired by dirt or other foreign particles lodged between the valve seat and valve plug (or by damaged sealing edges).
We recommend that the parts be disassembled, thoroughly cleaned and, if necessary, replaced.

When disassembling the control valve, first relieve the pressure from the corresponding section of the plant and drain. Recommendation: Remove the valve.

5.1 Replacing the stuffing box packing for standard valve versions

If the valve leaks around the stuffing box, this is good indication that the stuffing box packing (4.2) need be replaced as instructed below:
Separate the actuator (8) from the valve. For this purpose, perform the following for version: Actuator stem "extends". First apply a pressure which exceeds the lower-range value to the actuator (see nameplate).
Disconnect the coupling clamps connecting the actuator stem and the plug stem, and unthread the annular nut (8.2). Lift the actuator off the valve.
Remove the associated nuts (1.1, 6.1 and 6.2). Remove the valve bonnet (5), and unscrew the threaded bushing (5.2). Press out damaged stuffing box packing (4.2) using the plug stem (6). Pull out the valve plug (3) along with the plug stem (6). Remove the packing washer (4.3) and the packing spring (4.1), and clean the packing chamber.
Apply lubricant to the individual parts of the new stuffing box packing and also to the plug stem (order no.: 8150-0111).
Insert the plug stem (6) along with the attached valve plug (3) in the valve bonnet (5). Place the valve bonnet on the valve body (1) again, and secure the bolts using the hexagonal nuts (1.1) (note the tightening torque according to the table). Install the packing spring (4.1) and the packing washer (4.3), and slide the new stuffing box packing (4.2) carefully over the plug stem in the packing compartment. Screw in the threaded bushing (5.2), and turn tight. Screw the locknut (6.2) and the coupling nut (6.1) onto the plug stem (6).
Mount the actuator to the valve and adjust the lower or upper-range value as instructed in section 2.

5.2 Replacing the valve seat and valve plug

If the valve leaks, the reason preventing positive shut-off may be impurities or damaged sealing edges.

In the first case, thoroughly clean the associated parts. In the second case, replace.

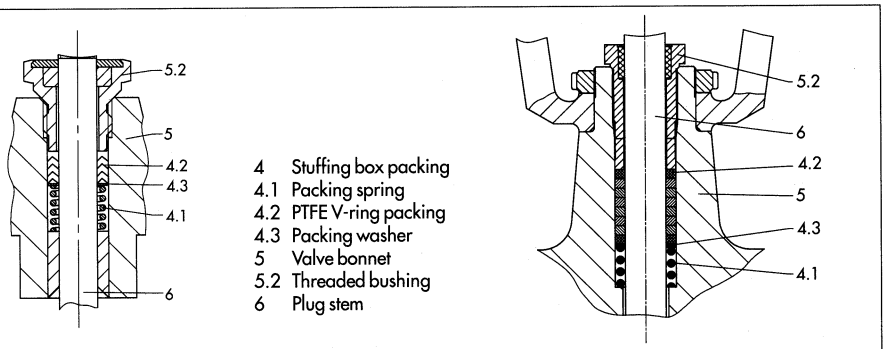


Fig. 6 · Replacing the stuffing box packing, sizes DN 15 to 150 (left) and DN 200 and 250 (right)

5.2.1 Valve plug

It is good practice to also replace the stuffing box packing (4.2) when adding the valve plug. Replace the plug as instructed below (see Fig. 3). Perform the same steps as instructed in section 5.1. However, install a new plug with attached plug stem in place of the old one. The worn plug can possibly be used again after it has been re-worked (see section 5.2.1.1). Apply lubricant to the plug stem prior to inserting (order no. 8150-0111).

5.2.1.1 Re-working the valve plug

Slight damages on the sealing edges of the valve plug can be corrected by re-turning.

For valve plugs with soft sealing, re-working is possible only up to dimension **x**, and only for valves with a seat bore above 12 mm (Fig. 7).
With seat bores of 63 or above, the entire sealing ring can be replaced should it be necessary (the plug parts are screwed together).

5.2.2 Valve seat

Replace the valve seat (2) as instructed below:
Unthread the hexagonal nuts (1.1), and lift the valve bonnet (5), plug stem (6) and actuator (8) off the valve body (1). Unscrew the valve seat (2) using the appropriate seat wrench tool (see table), and apply lubricant to the new valve seat (or possibly the old valve seat after re-working or thorough cleaning) on both the thread and the sealing conus (order no. 8150-0119) and screw in.
Place the valve bonnet (5) on the valve body again, and secure the bolts using the hexagonal nuts (1.1). The table lists the tightening torques for the seat rings and nuts holding the body flange (permissible deviation ±10 %).

Version with micro-trim element (Fig. 3.2)
In this version, the complete micro-trim element can be unscrewed from the valve body using a socket wrench (width across flats SW 27) and subsequently taken apart for cleaning purposes.
If the individual parts are damaged, the micro-trim element should be completely replaced.

SAMSON seat wrench tool
More details and information on the assembly procedure can be found in publication WA 029.

Seat bore mm	12	24...48	63...80	100...200
x (max.) mm	0.5	1.0	2.0	2.5

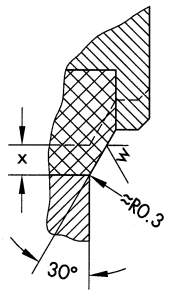


Fig. 7 · Valve plug with soft sealing

Table Seat wrench and tightening torques

Nominal size DN	Seat wrench Order no.	Seat thread mm	Torque Nm	Nuts (1.1) and bolts (5.4)	Torque Nm
15...25	9110-2403	M 32 x 1.5	170	4x M10	10
32...50	9110-2464	M 58 x 1.5	500	4x M12	30
65 and 80	9110-2467	M 90 x 1.5	1050	4x M16	60
100	9110-2471	M 110 x 1.5	1550	4x M20	100
125	9110-4075	M 125 x 1.5	1900	8x M16	60
150	9110-4076	M 152 x 1.5	2600	8x M20	100
200 and 250	0900-0172	M 230 x 3	4500	8x M27	390

5.3 Replacing the stuffing box packing, valve plug, valve seat and bellows (for valves with extension bonnet or bellows seal bonnet)

(Figs. 3 and 8). See also sections 5.1 and 5.2.

Separate the actuator (8) from the valve. For this purpose, perform the following for version: Actuator stem "extends". First apply a pressure which exceeds the lower-rang value to the actuator (see nameplate).

Loosen the coupling clamps connecting the actuator stem and the plug stem, and unthread the annular nut (8.2). Lift the actuator off the valve.

Remove the nuts (6.1 and 6.2) and bolts (5.4). Unloosen the threaded bushing (5.2). Remove the valve bonnet (5).

NOTE

When removing the valve bonnet, take extra care not to damage the stuffing box packing (4.2) by the thread of the plug stem extension (6.3). Always remove the stuffing box packing from the bonnet, and check whether it is suitable for further use.

Remove the hexagonal nuts (1.1). Remove the intermediate piece (12), plug stem (6) and valve plug (3) from the valve body (1).

5.3.1 Stuffing box packing

(Figs. 2, 6 and 8)

Replace as instructed in section 5.1. To push out, a suitable tool can be used instead of the plug stem.

5.3.2 Valve plug

Sizes DN 15 to 150

Unscrewing the plug stem (6) from the plug stem extension (6.3) requires that two nuts (for counter holding) be screwed to the protruding thread of the extension. In order to prevent damage with the bellows version, always make sure that no torque is transmitted to the bellows which is screwed to the intermediate piece.

We advise the use of a SAMSON assembly pliers (Fig. 8.2), in which the plug stems with 10 and 16 mm Ø can be clamped in the vice.

Apply lubricant to either the new or old, reworked valve plug (3) (order no. 8150-0111). Check whether the two locking washers (6.4) are still confined to the plug stem extension (6.3). Then, screw the plug stem tight in the plug stem extension (6.3) (tightening torque 50 Nm for Ø 10, 80 Nm for Ø 16 mm).

Sizes DN 200 and 250:

Remove the hexagonal screws (3.3), straining ring (3.5) and flange (3.6). Unscrew the valve plug from the plug stem using a suitable tool, preventing distortion of the plug stem (this is a part with the bellows). Assemble the new valve plug in reverse order.

Parts 3.5, 3.6 and 3.7 are omitted for the extension bonnet version, whereby the valve plug (3) and plug stem (6) are one part.

5.3.3 Valve seat

Replace as instructed in section 5.2.2.

5.3.4 Bellows

Sizes DN 15 to 150:

Unscrew the valve plug (3) along with the attached plug stem (6) from the plug stem extension (6.3), considering section 5.3.2. Unthread the nut (6.5) using the SAMSON socket wrench tool (order no.: 9250-0677.72). Pull the metal bellows (6.6) along with welded plug stem extension out of the intermediate piece (12). Clean the sealing surfaces on the intermediate piece. Push the replacement bellows in the intermediate piece, and tightly thread on the nut (6.5). Check whether the two locking washers (6.4) are still situated in the plug stem (6). Apply lubricant (order no. 8150-0119) to the thread of the plug stem, and screw the plug stem tightly in the plug stem extension (6.3) (tightening torque 50 Nm for 10, 80 Nm for 16 mm).

Sizes DN 200 and 250:
Unscrew the valve plug (3) from the plug stem as instructed in section 5.3.2, and pull out the metal bellows (6.6) together with the plug stem (6) upwards out of the intermediate piece (12).

Replace the sealing ring (6.7), and insert the new plug stem with metal bellows section (6.6).

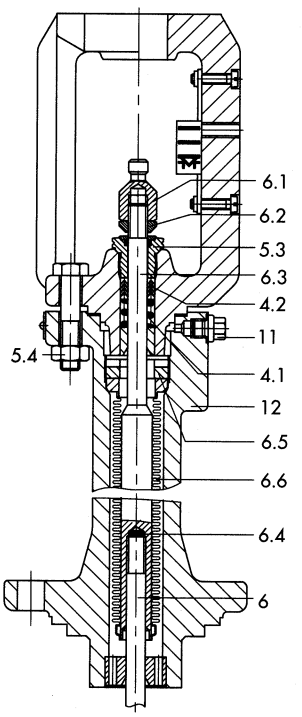
Screw on the valve plug, and secure using the straining ring (3.5), flange (3.6) and screws (3.7).

5.3.5 Re-assembling

Place the intermediate piece (12) on the valve body (1), and secure using the hexagonal nuts (1.1).

Place the valve bonnet (5) on the intermediate piece, and secure using the bolts (5.4) and nuts. Tighten the threaded bushing (5.2). Screw both the locknut (6.2) and the coupling nut (6.1) onto the plug stem extension (6.3).

Mount the actuator to the valve, and adjust the lower and upper-range value as instructed in section 2.



1.1 Nuts
3 Valve plug
3.5 Straining (tension) ring
3.6 Flange
3.7 Screws
4.2 Stuffing box packing
5 Valve bonnet
5.2 Threaded bushing
5.4 Bolts
6 Plug stem
6.1 Coupling nut
6.2 Locknut
6.3 Plug stem extension
6.4 Locking washers
DN 15 to 80 order no. 8382-2317
DN 100 to 150 order no. 8382-2321
6.5 Nut (sizes DN 15 to 150)
6.6 Metal bellows
6.7 Sealing ring (DN 200 and 250)
6.8 Sealing ring (DN 200 and 250)
11 Bellows test connection
12 Intermediate piece

Fig. 8.1 · DN 15 to 150 with metal bellows, no bellows (6.6) with extension bonnet

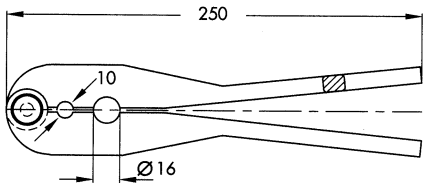


Fig. 8.2 · Clamping tool, tong order no. 9129-1995

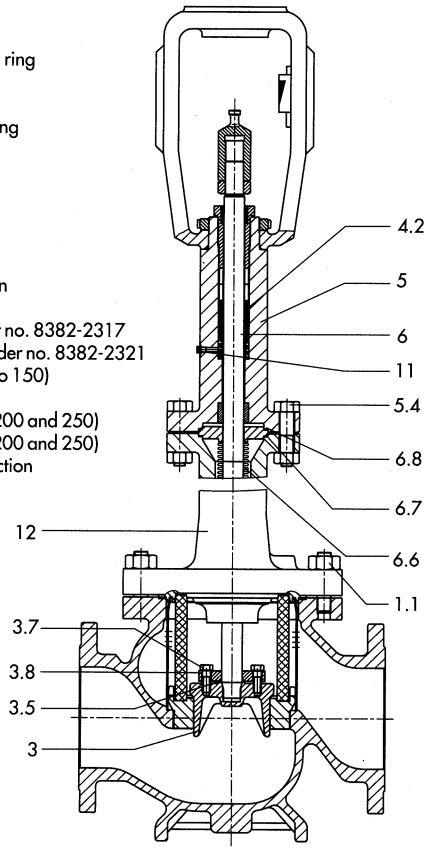


Fig. 8.3 · DN 200 and 250 with metal bellows (and flow divider)
no bellows (6.6) with extension bonnet

5.4 Replacing the stuffing box packing (or sealing ring) **for balanced valve plug** (Fig. 9)

After unthreading the hexagonal nuts (1.1), remove both the actuator (8) and the valve bonnet (5) from the valve body.

For this purpose, perform the following for version: Actuator stem "extends". First apply a pressure which exceeds the lower value of the signal range to the actuator (see nameplate).

Remove the stem connector (7) and the associated nuts (6.1 and 6.2). Pull the plug stem and the valve plug (3) out of the valve bonnet.

5.4.1 Size DN 40

Unscrew the threaded bushing (5.2). Remove the stuffing box packing (4.2), packing washer (4.3) and the packing spring (4.1). Push out bushing (3.2), and replace the stuffing box packing (3.1). Clean the bore in the valve bonnet. Apply lubricant to the bushing (3.2) (order no. 8150-0111), and press in. Also apply lubricant to the plug stem (6) and the effective areas of the packing (3.1).

For further assembly, proceed as instructed in section 2.

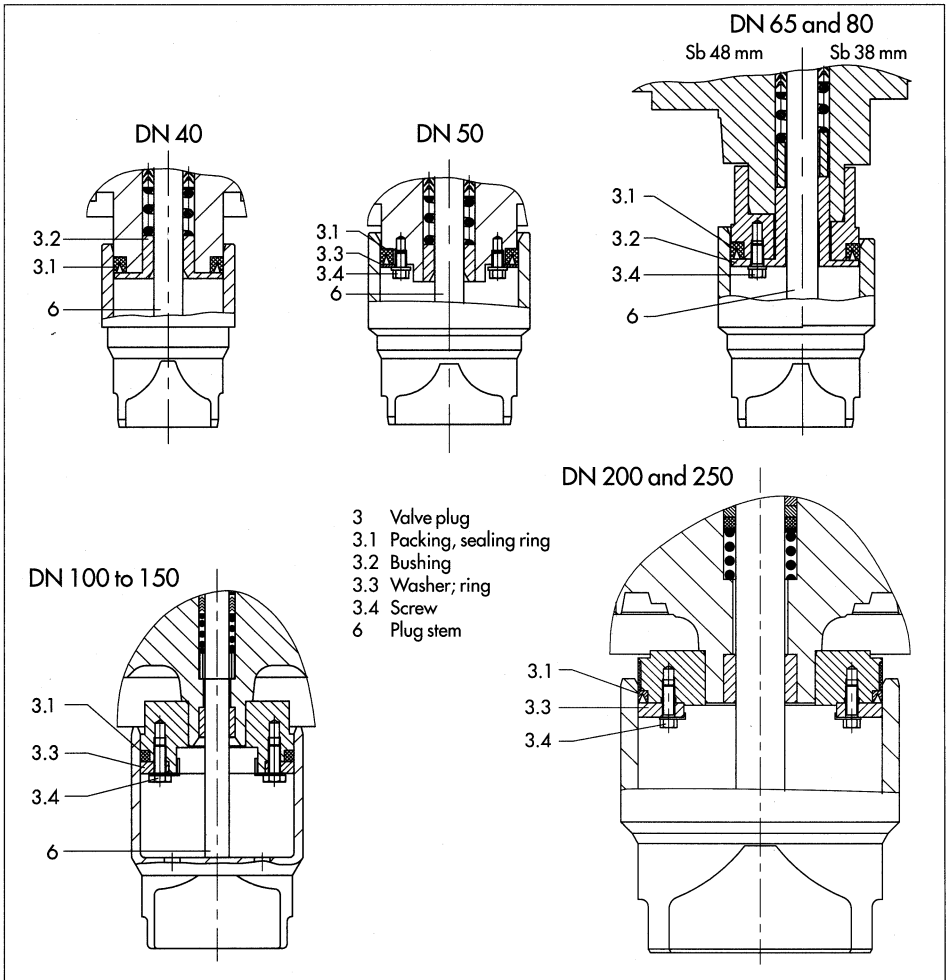


Fig. 9 · Balanced valve plug

5.4.2 Sizes DN 50 to 150

Remove the screw (3.4), screw retention and washer (3.3). Replace the stuffing box packing (3.1). Insert the washer (3.3). Insert the screw (3.4) and retention, and screw tight. Apply lubricant to the plug stem (6) and the effective areas of the stuffing box packing (3.1) (order no. 8150-0111). For further assembly, proceed as instructed in section 2.

5.4.3 Sizes DN 200 and 250

Remove the screw (3.4) along with the retention. Lift off the ring (3.3), and replace the stuffing box packing or sealing ring (3.1). Insert the ring (3.3). Insert the screw (3.4) along with retention, and screw tight.
Apply lubricant to the plug stem (6) and effective areas of the stuffing box packing (3.1) (order no. 8150-0111).

For further assembly, proceed as instructed in section 2.

6. Identifying mark of the guide bushing, valve seat and valve plug

6.1 Guide bushing

Material identification:

- No groove on the plane surface:
  Stainless steel: DIN-WN 1.4305
- Sharp recessed groove:
  Stainless steel: DIN-WN 1.4571
- Flat recessed groove:
  Material: Hastelloy

6.2 Valve seat

The **material number** is either stamped in or engraved.
When Stellited, "**st**" is stamped in.

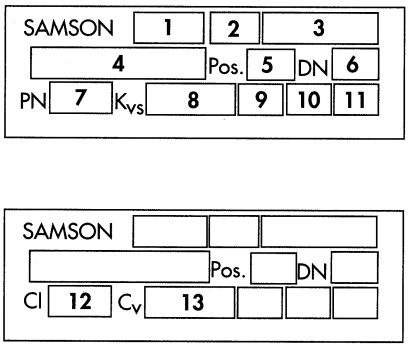
6.3 Valve plug

Material identification:

- No groove below the connecting thread:
  Stainless steel: DIN-WN 1.4006
- Sharp recessed groove below the connect ing thread:
  Stainless steel: DIN-WN 1 .4571
- Two sharp recessed grooves:
  Stainless steel: DIN-WN 1.4301
- Flat recessed groove below the connecting thread:
  Material: Hastelloy

For other materials, either the material number or designation is engraved.
The **K_{VS} value and characteristic** are engraved on the valve plug.
When **Stellited,** "**st**" is engraved.

7. Description of the nameplate



1 Type designation
2 Modification index
3 Material
4 Order no. (pos.) and modification index
5 Item. no. of order
6 Nominal size DN
7 Nominal pressure PN
8 K_{VS} value
9 Characteristic:
GL EQUAL PERCENT., **LN** LINEAR
10 Sealing:
ME METAL, **PT** SOFT
11 **D** Pressure balancing
1 or **3** flow divider

ANSI version
12 ANSI Class (pressure rating)
13 Cv value (K_{VS} x 1.17)

Fig. 10 · Nameplate on control valve

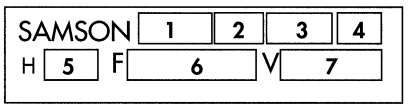


Fig. 11 · Nameplate on Type 271 Actuator

1 Type designation
2 Modification index
3 Effective diaphragm area
4 Actuator action:
FA Actuator stem "extends"
FE Actuator stem "retracts"
5 Travel
6 Bench range (spring range)
7 Bench range with "pre-tensioned" springs

8. Dimensions in mm and weights

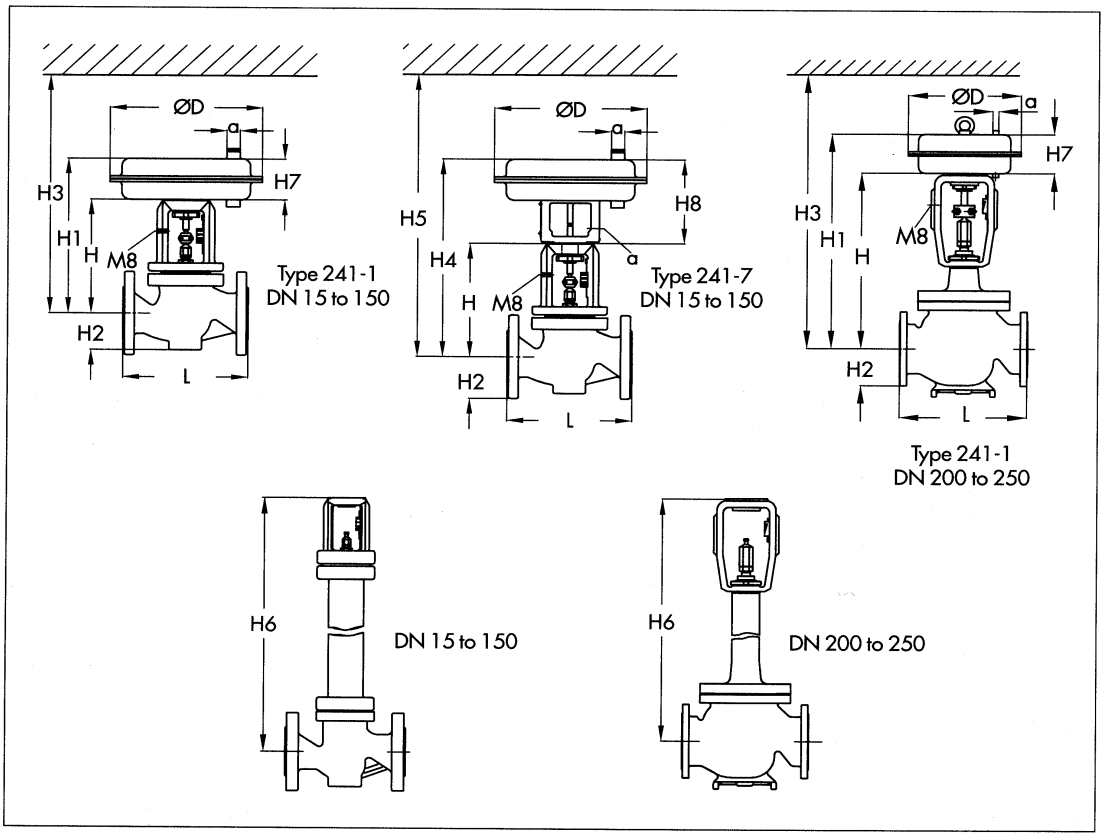
Standard version														
Nominal size DN		15	20	25	32	40	50	65	80	100	125	150	200	250
Length L		130	150	160	180	200	230	290	310	350	400	480	600	730
Height H1 with actuator cm^2	80	285						325						
	120	290												
	240	285						325						
	350	305						345						
	700	355						395		485	495 515[1]	525 550[1]		
	1400												1002	
	2100												1433	
	2800												1426	
H with actuator	≤700	220						260		350	360 380[1]	390 415[1]		
	1400												805	
	≤2100												1060	
H2	approx.	40			72			98		118	144	175	235	260
H4 with actuator	120													
	240	385						425						
	350	405						445						
	700	455						495		585	595 615[1]	625 650[1]		
Weight of valve without actuator approx. kg		5	5	7	11	12	15	24	30	42	80	120	330	380

[1] Body material cast iron GG 25

Version with extension bonnet or bellows seal bonnet, sizes DN 15 to 150												
DN		15	20	25	32	40	50	65	80	100	125	150
Height H6	Short/with bellows	405			395			435		635	625 645[1]	655 680[1]
	Long/long w. bellows	710			700			740		875	865	985
Weight Appr. kg	Short/with bellows	8	9	10	17	18	21	32	38	60	105	150
	Long/long w. bellows	12	13	14	21	22	25	36	42	68	113	158

Version with extension bonnet or bellows seal bonnet, sizes DN 200 and 250								
Version with:		Extension bonnet			Bellows seal bonnet			
Actuator effective area cm^2		1400	2100	2800	1400	2100	2800	
Height H6 with:	DN 200 DN 250	1250	1480		1453	1687		
Weight approx. kg	DN 200	380	400	400	390	410	410	
	DN 250	430	450	450	440	460	460	

Pneumatic actuator									
Actuator size cm^2		80	120	240	350	700	1400	2100	2800
Diameter D		150	168	240	280	390	530	670	770
Height H7		62	70	62	82	134	197	373	366
Height H8		163	157	163	183	235	298	374	467
H3 for actuator disassembly		430	430	430	460	695	1815	2375	2368
H5 for actuator disassembly		530	530	530	560	795			
Loading pressure connection **a**		G (NPT) 1/4	G (NPT) 1/8	G (NPT) 1/4	G (NPT) 3/8		G3/4	G1	
Weight Type 271 approx. kg	Without / with handwheel	2	2	5	8	22	70	280	350
				9	13	27	12	330	400
Weight Type 3277 approx. kg	Without / with handwheel		3.2	9	12	26			
				12	17	31			



11.15.1 Pneumatic acuator type 3277

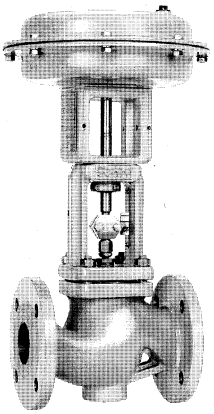


Fig. 1 · Type 3277 Pneumatic Actuator

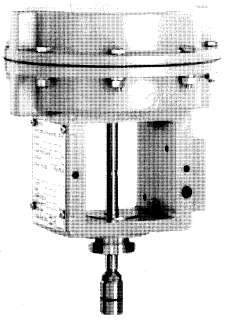


Fig. 2 · Type 3277-5 Pneumatic Actuator

1. Design and principle of operation

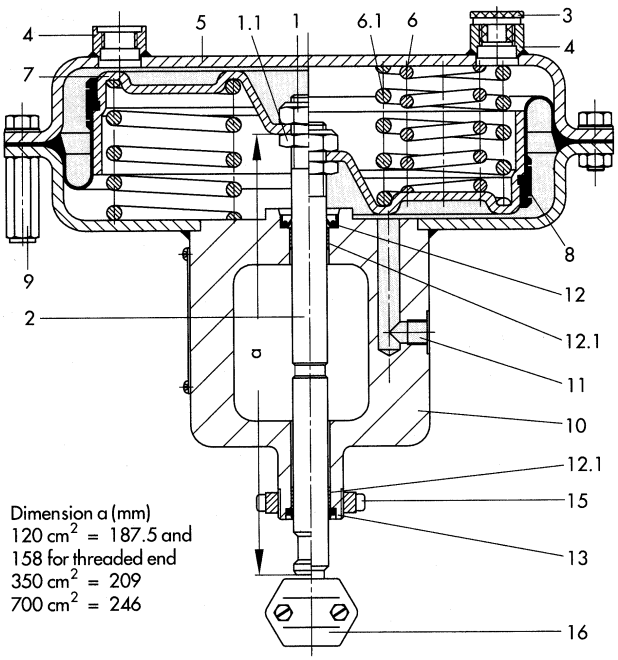
The **Type 3277 Pneumatic Actuator** (Fig. 1) is primarily used for attachment to SAMSON Valve Series 240, 250 and 280.

The **Type 3277-5 Pneumatic Actuator** (Fig. 2), for integral positioner attachment, features a die-cast aluminium housing and contains an effective diaphragm area of 120 cm^2. It is designed for attachment to Type 3510 Micro-flow Valves and SAMSON Valve Series 240.

The actuator assembly essentially consists of the following physical components: Two bolted diaphragm cases, rolling diaphragm, and the off-centered springs.

The bottom diaphragm case is permanently fixed to the yoke and is used for the direct attachment of either a positioner (pneumatic or electropneumatic type) or a limit switch.

Actuators furnished with a manual override (Fig. 5) are additionally equipped with a handwheel mounted directly on the diaphragm case. Moreover, a special version can optionally be equipped with a mechanically adjustable travel stop.



1 Nut
1.1 Nut
2 Actuator stem
2.1 Nut
2.2 Bushing
3 Vent plug
4 Signal pressure connection
5 Top diaphragm case
6 Springs
6.1 Additional springs
7 Diaphragm plate
7.1 Plate
8 Diaphragm
9 Bolts, nuts
10 Yoke with bottom diaphragm case
11 Signal pressure connection
12 Shaft sealing ring
12.1 Bearing
13 Wiper
14 Switch-over plate or connecting plate
14.1 Signal pressure guide for "Actuator stem extends"
14.2 "Actuator stem retracts"
15 Annular nut
16 Coupling (stem connector)

Fig. 3.1 · Type 3277 Pneumatic Actuator

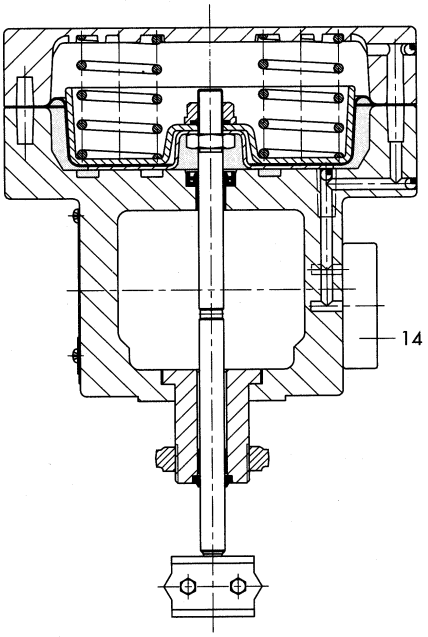


Fig. 3.2 · Type 3277-5 Pneumatic Actuator for Series 240 Valves

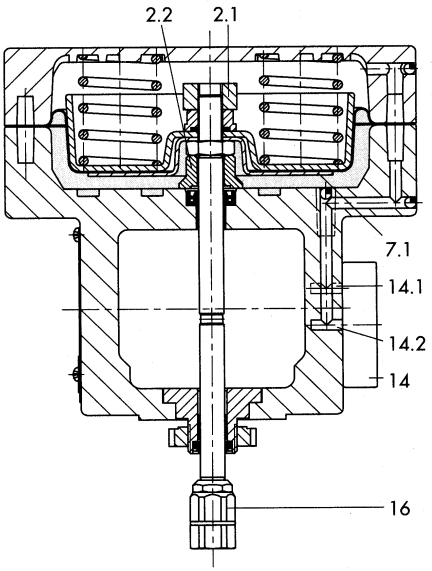


Fig. 3.3 · Type 3277-5 Pneumatic Actuator for Type 3510 Micro-flow Valve

Fig. 3 · Sectional drawings

The signal pressure p_{st} produces a force acting on the surface of the diaphragm which is balanced by the compression springs (6) arranged in the actuator. The number of springs and their compression determine the signal pressure range with consideration of the rated travel, where the travel is directly proportional to the signal pressure. A maximum of twelve off-centered springs can be installed; these may be, in part, inter-fitted.

Whenever the signal pressure fails, the springs loaded in the top and bottom diaphragm chamber resp. determine the **fail-safe action** of the actuator, namingly **"Actuator stem extends"** or **"Actuator stem retracts"**. As a result, the closure member of the attached valve is moved in the appropriate fail-close or fail-open position.

For actuator action **"Actuator stem extends"**, the actuator loading pressure is introduced to the **bottom** diaphragm chamber via the signal pressure connection (11) located on the side of the yoke, serving to move the actuator stem (2) in an upward (reverse) direction.

For actuator action **"Actuator stem retracts"**, the actuator loading pressure is introduced to the **top** diaphragm chamber via the signal pressure connection (4), serving to move the actuator stem in a downward (direct) direction.

With respect to **Type 3277-5 Pneumatic Actuator** (for integral positioner attachment) with an effective diaphragm area of 120 cm^2, the actuator loading pressure is introduced to the diaphragm chamber via the lateral holes located on the left or right of the yoke and via a switch-over plate. In this arrangement, the switch-over plate, which must be turned in line with the corresponding symbol, determines whether the actuator loading pressure is introduced to the **bottom or the top** diaphragm chamber (see Fig. 4, left).

For **Type 3277 Pneumatic Actuator** without a positioner (utilizing a connecting plate instead of switch-over plate), the actuator loading pressure is introduced to the diaphragm chamber directly via the signal pressure connection of the connecting plate. Turning it 90° in line with the symbol (Fig. 4 right) determines the arrangement necessary for the appropriate fail-safe action: **"Actuator stem extends"** or **"Actuator stem retracts"**.

The stem connector (16) — also called coupling — connects the actuator stem (2) to the plug stem of the valve.

Versions incorporating an additional manual override on the actuator contain an actuator stem which is moved via a spindle after the lock nut has been first removed.

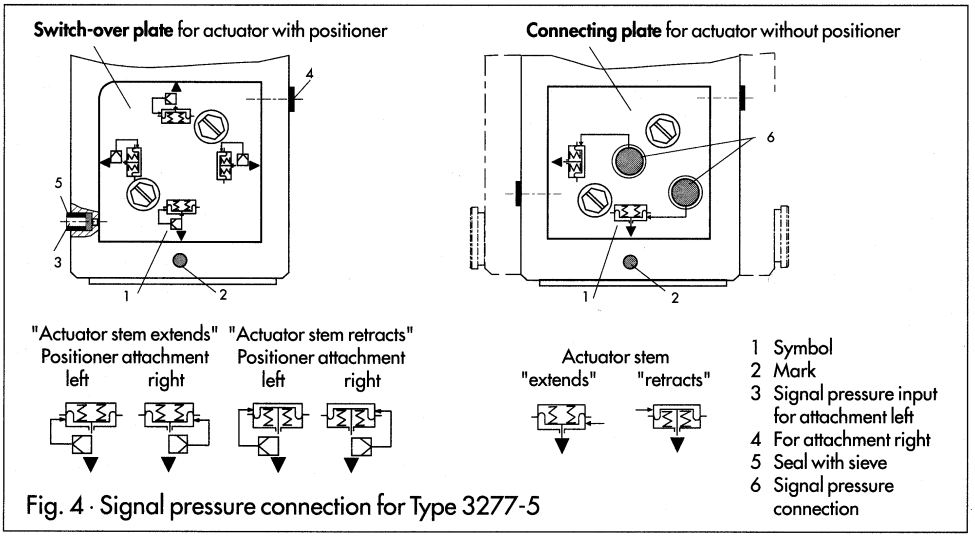


Fig. 4 · Signal pressure connection for Type 3277-5

2. Assembling and disassembling the actuator and valve

Detailed directions on how to assemble and disassemble these components can be found in the instruction manual pertaining to the respective control valve.

3. Operation

NOTE

Only apply actuator loading pressure to the chamber opposite of the actuator springs.

For trouble-free operation of the actuator, ensure that the vent plug (3) is not clogged.
For the versions disposing of a handwheel, make certain that the plug stem can be moved free of obstruction when the control valve is pneumatically actuated. For this purpose, place the handwheel in the neutral position.

3.1 Field reversing the actuator

For the pneumatic actuators, the operating direction and hence the fail-safe position can be reversed. Since this is not possible when the actuator is attached to the valve, it must be separated first.

The fail-safe action, **"extends"** or **"retracts"**, is marked on the nameplate with an appropriate symbol.

CAREFUL

Take special care when disassembling the actuator from the valve. Actuator springs may be pre-loaded!

Such a case can be recognised externally by the extended bolts on the diaphragm chambers. In this particular case, first loosen the short bolts and then, slowly and uniformly, the long bolts. When assembling again, proceed correspondingly in the reverse order.

3.1.1 Standard actuator version

Reversing the fail-safe action to "Actuator stem retracts"

NOTE

The operating direction of actuators with an effective diaphragm area of 700 cm^2 (travel = 30 mm) and spring ranges from 0.2 to 1 bar, 0.4 to 2 bar and 0.6 to 3 bar which are mounted to the valve with 15 mm stroke can only be changed when the standard actuator stem is replaced by the actuator stem which is 20 mm shorter (order number 0290-5266).

Because of the different travels, these actuators are pre-loaded by approximately 50 % when being assembled on the valve. Thus, a signal pressure range of 0.6 to 1 bar is achieved from a spring range of 0.2 to 1 bar, 1.2 to 2 bar from a spring range 0.4 to 2 and 1.8 to 3 bar from a spring range 0.6 to 3. The signal pressure range is marked on the nameplate for actuators to be pre-loaded on the valve.

CAUTION

Take extreme care when disassembling actuators with spring ranges 1.4 to 2.3 bar and 2.1 to 3.3 bar (with effective diaphragm areas of 120 cm^2 for 7.5 travel, also spring ranges 1.7 to 2.1 and 2.4 to 3 bar).

These actuators contain longer springs which are pre-loaded as a result of assembling the two diaphragm cases. Actuators pre-loaded in this way are equipped with three extended bolts and nuts (9.1).
Unscrew the hexagonal nuts and bolts (9) on the diaphragm cases. In the case of pre-loaded springs, first loosen the short bolts and then, slowly and uniformly, the long bolts and nuts until the actuator springs are released.
Lift off the top diaphragm case. Remove the springs (6). Pull out the actuator stem (2), the diaphragm plate (7) and diaphragm (8) from the yoke (10).
Unthread the nut (1) while counter holding the nut (1.1) (effective diaphragm areas 350

and 700 cm^2).
The nut (1.1) must not be removed on the actuator stem. It is secured with protective enamel. If the nut has been removed despite this, dimension **a** has to be assured at all times from the top edge of the nut to the bottom edge of the diaphragm stem (Fig. 3).
For actuators having effective diaphragm areas of 120 and 240 cm^2, clamp the actuator stem (2) using an appropriate tool.

CAREFUL
Never damage the sealing area of the stem!

Turn over the diaphragm plate with the diaphragm, and thread on the nut (1) again.
Coat the actuator stem with sealing compound and lubricant (**order number 8152-0043**).
Reverse the top diaphragm case (5), and insert the actuator stem, the diaphragm plate and the diaphragm. Install the springs (6), and push the yoke attached to the bottom diaphragm case over the actuator stem. Bolt together the diaphragm cases again. Remove the vent plug (3).
The springs which now press against the diaphragm plate from the bottom permit the actuator stem to be **retracted (fail-safe action)**.
Increasing signal pressure overpowers the spring force, causing the actuator stem to be **extended**.

Mark the reversed fail-safe action on the nameplate!

For **Type 3277-5 Pneumatic Actuator**, proceed in the same manner. However, additionally assemble the plate (7.1) and, depending on the version, the nut (2.1) and the bushing (2.2) for the mechanical travel stop.

Reversing the fail-safe action to "Actuator stem extends"

NOTE
The operating direction of actuators with an effective diaphragm area of 700 cm^2 (travel = 30 mm) which are mounted on valves with 15 mm travel can only be reversed when the installed actuator stem (length = 245 mm) is replaced by the 20 mm longer standard actuator stem (order number 0290-4727).

Unscrew the hexagonal nuts and bolts (9) on the diaphragm cases, and lift off the top diaphragm case (5). Remove the actuator stem, the diaphragm plate and the diaphragm from the yoke and the bottom diaphragm case (10).
Unthread the nut (1) while counter holding the nut (1.1) (effective diaphragm areas 320 and 700 cm^2).
For an actuator with an effective diaphragm area of 240 cm^2, clamp the actuator stem (2) using an appropriate tool.

CAREFUL
Never damage the sealing area of the stem!

Turn over the diaphragm plate with the diaphragm, and thread on the nut (1) again.
Coat the actuator stem with sealing compound and lubricant (**order number 8152-0043**).
Push the actuator stem, the diaphragm plate and the diaphragm in the bottom diaphragm case attached to the yoke. Install the springs (6), and attach the top diaphragm case; subsequently screw on with bolts, nuts and washers.
Screw in a vent plug (3) at the top signal pressure connection.
The springs which now press against the diaphragm plate from the top exert a force which **extends** the actuator stem **(fail-safe action)**. Increasing signal pressure overpowers the spring force, causing the actuator stem to **retract**.

Mark the reversed fail-safe action on the nameplate!

For **Type 3277-5 Pneumatic Actuator**, proceed in the same manner. However, additionally assemble the plate (7.1) and, depending on the version, the nut (2.1) and the bushing (2.2) for the mechanical travel stop.

3.1.2 Actuator with manual override (handwheel) (Fig. 5)

Relieve tension from the springs (6) using the handwheel (17). Remove the threaded pin (26), and unthread the stem connector nut (25) from the stem connector (22).
Knock out the clamping sleeve (23) and, and remove the ring (24). Unthread the annular nut (15), and lift off the flange section (21) with the stem connector nut (25).

Reversing the fail-safe action to "Actuator stem retracts"

To reverse the fail-safe action, proceed as described in section 3.1.1. In the procedure, however, in place of nut (1), substitute **"spindle with nut (27)"** at the appropriate text position.
After reversing, re-attach the flange section (21) with the annular nut (15) and the stem connector nut (25). Tighten the annular nut (15). Then, assemble the ring (24) with the clamping sleeve. Thread on the stem connector nut (25) until it contacts the stem connector (22), and secure with studs (26).

Reversing the fail-safe action to "Actuator stem extends"

To reverse the fail-safe action, proceed as described in the previous section. In the procedure, however, in place of nut (1), substitute **"spindle with nut (27)"** at the appropriate text position.
After reversing, re-attach the flange section (21) with the annular nut (15) and the stem connector nut (25).
Tighten the annular nut (15). Then, assemble the ring (24) with the clamping sleeve. Thread on the stem connector nut (25) until it contacts the stem connector (22), and secure with studs (26).

3.2 Replacing the diaphragm (Fig. 3)

Remove the diaphragm plate (7), the diaphragm (8) and the actuator stem (2) from the diaphragm case as described in section 3.1.
Remove the hose clamp, and lift off the diaphragm (8) from the diaphragm plate (7) (to be omitted for Type 3277-5 Pneumatic Actuator, since the diaphragm is held by the plate (7.1).
Attach a new diaphragm to the diaphragm plate, and insert the hose clamp equally in the corresponding groove and tighten.
Re-assemble the actuator as described in section 3.1.

3.3 Replacing the sealing ring (Fig. 6)

Remove the diaphragm plate (7) with the actuator stem (2) from the diaphragm case as described in section 3.1.
Coat the new shaft sealing ring with sealing compound and lubricant (**order number 8152-0043**) and insert.
When necessary, also replace the thrust bearing (12.1) and the wiper (13).
Re-assemble the actuator as described in section 3.1.

3.4 Adjusting the mechanical travel stop (Fig. 7)

(only for Type 3277 Pneumatic Actuator as special version)

The travel limitation can be adjusted upward or downward up to 50 % (mid-range) of the travel.

Downward travel stop (actuator stem extends)

Remove the lock nut (34), and unscrew the cap (33).
Remove the lock nut (31), and adjust with nut (32) the desired limitation; tighten the lock nut (31) again.

Upward travel stop (actuator stem retracts)

Remove the lock nut (34), and adjust the cap (33) to the desired limitation; tighten the lock nut (34).

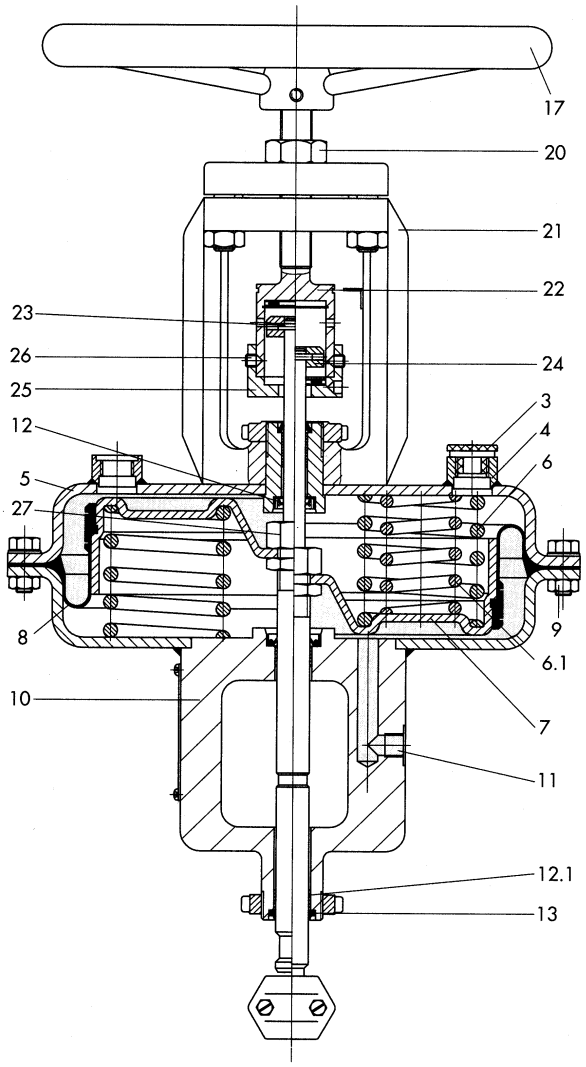


Fig. 5 · Type 3277 Pneumatic Actuator with handwheel

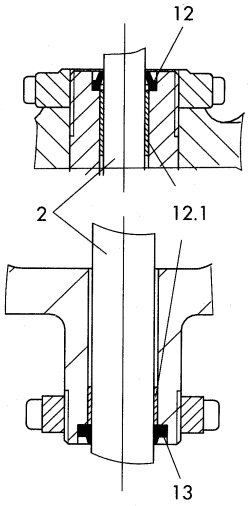
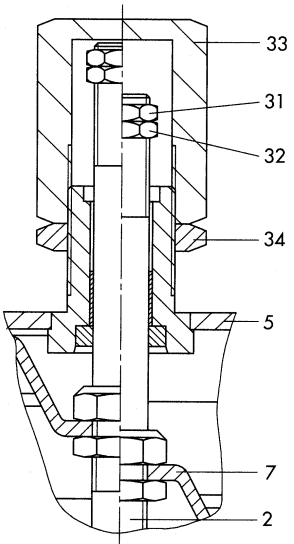


Fig. 6 · Stem sealing



"Actuator stem retracts" | "Actuator stem extends"

Fig. 7 · Mechanical limit stop

2	Actuator stem	12.1	Bearing		
3	Vent plug	13	Wiper		
4	Signal pressure connection	17	Handwheel		
5	Top diaphragm case	20	Lock nut		
6	Springs	21	Flange section		
6.1	Additional springs	22	Coupling (stem connector)		
7	Diaphragm plate	23	Clamping sleeve		
8	Diaphragm	24	Ring		
9	Bolts, nuts	25	Coupling nut		
10	Bottom diaphragm case	26	Stud	32	Nut
11	Signal pressure connection	27	Spindle with nut	33	Cap
12	Shaft sealing ring	31	Lock nut	34	Lock nut

11.15.2 Pneumatic positioner type 3760

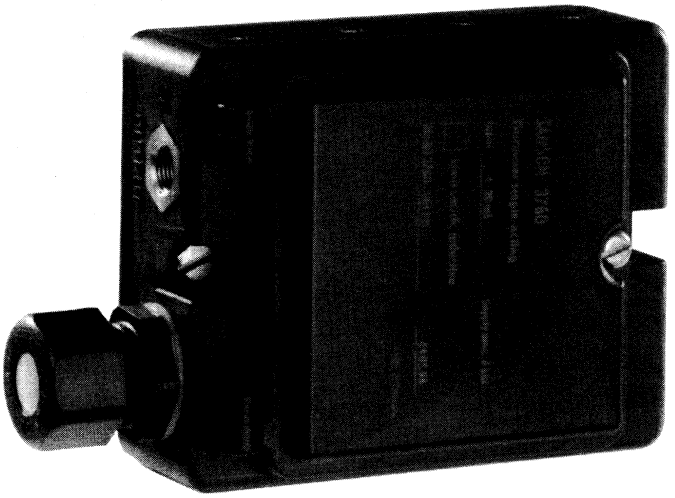


Fig. 1 · Type 3760 Positioner

WARNING

Assembly, start-up and operation of the device may only be performed by trained and experienced personnel familiar with this product. Proper shipping and appropriate storage are assumed. According to these Mounting and operating instructions, trained personnel is referred to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
Any hazards which could be caused by the process medium, the signal pressure and moving parts are to be prevented by means of appropriate measures.
If inadmissible motions or forces are produced in the pneumatic actuator as a result of the level of the supply air pressure, this must be restricted by means of a suitable pressure reducing station.

Technical data

Travel range in mm		0 to 5 0 to 7.5 0 to 15 (see also measuring spring, table on page 8)	
Reference variable	Pneumatic	0.2 to 1 bar (3 to 15 psi)	
Split-range 0 to 50 % or 50 to 100 % at 7.5 a. 15 mm travel	Electric mA	4 to 20 mA (with i/p module 6112 also 0 to 20 mA)	1 to 5 mA
		Internal resistance at +20 °C approx. 200 Ohm	approx. 850 Ω
Supply air		1.4 to 6 bar (20 to 90 psi)	
Signal pressure		Maximum 0 to 6 bar (0 to 90 psi)	
Characteristic		Linear, deviation from terminal-based conformity ≤1.5 %	
Operating direction		Reversible	
Hysteresis		≤0.5 %	
Sensitivity		>0.1 %	
Air consumption at steady state condition		At 0.6 bar signal pressure and supply pressures up to 6 bar ≤ 100 ln/h	
Air output capacity		With 1.4 bar 1600 ln/h, with 6 bar 5000 ln/h	
Transit times for Type 3277 Actuators (15 mm travel, 0.2 to 1 bar signal pressure)		120 cm^2 = ≤2s 240 cm^2 = ≤6s 350 cm^2 = ≤8s	
Permissible ambient temperature		−25 to +70 °C (special version up to −45° on request)	
For Ex-version		See Certificate of Conformity	
Version		3760-XXXX1X with i/p module 6109	3760-XXXX2X with i/p module 6112[1]
Effect	Temp. zero point	≤0.03 %/°C	
	Span	≤0.03 %/°C	
	Vibrations	Between 5 and 120 Hz and 2g ≤ 0.5 %	
	Supply air	≤ 0.6%/1 bar	
Effect when rotated 180°		< 3.5 %	
Degree of protection		IP 54 (IP 65 special version)	
Weight		0.6 kg	
Materials		Case: polyamide; external parts: stainless steel	
Accessories			
Inductive limit switch		Type SJ2 - SN	
Control circuit		Values in accordance with connected transistor relay	
Switching differential at rated travel		≤1 %	
Effect of temperature			

[1] Special version

1. Design and principle of operation

The pneumatic or electropneumatic positioner respectively ensures a preselected correspondence between the valve stem position (controlled variable x) and the control signal (reference variable w). The input signal received from a control unit is compared to the travel of the control valve, and a corresponding pneumatic signal pressure (output variable) is produced.

The positioner mainly consists of a pneumatic unit including a clamp (10), a measuring spring (7), a diaphragm lever (4), and an amplifier (12) with a double plug (13). The electropneumatic positioner is additionally equipped with an electropneumatic conversion unit (2).
The positioner is designed for direct attachment to the SAMSON Type 3277 Actuators.

If the input signal, i.e. the signal from the control unit connected in front of the positioner, is a pneumatic signal, it is led as a pressure signal p_e directly onto the diaphragm (3).
If, however, this input is a DC current signal in the range of, for example, 4 to 20 mA, it is directly led to the electropneumatic conversion unit (i/p converter) where it is converted into a proportional pressure signal p_e.

The pressure signal p_e produces a force on the measuring diaphragm (3), which is balanced by the force of the measuring spring (7). The deflection of the diaphragm (3) causes the lever (4) to move. The double plug (13) in the amplifier (12) follows this motion so that a signal pressure p_{st} is produced. This pressure is proportional to the input p_e.
The operating direction of the signal pressure, either increasing << or <> decreasing when the input signal increases, depends on the position of the amplifier which can be rotated by 180°.
A change in either the input signal or the valve position causes a pressure change in the amplifier. The output pressure p_{st} of the amplifier moves the plug stem to a position corresponding to the given control signal (reference variable).

The adjustment screws for ZERO (5) and SPAN (8) are used to adjust the starting point and the upper range value of the input signal.

The measuring spring (7) must be chosen to match both the rated valve travel and the nominal reference input span.

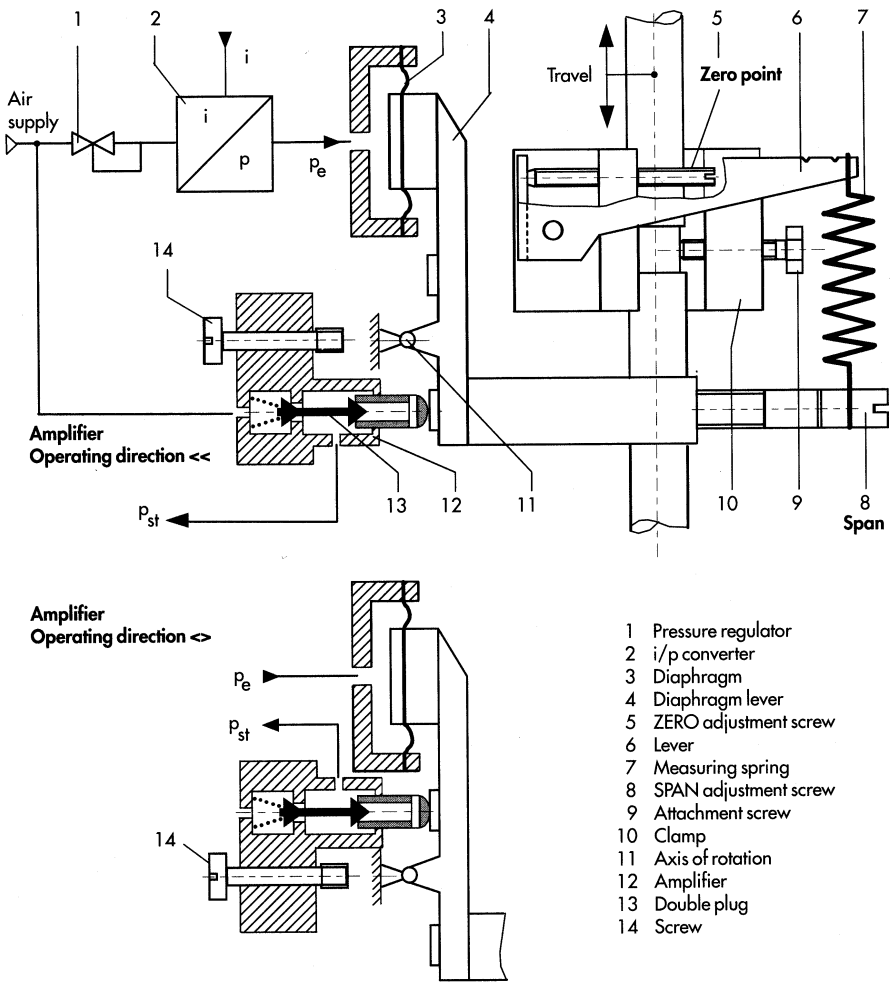


Fig. 2 · Functional diagram

2. Attaching the positioner to control valves

The positioner has to be attached directly to the actuator yoke using the two screws inside the case. The rubber profile serves as a seal between positioner case and yoke.

For positioner mounting, the following accessories are required: clamp, cover plate, and a plug with a seal.
The required attachment kit is listed in the table "Accessories" on page 7.

For attachment to 120 cm^2 actuators, the lateral signal pressure connection (output 36) is to be closed by means of a plug with a seal (see accessories). First, however, the filter installed in the connection is to be removed.
The signal pressure flows through the back signal pressure hole and the yoke and then directly into the selected diaphragm chamber. When attaching the positioner to the yoke, make sure that the seal containing a sieve is installed in the lateral bore hole of the yoke (Fig. 3).
How the signal pressure is supplied to the actuator depends on whether the positioner is attached on the left or right side of the yoke. For this purpose, the corresponding symbol on the switch-over plate must be aligned with the mark (point) on the yoke (see Fig. 3).

Important: If, in addition to the positioner, a solenoid valve or a similar device is to be attached to the actuator, the signal pressure hole at the back of the positioner case must be closed. For this purpose, use the screw installed (parked) in the hole below the signal pressure hole. Remove this screw and install it in the signal pressure hole (Fig. 3).
The signal pressure must be fed from the signal pressure connection "output" to the actuator via a connecting plate (order no. 1400-6820 with G 1/8 thread or 1400-6821 with NPT 1/8 thread). The black switch-over plate is no longer used.

For attachment to 240 and 350 cm^2 actuators, the signal pressure is to be supplied to the signal pressure connection of the actuator using the appropriate tubing. The tubing kit required for this purpose is listed in the table on page 7. Furthermore, the signal pressure hole on the back of the positioner case is to be closed. For this purpose, remove the screw installed in the hole below the signal pressure hole (parked), and install it in the signal pressure hole (see Fig. 3).

2.1 Adjusting and changing the direction of operation

The operating direction of the positioner also determines the positioner arrangement on the actuator, either on the left or right side of the yoke. This is illustrated in Fig. 4. The amplifier (12) must be arranged accordingly at the positioner.
When the input signal (reference variable) increases, the signal pressure p_{st} may either increase (direct action **>>**) or decrease (reverse action **<>**).

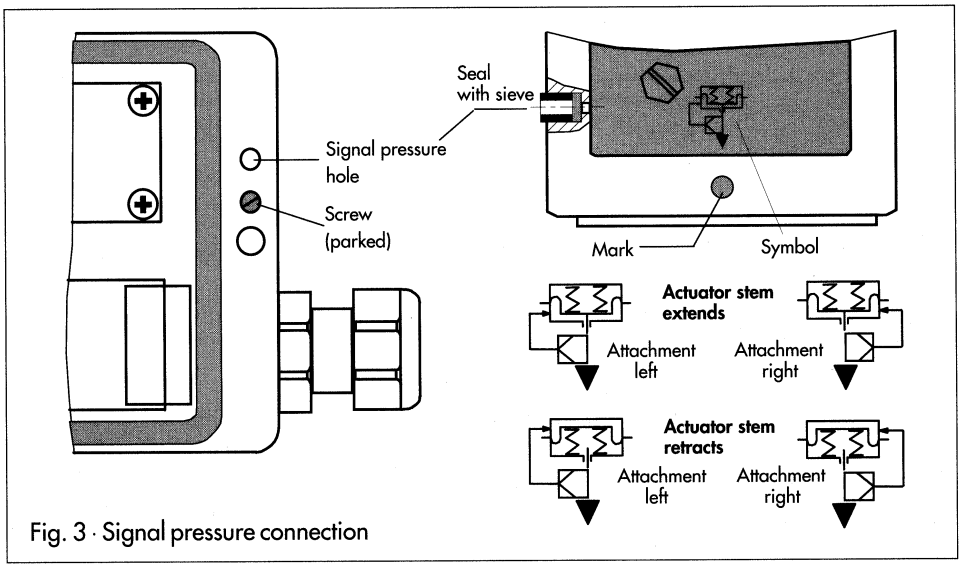


Fig. 3 · Signal pressure connection

The same applies when the input signal i decreases. For direct action **>>**, a decreasing and for reverse action **<>** an increasing signal pressure results.
The symbols indicating the operating direction are marked on the amplifier. The desired symbol must be aligned with the arrow stamped on the positioner case.
Should the visible symbol not correspond with the functionally required operating direction, proceed as follows: Remove fastening screw. Then, remove amplifier. Rotate amplifier 180°. Reinstall it and secure it with screw.

Important: Should the adjusted operating direction of an attached positioner have to be changed, the mounting position of the amplifier and the arrangement of the positioner on the valve must be changed.
The specifications left or right attachment mean that when looking onto the switch-over plate or the signal pressure connection respectively, the positioner is to be secured on either the right or left side of the actuator yoke. In this case, the signal pressure output (output 36) on the positioner must be on the side of the air connections at the yoke (Fig. 4).

Accessories		Order no.			
Attachment kit Clamp and cover plate		Actuator 120 cm^2		Actuator 240 and 350 cm^2	
		1400-6898		1400-6899	
Tubing kit with 6 x 1 mm tube for 240 and 350 cm^2 actuators					
Actuator		Actuator stem extends		Actuator stem retracts	
		Attachment left	right	left	right
240 cm^2	Zinc coated	1400-6919		1400-6921	1400-6923
	Niro	1400-6920		1400-6922	1400-6924
350 cm^2	Zinc coated	1400-6919		1400-6925	1400-6927
	Niro	1400-6920		1400-6926	1400-6928
Attachment kit for pressure gauge (only for versions without tubing)		For control signal (output) 1400-6900			

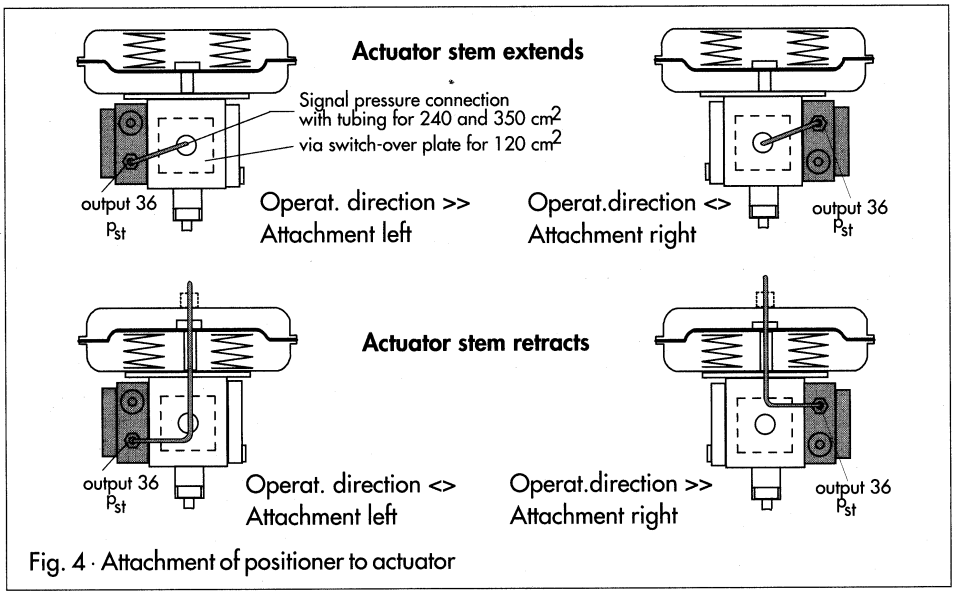


Fig. 4 · Attachment of positioner to actuator

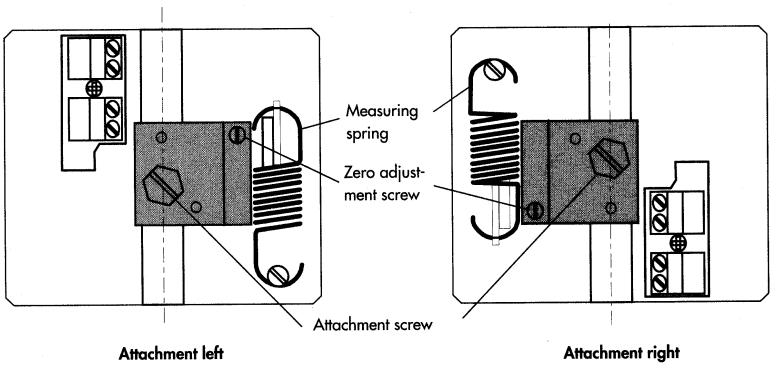


Fig. 5 · Attaching the clamp

Measuring spring				
	Colour	Reference variable	Travel	Order no.
1	Yellow	0...100 % 0...50 % 50...100 %	12/15 6/7.5 6/7.5	1400-6892
2	Red	0...100 %	6/7.5	1400-6893
3	Green	0...50 %	12/15	1400-6894
4	Blue	50...100 %	12/15	1400-6895
5	White	0...100 %	5	1400-6896
6	Brown	0...100 %	20	1400-6975
7	Black	0...100 % 0...50 % 50...100 %	10.5 5 5	1400-6976
8	Yellow/Red	0...50 %	10.5	1400-6977
9	Yellow/Green	50...100 %	10.5	1400-6978

2.2 Installing the clamp

After having attached the positioner to the yoke, the clamp (positioner accessory) is to be secured to the actuator stem oppositely to the positioner (Fig. 5).

Make sure that the attachment screw is located in the groove of the actuator stem and the clamp is aligned at exactly a right angle.

Subsequently, hang up the measuring spring at the lever of the clamp and at the span adjustment screw (at 5 and 6 mm travel in the outside groove, at 10.5 and 12 mm in the inside groove).

Turn zero adjustment screw to slightly tension the spring, thus ensuring that it cannot fall off.

Once having adjusted the positioner (section 4), cover yoke with the associated cover plate. The vent plug in the cover plate must be directed downwards when the control valve is installed in the plant.

For different valve travels and input ranges (see table above), the proper measuring spring is to be selected.

The springs are marked with different colours.

Note that the actuator is under pressure during operation. Any adjustments must be carried out carefully. Also note that the actuator stem moves. Therefore, be careful not to injure your fingers when working in the yoke area - to work on clamp and measuring spring, always use the appropriate tools.

3. Connections

3.1 Air connections

The air connections are designed as 1/8-18 NPT or ISO 228/1-G1/8 tapped holes. The supply air input is equipped with a filter to clean impure air. This filter is fixed on a support and can be removed, cleaned and replaced using a screwdriver, if necessary (order no. filter: 1400-6897).
It is possible to use the customary unions for metal and copper tubes or plastic hoses.
The supply air must be dry and free of oil and dust. Always observe the maintenance instructions applicable to the connected upstream pressure reducing stations. Thoroughly blow out all air lines before connecting them.

Important: The supply air (supply) should be adjusted to exceed the end value of the bench range of the actuator approximately 0.4 bar (see nameplate).

For the signal pressure connection (output 36), see notes in section 3 and Fig. 3.

3.2 Electrical connections

Electrical installation:
Always observe the pertinent VDE (Verband Deutscher Elektrotechniker) regulations and the accident prevention regulations of the employer's liability insurance association.
For installation in hazardous areas, always observe the regulations of the country where the device is intended for use (in the Federal Republic of Germany, VDE 0165).
For attachment to intrinsically safe circuits, the specifications stated in the Certificate of Conformity apply.

In the case of electropneumatic positioner models, the reference variable lines are to be connected to terminals **+11** and **–12** on the case via the PG screw gland.

In the case of models containing a limit switch, the electrical lines must be connected to the terminals **+** and **–**.

3.2.1 Transistor relays

For operation of the inductive limit switch, a transistor relay is to be connected in the output circuit. To ensure operational reliability of the positioner, this relay should adhere to the

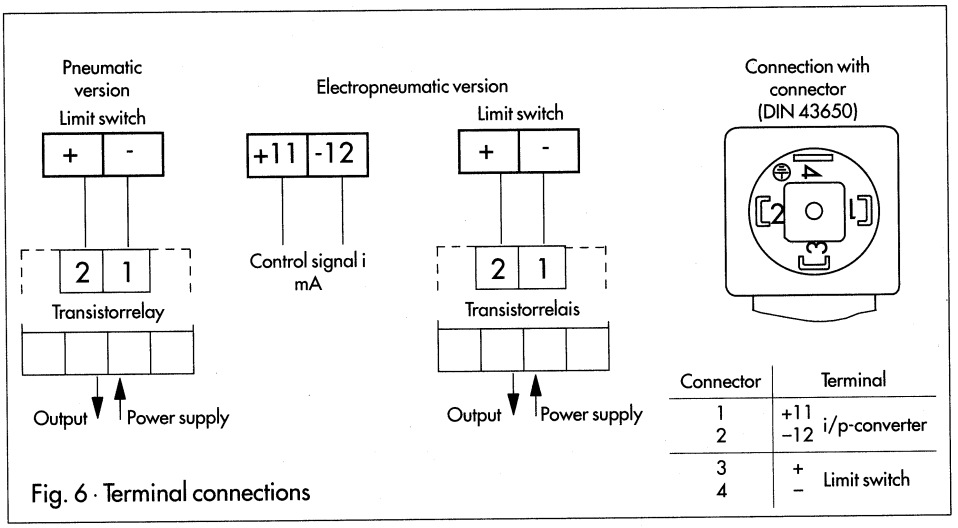


Fig. 6 · Terminal connections

limit values of the control circuit in compliance with Namur. When installation in hazardous areas is intended, observe the pertinent regulations.
For connection to the limit switch, we recommend to use the transistor relays manufactured by "Pepperl and Fuchs".

4. Operation — Adjustment

4.1 Starting point and reference variable

The integral measuring spring of the positioner is assigned to the valves rated travel and the input signal (reference variable %) according to the table on page 8.
Under normal conditions, the reference variable span comprises 100 % = 0.8 bar or 16 mA.
A smaller span of, for example, 50 % = 0.4 bar or 8 mA is only required for split-range operation (Fig. 7). By subsequent replacement of the measuring spring, the span can be changed.
When adjustment is made on the positioner, the travel must be adapted to the input signal (reference variable) and vice versa. With an input signal of, for example, 0.2 to 1 bar or 4 to 20 mA, the valve must travel trough its full range of 0...100 %. The starting point (zero) then is 0.2 bar or 4 mA, the upper range value is 1 bar or 20 mA.
In split-range operation, the controller output signal, split to control two control valves and positioners, is divided in such a way that these travel through their entire travel ranges each at a portion of the input signal range (e.g. first valve adjusted to 0.2 to 0.6 bar or 4 to 12 mA, and the second valve to 0.6 to 1 bar or 12 to 20 mA). When it is necessary to prevent the two from crossing over, consider a dead band of 0.05 bar or 0.5 mA as shown in Fig. 7.
The starting point (zero) is adjusted using the ZERO adjustment screw (5). The reference variable span and thus the upper range value has to be adjusted using the SPAN adjustment screw (8).
To make these adjustments at the pneumatic positioner, an air pressure source providing max. 1.5 bar has to be connected to the positioner input (input signal 27). This pressure source has to be connected to the positioner via a remote adjuster and a pressure gauge.
In the case of the electropneumatic positioner, an ammeter is to be connected to the terminals +11 and –12.

Furthermore, air must be applied to the supply air input (Supply 9).

4.2 Adjusting starting point and upper range value for actuator version: "Actuator stem extends"

Important: To ensure that the total closing force can be effective in the control valve, the diaphragm chamber must be completely vented at the lower (operating direction <<)

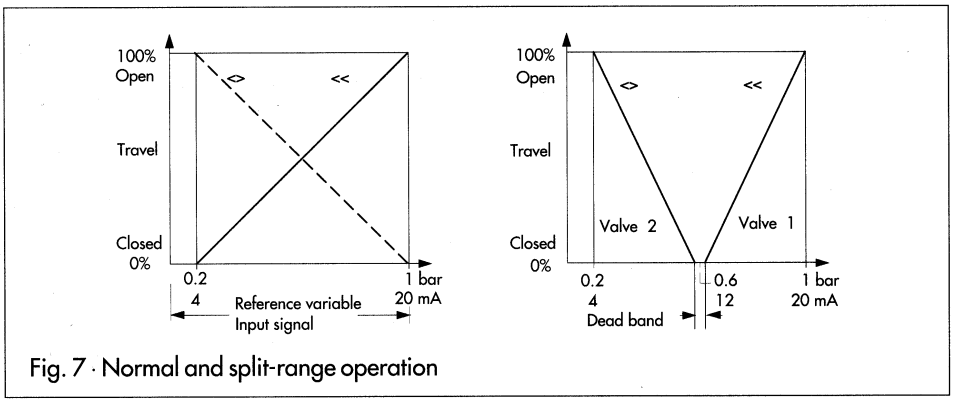


Fig. 7 · Normal and split-range operation

and the upper (operating direction <>) range value of the reference input signal.
Therefore, set input signal to a slightly increased starting point of approx. 0.025 bar (4.5 mA) when the operating direction is direct << and to a slightly lowered starting point of 19.775 bar (19.5 mA) when the operating direction is reverse <>.
This applies in particular to controllers and control systems whose output signal is limited to a range of 4 to 20 mA.

Starting point (zero) e.g., 0.2 bar (4 mA)

Turn the ZERO adjustment screw (5) until the plug stem just begins to move from the resting position (observe plug stem with travel indicator).
Decrease the input signal and increase again slowly. Check whether the plug stem starts moving at a starting point of 0.225 bar (4.5 mA) and, if necessary, correct.

Upper range value (travel), e.g. 1 bar (20 mA)
After the starting point has been adjusted, increase the input signal. The plug stem must be motionless at an end value of exactly 1 bar (20 mA) and therefore have passed 100 % travel (observe the travel indicator on the valve !). If the upper range value does not correlate, correct it at the span adjustment screw (8).
Turning the screw towards the fulcrum of the lever increases the travel, whereas turning it away from the lever fulcrum reduces the travel.

Make sure that the measuring spring (7) is aligned vertically for adjustment. If necessary, hang up spring at an other point at the lever (6).

After having corrected this value, reduce input signal and increase it again. First, check starting point, then check upper range value. Readjust both values again until these are correct.

4.3 Adjusting starting point and upper range value for actuator version: "Actuator stem retracts"

Important: For actuator version "Actuator stem retracts", the diaphragm chamber must be loaded with a pressure that is capable of tightly closing the valve, even with available upstream pressure of the plant. This concerns an upper range value of the input signal corresponding to 1 bar or 20 mA (direct operating direction <<) or a lower input range value corresponding to 0.2 bar or 4 mA (reverse operating direction <>).

The **required signal pressure** is estimated as follows:

$$\textbf{Required signal pressure [bar]} = \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} + F_{be} + 0.4$$

d = Seat diameter [cm]
Δp = Differential pressure $p_1 - p_2$ [bar]
A = Diaphragm area [cm^2]
F_{be} = End value of the bench range of the actuator [bar]

In the absence of such specifications, the following is assumed:
Required signal pressure =
End value of the bench range of the actuator (spring range) + 1 bar

Starting point (zero), e.g. 1 bar (20 mA)
Adjust the input signal to a starting point of 1 bar (20 mA) on the remote adjuster (ammeter). Turn ZERO adjustment screw (5) until the plug stem just begins to move from its initial position. Increase the input signal, and slowly reduce to a starting point of 1 bar (20 mA). Check if the valve begins to move at exactly 1 bar (20 mA). Correct any deviations at the zero adjustment screw (5).

Upper range value (travel), e.g. 0.2 bar (4 mA)
After having adjusted he starting point, adjust the input signal to an upper range value of 0.2 bar (4 mA) using the remote adjuster (ammeter).

With an upper range value of exactly 0.2 bar (4 mA), the plug stem must be motionless and therefore have passed 100 % travel (observe the travel indicator on the valve !). If the upper range value does not agree, then turn the span adjustment screw (8). Turning it towards the fulcrum of the lever increases the travel, whereas turning it away from the lever fulcrum reduces the travel.
After correcting the input signal, adjust it to 1 bar (20 mA) again. Turn the ZERO adjustment screw (5) again until the **required signal pressure** is indicated on a pressure gauge installed in the signal pressure line.
After having adjusted the positioner, make sure that the vent plug in the cover plate is directed downwards when the control valve is installed in the plant.

5. Adjusting the limit switch (Fig. 8)

The positioner version 3760-X**1**XXXX is equipped with an inductive limit switch for signalling, for example, a travel end position. The travel of the plug stem is transmitted to the tag of the proximity switch via the pin (5) and the lever (3).
For operation of the inductive limit switch, a transistor relay (section 3.2.1) is to be connected in the output circuit.
Normally, the limit switch is adjusted to provide a signal when the valve has reached one of its end positions. It is also possible, however, to adjust signalling of intermediate travel positions.
The desired operating function, i.e. whether the output relay must be picked up or released when the tag has made contact, has to be determined for working current or closed circuit current by means of a bridge at the transistor relay.

Adjusting the switching point:
Prior to adjustment of the limit switch, starting point and upper range value of the positioner are to be adjusted. The yellow switching point indicator (7) is to be located within the area of the notched mark (6). If necessary, adjust it accordingly at screw (4).
Move control valve to the desired switching position, and turn adjustment screw (4) to set the switching point. The latter is to be indicated by the LED at the transistor relay.
The switching element and the levers required to operate it are slightly sensitive to changes in temperature. In order to ensure safe switching, both the switching hysteresis and the displacement of the switching point due to fluctuations in temperature are to be considered when adjusting the positioner.
The terminal used to connect the limit switch (41/42 or 51/52) can be recorded on the adhesive function label in the positioner cover.
On the other label, the adjusted switching function, i.e. switching at either open or closed valve, should be ticked.

5.1 Retrofitting a limit switch

To install a limit switch in the positioner at a later date, the following retrofit kit is required:
For the pneumatic positioner:
Order no. 1400-6929
For the electropneumatic positioner:
Order no. 1400-6930

To install the limit switch, the positioner must be disassembled from the actuator.

Connect plug of the proximity switch cable to the connector (2) located on the PCB. Then, install limit switch unit (8) on the aluminium plate adjacent to the terminal base using two screws.
Attach positioner to the actuator.
Install angle plate with pin (5) at the clamp attached to the actuator stem, and secure it with screws. Make sure that the pin (5) is located in the recess of the operating lever (3).
Connect the transistor relay via Pg 13.5 glands or connectors to the terminals **+** and **-**.
For adjustment, see section 5.

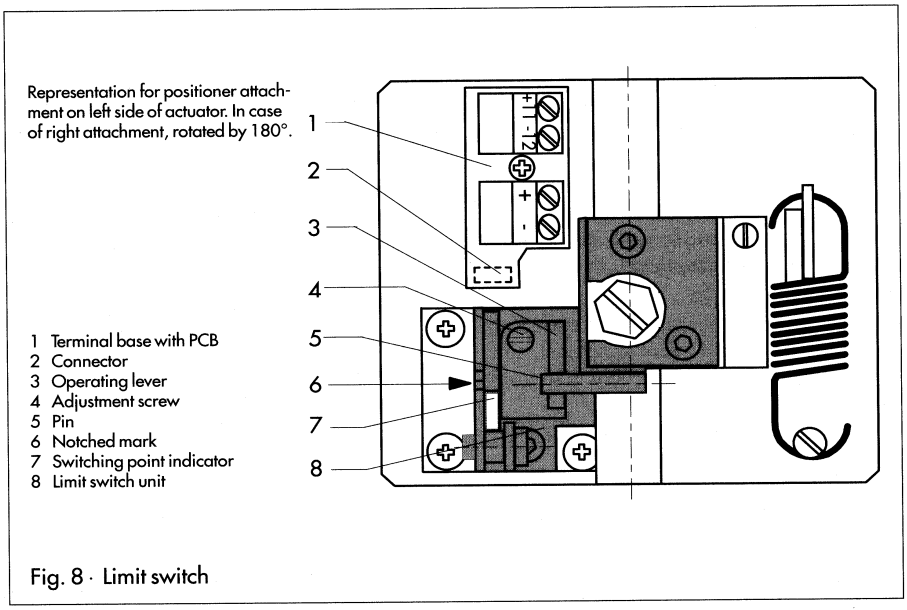


Fig. 8 · Limit switch

6. Converting the positioner (Fig. 9)

The positioner can be converted from a pneumatic to an electropneumatic device and vice versa using a corresponding conversion kit.
In addition to the conversion kit listed in the table on page 15, an i/p module is to be ordered, if required.

6.1 Converting the positioner from a pneumatic p/p to an electropneumatic i/p positioner

Remove screwed connection (4) installed at the control signal input (input signal 27), and replace it by a plug containing a seal (retrofit kit).
Remove plug (1), and replace it by a Pg-13.5 screw gland or a connector.
Loosen the two screws in the case. Then remove connecting plate (2) with sealing element (3).
Unscrew PCB on the terminal base. Push connecting cable of the retrofit kit through the terminal base into the case.
Install blue plug on the mid connector. Connect other end to the i/p module (with i/p module 6109, connector; with type 6112, terminal with blue – and green +). Install i/p module in the case using the two screws. In so doing, make sure that the sealing element (3) with the throttle is installed properly in the module. The throttle is located over the right bore hole in the case (top view), see Fig. 9.

6.2 Converting the positioner from an electropneumatic i/p to a pneumatic p/p positioner

Remove plug (8) with seal installed at the control signal input (input signal 27). Replace it by an appropriate screwed gland (5) with G 1/8 or NPT 1/8 thread.
Remove mounting screws. After having disconnected the electrical connections, take i/p module (7) out of the case. Close holes in the bottom of the case by means of the connecting plate (2) containing the sealing element (3). Make sure that the plate is installed in the correct position (see Fig. 9).
Unscrew PCB from the terminal base. Remove blue plug and pull out the connecting cable.
Reinstall PCB on the terminal base using screws.

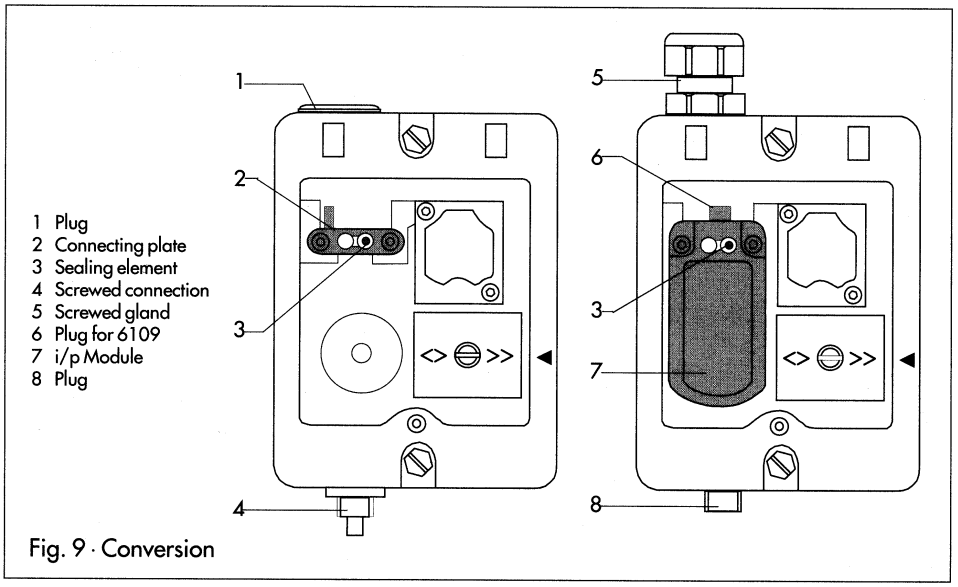
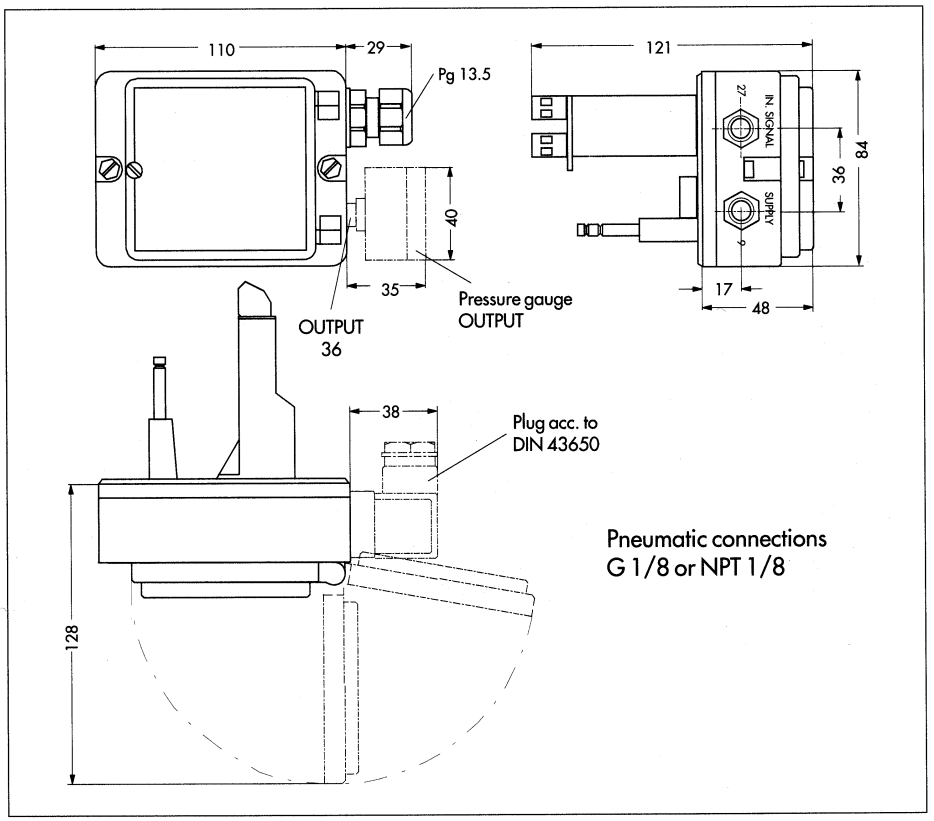


Fig. 9 · Conversion

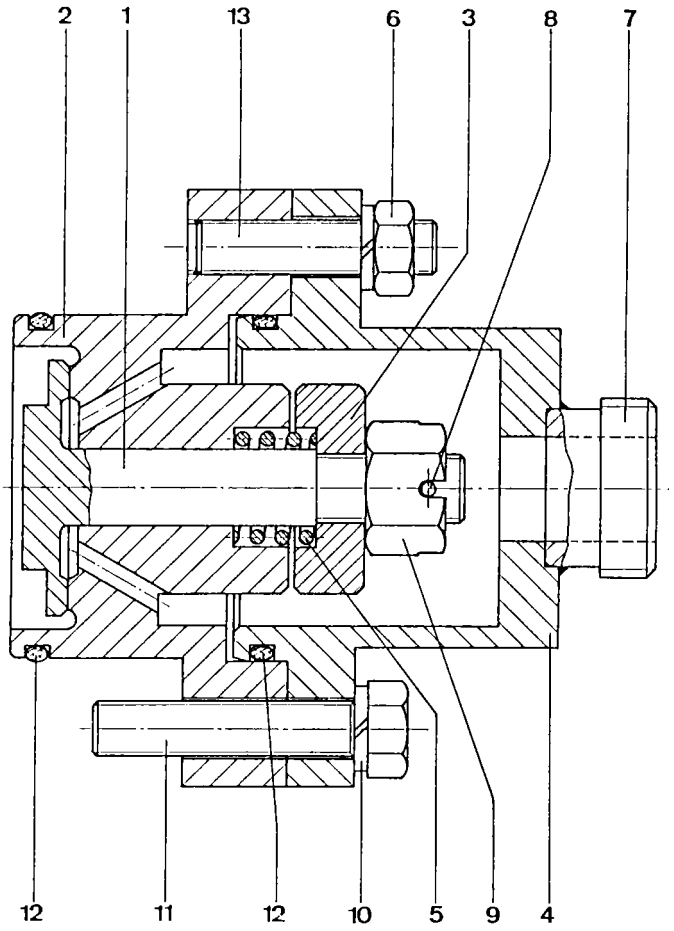
Conversion or retrofit kits		Order numbers			
From pneumatic to electropneumatic		With Type 6109 i/p Module [1] (ranges in mA)			
Without limit switch	1400-6903	4 to 20 not Ex	**6109-0010**		
With limit switch	1400-6904				
From pneumatic to electropneumatic		With Type 6112 i/p Module [1] (ranges in mA)			
		4 to 20 not Ex	**6112-041110**	0 to 20 not Ex	**6112-042110**
Without limit switch	1400-6905				
With limit switch	1400-6906	1 to 5 not Ex	**6112-043110**		
From electropneumatic to pneumatic		1400-6931			
Retrofitting of electrical connection		DIN 43650 - AF3 - Pg 11			
with connector		1400-6902			

[1] i/p modules with type numbers in bold type have to be ordered separately. These are not included in the conversion kit.

7. Dimensions in mm



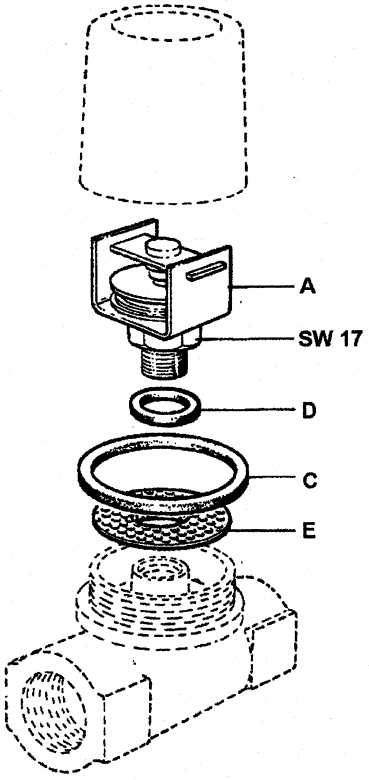
11.16 Steam nozzle system

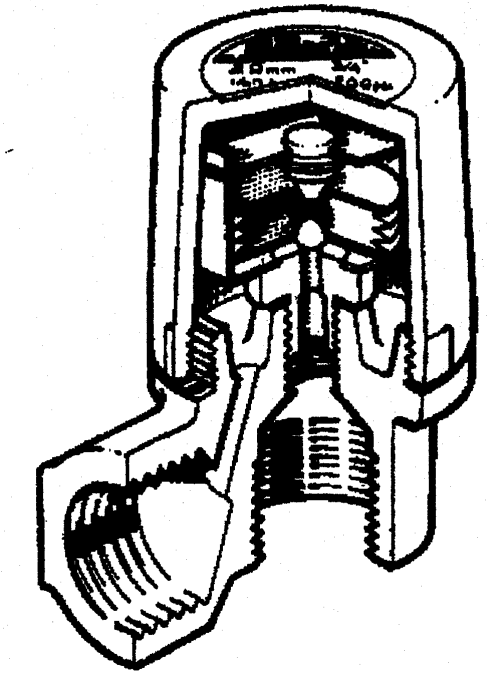


Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	valve disc	-	3K2604-20
2	1	valve disc	-	3K1308-01
3	1	nut	TC 300.02-427	3K0003-05
4	1	valve cover	TC 300.02-428	3K1330-03
5	1	pressure spring	SKU 40.09-10	3M6001-13
6	3	hexagon nut A2	M 8, DIN 934	3S0200-05
7	-	pipe unit	-	-
8	1	pin A2	2x25, DIN 94	3S0262-02
9	1	castle nut A2	M 10, DIN 935	3S0224-01
10	6	spring washer A2	B 8, DIN 127	3S0246-04
11	3	hexagon screw A2	M 8x40, DIN 931	3S0013-02
12	2	O-ring	2-133, S 604-70	3I0004-07
13	3	threaded bolt A2	AM 8x35, DIN 976	3S0190-01

11.17 Steam Trap - BP 23-3/4“,

11.17.1 Maintenance





- Types with Y-strainer: Screen to be cleaned periodically.
- For cleaning of trap and screen or replacement of the thermostatic element remove the cover and unscrew the valve assembly using a spanner size 17 mmacross flats.
- When replacing the element make sure that all gasket faces are clean. Moisten beginning of the thread with a drop of Loctite No. 40. If necessary fit a new valve seat gasket and a new body/cap gasket.

With the types BP 413 H, BP 423 H and BP 431 H thickness of spanner must not exceed 5 mm so that support plate and clamp holding the capsule are not damaged. Spanner must be kept in a horizontal position.

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	steam trap - BP 23		3H4100-08
A, D	1	steam trap - BP 23	Element-Set	1235.000.102
C, D	1	steam trap - BP 23	Seal Set	1235.000.104
E	1	steam trap - BP 23	Sifter	1237.000.108

11.18 Pressure transducer, type 4 AP-30

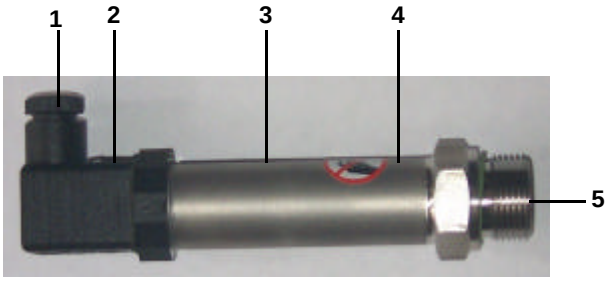
11.18.1 Description

All necessary adjustments and changes (where necessary) are explained in these Operating Instructions. However, if there should be any difficulties in starting up, please do not carry out any prohibited manipulations on the transducer. — You could endanger your rights under the warranty. Please contact the nearest subsidiary or the factory.

Introduction

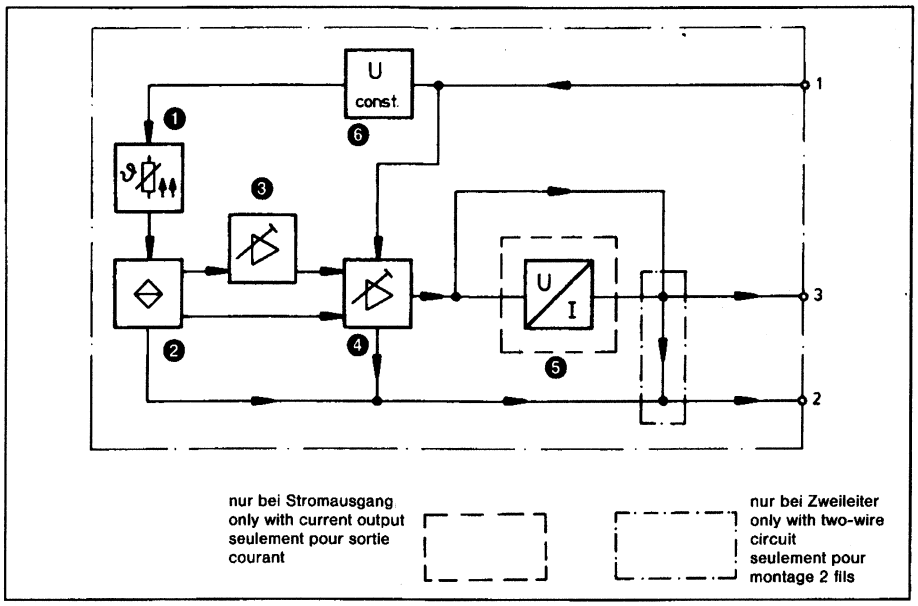
Piezo-resistive pressure transducers Type 4AP-30 are used for the measurement of pressure in hydraulic and pneumatic systems, in chemical and processing plants, and in ventilation and environmental engineering.

This style of connection is not suitable for high-viscosity and crystallising media which could block the bore of the pressure connection. Models with flush front diaphragm are available for such applications.



1	Terminal box with Pg9 gland	2	DIN plug with union nut
3	Transducer case	4	Pressure cell
5	Sealing face		

Block diagram



Operation

The pressure of the medium acts on the separating diaphragm of the piezoresis-tive transducer.The diaphragm transmits the pressure through a liquid to the silicon diaphragm with doped resistance bridge 2. This resistance bridge works according to the piezoresistive principle. It is linked through a temperature compensation module 1 to a constant voltage source 6.

The output signal of the resistance bridge is amplified in a differential amplifier 4 with a high input impedance. The span is adjusted with a span trimmer. The amplifier 3 with adjustable gain provides for zero correction. In case of a current output 0-20 mA or 4-20 mA the U/1 converter 5 changes the output signal into a proportional current.

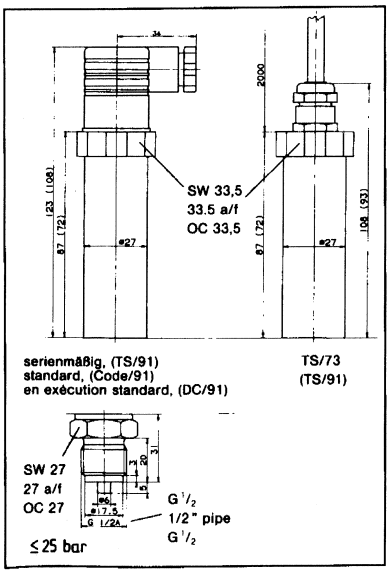
11.18.2 Instrument location

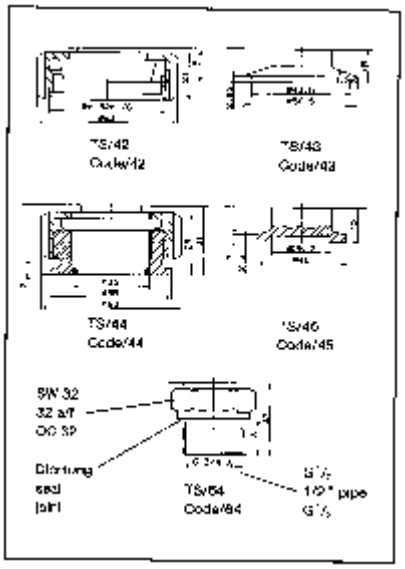
The ambient temperature and the temperature of the medium, measured at the transducer, must be between -30 and +120°C (-30°C and +90°C Code /73).

When selecting the connection cable please check it for its operating temperature..

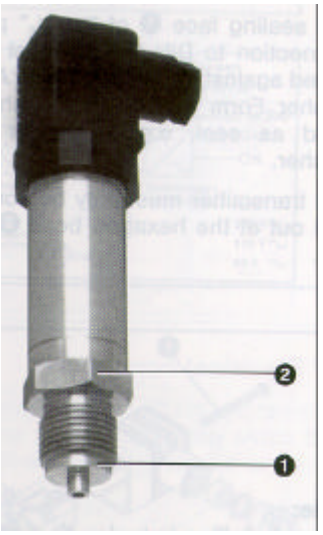
Inserting any object into the bore of the pressure connection may damage the pressure cell.

Dimensions





Einbau



Rage up to 4 bar,

standard position as "Dimensions"

ranges above 4bar,

operating position unrestricted

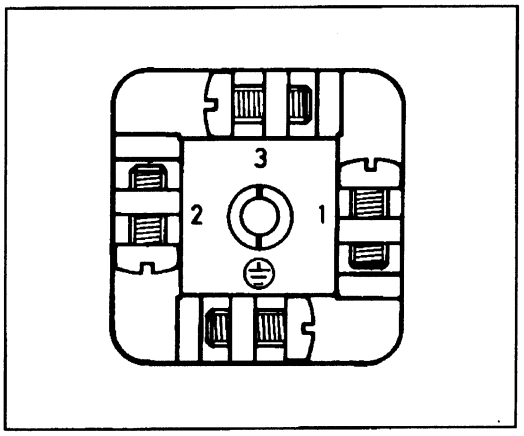
The sealing face 1 of the 1/2" pressure connection to DIN 16228 must be protected against durt and damage. A sealing washer Form B, DIN 16258 should be used as seal, e.g. a copper sealing washer.

The transmitter must only be screwed in and out at the hexagon boss 2 (27 mm a/f).

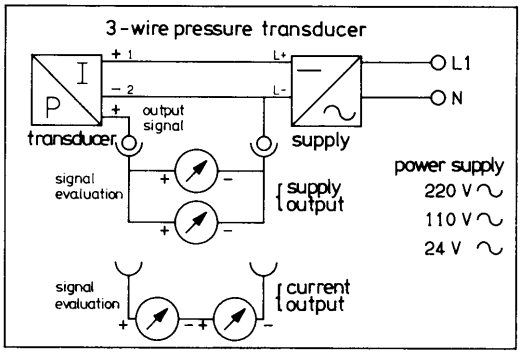
When installing in hydraulic systems it is useful to arrange the pressure transducer with the pressure connection at the top in order to prevent air being trapped.

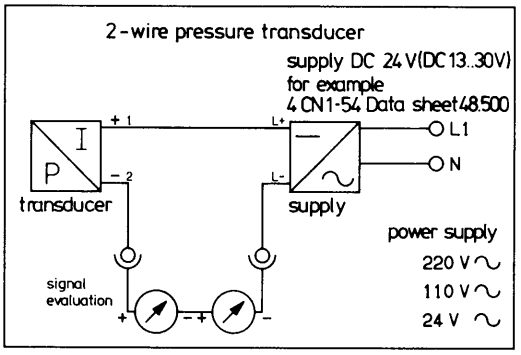
Connection diagram

Connection for	Terminals Connector	Cable
Supply 18-30 V d.c.	1 = L + 2 = L -	white grey
Output 0-10 V	2 = 3 = +	grey yellow
Output 0-20 mA	2 = - 3 = +	grey yellow
Output 4-20 mA	2 = - 3 = -	grey yellow
output Two-wire circuit	In Supply Current 4 to 20 mA	
Protectiv ground		
Screen		black

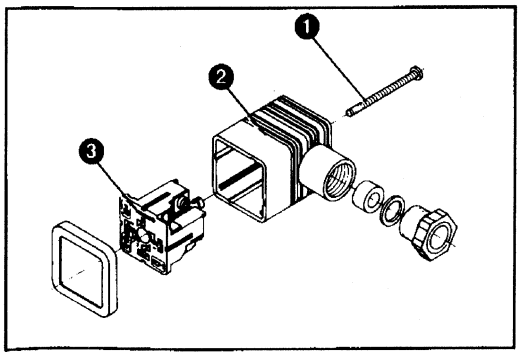


Conection diagram





Electrical connection



Terminal box to DIN 43650, Form AF,with Pg9 cable gland, conductor cross-section up to 1.5 mm², Protection IP 65.

11.18.3 Starting up

Applying pressure

Pressure must be applied slowly to the pressure transducer in order to avoid pressure surges. Note the load limit!

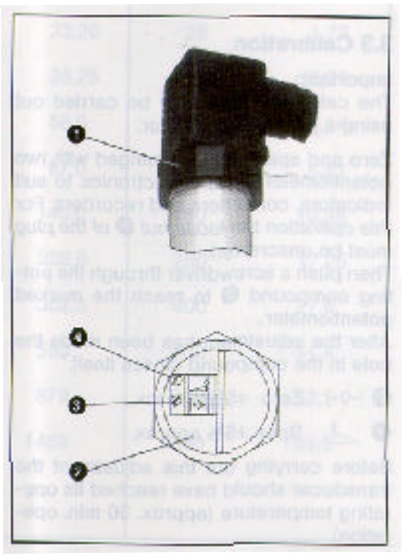
Functional test

Switch on supply. The output signal of the presure transducer must agree with the data on the enclosed test and calibration certificate.

In case of any deviations the transducer must be recalibrated.

Calibration

The calibration can only be carried out using a pressure calibrator.



Zero and span can be changed with two potentiometers in the electronics to suit indicators, controllers and recorders. For this operation the loose nut 1 of the plug must be unscrewed.

Then push a screwdriver through the potting compound 2 to reach the marked potentiometer.

After the adjustment has been made the hole in the compound closes itself.

3 Zero ±5% approx.

4 Span ±5% approx.

Before carrying out this adjustment the transducer should have reached its operating temperature (approx. 30 min. operation).

11.18.4 Maintenance / Faults

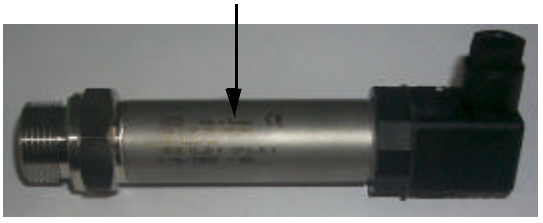
The transducer does not require any maintenance. In case of a fault please return it to the supplier with full details of the fault.

Conversion table

mm	inch	bar	psi	psi	bar
2.5	0.10	0,25	3,63	4	0,28
2.85	0.11				
3	0.12	0,4	5,80	6	0,41
5	0.20				
6	0.24	0,6	8,70	10	0,69
15	0.59				
16	0.63	1,0	14,50	15	1,04
17.5	0.69				
20	0.79	1,6	23,20	25	1,73
26.2	1.03				
27	1.06	2,5	36,25	40	2,76
28	1.10				
31	1.22	4	58,0	60	4,14
32	1.26				
34	1.34	6	87,0	90	6,21
35	1.38				
40	1.57	10	145,0	150	10,35
43.5	1.71				
46	1.81	16	232,0	250	17,25
50.5	1.99				
55	2.17	25	362,5	400	27,6
63	2.48				
72	2.83	40	580	600	41,4
87	3.43				
93	3.66	60	870	900	62,1
108	4.25				
123	4.84	100	1450	1500	103,5
2000	6.7 ft				
1.5 mm^2	0.0024 in^2				

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	pressure transducer	4AP30-010/64, -1 bis 1,5 bar	3P4006-01
	1	pressure transducer	4AP30-242/64, -1 bis 1,5 bar	3P4006-04
	1	pressure transducer	4AP30-020, 0 bis +6 bar	3P4006-05
	1	pressure transducer	4AP30-420, 0 bis 10 bar	3P4006-09
	1	pressure transducer	4AP30-242, 0 bis 10 bar	3P4006-10
	1	pressure transducer	4AP30-242/64, -1 bis +3 bar	3P4006-16

When ordering, please give us the position no. and the dimensions with (bar)!



11.19 Solid matter separator

Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	solid separator with flange A	DN100/DN50/DN65	3M1061-07
2	1	seal	DN 100	3I0136-10
3	1	cover for solid separator	DM250*70	3K4220-02
	1	cover seal, round	13,0*177 50SHORE	3I0100-21
	1	flange	DN65 V2A	3K1005-02
	1	straight	12M6*55 A2 DIN 7	3S0277-11
	1	cylindrical pin	12* 36 V2A	3K2222-02
	1	threaded pin	M 5* 8 A2 DIN 553	3S0170-01

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	eye bolt	M12* 65 A2	3S0140-13
	1	seal ring G	DN 50	3I0130-07
	1	T-piece	DN50/40/25	3M0214-04
4	1	2/2-way-straight-way valve	514 DN20 V2A	3P0000-07
5	1	2/2-way-straight-way valve	514 DN40 V2A	3P0000-13
	5	spiral suction tube, price p.m.	DN 40 PVC	3N2010-03
6	1	contact manometer	-1 - +3BAR R1/2	3P4005-02
7	1	spray head with blind taper	DN25/65 GERADE	3E0215-11
	1	seal ring G	DN 65	3I0130-08
	1	grooved nut	DN 65 A2 NR.2003	3N4170-08
8	1	butterfly valve	SV1/25FZ/1K+2G	3P0004-01
	1	seal ring G	DN 25	3I0130-04
	1	bevel stud with welding end	DN 25 V2A NR.2011.20	3N4110-04
	1	grooved nut, nw 25	DN 25 A2 NR.2003.20	3N4170-04

11.20 CP Valve terminal

Pos. No.	Qty.	Description	Dimensions	Part No.
1	1	CP Valve terminal-A.	10P-14-4B-MP-R-Y-4C	3P0070-50
2	1	CP Valve terminal-A.	10P-14-6B-MP-R-Y-6C	3P0070-51
3	1	CP Valve terminal-A.	10P-14-8B-MP-R-Y-8C	3P0070-52

When ordering, please give us the position no., dimensions and the part no. !

11.20.1 Technical specifications

Technical specifications CP valve terminal type 10	
Ansteuerungsspannung	DC +24V + 10%/-15% (20,4-26,4V)
Abfallstrom der Ventile	> 2mA
Protection class as per EN 60 529	IP 65
Tightening torques - Befestigungsschrauben der Anschlußplatte - Multipoldose	 - 1,0 + 0,2 Nm - 0,6 Nm
Materials (Plates, cover, pneumatic multiple connector plate: seal:	AL, AL-GD, Ms, PAXMD6, PET, POM, PPS, ST, NBR, HNBR

Operate the CP valve terminal only with the medium described below.
- If possible, use non-lubricated auxiliary pilot air (connection 12/14). Otherwise the oil content must not exceed 3-5 drops per 1000 l of air consumed. Use hydraulic oil of type DIN 51524-HLP32. Observe the instructions on special oil for maintenance units.
- In the case of CP valve terminals with internally branched auxiliary pilot air, the above mentioned instruction also applies to the supply air (connection 1/11).

11.20.2 Checking the valve functions

Manual override

You should use the manual override principally when commissioning the pneumatic system, in order to check the functioning and effectiveness of the valve or valve-cylinder combination.

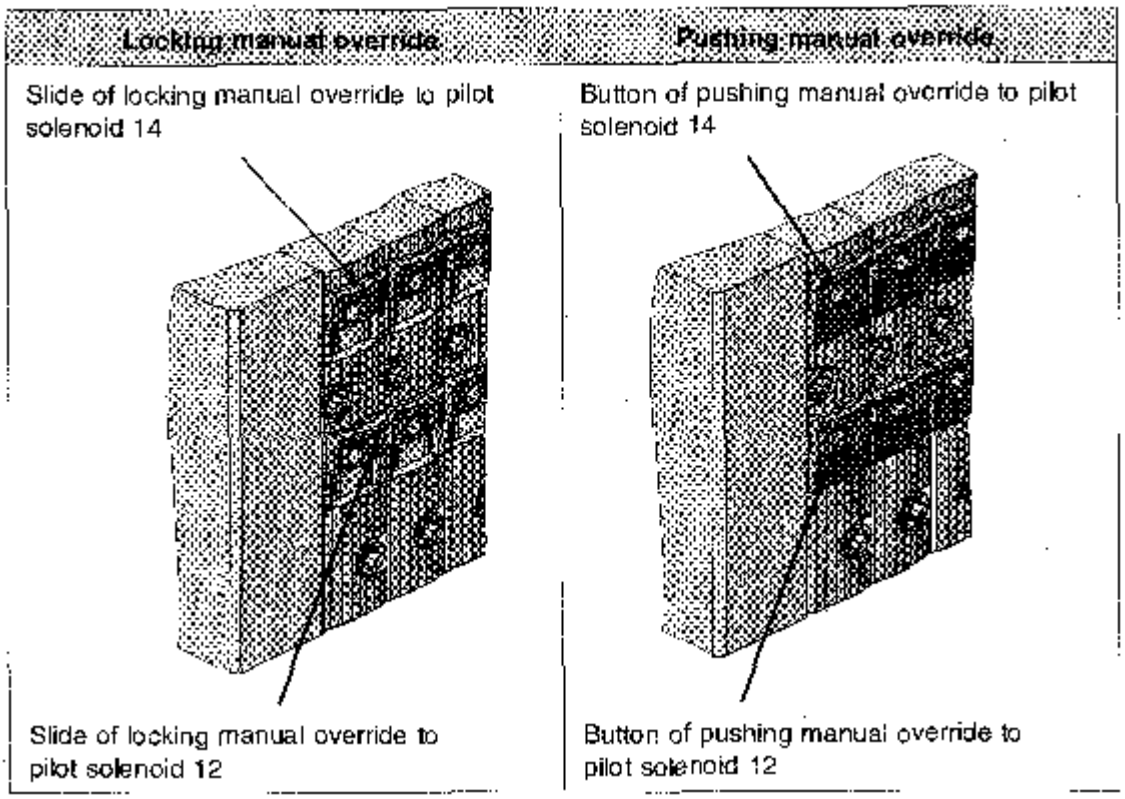
By actuating the manual override, you can switch the valve without an electrical signal. Only the compressed air supply need be switched on.

Before operating the manual override:
Disconnect the operating voltage supply to the valve solenoid coils by unplugging the contact (IC, MP AS-i or CP connection). You then avoid undesired actuation of the valve solenoid coils.

Before applying the operating voltage:
Make sure that all manual overrides are set again at their basic positions. You then avoid undefined switching states of the valves.

The manual override is intended for use as follows:

Manual override design	Mode of operation
Manual override with automatic reset (pushing)	Manual override is reset by spring force.
Manual override locking	Manual override remains active, until it is reset by hand.



When exhausting or repressurizing the valve terminal under the following conditions:
- with safety start-up valve (slow pressure build-up) and
- when there is an electrical signal (e.g. after EMERGENCY STOP) Supply the auxiliary pilot air separately (3 to 8 bar).

The auxiliary pilot air must reach its full level immediately after being switched on, otherwise the slow pressure build-up of the overall supply will have no effect with cylinders actuated as follows:

- by means of single solenoid valves

- by means of double solenoid valves which are switched to flow-through during the pressureless phase.

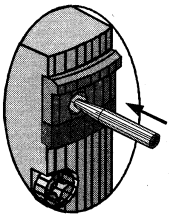
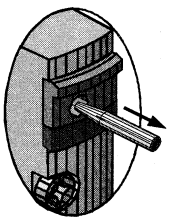
The effects of slow pressure build-up when there is an electrical signal are shown in the table below.

Separately supplied auxiliary pilot air	Pressure increase in overall supply	Pressure increase in auxiliary pilot air (12/14)	Moment when valve switches over	Movement of cylinder
taken behind safety start-up valve	slow	slow	after pressure increase at (1)	fast
taken in front of safety start-up valve	slow	fast	before pressure increase at (1)	slow

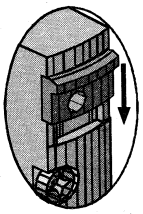
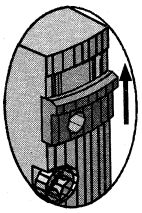
Use a blunt pointed object for actuating the pushing manual override.
Actuate the manual override with max. 30N.
You thereby avoid functional interference or damage to the manual override.

Proceed as follows:

- Switch on the compressed air supply.
- Check the functioning and mode of operation of each individual valve cylinder combination with the manual override as shown in the diagrams below.
- When the test is finished, switch off the compressed air supply again..

Actuate the manual override with automatic reset (pushing)		Reaction of valve
	Carefully press the plunger of the manual override as far as it will go.	The valve: – switches.
	Hold the plunger of the manual override pressed down.	– remains switched
	Release plunger. Spring resets the plunger to basic position.	– returns to basic position (not with 5/2-way double solenoid valve, Ident. code J)

Before commissioning the CP valve terminal, return the mamual override to basic position.

Actuate the manual override with locking		Reaction of valve
	Push the slide of the manual override down as far as possible.	The valve: – switches
	Leave slide in lower position.	– remains switched
	Push the slide of the manual override up as far as possible.	– returns to basic position (not with 5/2-way double solenoid valve, Ident. code J)

11.20.3 Locating faults

Impairment of function

When you switch on the compressed air supply or when you have tested the individual valves, you can learn the following about the operating status of the pneumatic system.

Operating status of the pneumatic system	Valve position	Error treatment when compressed air has been switched off
Air comes out... – of common tubing connections – of work tubing connections	– basic position – switch position	• Check the seal or tubing fitting
– between the modules	– basic position	• When switching on againrgulate separate auxiliary pilot air 3 to 8 bar
Valve or pneumatic system – does not react as expected	– switch position	• Check tubing
– does not react	– switch position	• When switching on again, check operating pressure (e.g. pressure zones) • Return for servicing
– does not react	– basic position	– Check regulator connection (apply pressure > 3 bar to regulator)

If the operating status of the pneumatic system differs from the desired pneumatic operating status, the following requirements are probably not fulfilled.

Desired pneumatic operating status	Requirement	Remarks
Free of leakage	– carefully laid tubing – regulated auxiliary pilot air	—
Fast reaction	Sufficient pressure supply via intermediate pressure modules	• Exhaust valve terminal at left and right-hand end plates (3/5 , 82/84)
Free of interference	Non-return valves in common exhaust tubing	– Applies when several systems with central ducted exhaust are used
Two pressure zones	Pressure zones are limited by isolating plate	– Can be fitted later
Vacuum operation/ low pressure operation	Separately regulated auxiliary pilot air (3-8 bar)	– Regulator can only be operated with pressure (between 3 and 8 bar)
EMERGENCY STOP of pressure zones	Regulator function for auxilary pilot air guaranteed in spite of complete supply being switched off	– Regulator regulates auxiliary pilot air for all valve plates on a terminal
Slow switching on after EMERGENCY STOP	When there are control signals the auxiliary pilot air must be at full level immediately after it is switched on	

11.20.4 LED - display of valves

There is a yellow LED for each valve solenoid coil. This LED shows the switching status of the valve solenoid coil when the CP valve terminal is ready to operate..

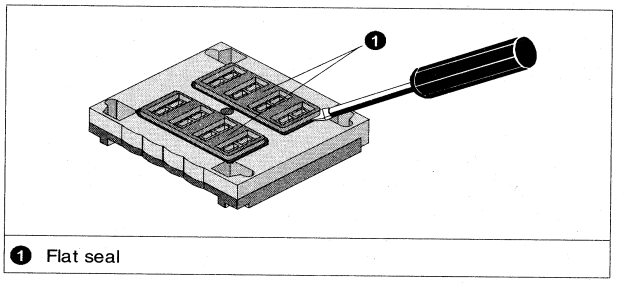
Observe the assignment of the LED to the appropriate manual override: With IC connenction:
- LED in front plug to upper manual override (14)
- LED in rear plug to lower manual override (12)

With MP-, ASI- or CP-connection:
- lower LED in plug cover to upper manual overide (14)
- upper LED in plug cover to lower manual override (12)

11.20.5 Maintenance

Replace the flat seals between the valve block and the connecting plate if these seals are more than one year old. You thereby guarantee reliable sealing for your CP terminal.

The flat seals are seated at the bottom of the electrial connector plate (see diagram).



1 Flat seal

- Remove the self-adhesive flat seal from the recess. Use a screwdriver here to carefully loosen one corner of the seal. Then carefully pull the seal away from the electrical connector plate.
- Remove the protective foil from the new seal. Glue the flat seal into the recess.
- Place the end cover on the connecting lugs of the valve block. Carefully press down the end cover.
- Tighten the screws of the electrical connector plate in diagonally opposite sequence with 0.6 Nm (CPV10/14) or with 3 Nm (CPV18).
- CP terminals with CP connection and relay plates:
- Fit the plugs onto the relay outputs as described under "Connecting current-consuming devices to the relay plate."

11.21 Pneumatic filter regulateur LFR

11.21.1 Commissioning

Adjusting the regulator LR- , LFR- ...:

1. Slowly pressurize the complete system.

2. Pull the pressure setting button upwards (away from the housing).

3. Turn the pressure setting until the desired pressure is shown on the manometer The input pressure must be at least 1 bar greater than the output pressure.

4. Press the pressure setting button downwards (towards the housing) to secure it against unintentional turning.

11.21.2 Maintenance and care

If a condensate level of approx 10 mm below the filter is reached:

• Open the bleeder screw by turning it in an anti-clockwise direction (see from below). The condensate can then flow out.

With less flow despite same pressure setting:

• Replace the filter element

1 Exhaust the system and the unit

2 Unscrew the filter bowl in an anti-clockwise direction

3 Grasp the new filter element only at the lower end

4 Refit the parts in the reverse order from dismantling

5 Recommission as described in the section "Commissioning"

11.21.3 Cleaning

• Use only the cleaning agents specified

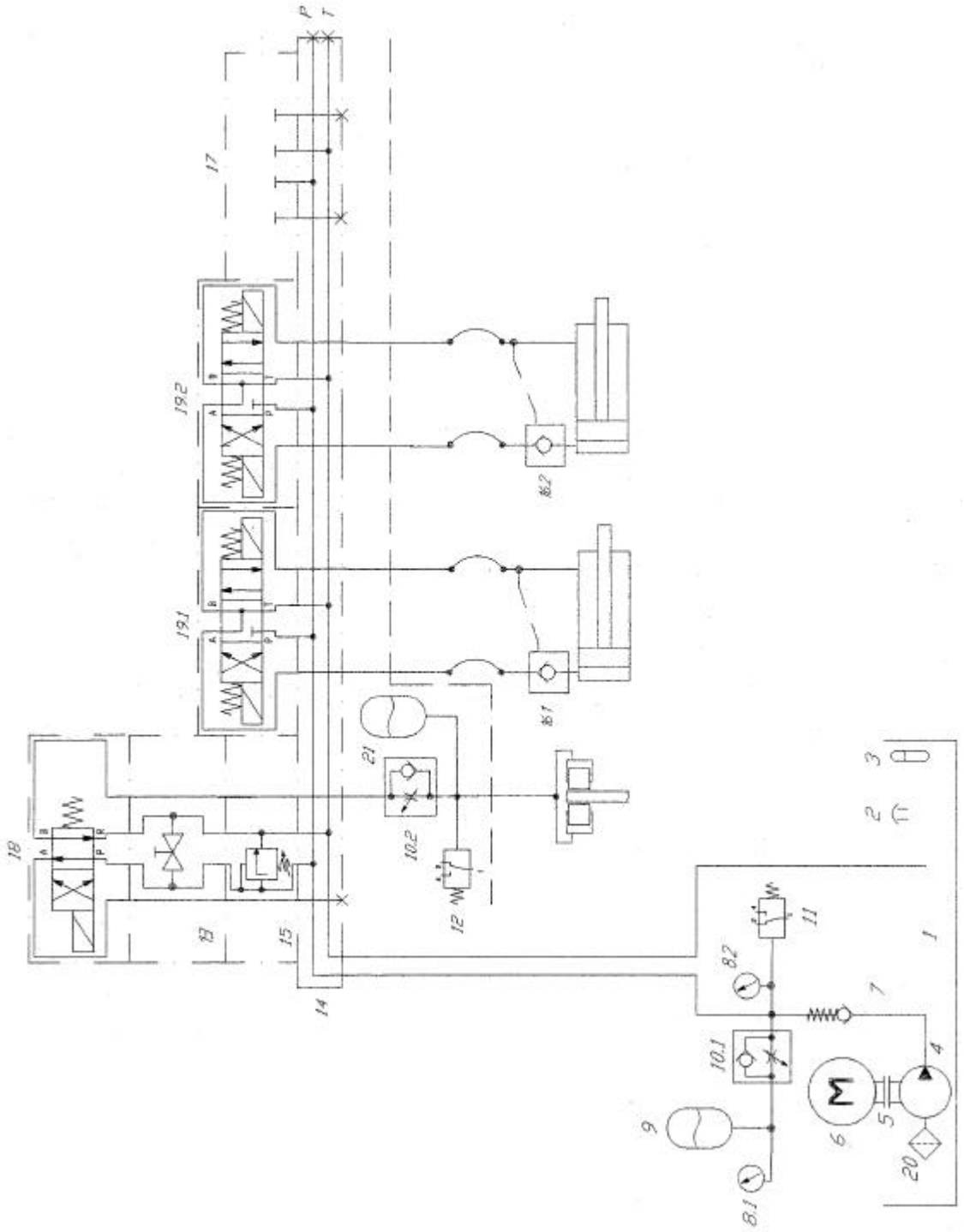
Component	Cleaning agent
Filter bowl	Water or soap sud (max +60°C), benzine (aromatics free)

11.21.4 Eliminating faults

Fault	Possible cause	Remedy
No pressure display	Shut-off valve closed	Open shut-off valve
	Pressure not set	Set pressure with pressure setting buttom
	Manometer defective	Replace manometer
No pressure display pressure fails when compressed air is applied)	Filter element is dirty	Replace filter element
	Restriction between shut-off valve and maintenance unit	Check tubing
Pressure increases above set operating pressure	Defective valve face on sealing seat	Return to Festo
Exhaust can be heard at setting button	Valve seat damaged	Return to Festo
Exhaust can be heard at bleeder screw	Leakage in bleeder screw	Tighten or replace

Pos. No.	Qty.	Description	Dimensions	Part No.
	1	pneumatic filter regulator	Typ LFR - 1/4" - D - MINI	3P4340-17
	1	pneumatic filter regulator	Typ LFR - 1/2" - D - MIN	3P4340-18
	1	pneumatic filter regulator	Typ LFR - 1" - D - MAXI	3P4340-20

11.22 Hydraulic unit type HST 102-A-3-S/E-00

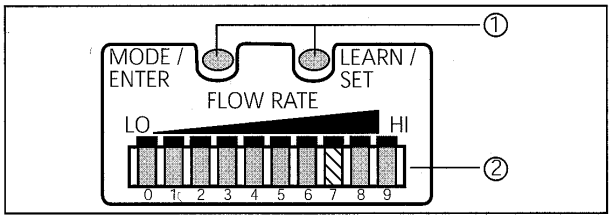


Pos. No.	Qty.	Description	Dimensions	Part No.
		Hydraulic unit	**HST 102-A-3-S/E00**	**3H0044-08**
1	1	oil tank	20 l	**HST-063-A-1-Z-01**
	1	cover for oil tank		**HST-063-A-1-Z-02**
	1	seal		**HST-063-A-1-Z-03**
2	1	charging hole		**TCO 300**
3	4	oil sight glass		**GN543-15-R1/2-A-SW**
	4	fastening screw		**GN 543**
4	1	gear pump		**AP 100/3,5 code 218**
	2	angle flange		**RF 199 G 3/8**
5	1	pump bearer		**PE 200/87/10**
	1	coupling		**Softex 19/24.Ni-24 Alu**
6	1	threephase motor	1,5KW, 4pol, B5, IP55	**FC 90 L-4**
7	1	non-return valve		**RD NW 08 HL**
8	2	manometer		**63, 0-250bar, G 1/4**
9	1	hydraulic accumulator		**0,7/250/80/A/M18*1,5/NBR**
10	1	one-way restrictor		**RD 1**
11	1	manometer switch		**DG 35-1/4**
12	1	manometer switch	1-10bar/210	**0161-43814-1-001**
13	1	unloading valve		**AAHP6/V**
14	1	connection block 4-fold	NG 6	**J-BT-402-60**
15	1	presssure relief valve	Zw.Pl.,NG6	**BASSA06-P-210**
16	2	pilot-controlled check valve		**RH 1**
17	1	blind plate	NG 6	**BS 3.01**
18	1	4/2 way solenoid valve	NG 6	**J-KSO-G02-2A-10**
19	2	4/3 way solenoid valve	NG 6	**J-KSO-G02-4C-10**
20	1	filter		**UC-SE-1320**
21	1	hydraulic accumulator		**0,075/250/50/M14*1,5/NBR**
22	3	connector with cable	A	**grey**
23	2	connector with cable	B	**black**
	20l (17kg)	**hydraulicoil**	**Gargoyle Arctic SH 226**	**9S2030-05**

11.23 Flow monitor compact

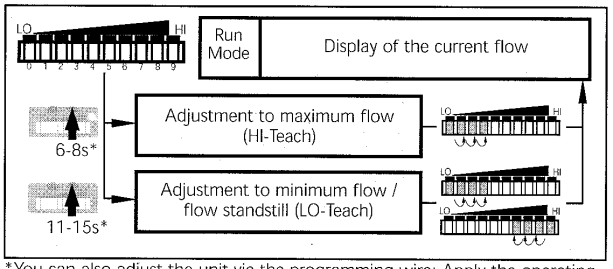
Pos. No.	Qty.	Description	Dimensions	Part No.
	1	flow monitor compact	G1/4" 20-36V	3P4022-10

Controls and visual indication

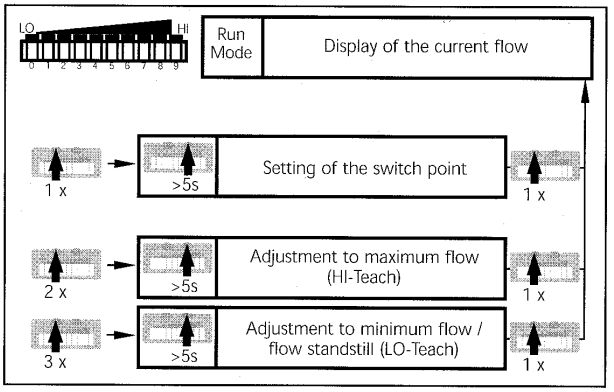


①	setting button Mode/Enter	selection of the parameters and acknowledgement of the parameter values
	setting button Learn/Set	adjustment to maximun / minimum flow setting of the parameter values (scrolling by holding pressed; incremental by pressing briefly)
②	function display	LEDs green: current flow within the display range (LO ... HI) - LEDs 0 to 9 are lit: maximum flow is reached - LED 9 flashes, LEDs 0 to 8 are lit: flow is considerably higher (2 LEDs) than the display range - LED 0 flashes: flow is lower than display range
		LED yellow / red: switch point (SP) (yellow: flow ≥ SP; red: flow < SP)

Menu structure



*You can also adjust the unit via the programming wire: Apply the operating voltage (+UB) to pin 2 (P) for the respective time.



Function and features

The flow monitor monitors liquid and gaseous media It senses whether a preset flow value has been reached or not and provides a switching signal.

• An LED display indicates the relative flow value (referred to the minimum and maximum flow values).

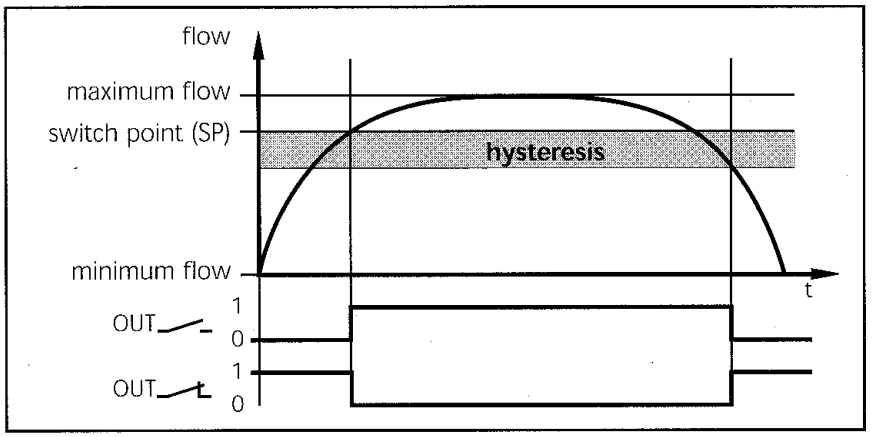
• It is also possible to indicate Switching status excess flow underflow and flow standstill.

• Adjustment to maximum flow (HI-Flow) and minimum flow / flow standstill (LO-Flow) via setting button or programming wire.

The unit

• can be used as N 0 or N C

• and operates with a defined hysteresis.



When the flow rises the output switches when the switch point (SP) has been reached.

When the flow falls again the output switches back when the value SP hysteresis has been reached.

The **hysteresis** is considerably influenced by the choice of the operating range on the sensitivity curve of the sensor:

- In the case of adjustment to HI-Flow values in the range 0...60 cm/s the hysteresis is 2 - 4 cm/s (values apply to water).

- In the case of adjustment to HI-Flow values above 100 cm/s the hysteresis increases as flow rises.

The typical **response time** of the unit is 3...8s. It can be influen by setting the LO-Teach and the switch point:

• The lower the LO-Teach or the switch point is set, the faster the unit switches **on.**

• The higher the LO-Teach or switch point is set, the faster the unit switches **off.**

Programming

Brief instructions

1. Turn on the operating voltage after installation and electrical connection After approx 15s the unit is ready for operation.

2. Set the **maximum flow** and keep it constant.

3. Press the Learn/Set button for at least 5s The unit is adjusted to the maximum flow

4. Set the minimum flow / flow standstill

5. Press the Learn/Set button for at least 10s The unit is adjusted to the minimum flow / flow standstill.

After this procedure the unit is ready for normal operation.

If needed, set the switch point (see "setting of switch point" for changing the reaction time and excess gain).

Manual setting options

Manual setting options

• Manual adjustment to maximum flow

a) monitoring and optical indication of flow decrease (see "monitoring flow decrease")

b) monitoring and optical indication of excess flow (see "monitoring excess flow")

• Manual adjustment to minimum flow / flow standstill (see "minimum flow / flow standstill")

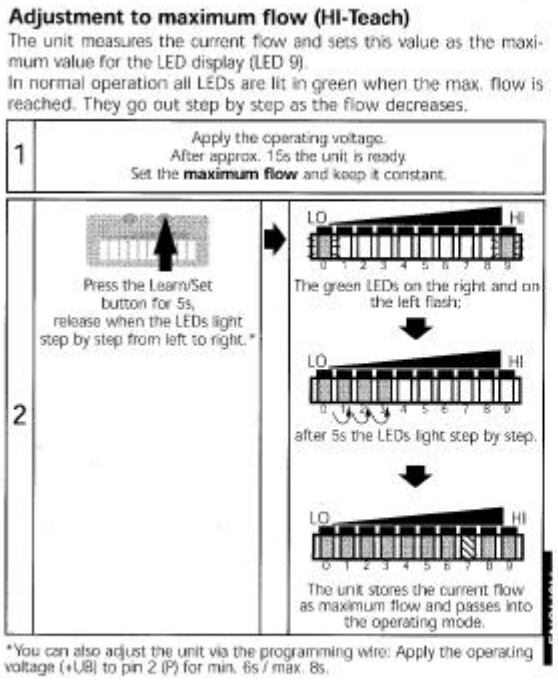
The following applies to all setting procedures:

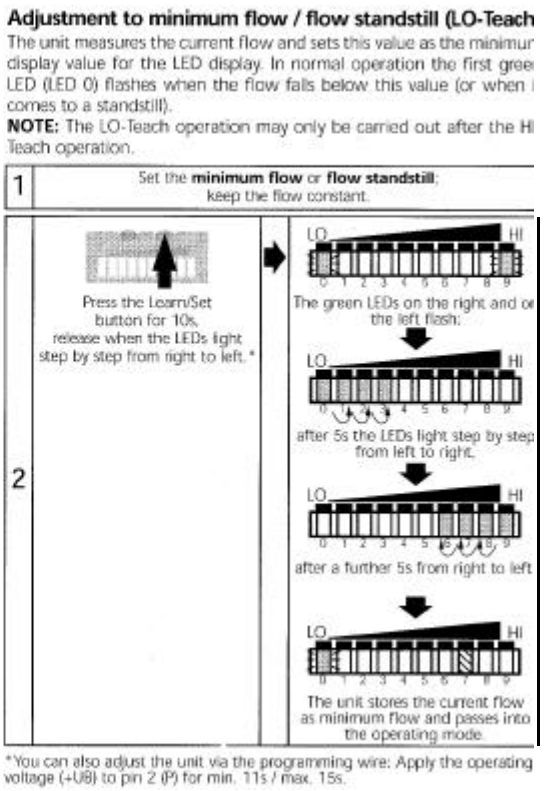
• If no button is pressed for 20s during the setting procedure, the unit returns to the operating mode with the parameter values unchanged.

• If adjustment has not been possible, all the red LEDs flash The unit returns to the operating mode with the parameter values unchanged.

Locking / Unlocking:

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: Press both push buttons for 10s. Indication goes out briefly (acknowledgement of locking / unlocking). Units are delivered from the factory in the unlocked state.

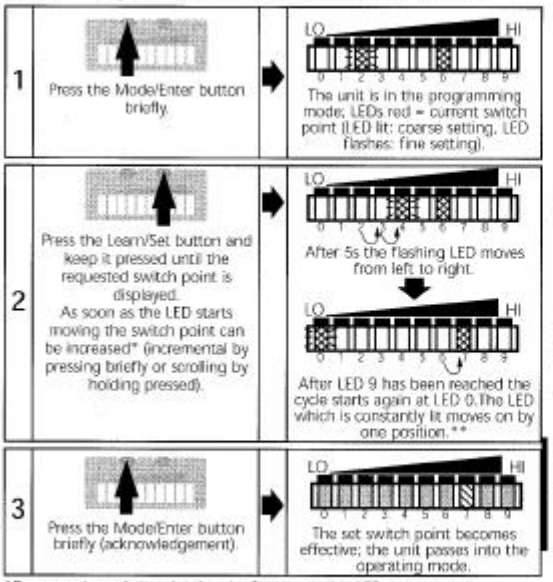




Setting of the switch point

The switch point is preset at the factory (LED 7). The setting influences the reaction time of the unit.

- High switch point = fast reaction in the case of flow decrease.
- Low switch point = fast reaction in the case of flow increase.



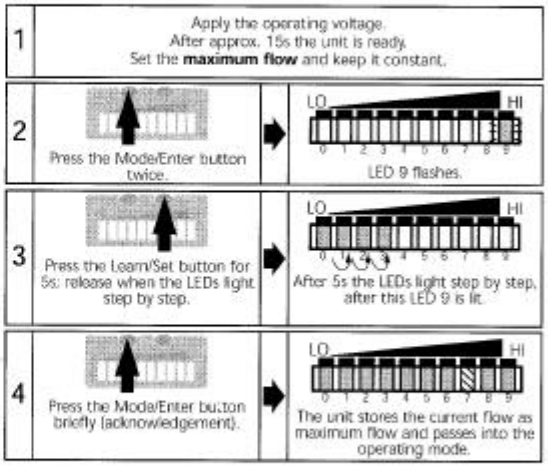
*Decrease the switch point: Let the flashing and lit LEDs move to the maximum setting value. Then the cycle starts again at the minimum setting value.

**Overflow: If the flashing LED and the lit LED exceed the maximum setting value, the cycle starts again at the minimum setting value.

Manual adjustment to maximum flow (HI-Teach)

a) Monitoring flow decrease

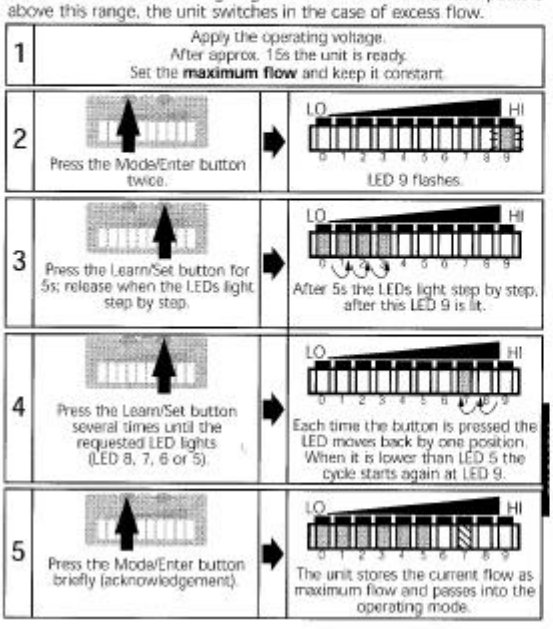
The unit measures the current flow and sets this value as the maximum value for the LED display (LED 9).
In normal operation all LEDs are lit in green when the max. flow is reached. They go out step by step as the flow decreases.



Manual adjustment to maximum flow (HI-Teach)

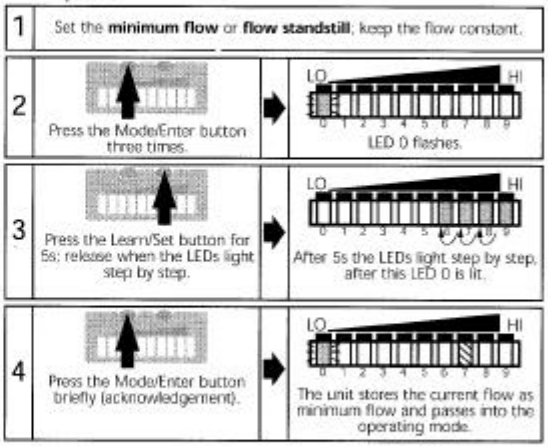
b) Monitoring excess flow

The unit measures the current flow and sets this value as the maximum value for the LED display.
In addition the display width is defined (LEDs 0 to 5, LEDs 0 to 6, ... LEDs 0 to 8). In the case of maximum flow all LEDs in this range are lit. The LEDs above the range signal excess flow. If the switch point is above this range, the unit switches in the case of excess flow.



Manual adjustment to minimum flow / flow standstill (LO-Teach)

The unit measures the current flow and sets this value as the minimum display value for the LED display. In normal operation the first green LED (LED 0) flashes when the flow falls below this value (or when it comes to a standstill).
NOTE: The LO-Teach operation may only be carried out after the HI-Teach operation.



11.23.1 Commissioning / Operation / Maintenance

After mounting, wiring and setting check whether the unit operates correctly.

When the supply voltage is applied, all LEDs light and go off one after

the other. * The unit is then ready for operation.

* During this time the output is switched according to the programming:

ON with the NO function and OFF with the NC function.

Failure indication: In the case of a short circuit the function indication and the red LED row are lit alternately.

Check the sensor tip for build-up from time to time Clean it with a soft cloth If necessary, build-up which adheres firmly (e. g. lime) can be removed with a common vinegar cleansing agent.

12. List of documents provided by our suppliers

Description	Dimensions	Part No.	Index
Microcut	MCH-D 40 K^		**1**
Durchgangsventile	Typ 241		**2**
Stellungsregler	Typ 3760^		**2**
Mixer	SMR DN 200		**3**
Water Valves	WVTS and WVS 32-100		**4**
Pressure Reducing Valve	D 06 F		**5**
Vacuum pump	2BV5 110	3H0001-20	**6**
Butterfly Valves	DN 50/DN 25	3P0004-59 3P0004-17	**7**
Gear Units	KF107 DV160 L8/4 BM/HR R 67 DT 132 S4 B3	3C2179-20 3C2035-03	**8**
Simatic HMI	TP 27		**9**
NEMO-Pump	NM 053	P00001-944	**10**

13. Serviceadressen / Service adresses / Adresse du SAV

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