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# KHK Krakow

## Waste Thermal Treatment Plant

CLIENT:



KRAKOWSKI HOLDING  
KOMUNALNY S.A.

CONTRACTOR:



POSCO ENGINEERING  
& CONSTRUCTION CO.,LTD.

SUBCONTRACTOR IDENTIFICATION:



INTEGRAL ENGINEERING  
& UMWELTTECHNIK GmbH



SUBCONTRACTOR TITLE: 1-649-00-EM610-00103\_00

TITLE OF DOCUMENT:

Flue Gas Cleaning System  
Operating manual / Instrukcja obsługi  
Pneumatic conveying system / Pneumatyczny system

Page  
1

N° document :

1-649-00-EM610-00103\_00

Issue:

A



**HENSEL**

**GmbH  
Giessereitechnik  
D 57074 Siegen**

# Operating manual

Our Order-No. : **201678AA**

Customer: : **IEM Kastl  
Industriegebiet  
D-95506 Kastl (Kemnath)**

Project : **KHK Krakow**

Plant : **PNEUMATIC CONVEYING SYSTEM FOR RESIDUES**

Built : **2014**



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Order-No. :  
Order-date : **22.05.2014**

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## 1 Operating Instructions

### 1.1 Preliminary remark

Due to security reasons these security remarks have to be respected in addition to the documentation referring to the product. The security remarks serve to protect persons and things against damages and dangers possibly resulting out of incorrectly use, false handling, insufficient or improper maintenance or other faulty treatment of the installation.

The present operating instructions contain all information necessary for a dangerless use of the installation/machine. The operating instructions direct themselves to the staff scheduled to operate the installation and which is trained during the start-up phase. Fundamental specialized knowledge is required.



### 1.2 Important general remarks

This documentation represents an essential part of the following installation:

Type of installation: **Pneumatic Conveying Plant for residues**  
Year of construction: **2014**  
Vessel Reference no.: **1178**  
**1179**  
Project no.: **201678AA**

The pneumatic conveyor is equipped with a well-visible boiler plate for the pressure vessel. The other devices, machines and appliances forming a part of the installation have a type mark effected by the corresponding manufacturer (please refer either to the individual device or to the enclosed individual descriptions of each device).

In case of questions or spare parts orders please indicate at any rate:

- serial/machine no.
- type of installation
- delivery date
- the exact place of erection
- the name and phone number of your responsible staff member

In case of questions, technical problems and spare parts requirements, please refer directly to Messrs. HENSEL using the address and phone/fax no. indicated on the first page.



## 1.3 Individual operating instructions of subcontractors

These operating instructions contain separate operating instructions of the manufacturers of different installation components. Even if not expressly mentioned, indications made as to security, handling, inspection and maintenance have to be taken from those operating instructions and to be observed in each individual case.

## 1.4 Up to date

The laws, directions, regulations and norms etc on which the production of the delivered installation is based and which are indicated not only in this operating manual but also in the enclosed individual device description correspond to the installation production and to the wording of this manual.

### **This operating manual is not subject to any modification service!**

The right to modifications and improvements in the sense of a technical further development concerning all technical data, indications and illustrations is at any time reserved. A requirement for free-of-charge modifications or improvements of installations already delivered does NOT exist.

## 1.5 Copyrights

© Mai 2014, HENSEL GmbH, D-57074 Siegen, Germany

The copyright as to this operating manual remains with HENSEL. All rights are reserved, in particular in case of a patent application and/or a registered design entry.



## 1.6 Wear and tear parts

We expressly draw your attention to the fact that spare parts and accessory components having not been delivered by us, cannot be checked or released by us either. The incorporation and/or the use of such products could therefore possibly influence or change the constructively designed and determined characteristic features of the installation in a negative way. For damages resulting out of the use of non-genuine parts or accessory components, the manufacturer does NOT assume any responsibility.. The spare parts and accessory components lists do contain all individual parts of the installation. Standard parts can be bought in specialized shops.

To mount, demount or start-up the installation, please require corresponding specialized staff from Messrs. HENSEL or phone to receive the necessary information.



## 2 Fundamental Security Remarks

### ! Remark !



Before effecting works at the installation/machine, please observe at any rate the chapter „ fundamental security remarks“. Moreover, please Respect all usual, national directions and regulations (UVV, VBG- Directions etc.)

The operating manual has to be stored in a way that at any time the responsible staff has free access to it.

The valid local and internal directions of each company as to work protection, installation security and environmental protection have to be respected during each mounting, start-up, operational and non-operational phase (stop) of the installation. The company running the installation has to write these instructions for the operating staff.

The installation/machine is designed/produced according to the technique and the valid technical security regulations. However, when using it, there may be dangers for body and life of the users or third parties or prejudices to the machine or other material assets in case it is operated improperly by non-trained staff or according to the purpose for which it was designed.

Do only operate/run the installation/machine if all protective devices/installations are in technical free-from-defect conditions and do properly operate. Do employ the installation/machine only according to the purpose for which it was designed.

Do act being conscious of the security hints and existing dangers and respect the operating manual.

Malfunctions impairing the security have to be immediately eliminated! Do avoid any way of working or switching impairing the security of the staff, the installation or the material assets.

In case of any operational malfunction find firstly its reason and eliminate it.



**Malfunctions or damages are only allowed to be eliminated by specialized and trained personal!**



## 2.1 Use according to the purpose to be designed for

The conveying installation with the conveyor A 500 serves to the pneumatic transport (discontinuous transport) of dry, dusty bulk material (filter dust, residues).

Another or additional use (e.g. the transport of explosive materials) is not according to the purpose for which the installation was designed. For damages thus resulting, the manufacturer does not assume any responsibility. The risk does solely bear the company running the installation.

For a use according to the purpose for which the installation was designed it goes without saying that the operating instructions and all remarks at the installation/machine as well as all inspection and maintenance instructions are observed and respected.

## 2.2 Organizational measures



The staff being instructed to effect actions at the installation/machine has to read **before the beginning of the works** the operating manual and here above all the chapter "**Fundamental security remarks**". This does particularly pertain for such persons, working only occasionally on the machine/installation (e.g. maintaining and repairing works). In addition to the operating instructions, all generally valid legal and other binding regulations concerning accident prevention and environmental protection ( e.g. wearing of personal protection equipment, waste management) have to be respected and observed.

The operating manual has to be stored in a way that at any time the responsible staff has free access to it.

The staff is not authorized to wear open long hair, loose clothing or jewelry including rings. There is the danger of injuries, e.g. by getting caught.



Modifications or attached constructions or rebuilding at the machine may only be effected with the expressive authorization of the manufacturer. This is also valid for the incorporation and the regulation of security installations and valves as well as for the welding at pressure vessels and at supporting parts.

**! Attention !**



**Modifications at pressure vessels are always subject to the authorization and verification of the manufacturer.**



## 2.3 Remarks as to special types of danger

### Electrical energy



Works at electrical installations may only be effected according to the valid electric regulations by skilled and specialized electric staff or by trained persons under supervision and monitoring of a skilled and specialized electric staff.

The electrical equipment of the machine/installation has to be checked regularly. Defects (e.g. lose connections, scorched cables) have to be removed immediately by a skilled electric specialist.

Do only use genuine fuses having the recommended strength of current. In case of malfunction of the electric energy supply, the installation/machine has to be cut off immediately.

### Pneumatic

All conductions/lines, hoses and screwed connections have to be verified regularly concerning leakage and external visible damages.

Damages have to be eliminated immediately!

Compressed air conducts/lines have to be installed and mounted by a specialist. Make sure that the connections are not mixed up.

Fittings, length and quality of the hose ducts have to correspond to the requirements.

### ! Danger of injuries!



**Before opening the conveying system, make is pressureless. Danger is given due to product or installation parts possibly spinning around!**

## 2.4 Operating personal

The staff which is going to run, operate and maintain the installation on site should be instructed and trained before the first start-up by a staff member of **HENSEL GmbH**.



## 3 Transportation

### **! Attention !**



Please respect the valid regulations for the work with lifting devices, fork-lift trucks etc. Do only use for loading works lifting devices and load suspension devices having sufficient carrying force!

### 3.1 Transport on site

Do transport the machine/installation on site with utmost caution and according to the following instructions.

- In case the installation/machine has already been in service, remove alle connected supply conductions from the installation/machine before moving it.

### **! Danger of-injuries !**

**Make sure that no person is under the load!**



### 3.2 Lifting with fork-lift truck

Make sure that the admissible transport weight of the fork-lift truck is not exceeded.

### **! Attention !**

**The conveyer can be transported with a fork-lift truck (without lifting ropes) if it is firmly screwed on a palett or securely fastened in a skeleton container.**



## 4 Storing



The installation/machine can be stored in its transport condition. The storing place must be dry, the ambient temperature has to be above minus 10°. The installation/machine has to be stored in a way that no condensate water can be built.



## 5 Erection/Connection

### 5.1 Requirements to the place of installation

<b>Fixing</b>	The fixing of the machine has to be effected according to the local conditions. The pneumatic sender has to be erected on a level, firm ground. The connecting pipes towards the storage vessels have to be tight /leakproof and connected without any tension.
<b>Space requirement</b>	In order to be able to effect cleaning and maintaining works, the installation must be easily and safely accessible from all sides. From each side there should be a minimum space of 1 m.
<b>Illumination</b>	The illumination in the area of the machine/installation should be designed that at any time a safe working at all machine parts is guaranteed.
<b>Supply connections</b>	The supply with electric energy and compressed air should be designed that the machine/installation is supplied at any time with the required quantities. The specifications of the connections are indicated in the technical data sheets.
<b>Equipotential-bonding</b>	The customer is responsible for the equipotential bonding.

### 5.2 Erection

- Transport the installation/machine to the planned location as described in chapter „Transportation“.
- Remove if necessary all transport securities as well as packing and fixing materials.

### 5.3 Connection

- Place all feeding pipes in a way that they do not represent any danger for the operating staff (tripping traps etc.) and that there are no traction charges on them.
- Make a specialist to place the electric connections according to the wiring and terminal diagrams.
- Make the compressed air connection available according to the indications given. Make sure that it is leakproof and tight.



- For maintenance works at the machine/installation, it must be possible to interrupt the compressed air connection by help of a manual shut – off device (e.g. ball valve).
- To guarantee that best conveyor characteristics are achieved, make sure that the given compressed air features are respected.

**! Attention !**



**Make sure that the fuse protection of the compressed air net is tuned on the maximal operating pressure according to the pressure vessel plate.**

- Make sure that there is a connection with the conveying pipe.

**! Attention !**



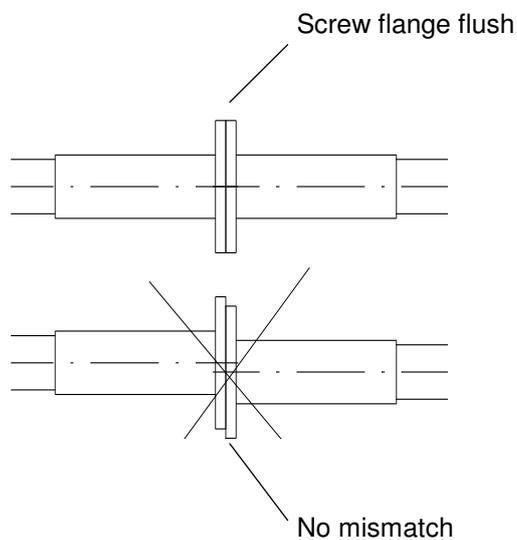
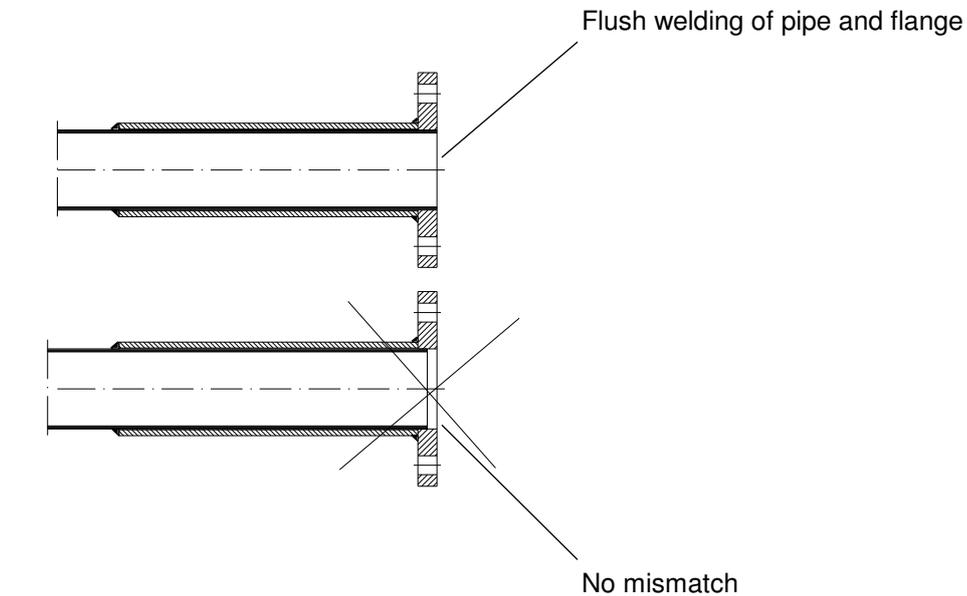
**Make sure that in the receiving hopper a aeration (filter), a overpressure protection as well as a level indicator sonde are available.**

### 5.4 Assembly of the conveyor pipes

- The conveying tubes should run in a way that the less possible amount of deviations is required.
- The conveying tube should be placed without any vertical conduction guides to the bottom. In case such a line direction should be inevitable, please inform Messrs. **Hensel** beforehand.
- One or more activators have to be incorporated at appropriate locations in the ducts.
- Each pipe should be supported with 2 holders. The tubes must be incorporated without tension. Especially in the area of the activators and shut-off valves attention has to be paid to the fact that in case of a demounting during a maintenance work the ducts are still supported and held.
- Make sure at any rate that the flange connections are carefully and properly realized. The flanges must be screwed together without mismatch and must be flush mounted. On matching pieces being manufactured during the assembly the tubes have to be evenly cut. The flanges must be evenly flush welded. (refer to illustration page 15).



- The conveyor pipes are equipped at their ends with reinforced connection pieces. The connecting pieces and flanges must be exactly flush welded to the conveyor pipe.



- between each flange connection a flat packing is incorporated
- screw tight cross-wise all screws



## 6 Start-Up

### Staff

The first start-up should be effected by a **HENSEL** start-up specialist or by specialized and trained staff. During this start-up the personal which is planned to operate the installation/machine should be trained to operate it.

### Conditions-Requirements

- the installation/machine must be installed and fixed according to the indications made in the operating manual.
- all mechanical and electric installations must be carried out by a specialist
- the conveyor and all ducts must be clean and dry



**In particular the fluid bottom must be checked for damages. The fluid bottom must be dry and free of leakages**

- the protection of the compressed air net must correspond to the operating pressure on the pressure vessel plate.
- the compressed air supply must be able to be interrupted by means of a manual shut-off device.

### 6.1 Adjustment/Set-up pneumatic sender

- Open the ball valve in the compressed air supply
- Adjust the pressure at the customer's pressure regulator on 6 bar according the following individual descriptions.
- Adjust the pressure regulators at the pneumatic conveyor and at the air quantity regulators at the activators according to the following individual descriptions
- Adjust the incorporated level indicators according to the separate description and test the function.



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## 7 Operation conveying system

### 7.1 Security remarks



**The installation/machine is only allowed to be run if it is in a secure and fully operative condition.**

**Malfunctions have to be reported immediately to the department in charge. If necessary the installation/machine has to be shut down immediately and to secure. Make a specialist to eliminate the malfunction immediately.**

**Before each starting make sure that nobody is endangered by the starting machine/installation.**

### 7.2 Description of installation

The residues that come from the BHF installation should transport with a pneumatic conveyor A 500 in a silo.

The residues are transported towards the conveyor by help of a buffer tank. The conveyor transported then the dust in a discontinuous method through a pipe into the silo. The silo is controlled with a level probe max. When this probe will reached, the conveyor make the current conveying cycle up to the end of the cycle. When the cycle is finished must be locked the conveyor.

The conveyor and the material transport out of the filter could start again when the probe max. in the silo is not covered.

**For further information about enable and locking contacts and functions please read the main documentation from IEM**

The delivered installation consists of the following components:

- a) 2 x buffer tank
- b) 2 x pneumatic conveyor A 500
- c) 2 x valve installation for conveyor A 500
- d) 6 x installation activator / booster
- e) 2 x conveying pipe DN 65



## 7.2.1 Photo buffer tank

KKS-Nr.: 01ETG20BB001

KKS-Nr.: 02ETG20BB001

Buffer tank (14)

Measuring nozzle 1-1/2"

Connectionplate / support

Fluidising nozzels

Emergency outlet flange



Pre butterfly valve (1)



## 7.2.1 Photo buffer tank (top view)

KKS-Nr.: 01ETG20BB001

KKS-Nr.: 02ETG20BB001

Connection for metalflex hose, exhaustion conveyor

Buffer tank (14)

Level indicator max. (13)

Connection flange for filling



Over,-under pressure valve (46)

Connection flange for exhaustion-buffer

Inspection opening with cover plate



## 7.2.2 Photo conveyor A 500

KKS-Nr.: 01ETG20BB002

KKS-Nr.: 02ETG20BB002

butterfly valve (5)  
for exhaustion

metall-flex hose for exhaustion (29)

valve  
installation-plate

pressure vessel (10)

safety valve(28)



fluid bottom

hand hole  
for cleaning and inspection



level indicator max. (9)

inlet closure (3)

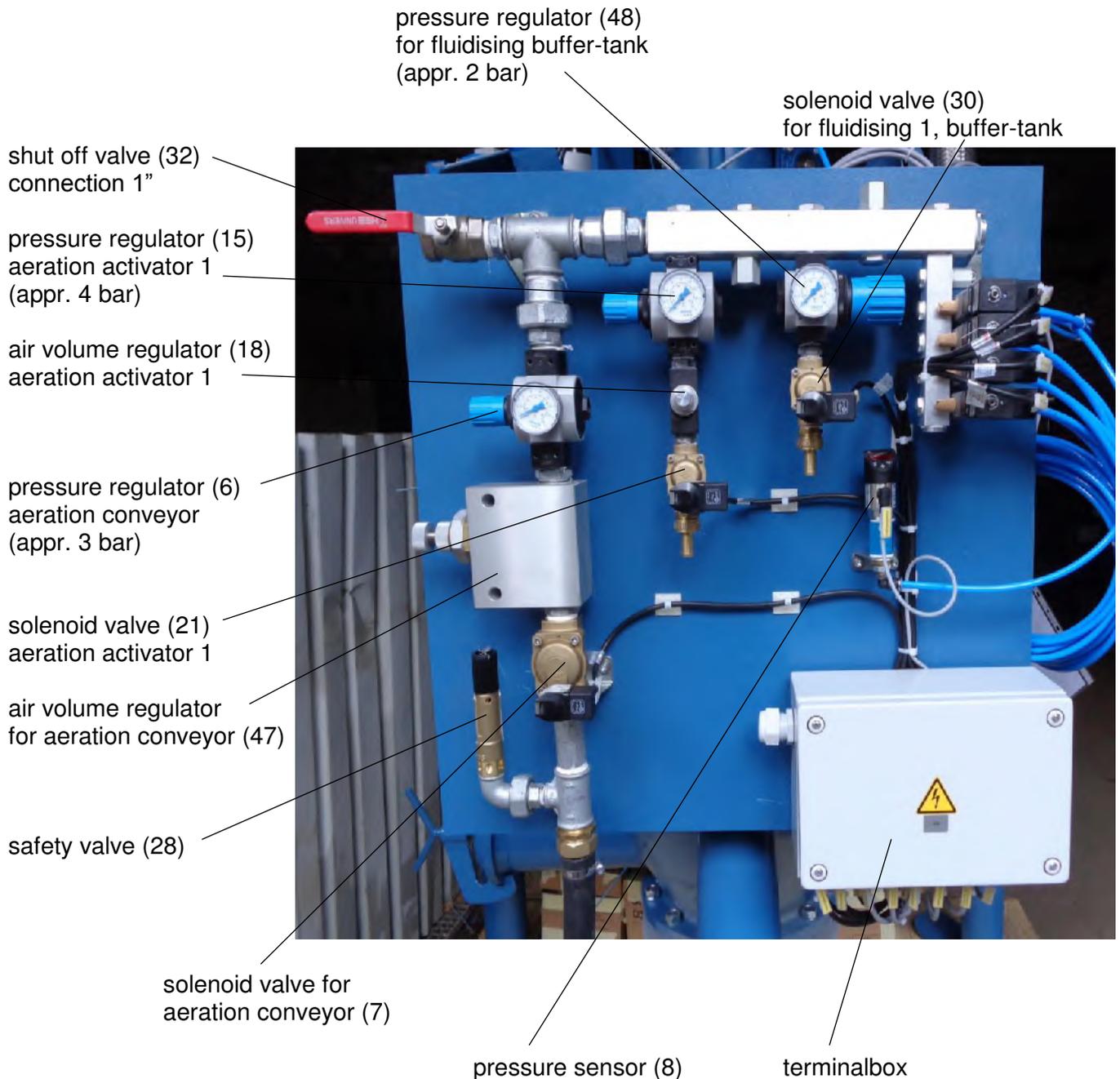
compensator (27)

pressure vessel (10)





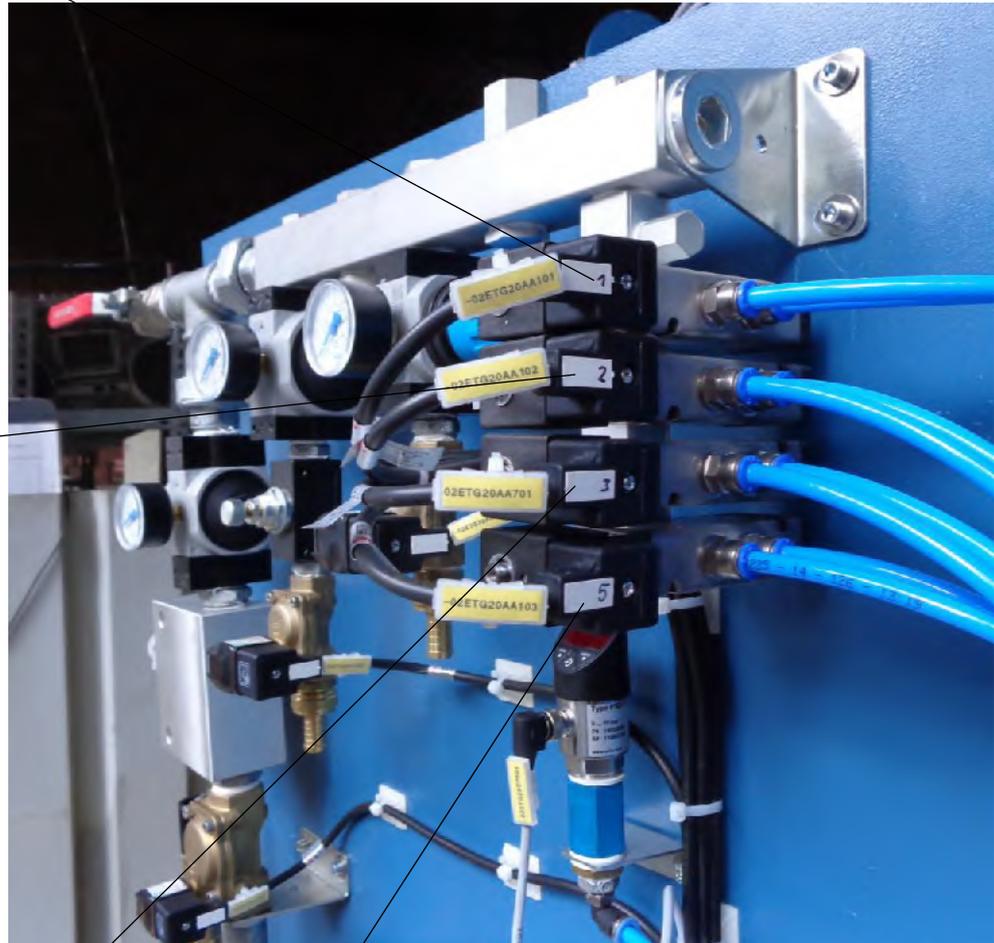
## 7.2.3 Photo valve installation conveyor A 500





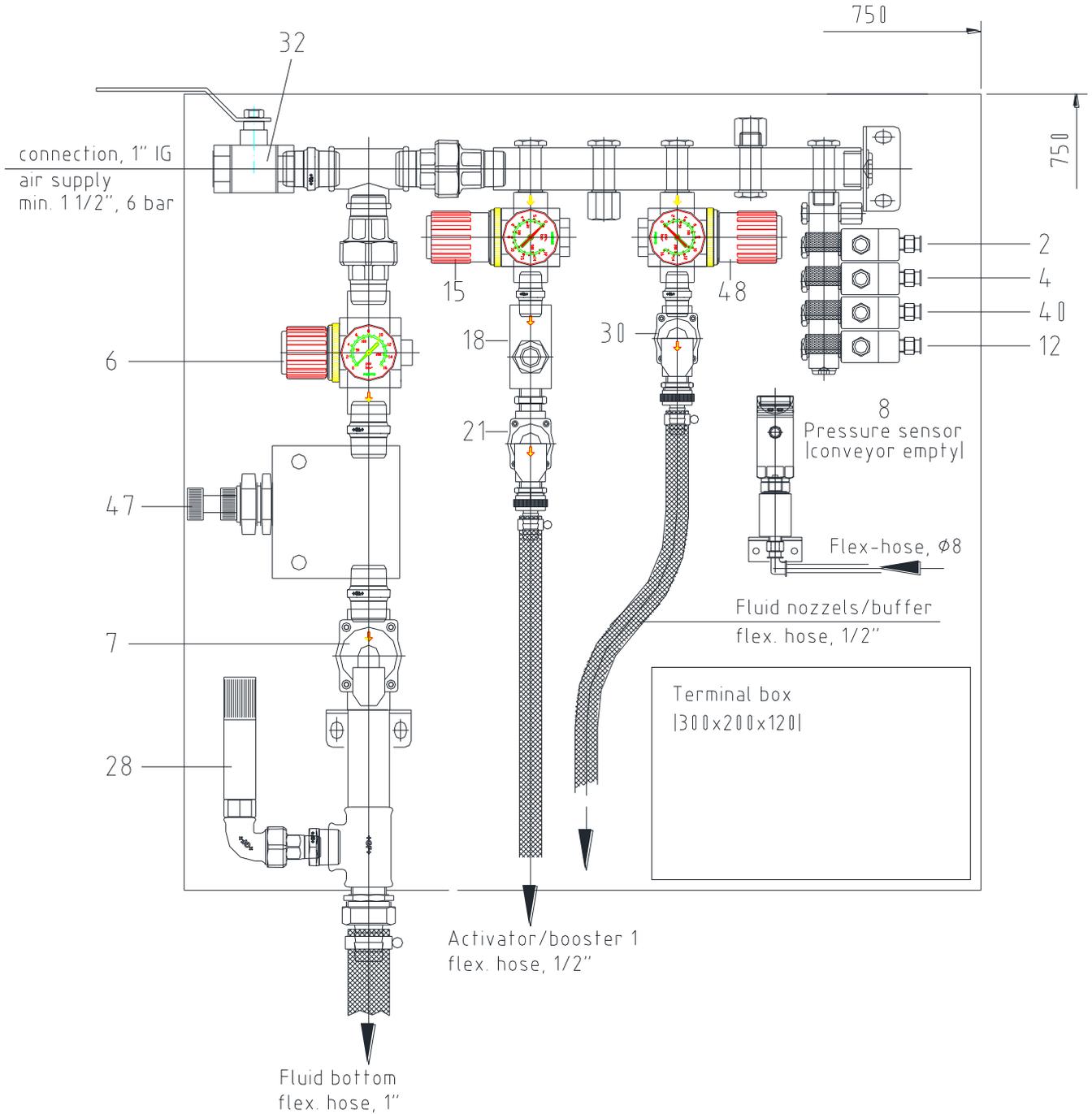
solenoid valve (2)  
for pre butterfly valve

solenoid valve (4)  
for inlet closure



solenoid valve (40)  
for butterfly valve exhaustion

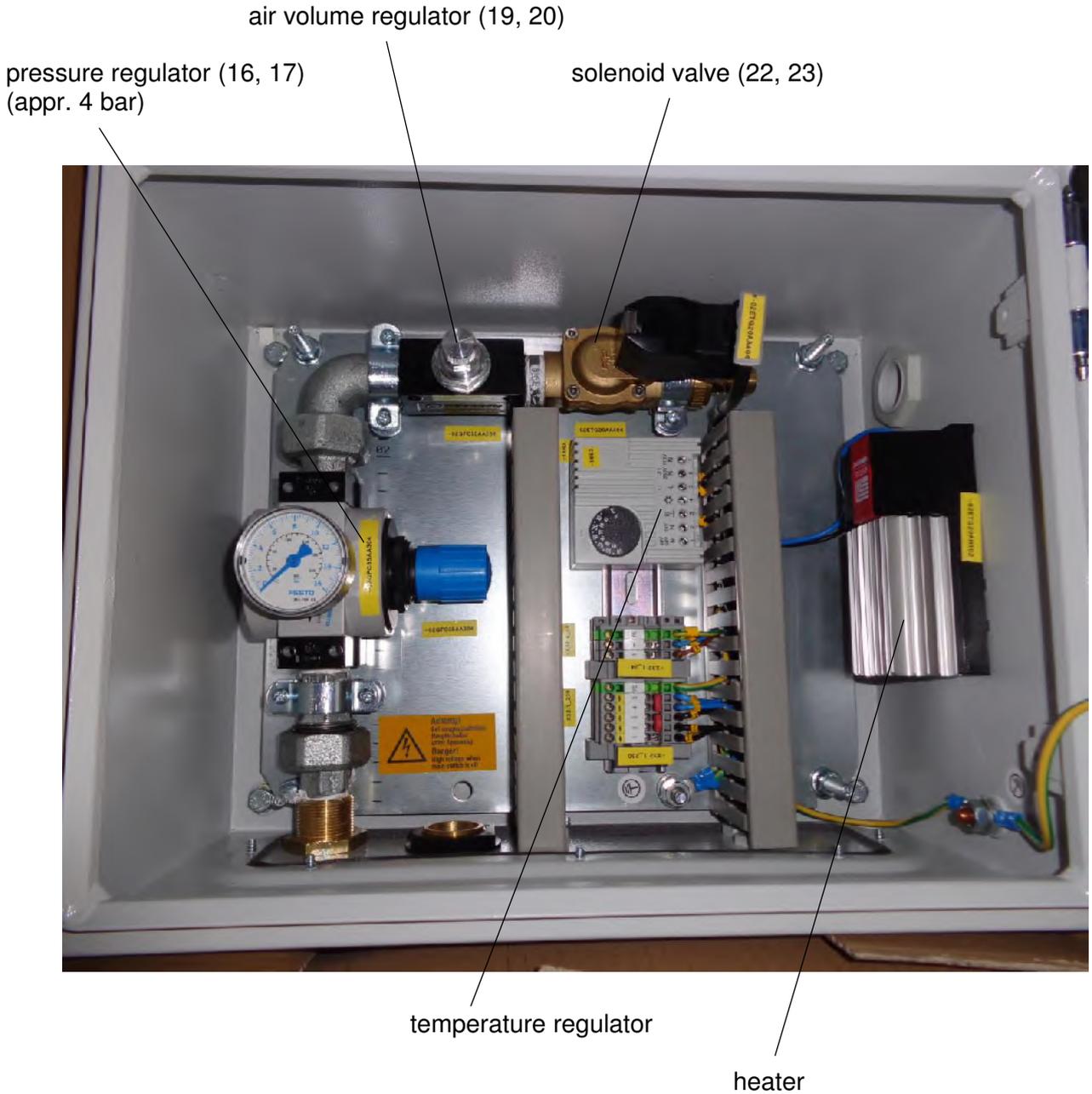
solenoid valve (12)  
for ball valve conveyor outlet

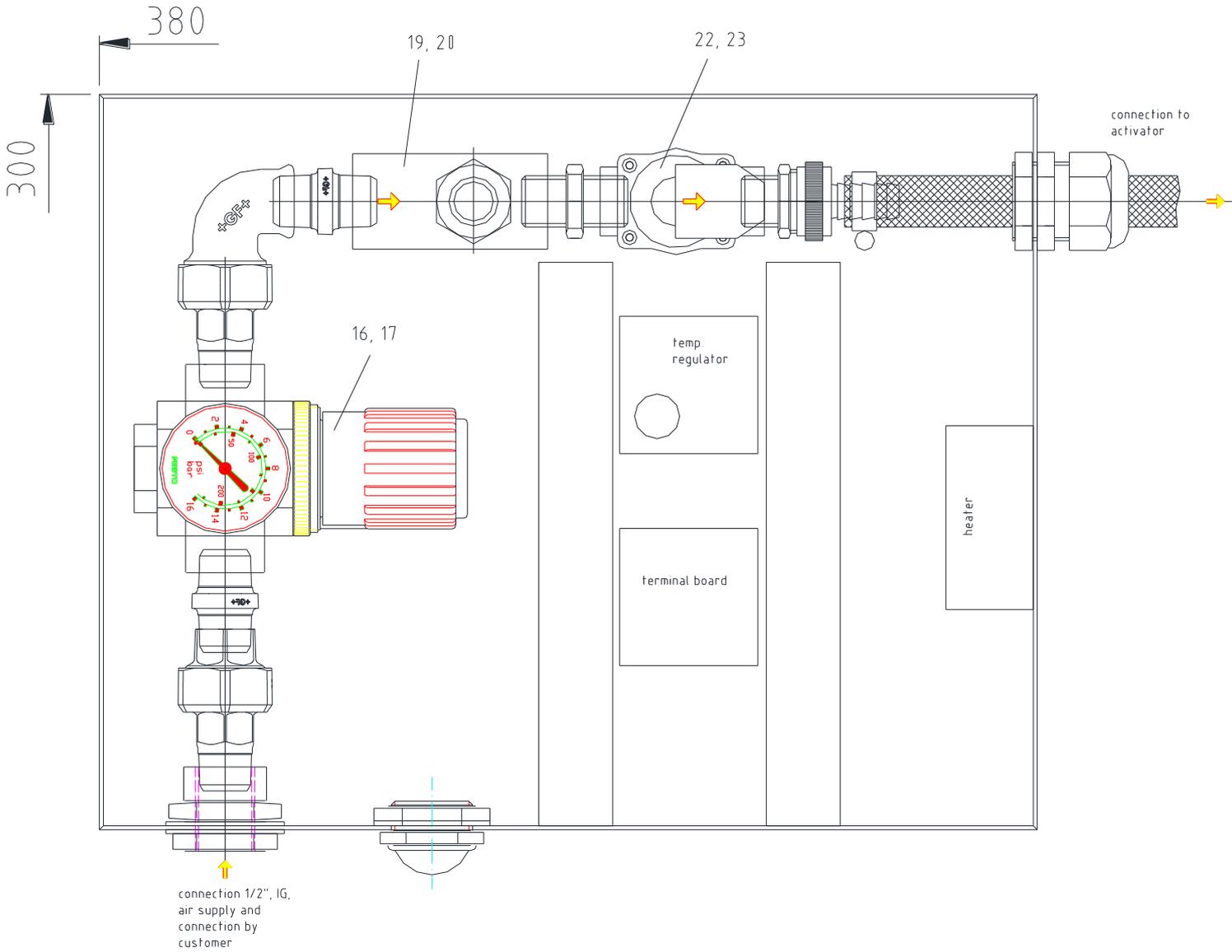




## 7.2.4 Photo valve installation activator 2 and 3

KKS-Nr.: 01ETG20BN102  
KKS-Nr.: 02ETG20BN103  
KKS-Nr.: 01ETG20BN102  
KKS-Nr.: 02ETG20BN103







## 7.3 Functioning conveying system

### 7.3.1 Functioning

#### Control cabinet

The conveyor is controlled by the main control on the side of the customer in the conducting observation point.

#### Switch on installation

1. Open air supply to all cabinets for valve installation
2. Switch-on conveying plant at control cabinet.

#### Switch on pneumatic conveyor

1. Switch-on pneumatic conveyor A 500
2. The conveying plant is now on and the conveyor is ready for operation.  
The following releasing conditions have to be fulfilled:
  - a) The conveyor does not have malfunction
  - b) Max-probe in the silo is not covered.
3. The conveyor function runs now automatically until
  - a) Max-probe in the silo is covered.
  - b) The conveyor will be switched off.
  - c) The conveyor has malfunction.

An already started conveying cycle has to be finished at **a** and **b**  
After the conveying cycle the conveyor will be locked.

#### Malfunctions Messages

The following functions are monitored:

- a) exceeding of maximal conveying time time)
- b) malposition limit switch pre butterfly valve
- c) malposition limit switch inlet closure
- d) malposition limit switch ball valve conveyor outlet



## Acknowledge Malfunctions

1. Valid for all malfunctions:  
Check why the malfunction is indicated. If no error can be detected, the malfunction has to be acknowledged and the conveyor is again started. In case of the malfunction is repeated, the specialized staff has to investigate the reason for the malfunction carefully.

## Switch off pneumatic conveying installation

1. Switch off the conveyor at the control cabinet.  
Wait until a possibly running transport cycle is finished
2. If necessary shut off control cabinet
3. If necessary shut off air supply

## General Remarks

1. In normal case the installation runs automatically without operating staff and is operated and adjusted from the control cabinet. In case of occurring problems the installation is only authorized to be operated by trained and specialized staff.
2. The installation can remain „on“ after shift-end but should be switched-off if possible.
3. Additional information can be taken from the customer's electric documentation.



## 7.3.2 Technical datas

### Level Indicators:

Conveyor max: 10-55 V/DC, capacitiv  
Buffer tank max: 10-55 V/DC, capacitiv

### Pressure sensor:

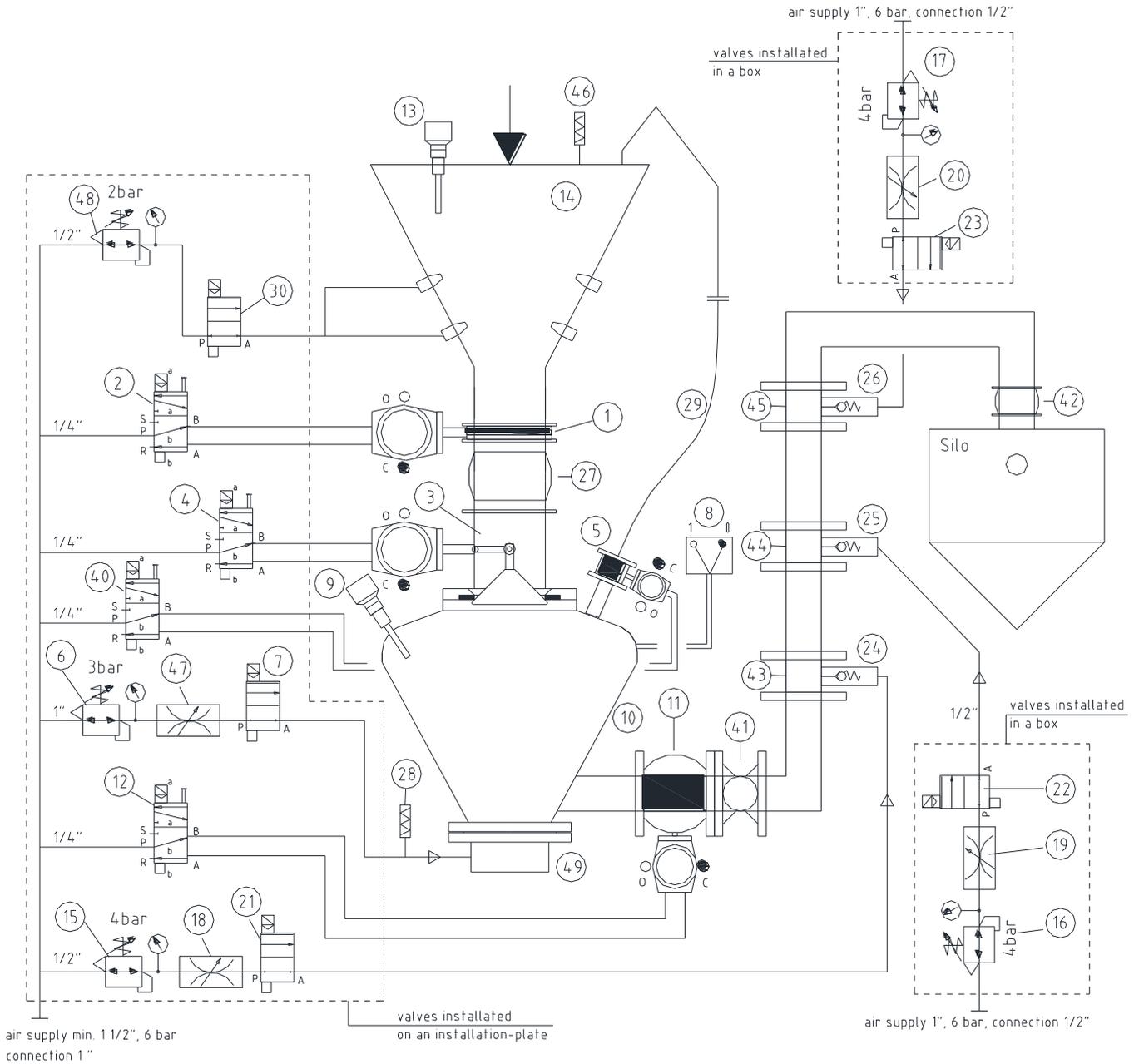
Conveyor empty: pressure sensor with limiting value contact

### Switching functions of the solenoid valves

Solenoid valve-butterfly valve:	5/2 way, 24 V/DC = 1,5W	butterfly valve closed without tension
Solenoid valve-inlet closure:	5/2 way, 24 V/DC = 1,5W	inlet closed without tension
Solenoid valve-aeration:	2/2 way, 24 V/DC = 8W	aeration closed without tension
Solenoid valve-ball valves:	5/2 way, 24 V/DC = 1,5W	outlet closed without tension
Solenoid valve-activators:	2/2 way, 24 V/DC = 8W	activator closed without tension
Solenoid valve-fluidising buffer:	2/2 way, 24 V/DC = 8W	fluidising closed without tension



## 7.4 Functional description conveyor A 500

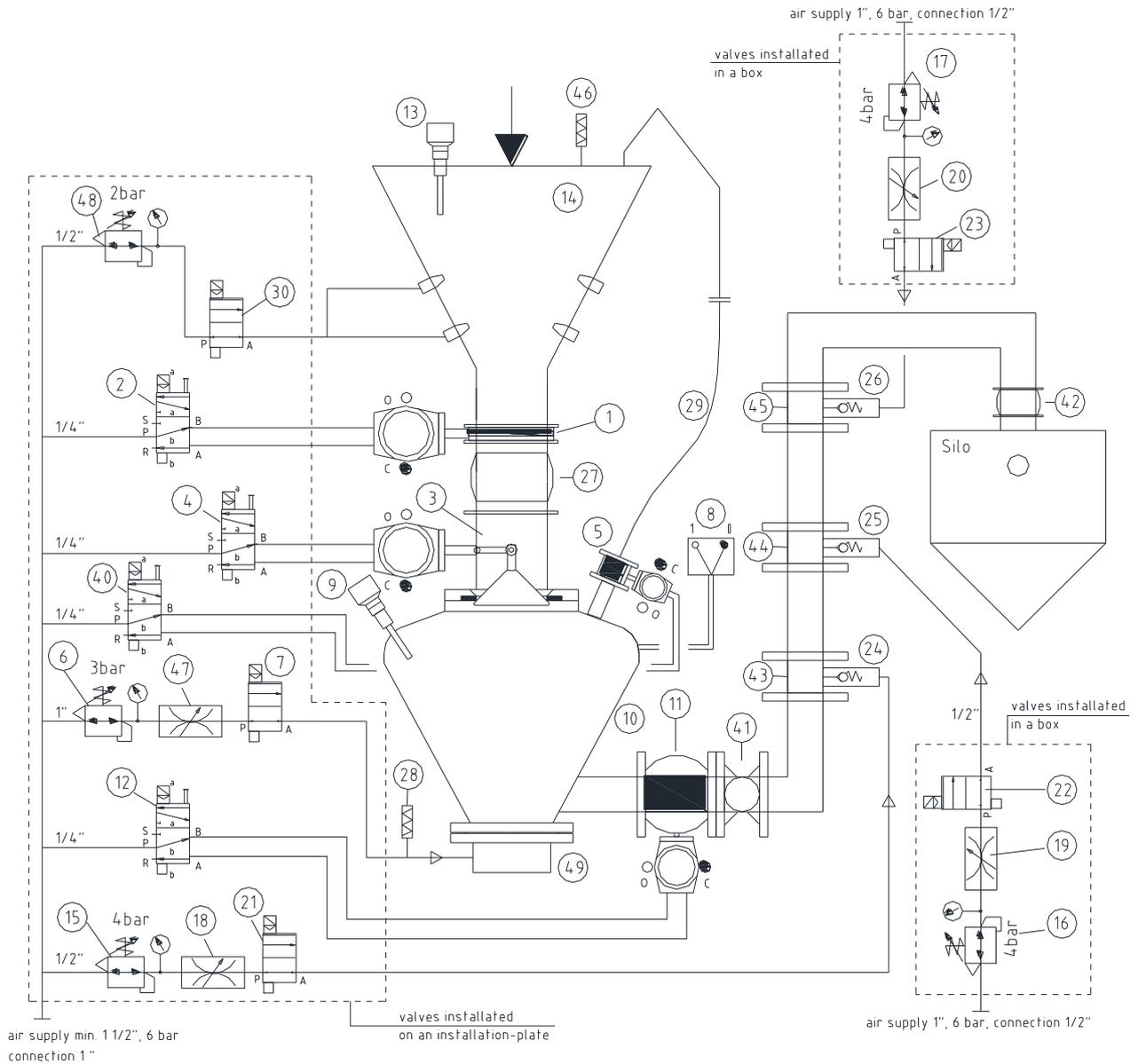




## KKS-numbers in accordance with function diagram, page 33

No.	description	KKS-number-line 1	KKS-number-line 2
01	pre butterfly valve	01ETG20AA101	02ETG20AA101
02	solenoid valve for pre butterfly valve	01ETG20AA101	02ETG20AA101
03	inlet closure	01ETG20AA102	02ETG20AA102
04	solenoid valve for inlet closure	01ETG20AA102	02ETG20AA102
05	butterfly valve for exhaustion	01ETG20AA701	02ETG20AA701
06	pressure regulator for aeration conveyor	01QFC35AA302	02QFC35AA302
07	solenoid valve for aeration conveyor	01QFC35AA302	02QFC35AA302
08	pressure sensor conveyor A 500 empty	01ETG20CP501	02ETG20CP501
09	level indicator conveyor A 500 max.	01ETG20CL103	02ETG20CL103
10	pressure vessel A 500-HT	01ETG20BB002	02ETG20BB002
11	ball valve conveyor outlet	01ETG20AA103	02ETG20AA103
12	solenoid valve for ball valve conveyor outlet	01ETG20AA103	02ETG20AA103
13	level indicator buffer-tank max.	01ETG20CL101	02ETG20CL101
14	buffer-tank	01ETG20BB001	02ETG20BB001
15	pressure regulator aeration activator 1	01QFC35AA303	02QFC35AA303
16	pressure regulator aeration activator 2	01QFC35AA304	02QFC35AA304
17	pressure regulator aeration activator 3	01QFC35AA305	02QFC35AA305
18	air volume regulator aeration activator 1	01QFC35AA503	02QFC35AA503
19	air volume regulator aeration activator 2	01QFC35AA504	02QFC35AA504
20	air volume regulator aeration activator 3	01QFC35AA505	02QFC35AA505
21	solenoid valve aeration activator 1	01ETG20AA403	02ETG20AA403
22	solenoid valve aeration activator 2	01ETG20AA404	02ETG20AA404
23	solenoid valve aeration activator 3	01ETG20AA405	02ETG20AA405
24	non return valve activator 1		
25	non return valve activator 2		
26	non return valve activator 3		
27	compensator	01ETG20BZ001	02ETG20BZ001
28	safety valve	01QFC35AA201	02QFC35AA201
29	metall-flex hose for exhaustion	01ETG20BR501	02ETG20BR501
30	solenoid valve for fluidising 1, buffer-tank	01ETG20AA401	02ETG20AA401
31	air pressure pipe activator 2	01QFC35BR001	02QFC35BR001
32	shut off valve	01QFC35AA501	02QFC35AA501
33	open-end position, pre butterfly valve	01ETG20CG101	02ETG20CG101
34	closed-end position, pre butterfly valve	01ETG20CG102	02ETG20CG102
35	open-end position, inlet closure	01ETG20CG103	02ETG20CG103
36	closed-end position, inlet closure	01ETG20CG104	02ETG20CG104
37	open-end position, ball valve conveyor outlet	01ETG20CG105	02ETG20CG105
38	closed-end position, ball valve conveyor outlet	01ETG20CG106	02ETG20CG106
39	conveying-pipeline DN 65	01ETG20BR101	02ETG20BR101
40	solenoid valve for butterfly valve/exhaustion		
41	inspection glass	01ETG20BR001	02ETG20BR001
42	compensator	01ETG20BR001	02ETG20BR001
43	activator / booster 1	01ETG20BN101	02ETG20BN101
44	activator / booster 2	01ETG20BN102	02ETG20BN102
45	activator / booster 3	01ETG20BN103	02ETG20BN103
46	over,-under pressure valve, buffer-tank	01ETG20BZ002	02ETG20BZ002
47	air volume regulator for aeration-conveying	01QFC35AA502	02QFC35AA502
48	pressure regulator fluidising, buffer-tank	01QFC35AA301	02QFC35AA301
49	fluid bottom		

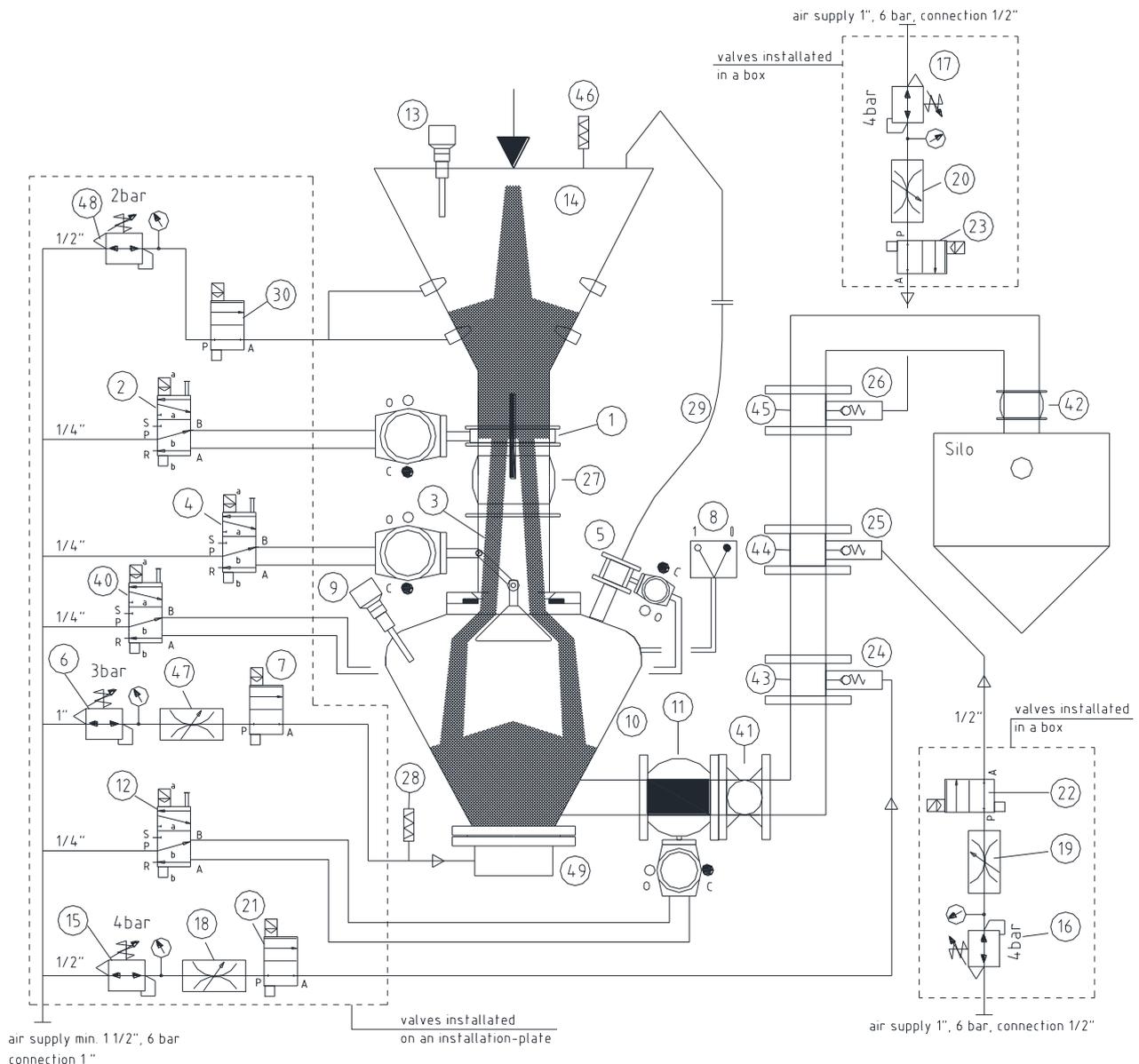
### 1.0 Adjustment



- 1.1** Adjust air pressure at pressure regulator ( 6 ) to 3 bar  
Adjust air pressure at pressure regulator ( 15 ) to 3 bar. The same adjusting at all built in activators
- 1.2** Adjust min contact at pressure sensor ( 8 ) to 0,3 - 0,5 bar as described in single description. The right adjustment has to be make during start up
- 1.3** At first testing all functions without material by hand pressing the solenoid valves  
Adjusting or testing Max probe acc. to the separate description
- 1.4** Open the air volume regulator ( 47 ) ( appr. 5 turns anti clockwise)
- 1.5** Open the air volume regulator ( 18 ) at all installed activators ( 43 ) in the conveying tube ( appr. 5 turns anti clockwise)

**Attention!** It is of utmost importance that the manual levers are placed afterwards in the O-position as otherwise the automatic mode does not work.

## 2.0 Filling sequence



**2.1** Start conveyor.

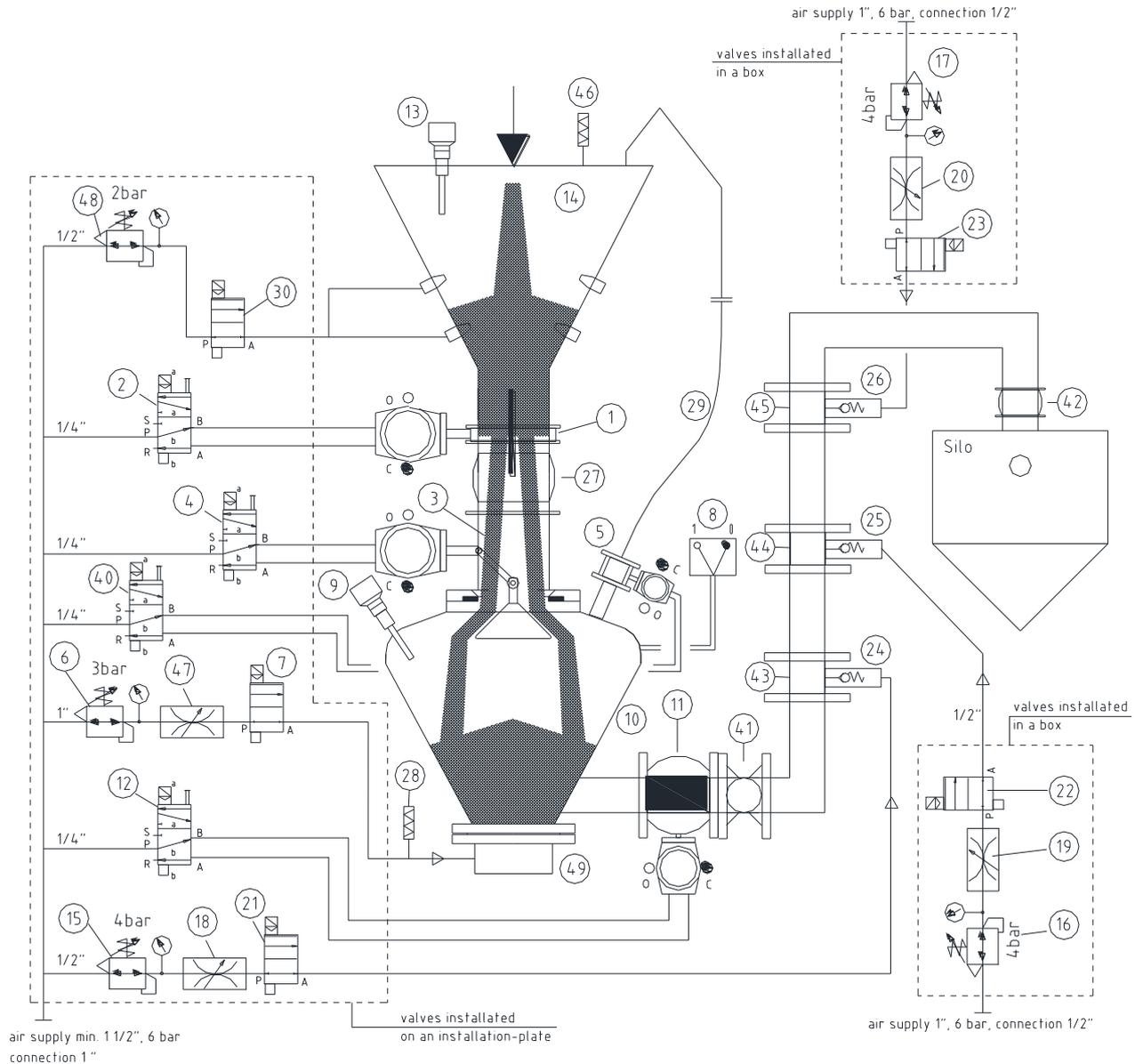
**2.2** Ball valve conveyor outlet ( 11 ) is closed. Solenoid valve ( 12 ) without tension. Limit switch indicates closed.

**2.3** Exhaustion valve ( 5 ) opened. Solenoid valve ( 40 ) with tension. Limit switch indicates open.

**2.4** Exhaustion time starts ( appr. 10 sec )

**2.5** Exhaustion time has run down. Inlet closure ( 3 ) opens. Solenoid valve ( 4 ) with tension. Limit switch indicates open. The inlet closure may be only opened when the pressure in the vessel is  $P = 0$

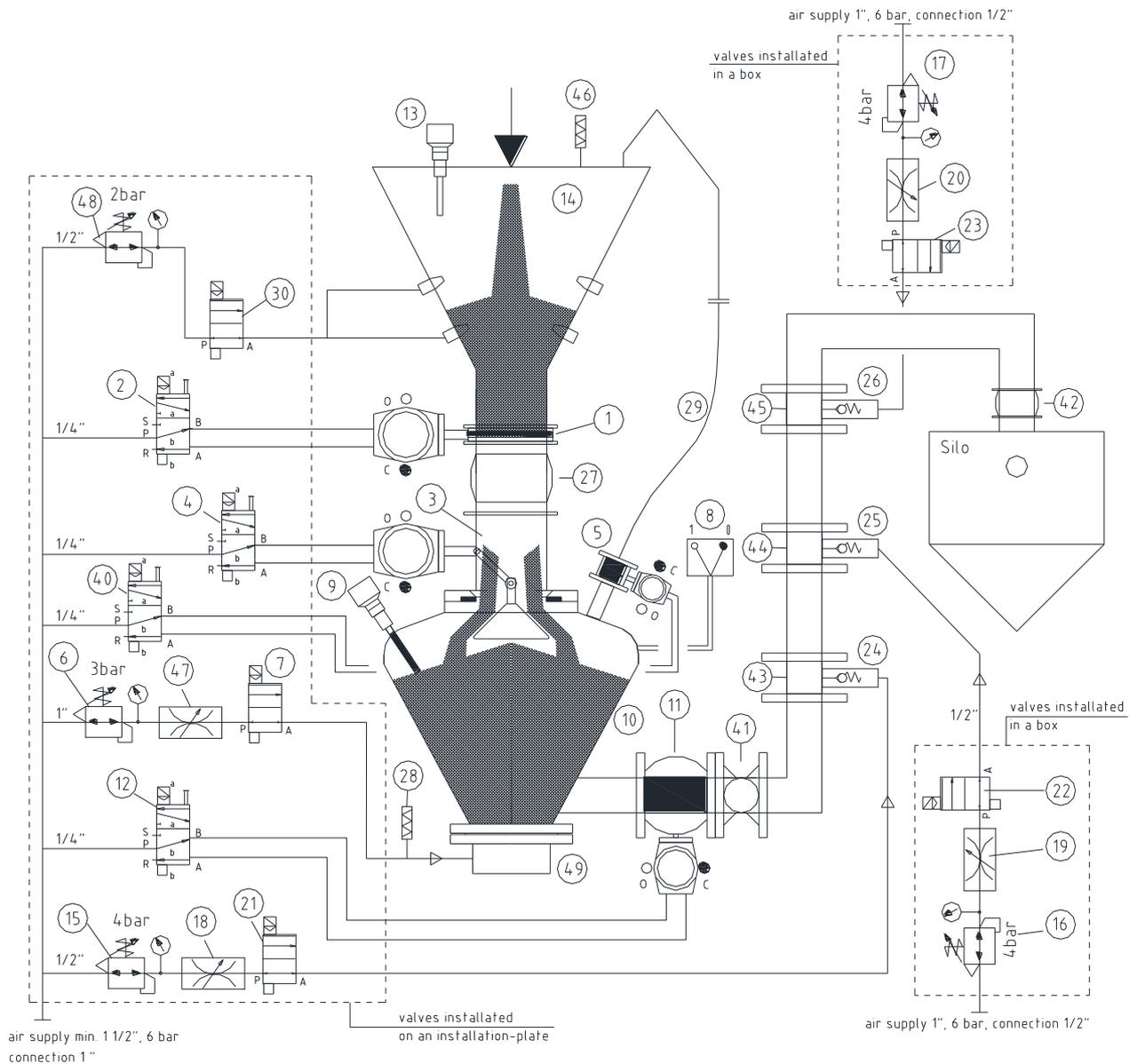
**2.6** Times started ( approx. 3 sec )



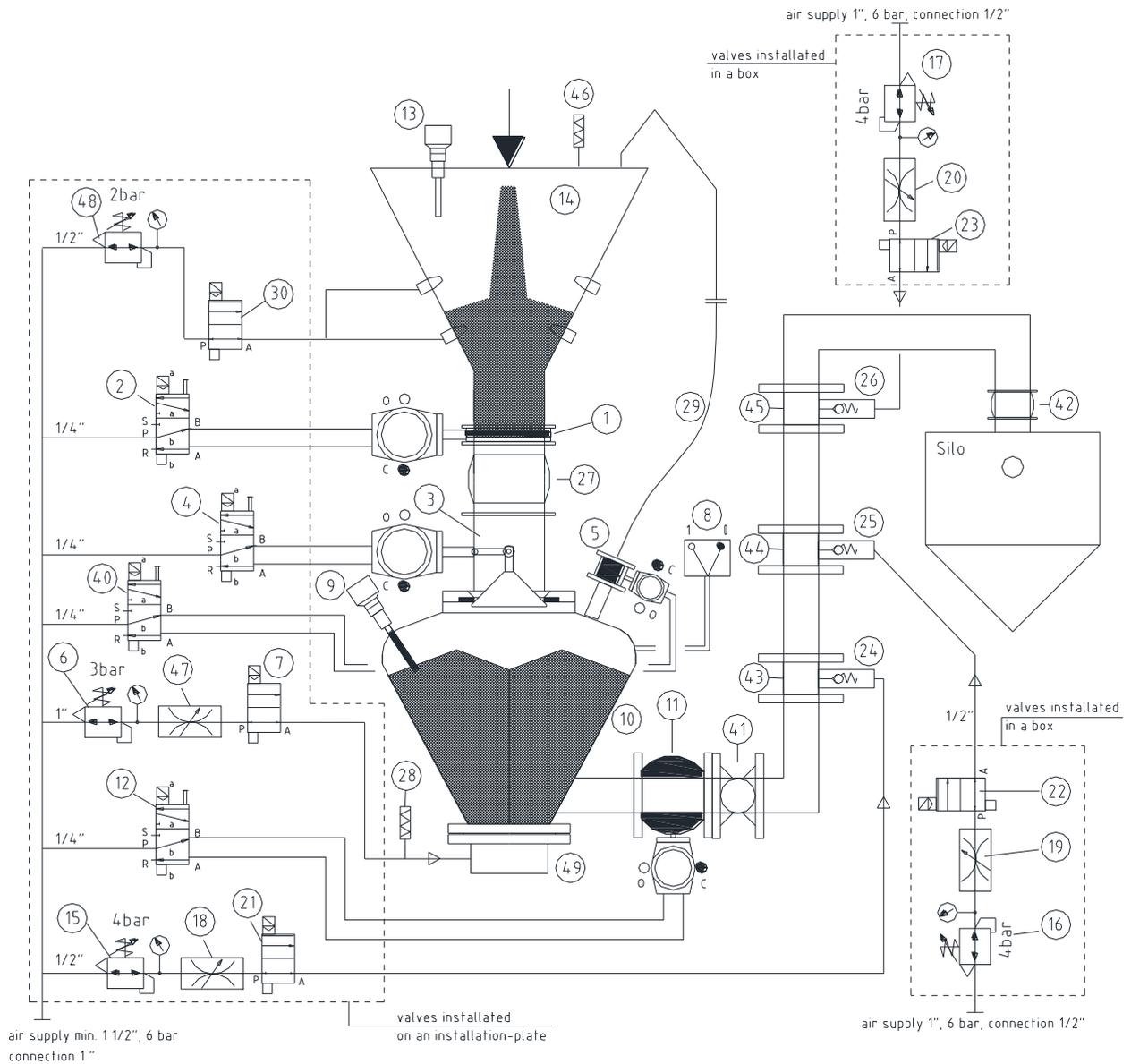
- 2.7** Times has run down.  
Pre butterfly valve ( 1 ) opens. Solenoid valve ( 2 ) with tension. Limit switch indicated open.
- 2.8** Solenoid valve ( 30 ) for injector nozzles at the cone of the buffer tank opens discontinued.  
(appr. 0,5 - 1 sec. open and 30 sec. break)  
Solenoid valves open with tension.  
The injection serves as run help and fluidising in the cone of the buffer tank.
- 2.9** Pressure vessel ( 10 ) gets filled.
- 2.10** The displaced air of the pressure vessel escapes via the opened exhaustion valve (5)



### 3.0 Closing sequence

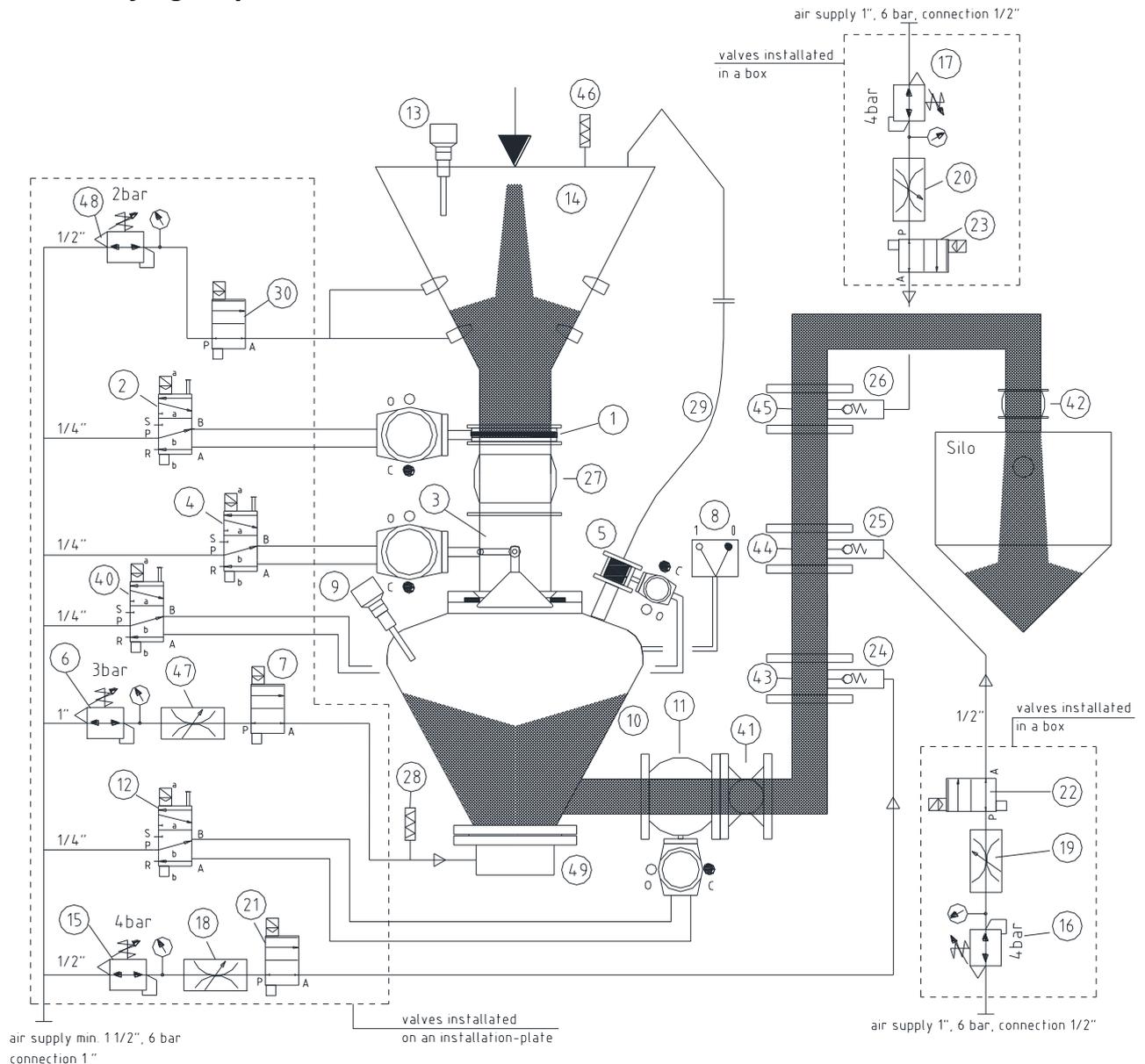


- 3.1** Max-probe ( 9 ) is reached.  
Pre butterfly valve ( 1 ) closed. Solenoid valve ( 2 ) without tension.  
Limit switch indicates closed.
- 3.2** Solenoid valve ( 30 ) for injector nozzles closed.  
Solenoid valve without tension.
- 3.3** The remaining material still falls into the pressure vessel.
- 3.4** Time started ( approx. 3 - 5 sec. )



- 3.5** Time has run down.  
Inlet closure ( 3 ) closed. Solenoid valve ( 4 ) without tension. Limit switch indicates closed.
- 3.6** Exhaustion valve ( 5 ) closed. Solenoid valve ( 40 ) without tension.  
Limit switch indicates closed.
- 3.7** Ball valve conveyor outlet ( 11 ) opens. Solenoid valve ( 12 ) with tension.  
Limit switch indicates open.

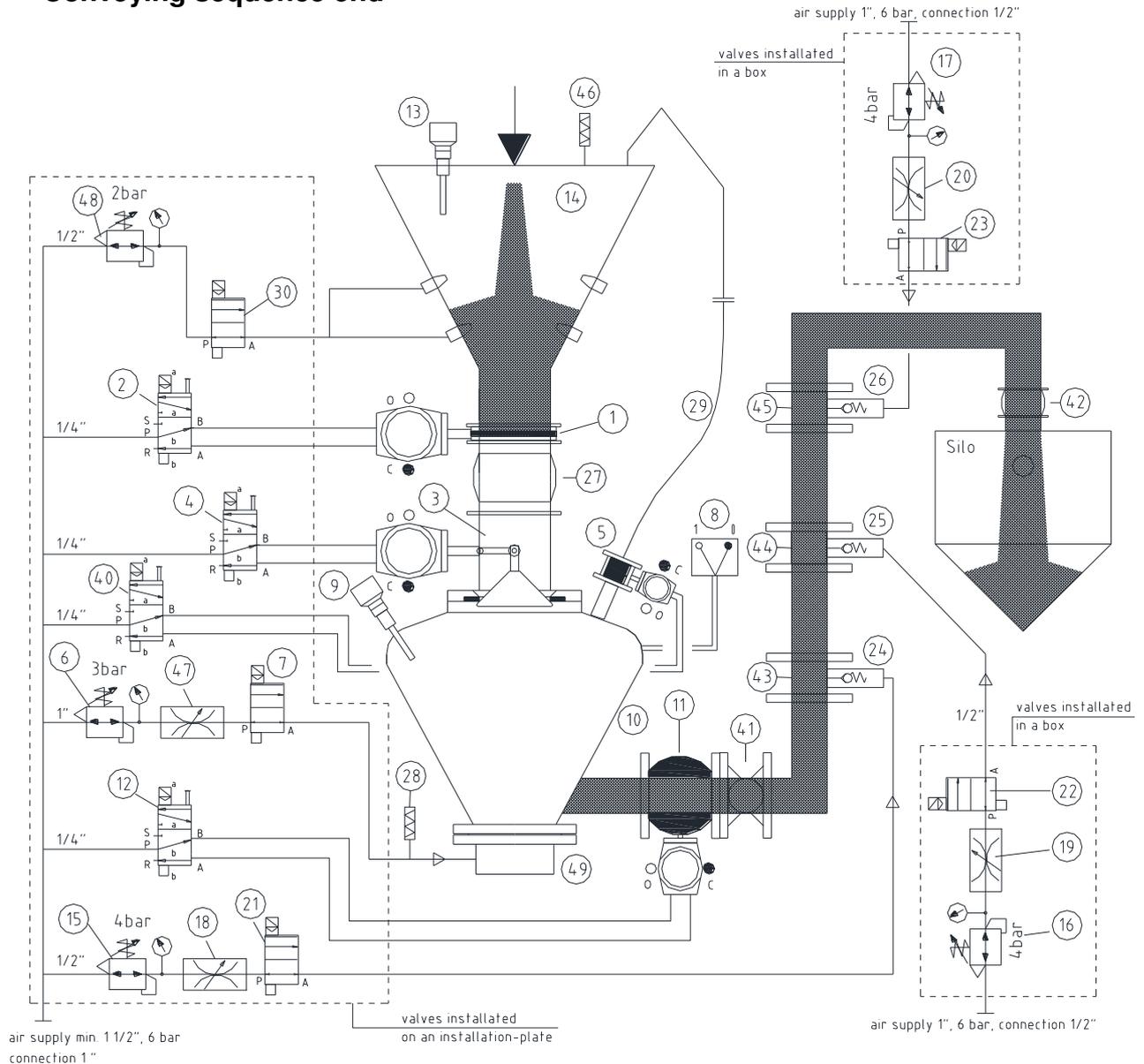
### 4.0 Conveying sequence start



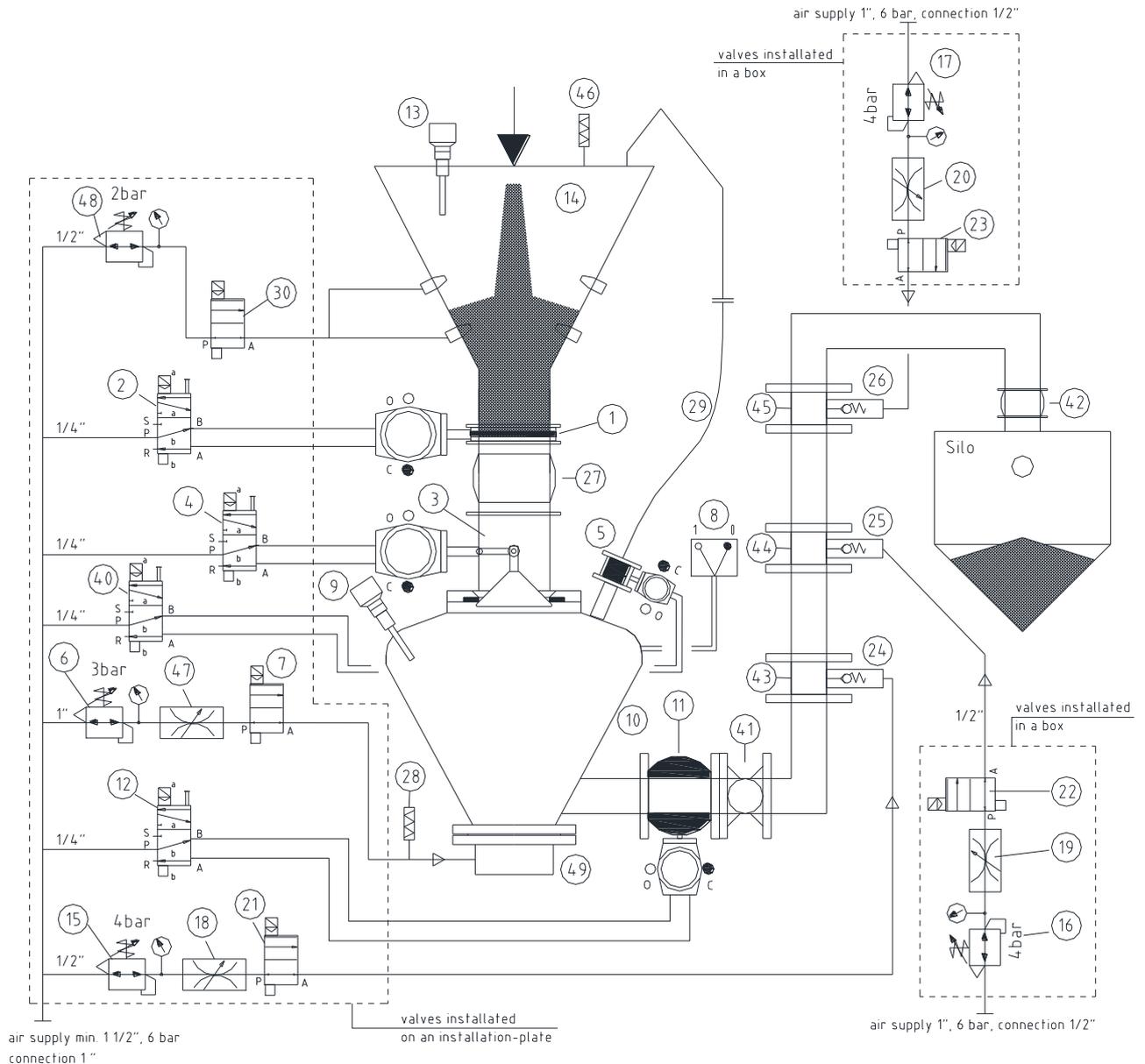
- 4.1 Solenoid valve for aeration ( 7 ) opens. Pressure vessel ( 10 ) is set under pressure via fluid bottom ( 49 ). All solenoid valves ( 21,22,23 ) of all installed activators ( 43,44,45 ) in the conveying pipe opens too.
- 4.2 Time for conveying time starts ( approx. 60 - 90 sec., due to conveying distance ). (The exact time will be adjusted during the start up).
- 4.3 Breakdown time started ( approx. 5 min. )
- 4.4 Material is fluidized at the aeration bottom ( 49 ) and blown with rising pressure trough the conveying pipe to the receiving silo. (The conveying speed is approx. 20 - 25 m/sec.)
- 4.5 Pressure overcomes the min- contact of the pressure sensor ( 8 ).
- 4.6 MAX-probe ( 9 ) is uncoverd.



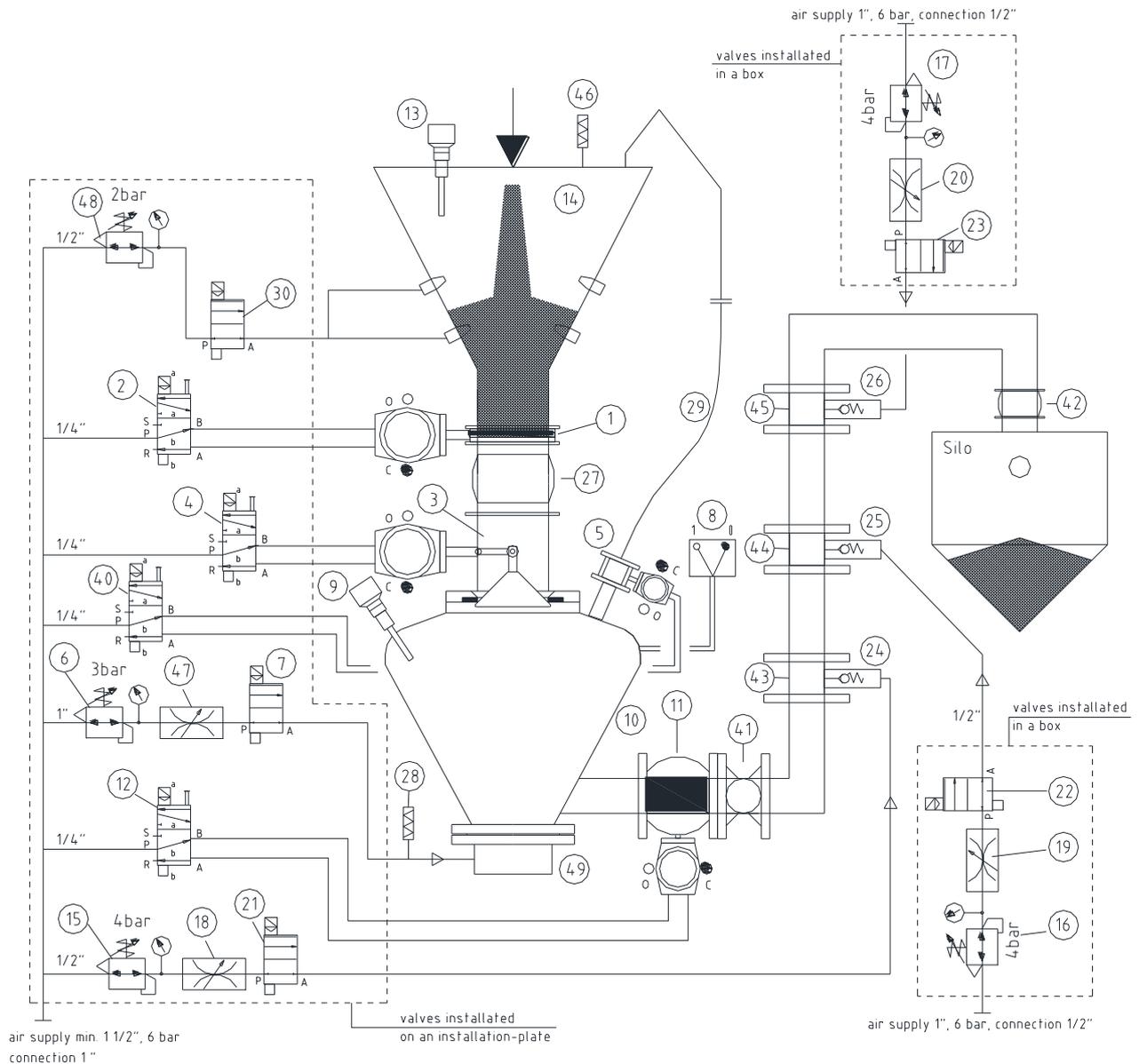
### 5.0 Conveying sequence end



- 5.1** Pressure vessel ( 10 ) becomes empty.
- 5.2** Time for conveying has run down.
- 5.3** When the conveying pressure has fallen down under the adjusted min-pressure after the time relais for conveying time runs down, the conveying pipe is empty. Additional conveying time started ( approx. 20 sec. ), the exact time will be adjusted during the start up. (Continued 5.5)
- 5.4** If the level of the conveying pressure is still higher than the adjusted min-pressure, the conveying pipe is not empty and the pressure sensor ( 8 ) takes control of the aeration.



- 5.5 Conveying pipe becomes empty. Pressure at pressure sensor ( 8 ) falls down and uncovered min pressure contact. Additional conveying time starts ( appr. 20 sec. ), the exact time will be adjusted during the start up.
- 5.6 Additional conveying time has run down. Aeration valve ( 7 ) and all solenoid valves ( 21,22,23 ) for parallel switched activators closed. Solenoid valves without tension. Conveying is still finished.
- 5.7 Breakdown time runs back to 0-Position.

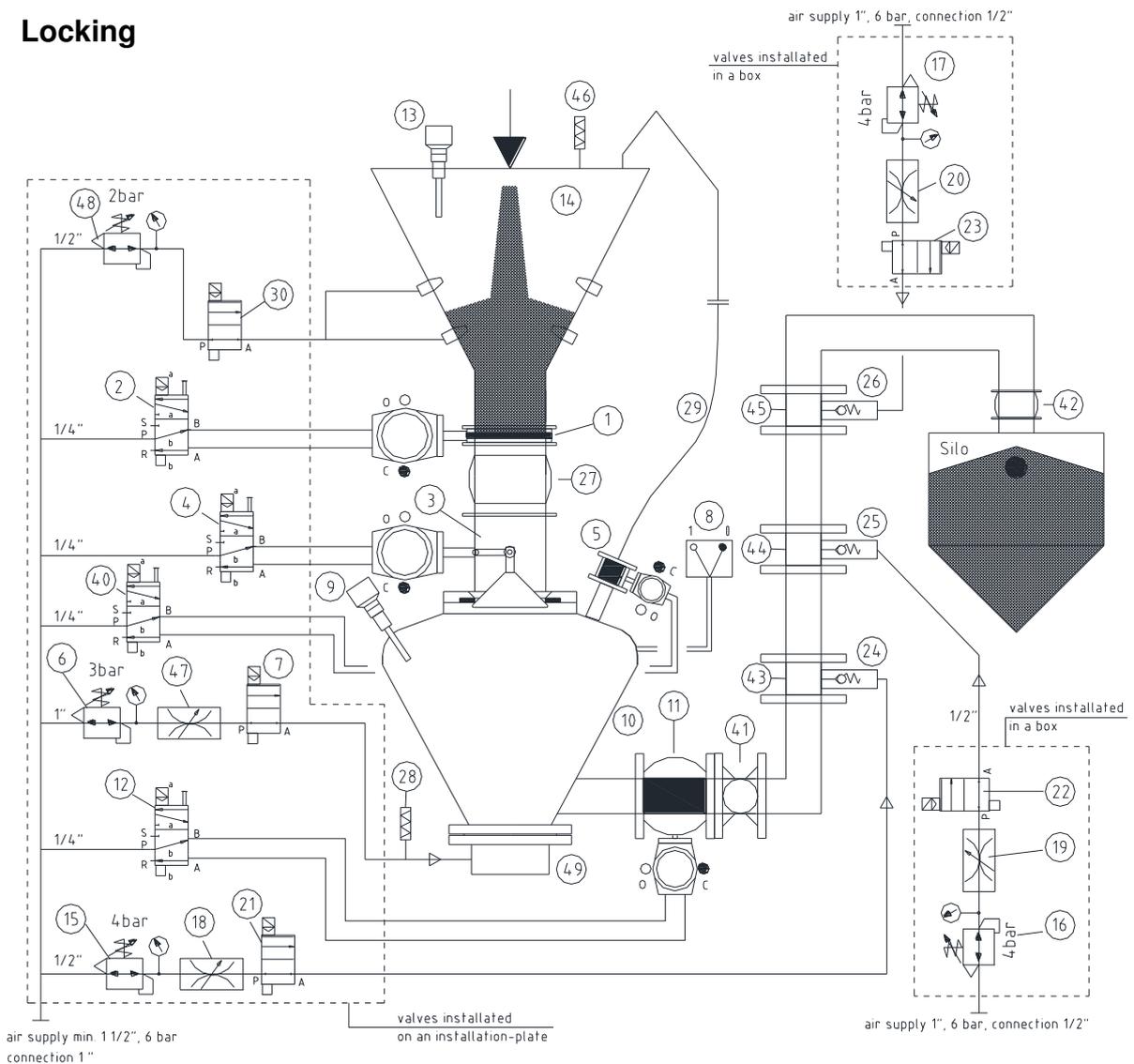


- 5.8** Ball valve conveyor outlet ( 11 ) closed.  
Solenoid valve ( 12 ) without tension.  
Limit switch indicates closed.
- 5.9** Exhaustion valve ( 5 ) opens Solenoid valve ( 40 ) with tension.  
Limit switch indicates open.  
Time for exhaustion started ( approx. 10 sec. )

Following sequences as described from pos 2.5



### 6.0 Locking



- 6.1 Under automatic operation sequences 2.4 - 5.9 operate successively.
- 6.2 If the max-probe in silo is reached, the conveyor must be locked to stop further conveying. An already started conveying cycle from ( 4.1 ) has to be finished, up to ( 5.9 )
- 6.3 After the max probe in the silo is uncovered the conveyor will be restarted.
- 6.4 If the filtration installation is disconnected at the end of work, the enable signal for the conveying plant is omitted. In order to avoid a caking or in wintertime a freezing of the material being perhaps already inside the plant, the conveyor starts now a conveying cycle without the max-probe in the conveyor has been reached. Having once finished the conveying cycle, the empty conveyor is locked and stands still.

For further details please look at the description off the main control.

### Note



**Jamming of conveying tube can be caused by interruption of a started conveying cycle**



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## 7.6 Maintenance Remarks

The maintenance activities herunder described serve to prolongate the service life of the installation/machine. Moreoever, the availEMility and the efficacy are increased.

### 7.6.1 Deaeration of conveying system

**! Danger of injuries !**



**Before opening the conveying system for maintenance purposes, it must be made at any reate pressure-less. Danger due to material parts spinning out and around.**

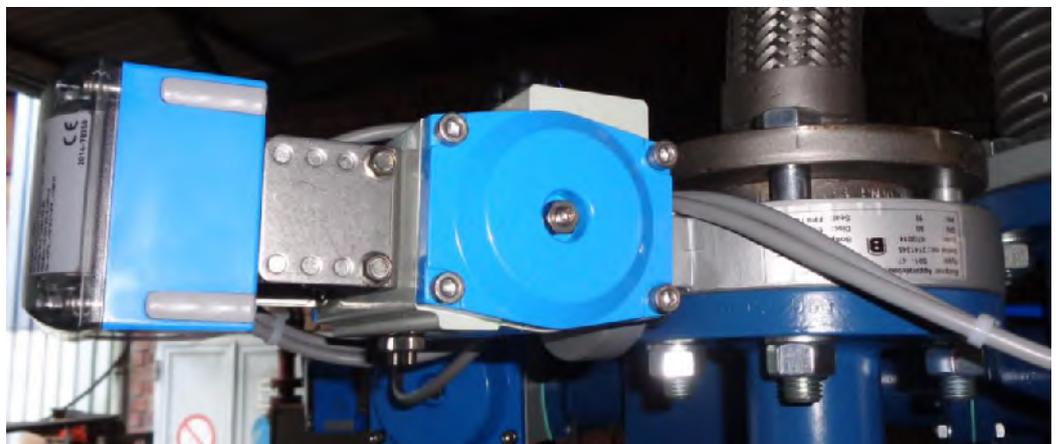
#### 7.6.1.1 In Normal Operating Mode

- Shut off the product feeding above the conveyor
- In case the conveyor is just transporting, wait until the conveying cycle with deaerating has been finished. Then switch off the conveyor at the control cabinet.
- Close the shut off device in the compressed air supply.
- Interrupt the electric current supply.

#### 7.6.1.2 In Case of Malfunction

In case the conveyor shows a malfunction, the conveying system can still be under pressure. This may for example occur if the conveying pipe is blocked. Do proceed as follows when deaerating:

- Switch off the conveyor at the control cabinet. Valves become tensionless and can thus be manipulated by hand
- Shut off the product feeding above the conveyor.
- Open the butterfly valve for exhaustion.



Thus the aerating valve and the conveyor are deaerated.  
**ATTENTION: the pipes may still be under pressure !**



- Close the shut off device in the compressed air supply.
- Interrupt the current supply.
- Search for the reason of the malfunction and eliminate it.

**Place the manual actuator level at any rate again in the automatic position once the malfunction elimination has been successfully completed.**

## 7.7 Maintenance and up-keep

### 7.7.1 Maintenance intervals

Besides monitoring and if necessary correcting the during the start-up phase adjusted times and pressures, it is important to maintain the Installation/machine (conveyor) completely in regular intervals. Special attention has to be paid to the following parts:

- Pre butterfly valve
- Inlet closure
- Butterfly valve for exhaustion
- Ball valve for conveyor outlet
- Fluid bottom
- Activators

**! Attention !**



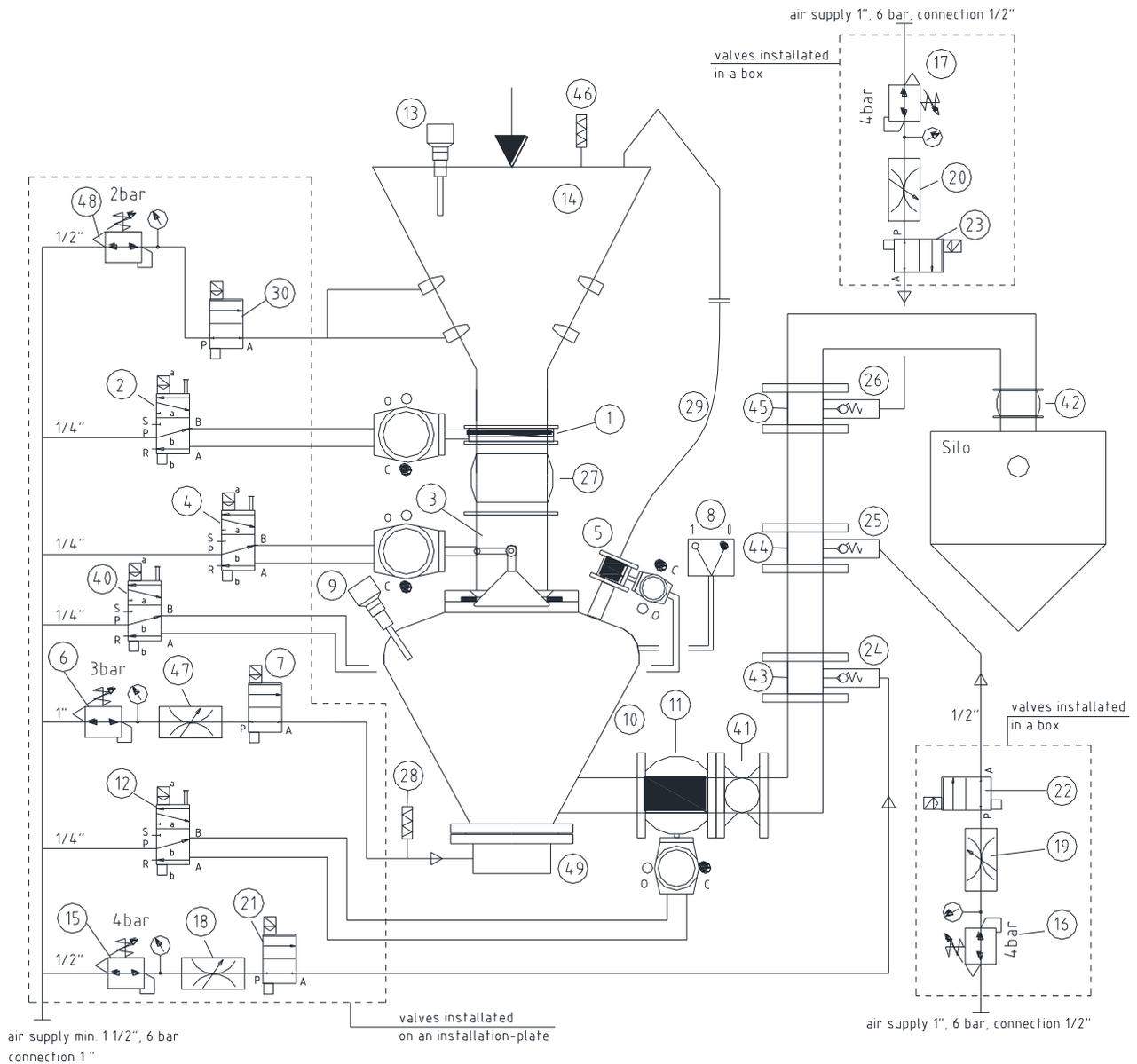
**Control permanently the times of the conveyor adjusted during the start up phase and correct them if necessary. Recomendable is a daily check directly after the start-up as long as the times do no longer change. After that a weekly control is recommended.**

**Not regularly running conveying cycles cause an increased wear of the conveying tubes.**

During maintaining the corresponding machine parts have to be cleaned.



## Giessereitechnik



pos.	description	intervall
1	Pre butterfly valve	3 monthly
3	Inlet closure	3 monthly
5	Butterfly valve for exhaustion	6 monthly
49	Fluid bottom	3 monthly
11	Ball valve for conveyor outlet	3 monthly
	all activators	6 monthly
	all solenoid valves at conveyor and activators	monthly



## 7.7.2 Pre butterfly valve

### Check

- Check weekly in an acoustic way the leakproof/tightness of the valve. If the vessel is under pressure. Burbbling air noises proof if there are leakages. Change the valve in case of leakages.
- Every 3 months at the latest an optic control should be effected at the dismantled valve

### Change

- Deaerate the conveying system according to chapter „deaerate conveying system



- Close the shut off device in the compressed air supply
- Mark the compressed air hoses of the compressed air cylinder
- Loosen the compressed air hoses
- Loosen the fixing screws  
**Make sure that the sender is not under pressure !**
- Loosen the screws a the feeding pipe above the sender and remove the pipe .
- Lift the valve of the sender.
- Change the flaps and/or the seal insert according to the following reparation instruction.
- Lift the flaps in their correct position onto the sender and fix all supply rubes and screwed connections. Screw the screws cross-wise tight.
- Connect the compressed air hoses again according to their markings and open the compressed air supply
- before switching on the sender, make a functioning control (manual actuating at solenoid valve 2).



Switch appr. 45° down (automatic operating)



Switch appr. 45° to top, (manual operating)



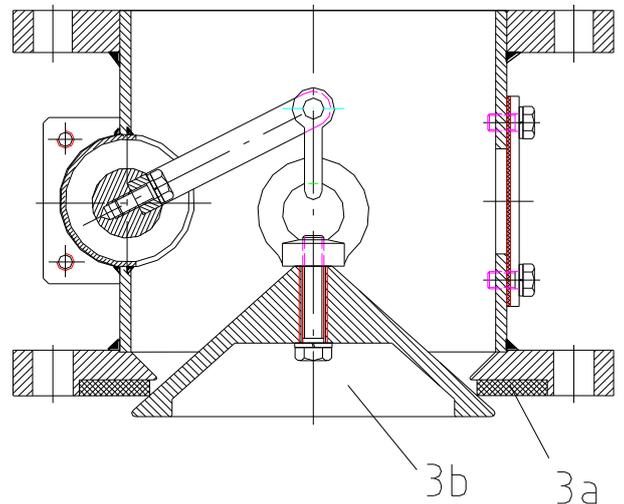
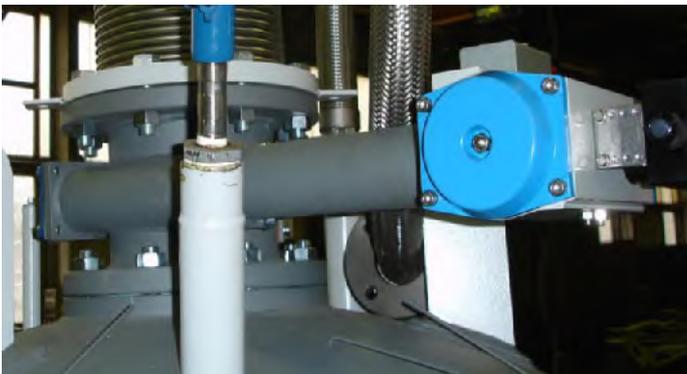
## 7.7.3 Inlet closure AKP 200

### Check

- Check weekly in an acoustic way the leakproof/tightness of the inlet closure if the vessel is under pressure. Burbbling air noises proof if there are leakages. Change the closure in case of leakages.
- Every 3 months at the latest an optic control should be effected at the dismantled inlet closure

### Change

- Deaerate the conveying system according to chapter „exhaustion conveying system
- Close the shut off device in the compressed air supply
- Mark the compressed air hoses of the compressed air cylinder
- Loosen the compressed air hoses
- Loosen the fixing screws  
**Make sure that the conveyor is not under pressure !**
- Loosen the screws a the feeding pipe above the conveyor and remove the pipe .
- Lift the inlet closure of the conveyor.
- Change the seals 3a and/or the cone 3b



- Lift the inlet closure in the correct position onto the conveyor and fix all supply tubes and screwed connections. Screw the screws cross-wise tight.
- Connect the compressed air hoses again according to their markings and open the compressed air supply
- before switching on the conveyor, make a functioning control (manual actuating at solenoid valve 4).



## 7.7.4 Butterfly valve for exhaustion

### Check

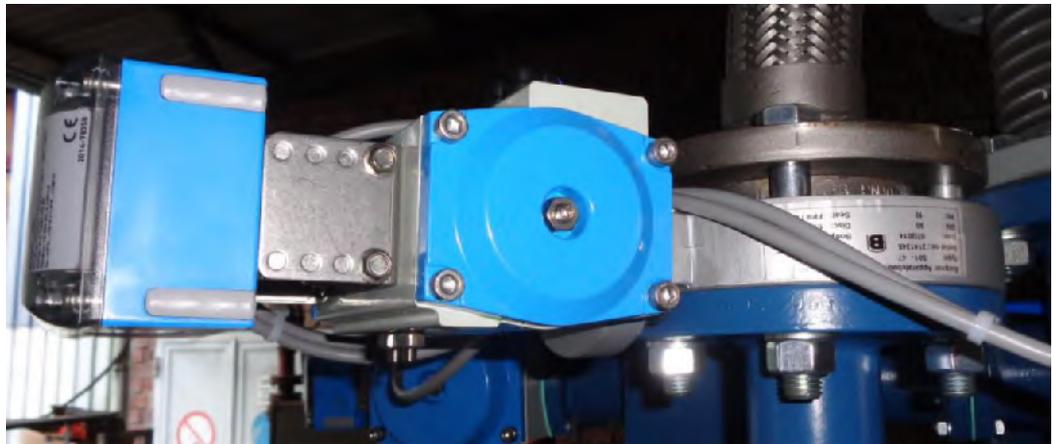
- Check weekly in an acoustic way the leakproof/tightness of the exhaustion butterfly valve if the vessel is under pressure. Bubbling air noises proof if there are leakages. Change the valve in case of leakages.
- Every 6 months at the latest an optic control should be effected at the dismantled valve.

### Change

- Deaerate the conveying system according to chapter „deaerate conveying system



- Close the shut off device in the compressed air supply.
- **Make sure that the system is not under pressure!**
- Loosen the exhaustion hose from the exhaustion valve.
- Unscrew the exhaustion valve from the conveyor.
- Change the valve and/or the seal insert according to the following reparation instruction.



- Screw the repaired valve again onto the conveyor
- Fasten the exhaustion hose.



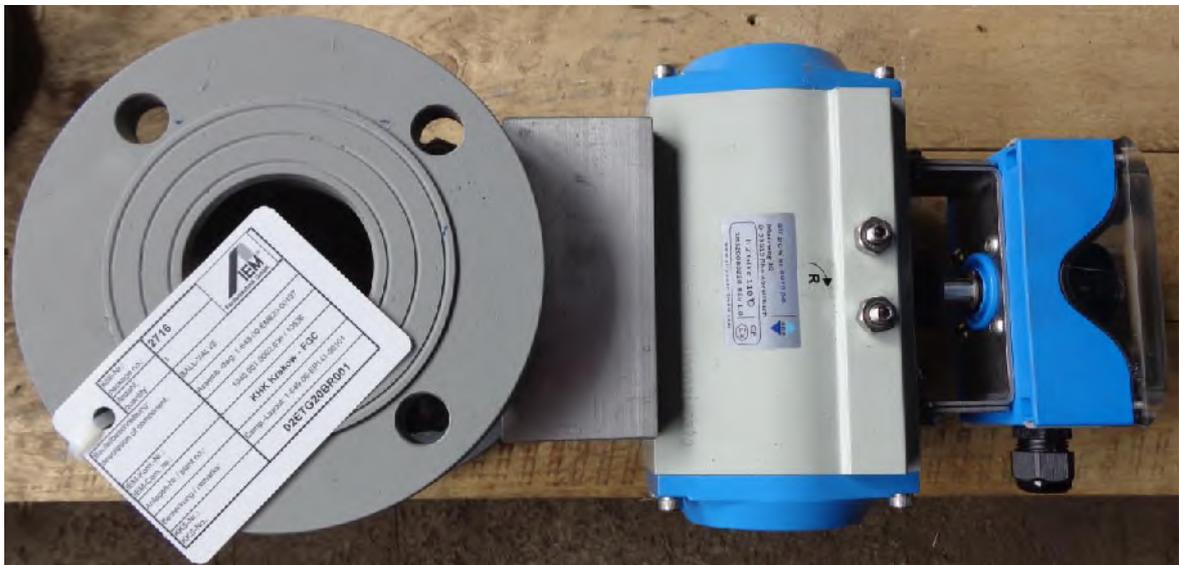
## 7.7.5 Ball valve conveyor outlet KGH 65

### Check

- Check weekly in an acoustic way the leakproof/tightness of the ball valves if the vessel is under pressure. Burbling air noises proof if there are leakages. Change the closure in case of leakages.
- Every 3 months at the latest an optic control should be effected at the dismantled ball valve

### Change

- Deaerate the conveying system according to chapter „exhaustion conveying system
- Close the shut off device in the compressed air supply
- Mark the compressed air hoses of the air cylinder
- Loosen the exhaustion hose
- Loosen the fixing screws  
**Make sure that the conveyor is not under pressure !**
- Lift the ball valve of the conveyor.
- Change the complete ball valve our single spare parts accorded with the single operating instruction for ball valves.



- Lift the ball valve in the correct position onto the conveyor and fix all supply tubes and screwed connections. Screw the screws cross-wise tight.
- Connect the compressed air hoses again according to their markings and open the compressed air supply
- before switching on the conveyor, make a functioning control (manual actuating at solenoid valve 13 ).



## 7.7.6 Fluid bottom DN 300

### Check

- Check monthly the fluid bottom.

### Change

- Deaerate the conveying system according to chapter „Deaerating conveying system“.
- Close the shut off device in the compressed air supply.



- **Make sure that the conveyor is not under pressure !**
- Loosen the compressed air hose at the bottom part of sender.
- loosen the fixing screws at connection flange at the lower part of the conveyor and take out the fluid bottom



- change the complete fluid bottom or necessary parts
- Screw the flange back to its correct position under the conveyor and tighten all screws. Use if necessary new seals. Tighten the screws cross-wise.
- Reconnect the compressed air hose.



## 7.7.7 Activator / booster conveying pipe

### Check

- Check the activator every 6 months as to tear and wear. To do so, the activator has to be removed out of the tube. In case of wear or tear build in a new activator.
- Check monthly the functioning of the nonreturn valve at the activator. By switching the manual actuator of the solenoid valve when machine is stopped, it is possible to hear if the air streams through the nonreturn valve into the tube. In automatic mode the streaming noises can also be heard. If there are no such noises, the nonreturn valve has to be changed.

### Change



- Deaerate the conveying system according to chapter „deaerating Conveying system“
- Close the shut off device in the compressed air supply to the activator.
- **Make sure that the system is not under pressure !**
- Loosen the compressed air supply.
- Loosen the plug for the electric supply.
- Unscrew the compressed air installation from the activator.
- Unscrew the defective nonreturn valve from the compressed air installation.
- Screw the new nonreturn valve in the correct flow-through direction to the compressed air installation. Use new seal tape.
- Screw the compressed air installation against to the activator.
- Reconnect the compressed air installation.
- Reconnect the plug for the electric supply
- Do make a functioning control (manual actuation at the solenoid valve) before restarting the sender.



(Automatic operation)



(manual operation)



## 7.8 Malfunctions / Elimination of Malfunctions

In case of a malfunction check before searching for the error if the electric and pneumatic energy supply is sufficient.

**Occured malfunctions have to be reported immediately to the Department in charge. If necessary the installation/machine has to be shut down and to be secured. Make a trained specialist to eliminate the malfunction immediately.**

Malfunction	Possible Reasons	Measures
7.8.1 Filling of conveyor		
7.8.1.1 Filling time too long	<ul style="list-style-type: none"> <li>• max signal of conveyor not given</li> <li>• possible foreign substances in supply duct</li> <li>• pre butterfly valve has not opened</li> <li>• inlet closure has not opened</li> </ul>	<ul style="list-style-type: none"> <li>• check</li> <li>• check</li> <li>• check solenoid valve check air cylinder</li> <li>• check solenoid valve check air cylinder</li> </ul>
7.8.2 Transport (conveying)		
7.8.2.1 Conveying time too long efficiency too low	<ul style="list-style-type: none"> <li>• net pressure too low</li> <li>• pressure regulator not correctly adjusted</li> <li>• nonreturn valve at activator defective</li> <li>• conveying tube blocked</li> </ul>	<ul style="list-style-type: none"> <li>• eliminate malfunction</li> <li>• adjust again</li> <li>• change valve</li> <li>• see point 7.8.2.3</li> </ul>
7.8.2.2 Conveying cycle does not end	<ul style="list-style-type: none"> <li>• pressure sensor at the conveyor does not acutate</li> </ul>	<ul style="list-style-type: none"> <li>• adjust again</li> </ul>
7.8.2.3 conveying tube blocked	<ul style="list-style-type: none"> <li>• material is wet/humid</li> <li>• compressed air is wet/humid</li> </ul>	<ul style="list-style-type: none"> <li>• check, eliminate reason</li> <li>• check, eliminate reason</li> </ul>
7.8.2.4 material in exhaustion tube	<ul style="list-style-type: none"> <li>• exhaustion valve not tight</li> </ul>	<ul style="list-style-type: none"> <li>• check and if necessary repair</li> </ul>



## 7.9 Technical datas pneum. conveyors A 500

This operating manual describes the pneumatic conveying system for filter dust, in particular the pneumatic conveyor A 500 with its accessories built in this installation. The following data must correspond to those indicated on the type plate of the conveyor (in bold letters)

Designation of type	Pneumatic conveyor <b>A 500-HT</b>
Order no.	<b>201678AA</b>
Factory no.	<b>1178</b>
Year of construction	<b>2014</b>
Weight *	appr. 450 kg
Capacity	<b>650 ltr.</b>
Useful contents	500 ltr.
Admissible operating temperature *	<b>180° C</b>
Admissible static operating overpressure	<b>6 bar</b>
Admissible dynamic operating pressure	0 – 5 bar
Tension valves	24 V
Level indication max.	24 V
Admissible conveying product temperature	appr. 160°C

\* does only refer to conveyor

Designation of type	Pneumatic conveyor <b>A 500-HT</b>
Order no.	<b>201678AA</b>
Factory no.	<b>1179</b>
Year of construction	<b>2014</b>
Weight *	appr. 450 kg
Capacity	<b>650 ltr.</b>
Useful contents	500 ltr.
Admissible operating temperature *	<b>180° C</b>
Admissible static operating overpressure	<b>6 bar</b>
Admissible dynamic operating pressure	0 – 5 bar
Tension valves	24 V
Level indication max.	24 V
Admissible conveying product temperature	appr. 160°C

\* does only refer to conveyor

### Manufacturer's Declaration

For this types of conveyors a manufacturer's declaration according to the EC machine regulations EG 97/23 was given.

A copy of this manufacturer's declaration is enclosed to this documentation.



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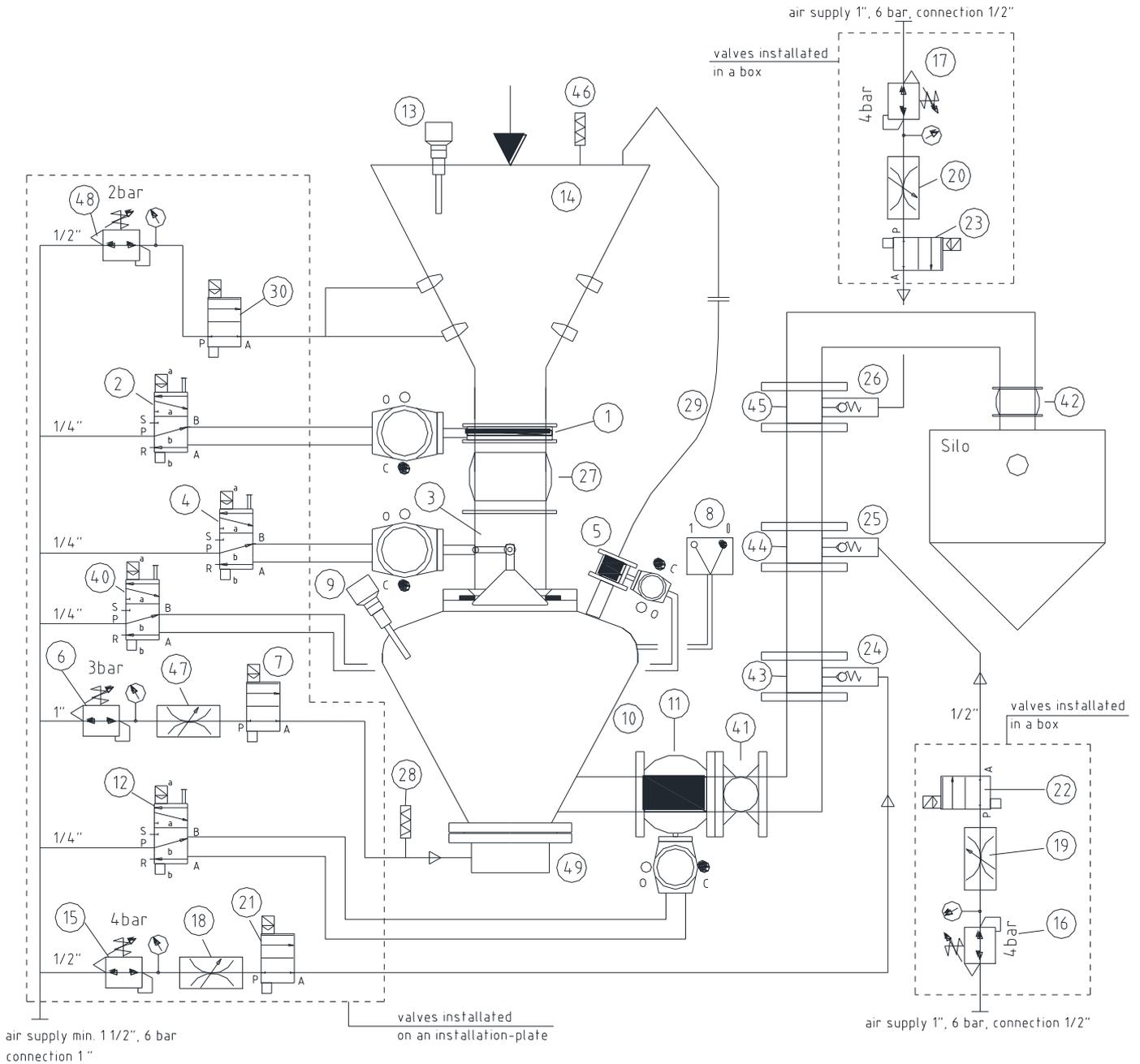
## 8 Spare parts

sheet	description	E-List
8.1	Pneumatic conveyor A 500-HT	E 192-HT-201678
8.2	Fluid bottom DN 300-HT	E 136-300
8.3	Pre butterfly valve DN 200-HT	E 175-HT
8.4	Inlet closure AKP 200-HT	E 195/200.1-HT
8.5	Butterfly valve DN 50 for exhaustion	E 175/50
8.6	Activator / booster DN 65 - A	E 71/80.1
8.7	Ball valve KGH 65 for conveyor outlet	E 67/80
8.8	Metal compensator DN 200	
8.9	Metal compensator DN 80	
8.10	Conveying tube DN 65 x 6m	
8.11	Bending pot DN 65-90°	
8.12	Inspection glass DN 65	



## 8.1 Pneumatic conveyor A 500-HT

E 192-201678





## Spare part list A 500-HT

part	qty	description	order no.	make	sp.pa- list	article no.	price/p c €
1	1	pre butterfly valve	M01-41/200g1acFCCA1	Burgmer	E 175	15310	
2	1	5/2 way solenoid valve	V61B513A-A2000	Norgren		15096	
3	1	inlet closure	AKP 200-HT	Hensel	E 195		
4	1	5/2 way solenoid valve	V61B513A-A2000	Norgren		15096	
5	1	exhaustion butterfly valve	S01-47/050g1acFCJA1	Burgmer	E 175	15313	
6	1	pressure regulator 1"	LR-1-D-Maxi	Festo		12123	
7	1	2/2 way solenoid valve 1"	8240402.9101.02400	Buschj.		12548	
8	1	pressure sensor	PSD-31	WIKA		15314	
9	1	level indicator conveyor max.400 mm	FTM51-AGG2L2A32AA	E + H		14474	
10	1	pressure vessel	DB A 500-HT	Hensel			
11	1	ball valve	400/65/2/SO/FA	Prokosch		15319	
12	1	5/2 way solenoid valve	V61B513A-A2000	Norgren		15096	
13	1	level indicator buffer max. 500 mm	FTM51-AGG2L2A32AA	E + H		15318	
14	1	buffer tank		Hensel			
15	1	pressure regulator 1/2"	LR-1/2"-D-MAXI	Festo		12116	
16	1	pressure regulator 1/2"	LR-1/2"-D-MAXI	Festo		12116	
17	1	pressure regulator 1/2"	LR-1/2"-D-MAXI	Festo		12116	
18	1	air volume regulator 1/2"	T1000C4800	Norgren		12485	
19	1	air volume regulator 1/2"	T1000C4800	Norgren		12485	
20	1	air volume regulator 1/2"	T1000C4800	Norgren		12485	
21	1	2/2 way solenoid valve 1/2"	8240202.9101.02400	Buschj.		12430	
22	1	2/2 way solenoid valve 1/2"	8240202.9101.02400	Buschj.		12430	
23	1	2/2 way solenoid valve 1/2"	8240202.9101.02400	Buschj.		12430	
24	1	non return valve 1/2"	S/522	Norgren		10014	
25	1	non return valve 1/2"	S/522	Norgren		10014	
26	1	non return valve 1/2"	S/522	Norgren		10014	
27	1	compensator	BF41 LP DN 200	Berghöfer		13250	
28	1	safety vlave 1/2"	SV 245-A 1/2"-6 bar	Brauckm.		14192	
29	1	metall-flex hose for exhaustion DN 50	7257.K-050-01800-02--x	Schmitz		13219	
30	1	2/2 way solenoid valve 1/2"	8240202.9101.02400	Buschj.		12430	
31							
32	1	hand ball valve 1/2"	71062000012	Allrohr		13280	

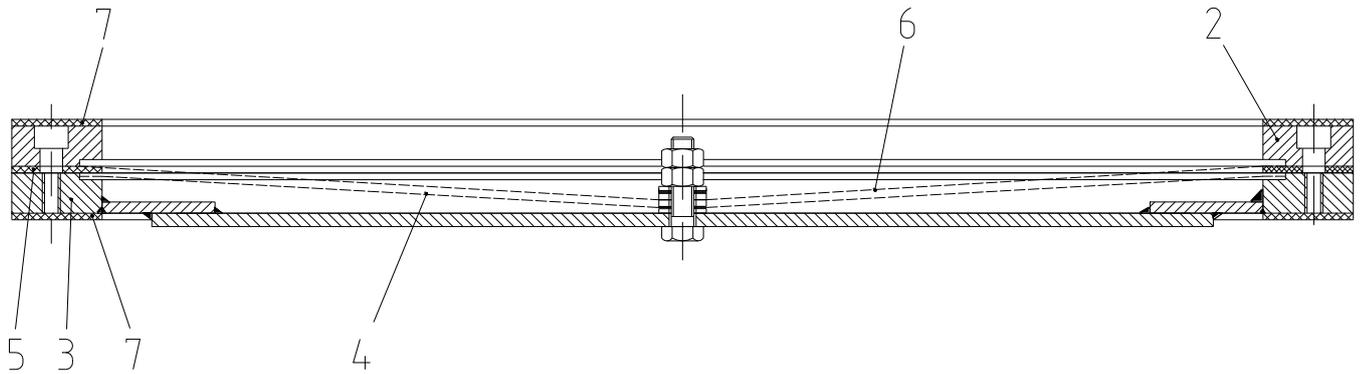


part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
41	1	inspection glass DN 65	769-GG DN 65	BSA		15354	
42	1	metal compensator DN 80	BF410080	Berghöfer		15342	
43	1	activator, DN 65	DN 65-A	Hensel	E 71		
44	1	activator, DN 65	DN 65-A	Hensel	E 71		
45	1	activator, DN 65	DN 65-A	Hensel	E 71		
46	1	over,-under pressure valve	VCP2731C	WAM		14560	
47	1	air volume regulator 1"	40 45 501	Norgren		13043	
48	1	pressure regulator 1/2"	LR-1/2"-D-MIDI	Festo		12117	
49	1	fluid bottom	DN 300-HT	Hensel	E 136/300	10041	

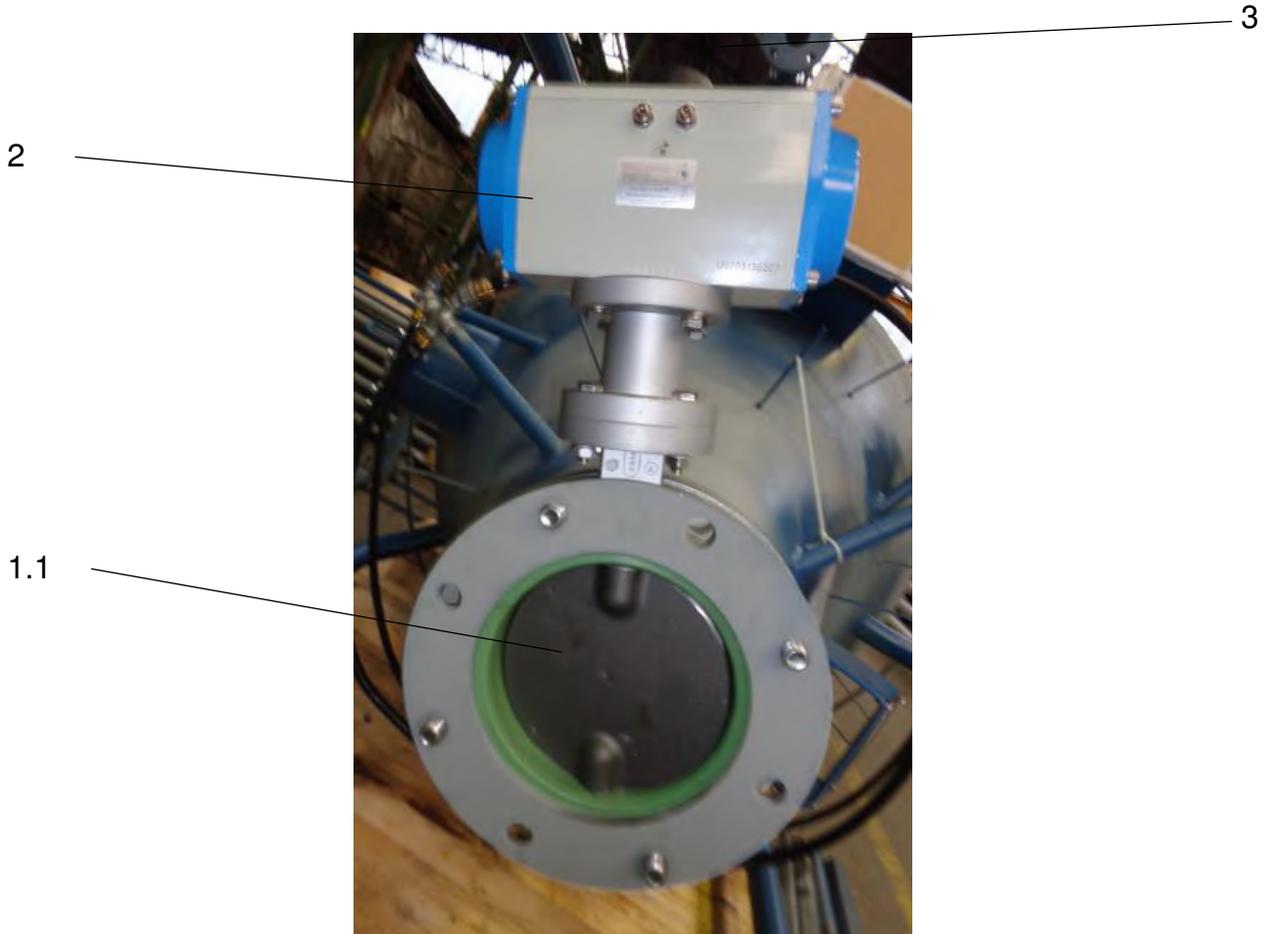


## 8.2 Fluid bottom DN 300-HT

E 136/300



part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
1	1	aeration bottom, compl.	H-2-1041-HT	Hensel		10041	
2	1	flange	378 x 320 x 14 - o	Hensel		12292	
3	1	flange	378 x 320 x 14 - u	Hensel		12293	
4	1	siev	340 - MW 3	Hensel		12297	
5	1	seal	378 x 320 x 3 - Si-rot	Hensel		12290	
6	1	straining cloth	D = 378-HT-yellow	Hensel		10035	
7	2	seal	378 x 330 x 3-HT Graphit Spießblech			12695	

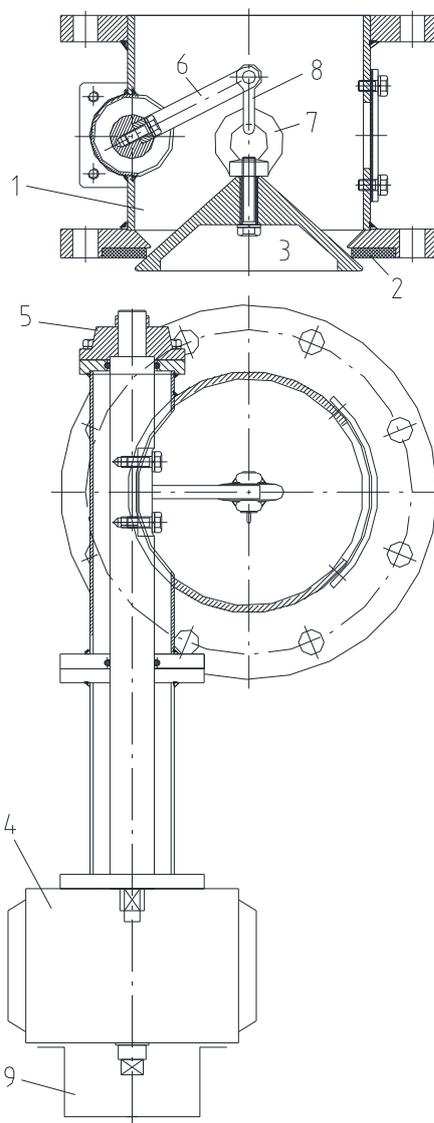


part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
1	1	Butterfly valve, compl. with actuator and limit switch	Modular-system valve DN 200, M01-41/200g1acFCCA1	Burgmer		15310	
1.1	1	Butterfly valve, <u>without</u> actuator and limit switch	Modular-system valve DN 200, M01-41/200g1acFCCA1	Burgmer			
2	1	Air cylinder	APD 110 F 07 / SW 17	APE			
3	1	Limit-switch-box with two switches	ESB-P2-D2, XS618B1MAL2	APE / Telem.			
4	1	5/2 way solenoid valve	V61B513A-A2000	Norgren		15096	

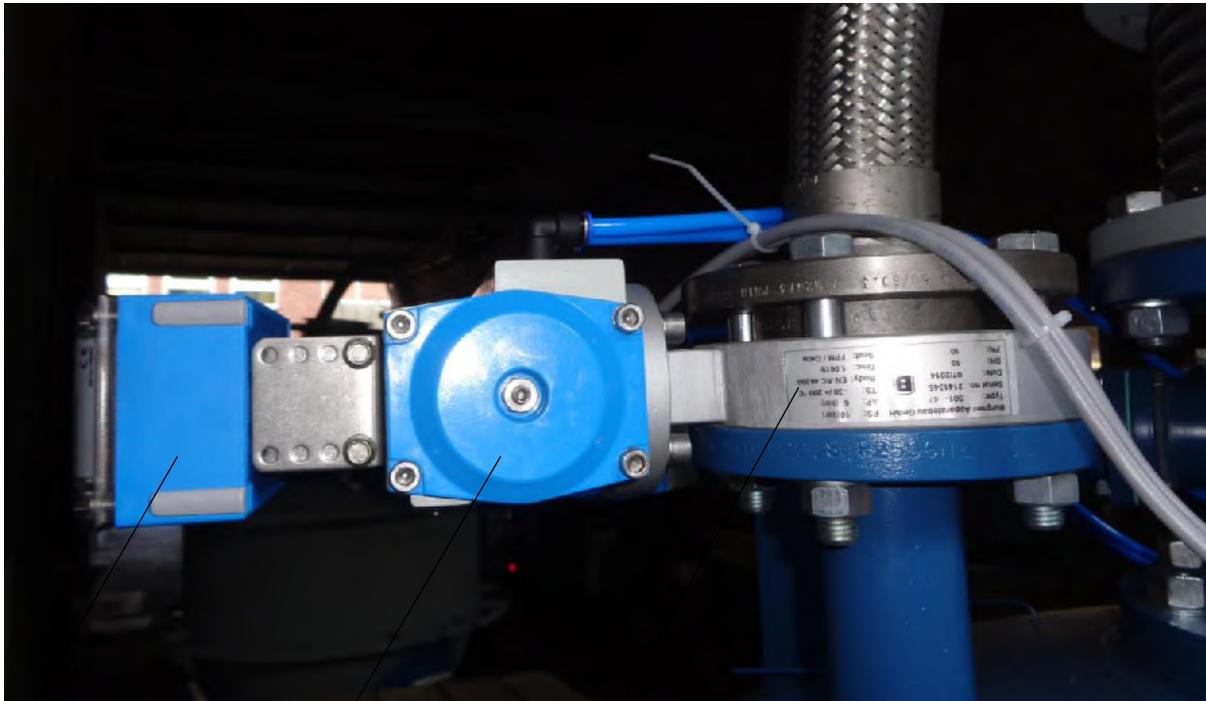


## 8.4 Inlet closure AKP 200-HT

E 195/200-HT



part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
1	1	inlet closure, compl. with cylinder and box	AKP – 200 - HT	Hensel			
1.1	1	inlet closure, compl. <u>without</u> cylinder and box	AKP – 200 - HT	Hensel			
2	1	Seal, heat-resistant	SI 265-175-10, red	Hensel		10019	
3	1	Cone, enamel	H-4-1085-M16-EM	Hensel		12393	
4	1	Air cylinder	APD 110/090-F07-F10- Z14x22-C/D	APE		14123	
5	1	Bearing HT	FY 25 TF/VA201	SKF		12371	
6	1	Cardan shaft	SCHW 3 S	Hensel		12365	
7	1	Ring nut – M16				12366	
8	1	Shackle					
9	1	Limit-switch-box, with two switches	ESB-P2-D2 NBB2V3E2	APE / P+F			



4

3

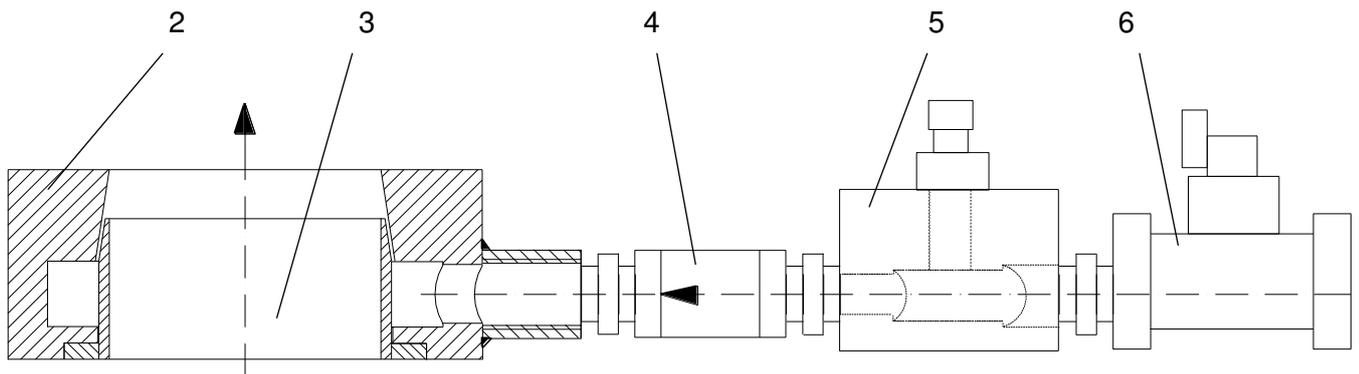
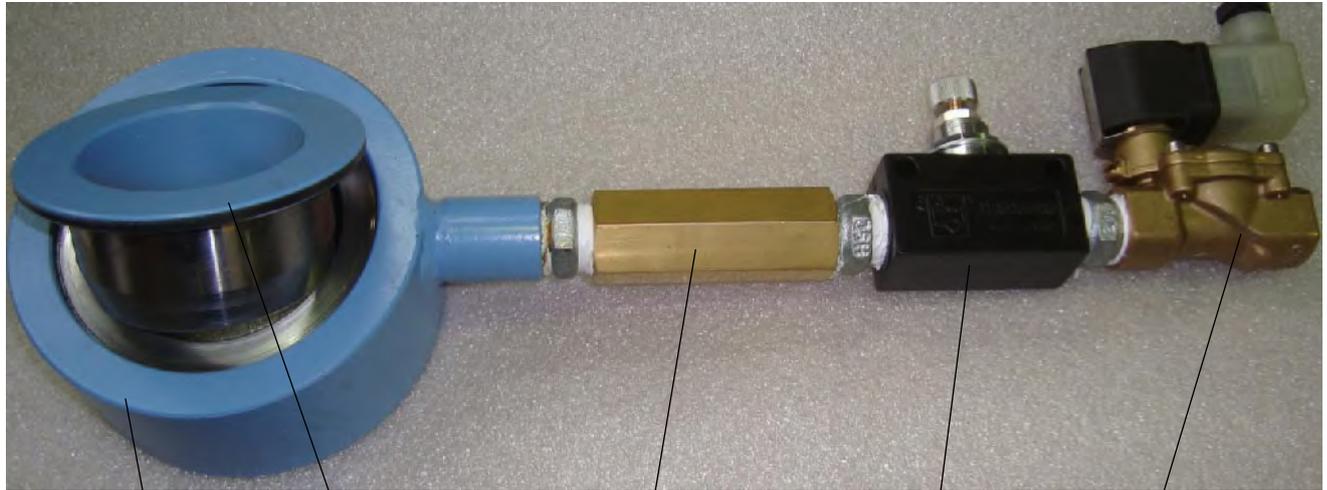
1 / (1.1)

part	qty	description	order no.	make	sp.pa-list	article no.	price/pc €
1	1	exhaustion butterfly valve (complete)	S01-47/050g1acFCJA1	Burgmer	E 175	15313	
1.1	1	exhaustion butterfly valve <u>without</u> cylinder and box	S01-47/050	Burgmer	E 175		
2	1	seal DN 50	FPM green (Viton)	Burgmer			
3	1	Air cylinder	APD 60	APE			
4	1	Limit-switch-box, with two switches	ESB-P2-D2 NBB2V3E2	APE / P+F			



## 8.6 Activator/booster DN 65-A

E 71/80.1



part	qty.	description	order no.	make	Art.-Nr.	price/pc
1	1	activator, compl. with air installation, Pos. 2 - 6	DN 65	Hensel		
1.1	1	activator, compl. <u>without</u> air installation, Pos. 2 - 3	DN 65	Hensel		
2	1	activator housing	DN 65-GH-	Hensel	10085	
3	1	ring nozzle	DN 65--RD-	Hensel	12524	
4	1	nonreturn valve	S / 522	Norgren	10014	
5*	1	air volume regulator	T1000C4800	Norgren	12485	
6*	1	2/2 way solenoid valve 1/2"	8240202.9101.11000	Buschj.		
7*	1	pressure regulator 1/2"	LR-1/2"-D-MAXI	Festo	12116	

! Remark!

\* Valves for activator 1, on the valve installation-plate at the conveyor

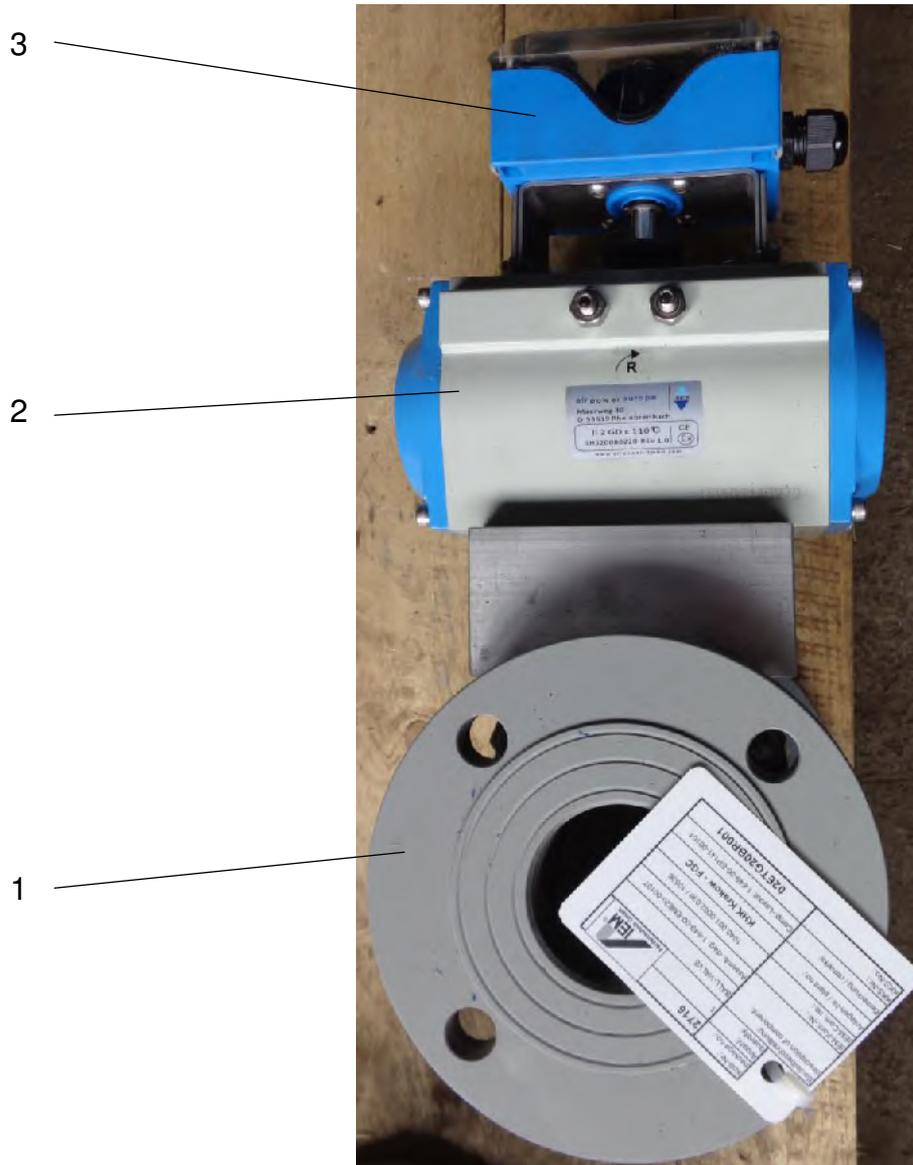
\* Valves for activator 2, in the

\* Valves for activator 3, nearby the activator

\* Pos. 7 not represented in diagramm



## 8.7 Ball valve KGH 65 for conveyor outlet E 67/80



part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
1	1	Ball valve DN 65 (complete with actuator and limit switch)	KGH 08000127 DN 65-400/80/2/SO/FA	Prokosc		15319	
1.1	1	Ball valve DN 65 (complete, <u>without</u> actuator and limit switch)	KGH 08000127 DN 65-400/80/2/SO/FA	Prokosc			
2	1	Air cylinder	APD-090/090-V17-H	APE			
3	1	Limit switch in Box	ESB-P2-D2- NBB2V3E2	APE /P+F			

### Remark!

Further details and spare parts look at separate description in chapter 12



8.8 Metal compensator DN 200

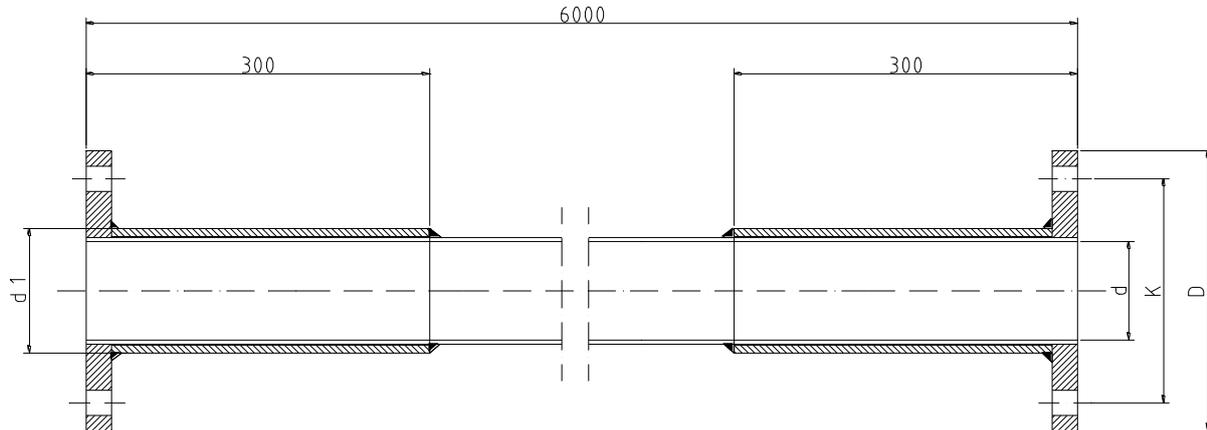
8.9 Metal compensator DN 80



part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
1	1	Axial-Compensator DN 200 PN 2,5 / height 210mm	BF41LP0200	Berghöfer		15309	
1	1	Axial-Compensator DN 80 PN 16 / height 165mm	BF410080	Berghöfer		15342	

## 8.10 Conveying tube DN 65 x 6m

### Conveying tube with reinforcing tube



DN	D	K	n	b	tube Ø, normal	tube Ø, reinforced	sockets Ø d1
65	185	145	4	18		76,1 x 5,6 mm	88,9 x 5,6 mm

#### Execution:

Conveying tubes are made of finless tubes DIN 2448 with regular wall thickness and a length up to 6 mtr. (DN125 4m). Both sides are provided with fixed flanges according to DIN 2576. When conveying rough or abrasive materials the tube ends are reinforced with pipe sockets.

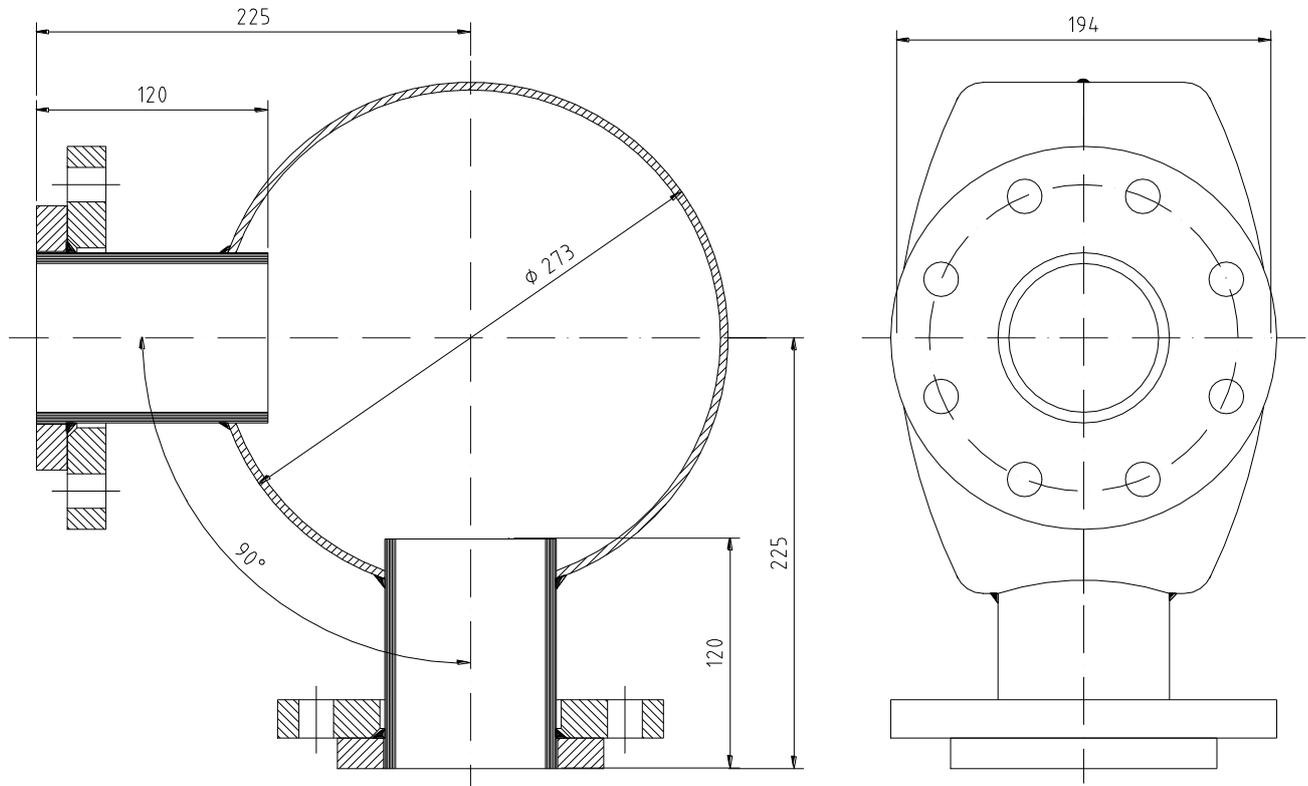
#### Equipment of each tube:

- 2 seal
- 4 or 8 hexagon head cap screws
- 1 galvanized tube clamp DIN 3570

part	qty	description	order no.	make	sp.pa-list	article no.	price/pc €
1	1	conveing tube DN 65 x 6m, reinforced	L = 6000mm with 2 flange	Hensel		12616	
2	1	conveing tube DN 65 x ??? reinforced	L = ???mm with 2 flange	Hensel		on request	



## 8.11 Bending pot DN 65 - 90°



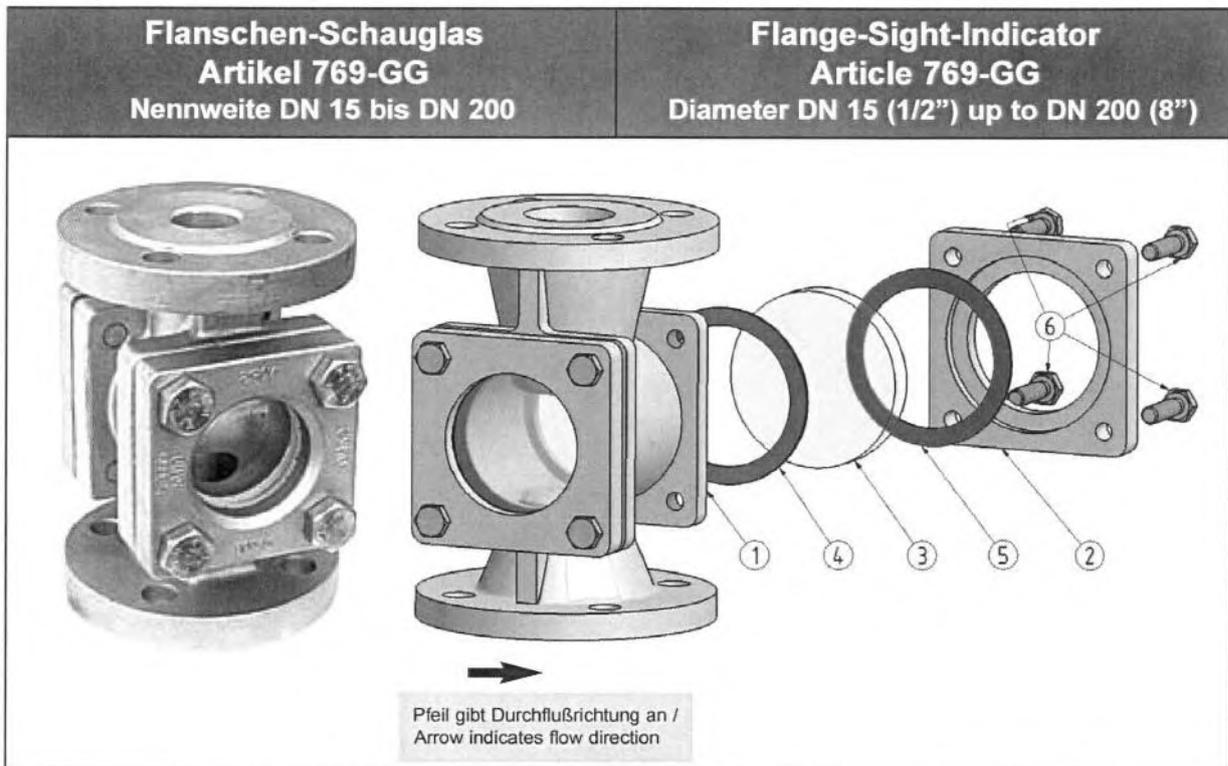
**Reinforced bending pots 90° for the thrust-conveying process of dry, granular, abrasive bulk materials like silica sand**

NW	housing bottom	tube DIN 2448	flange DIN 2642	holes
65	273 x 4mm	82,5 x 8,8mm	Ø 185 , circle of holes Ø 145	4 x Ø 18mm

part	qty	description	order no.	make	sp.pa- list	article no.	price/pc €
1	1	bending pot DN 65 - 90°		Hensel		12514	



## 8.12 Inspection glass DN 65



### Flanschen-Schauglas, Artikel 769-GG

- Beidseitig Schauglas zur Sichtkontrolle und Beobachtung von Füllung und Strömung in Rohrleitungen.
- Sie ermöglichen eine zuverlässige Überwachung der Funktion und Leistung von einzelnen Apparaten sowie ganzen Anlagen
- Die serienmäßige Tropfnase zeigt kleinste Durchflußmengen an
- Für neutrale, gasförmige und flüssige Medien.
- Beidseitig mit Flanschanschluß nach DIN 2501 PN 10 / PN 16. Auf Anfrage auch nach ASME B16.5, class 150 lbs

#### Materialausführung:

Pos.	Bezeichnung	Werkstoff
1	Gehäuse	Grauguss GG 25 EN-GJL-250
2	Deckelflansch	Grauguss GG 25/S235JRG2
3	<input type="checkbox"/> Schauglas	Natron-Kalk-Glas DIN 8902
	<b>oder wahlweise</b>	Borosilikat-Glas DIN 7080
4	<input type="checkbox"/> Dichtung	Graphit <sup>1)</sup> (Medienseitig)
5	<input type="checkbox"/> Dichtung	Aramidfaser (Deckelseitig)
6	Schrauben	4.6 / 5.6 verzinkt
	<input type="checkbox"/> = Ersatzteil	

#### Temperaturbereich:

Natron-Kalk-Glas bis max. Temperatur bis zu +150° C  
Borosilikat-Glas bis max. Temperatur bis zu +280° C

<sup>1)</sup> Auf Anfrage auch Dichtung (Pos. 4) in Werkstoff PTFE / VITON / EPDM oder Perbunan (NBR) lieferbar

bei stark basischen Medien mit höheren Drücken empfehlen wir zusätzlich Glimmerscheiben einzusetzen.

### Flange-Sight-Indicator, Article 769-GG

- Sight glass on both sides for visual inspection and observation of filling and flow in pipelines.
- They provide a reliable monitoring of function and performance of individual machines and entire plants.
- The standard Infusion shows smallest rates of flow.
- For neutral, gasiform and liquide media.
- Both sides flange connection acc. to DIN 2501 PN 10 / PN 16. On request also with flange acc. ASME B16.5, class 150 lbs

#### Material design:

Pos.	Discription	Material
1	Body	Cast iron ASTM A 126-B ( GG 25)
2	Covers	Cast iron ASTM A 126-B ( GG 25)
3	<input type="checkbox"/> Sight glass	Soda-lime-glass DIN 8902 /
	<b>or alternatively</b>	Borosilicate-glass DIN 7080
4	<input type="checkbox"/> Gasket	Graphite <sup>1)</sup> (media side)
5	<input type="checkbox"/> Gasket	asbestos free aramid (cover side)
6	Screws	4.6 / 5.6 galvanized
	<input type="checkbox"/> = Spare part	

#### Temperature range:

Soda-lime-glass up to max. temperature +150° C  
Borosilicate-glass up to max. temperature +280° C

<sup>1)</sup> On request also gasket available (Pos. 4) from PTFE / VITON / EPDM or Buna (NBR)

In strongly alkaline media with higher pressures we also recommend the use of mica shield.



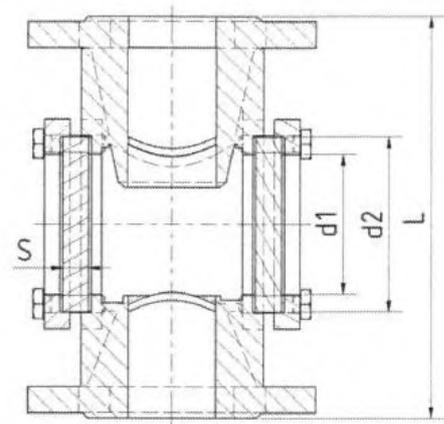
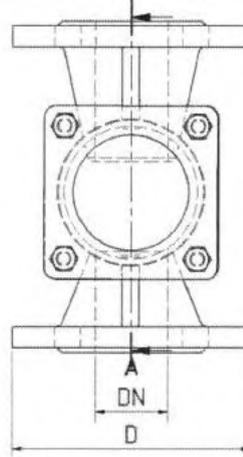
<b>Flanschen-Schauglas</b> <b>Artikel 769-GG</b> <b>Nennweite DN 15 bis DN 200</b>	<b>Flange-Sight-Indicator</b> <b>Article 769-GG</b> <b>Diameter DN 15 (1/2") up to DN 200 (8")</b>
--	--



DN 15-DN 50  
( Deckel quadratisch  
square cover )



DN 65-DN 200  
( Deckel rund  
round cover )



**Artikel 769-GG, Ausführung in Grauguss**

- beliebige Einbaulage (Durchflußrichtung beachten)
- beiderseits Flanschanschluß
- Betriebsdruck max. 16 bar
- Betriebstemperatur max. +150° C oder +280° C
- Zeugnisse: WAZ nach DIN 50049.2.2 oder APZ nach DIN 50049-3.1B

**Auf Anfrage:**

- mit Schweißenden
- mit Rotor
- mit Schauglas-Leuchten
- mit Klappe
- mit ANSI-Flanschen
- mit Heitzmantel

**Article 769-GG, design in cast iron**

- optional installation (take care of flow direction)
- both sides flange connection
- working pressure max. 16 bar
- working temperature max. +150° C or +280° C
- Certificate: WAZ acc. to DIN 50049.2.2 or APZ acc. to DIN 50049-3.1B

**On request:**

- with welding ends
- with rotor
- with sight glass light
- with flap
- with ANSI-flanges
- with heating jacket

**technische Angaben**  
**technical details**

Nennweite / size	Borosilikatglas, Bestell.-Nr.: borosilicate glass, Order-No.:	Natron-Kalk-Glas, Bestell.-Nr.: Soda-lime-glas, Order-No.:	d1 (mm)	D (mm)	Glasplatte		L (mm)	Gewicht / weight (kg)
					d2 (mm)	S (mm)		
DN 15 (1/2")	36.5550.2.11	36.5518.2.11	32	95	45	10	130	3,6
DN 20 (3/4")	36.5550.2.13	36.5518.2.13	32	105	45	10	150	4,0
DN 25 (1")	36.5550.2.15	36.5518.2.15	48	115	63	10	160	6,4
DN 32 (1 1/4")	36.5550.2.18	36.5518.2.18	65	140	80	12	180	7,4
DN 40 (1 1/2")	36.5550.2.19	36.5518.2.19	65	150	80	12	200	10,6
DN 50 (2")	36.5550.2.21	36.5518.2.21	80	165	100	15	230	14,5
DN 65 (2 1/2")	36.5550.2.24	36.5518.2.24	80	185	100	15	290	23,0
DN 80 (3")	36.5550.2.25	36.5518.2.25	100	200	125	20	310	32,0
DN 100 (4")	36.5550.2.27	36.5518.2.27	125	220	150	25	350	42,0
DN 125 (5")	36.5550.2.28	36.5518.2.28	150	250	175	25	400	47,0
DN 150 (6")	36.5550.2.29	36.5518.2.29	175	285	200	30*	480	64,0
DN 200 (8")	36.5550.2.31	36.5518.2.31	175	340	200	30*	600	98,0

12. Reviz02

**Information:** \*16 bar only design with borosilicate glass possible / **Information:** \*16 bar only design with borosilicate glass possible



**blank sheet**



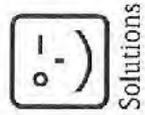
## 9 Operating instructions for Level indicator

Conveyor 1 A 500 max.: L = 400mm KKS: 01ETG20CL103

Conveyor 2 A 500 max.: L = 400mm KKS: 02ETG20CL103

Buffer tank 1 max.: L = 500mm KKS: 01ETG20CL101

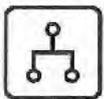
Buffer tank 2 max.: L = 500mm KKS: 02ETG20CL101



Solutions



Services



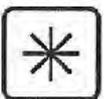
Systems  
Components



Registration



Liquid  
Analysis



Temperature



Flow



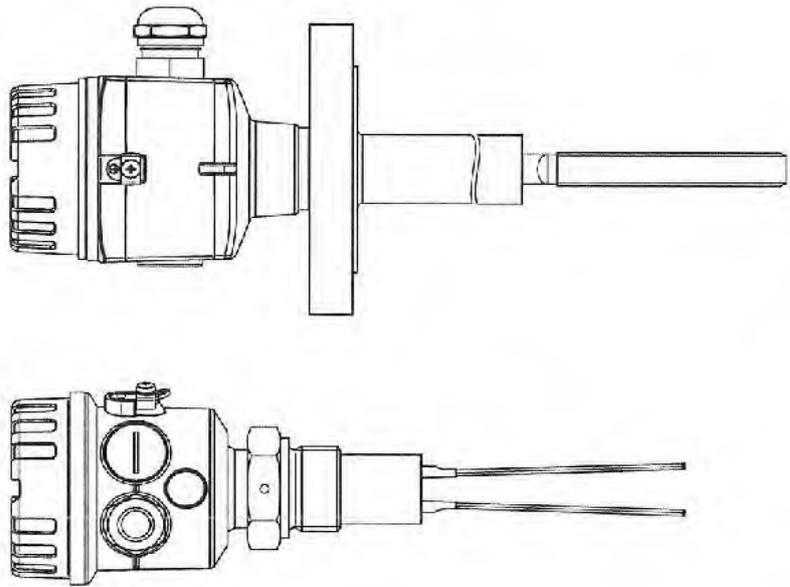
Pressure



Level

## Operating Instructions

# Soliphant M FTM50, FTM51



de - Füllstandgrenzschafter

en - Level Limit Switch

fr - Détecteur de niveau

es - Detector de nivel

it - Interruttore di livello

nl - Niveauschakelaar

KA229T/00/a6/06.07  
71036024



Endress+Hauser

People for Process Automation

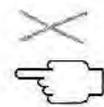


de - Inhalt	en - Contents	fr - Sommaire
Sicherheitshinweise	Notes on Safety	Conseils de sécurité
Handhabung	Handling	Manipulation
Geräte-Identifikation FTM50	Device Identification FTM50	Identification FTM50
Geräte-Identifikation FTM51	Device Identification FTM51	Identification FTM51
Einbauhinweise	Mounting Notes	Conseils pour le montage
Messeinrichtung	Measuring system	Ensemble de détection de niveau
Auswahl der Gabellänge	Selection of the fork length	Sélection de la longueur de fourche
Sicherheitsschaltung	Fail-safe mode	Sécurité
Diagnose	Diagnosis	Diagnostic
Hinweise zur Symbolik	References to the symbolism	Symboles utilisés
Anschluss	Connections	Raccordement
Sedimentation	Sedimentation	Sédimentation
Wartung	Maintenance	Maintenance
Technische Daten	Technical Data	Caractéristiques techniques
Zubehör	Accessories	Accessoires
Fehlersuche	Trouble-shooting	Recherche de défauts
Ersatzteile	Spare parts	Pièces de rechange
Reparatur	Repair	Réparations
Ergänzende Dokumentation	Supplementary Documentation	Documentation complémentaire



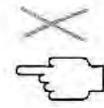
**Achtung!**

= verboten;  
führt zu fehlerhaftem Betrieb  
oder Zerstörung.



**Caution!**

= forbidden;  
leads to incorrect operation  
or destruction.

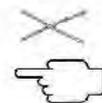


**Attention!**

= interdit; peut provoquer  
des dysfonctionnements  
ou la destruction.



es - Índice	it - Indice	nl - Inhoud
Notas sobre seguridad	Note sulla sicurezza	Veiligheidsinstructies
5	5	5
Modo de empleo	Accorgimenti	Behandeling
6	6	6
Identificación del equipo FTM50	Identificazione: strumento FTM50	Instrument-identificatie FTM50
8	8	8
Identificación del equipo FTM51	Identificazione: strumento FTM51	Instrument-identificatie FTM51
12	12	12
Recomendaciones de montaje	Note al montaggio	Inbouwtips
16	16	16
Sistema de medida	Sistema di misura	Meetopstelling
17	17	17
Selección de la longitud de la horquilla	Selezione della lunghezza della forcella	Keuze van de vorklengte
20	20	20
Commutador de seguridad	Selezione della modalità di sicurezza	Veiligheidsschakeling
25	25	25
Diagnóstico	Diagnosi	Diagnose
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Significado de los símbolos	Riferimento dei simboli	Verwijzing via symbolen
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Conexiones	Collegamenti elettrici	Aansluiting
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Sedimentación	Sedimentazione	Sediment
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Mantenimiento	Manutenzione	Onderhoud
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Datos técnicos	Dati tecnici	Technische gegevens
52	52	52
Accesorios	Accessori	Toebehoren
54	54	54
Identificación de fallos	Individuazione e eliminazione delle anomalie	Fout zoeken
59	60	61
Repuestos	Ricambi	Reserve-onderdelen
62	62	62
Reparaciones	Riparare	Reparatie
65	65	65
Documentación suplementaria	Documentazione supplementare	Aanvullende documentatie
66	66	66



**Atención!**

= Prohibido; peligro de mal funcionamiento o de destrucción.

Endress + Hauser



**Attenzione!**

= Vietato; pericolo di malfunzionamento o di distruzione.



**Opgelet!**

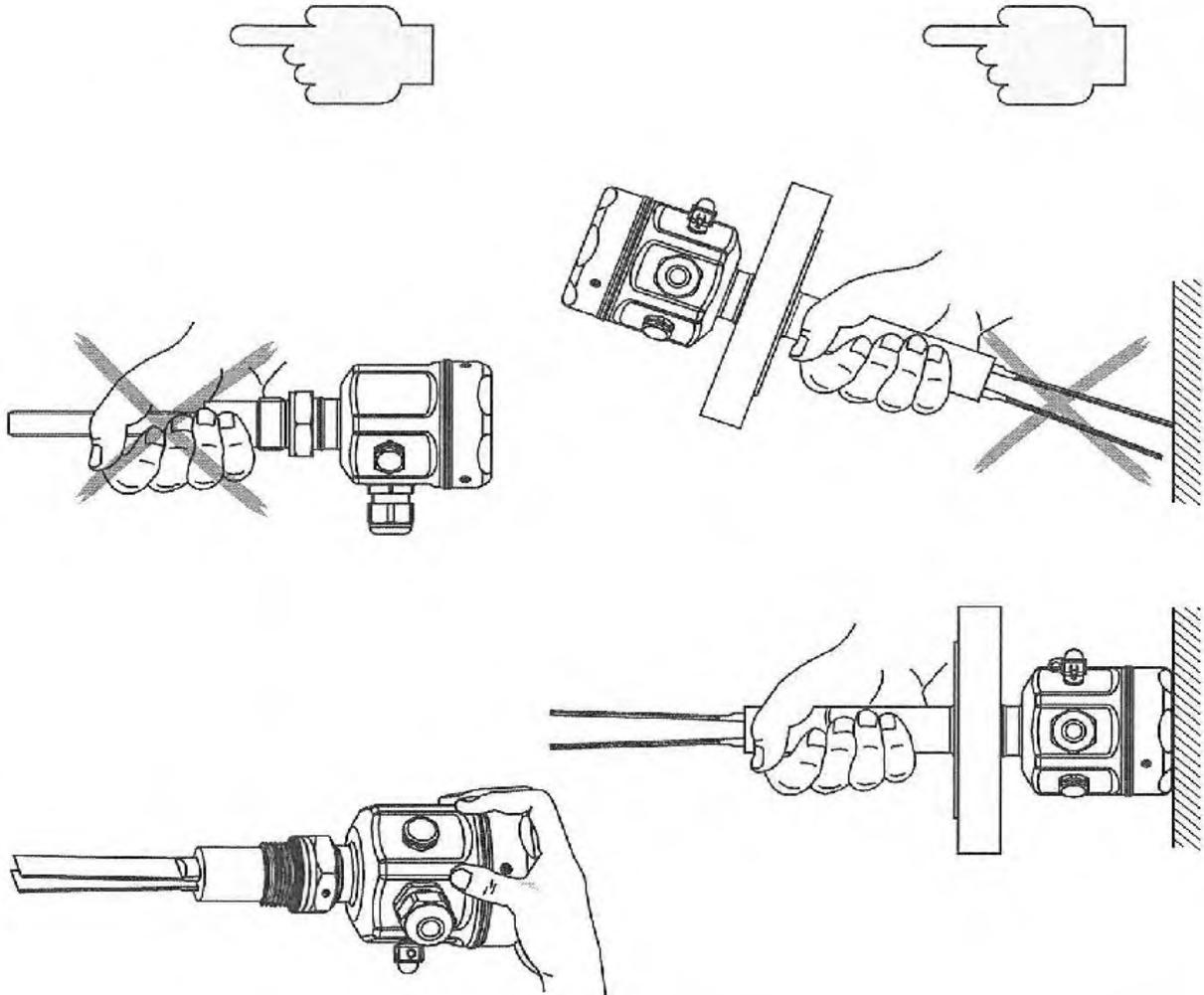
= verboden; leidt tot foutieve werking of storing.



de - Sicherheitshinweise	en - Notes on Safety	fr - Conseils de sécurité
<p>Der Soliphant M FTM50, FTM51 ist ein Füllstandgrenzschalter für Schüttgüter.</p> <p>Bei unsachgemäßem Einsatz können Gefahren von ihm ausgehen.</p> <p>Das Gerät darf <b>nur von qualifiziertem und autorisiertem Fachpersonal</b> unter strenger Beachtung dieser Betriebsanleitung, der einschlägigen Normen, der gesetzlichen Vorschriften und der Zertifikate (je nach Anwendung) eingebaut, angeschlossen, in Betrieb genommen und gewartet werden.</p> <p>In der Gebäudeinstallation ist ein Netzschalter für das Gerät leicht erreichbar in dessen Nähe zu installieren.</p> <p>Es ist als Trennvorrichtung für das Gerät zu kennzeichnen.</p>	<p>The Soliphant M FTM50, FTM51 is designed for level limit detection in bulk solids.</p> <p>If used incorrectly it is possible that application-related dangers may arise.</p> <p>The level limit switch may be installed, connected, commissioned, operated and maintained <b>by qualified and authorised personnel only</b>, under strict observance of these operating instructions, any relevant standards, legal requirements, and, where appropriate, the certificate.</p> <p>Install an easily accessible power switch in the proximity of the device.</p> <p>Mark the power switch as a disconnector for the device.</p>	<p>Le Soliphant M FTM50, FTM51 doit être exclusivement utilisé comme détecteur de niveau pour produits solides.</p> <p>Il peut être source de danger en cas d'utilisation non conforme aux prescriptions.</p> <p>L'appareil ne doit être installé, raccordé, mis en service et entretenu <b>que par un personnel qualifié et autorisé</b>, qui tiendra compte des indications contenues dans la présente mise en service, des normes en vigueur et des certificats disponibles (selon l'application).</p> <p>Installer un interrupteur à proximité immédiate de l'appareil en veillant à ce qu'il soit facilement accessible.</p> <p>Il est à identifier comme interrupteur du détecteur.</p>



es - Notas sobre seguridad	it - Note sulla sicurezza	nl - Veiligheidsinstructies
<p>El detector de nivel Soliphant M FTM50, FTM51 ha sido diseñado para la detección de límite en sólidos a granel.</p> <p>Su empleo inapropiado puede resultar peligroso.</p> <p>El equipo deberá ser montado, conectado, instalado y mantenido <b>única y exclusivamente por personal cualificado y autorizado</b>, bajo rigurosa observación de las presentes instrucciones de servicio, de las normativas y legislaciones vigentes, así como de los certificados (dependiendo de la aplicación).</p> <p>Instalar un interruptor de fácil acceso en las proximidades del equipo.</p> <p>Identificar el interruptor como desconectador del equipo.</p>	<p>Il Soliphant M FTM50, FTM51 e particolarmente studiato per l'impiego come sogliadi livello in solidi grossi.</p> <p>Un'installazione non corretta può determinare pericolo.</p> <p>Lo strumento può essere montato <b>solamente da personale qualificato ed autorizzato</b>.</p> <p>La messa in esercizio e la manutenzione devono rispettare le indicazioni di collegamento, le norme e i certificati di seguito riportati.</p> <p>Installare un interruttore per l'alimentazione in prossimità del dispositivo.</p> <p>Marcare l'interruttore come disconnessione del dispositivo.</p>	<p>Gebruik de Soliphant M FTM50, FTM51 alleen als niveauschakelaar voor vaste stoffen.</p> <p>Indien niet correct gebruikt kunnen gevaarlijke situaties ontstaan.</p> <p>Het instrument <b>alleen door gekwalificeerd en geautoriseerd personeel</b> laten inbouwen, aansluiten, in bedrijf nemen en onderhouden.</p> <p>Neem de instructies in deze Inbedrijfstellingsvoorschriften, de desbetreffende normen, de wettelijke voorschriften en eventuele certificaten in acht.</p> <p>Installeer een makkelijk bereikbare voedingschakelaar in de nabijheid van het instrument.</p> <p>Kenmerk de voedingschakelaar specifiek voor het instrument.</p>



**de - Handhabung**

Am Gehäuse, Flansch oder Verlängerungsrohr anfassen.

**en - Handling**

Hold by housing, flange or extension tube.

**fr - Manipulation**

Tenir par le boîtier, la bride ou le tube prolongateur.

**es - Modo de empleo**

Coger por el cabezal, brida o tubo de extensión.

**it - Accorgimenti**

Afferrare la custodia, per la flangia o per il tubo di estensione.

**nl - Behandeling**

Vastpakken via behuizing, flens of verlengbuis.



**de** - Nicht verbiegen  
Nicht kürzen  
Nicht verlängern

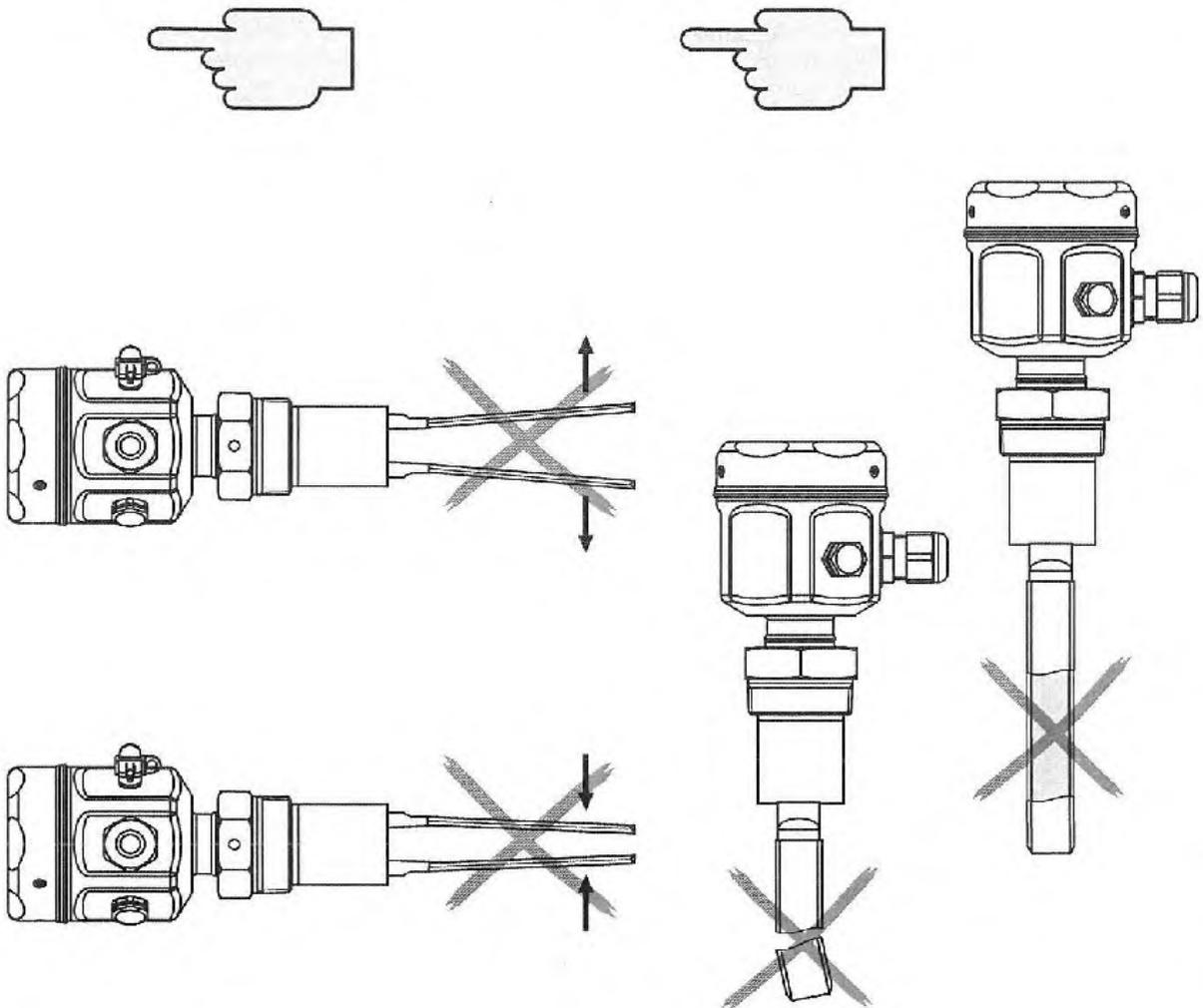
**en** - Do not bend  
Do not shorten  
Do not lengthen

**fr** - Ne pas déformer  
Ne pas raccourcir  
Ne pas rallonger

**es** - No torcer  
No acortar  
No alargar

**it** - Non stringere o allargare  
Non accorciare o allungare  
Non piegare

**nl** - Niet verbuigen  
Niet inkorten  
Niet verlengen





FTM50

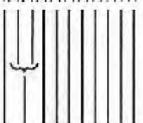
de - Geräte-Identifikation  
 en - Device Identification  
 fr - Identification de l'appareil  
 es - Identificación del equipo  
 it - Identificazione dello strumento  
 nl - Instrument-identificatie



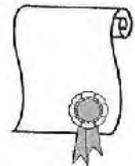
**ENDRESS+HAUSER**  
SOLIPHANT M

Order Code

FTM50-#####



- A \*1
- C CSA General Purpose, CSA C US
- D FM DIP-AIS Cl. II, III, Div. 1, Gr. E-G + CSA DIP Cl. II, III, Div. 1+2, Gr. E-G
- E IEC Ex iaD A20
- F FM IS Cl. I, II, III, Div. 1, Gr. A-G + NI + CSA IS Cl. I, II, III, Div. 1+2, Gr. A-G
- G IEC Ex tD [iaD] A21
- H FM XP-AIS Cl. I, Div. 1, Gr. A-D + CSA XP Cl. I, Div. 1+2, Gr. A-D
- S TIIS Ex d IIC T3
- T TIIS Ex ia IIC T3
- X NEPSI Ex ia IIC T6
- Z NEPSI Ex d [ia] IIC T6
- 8 NEPSI DIP
- Y \*2
- 1 ATEX II 1 D, 1/2 GD, 1/3 GD Ex ia IIC T6
- 2 ATEX II 1/2 D Ex tD
- 3 ATEX II 3 D, ATEX II 3 G EEx nA/nL/nC
- 4 ATEX II 1/3 D Ex tD
- 5 ATEX II 1 D, ATEX II 1/2 G Ex de [ia] IIC T6
- 6 ATEX II 1 D, ATEX II 1/2 G Ex d [ia] IIC T6
- 7 ATEX II 1 D, II 1 G Ex ia T6 (XA)

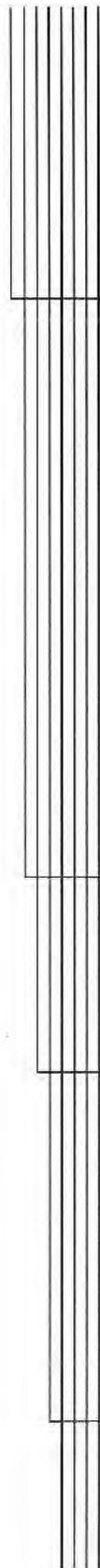


- AF 2", 150 lbs, RF, ANSI B16.5
- AG 3", 150 lbs, RF, ANSI B16.5
- AH 4", 150 lbs, RF, ANSI B16.5
- B3 DN50, PN25/40 A, EN1092-1 (DIN2527 B)
- BS DN80, PN10/16 A, EN1092-1 (DIN2527 B)
- BT DN100, PN10/16 A, EN1092-1 (DIN2527 B)
- GG EN10226, R 1½
- GJ ANSI, NPT 1½, d = 1.67"
- GK ANSI, NPT 1¼, d = 1.38"

Endress + Hauser



Endress + Hauser



GX ANSI, NPT 1½, d = 1.38" --> ISA  
 KF 10K 50, RF, JIS B2220  
 KG 10K 80, RF, JIS B2220  
 KH 10K 100, RF, JIS B2220  
 TD Tri-Clamp ISO2852, DN40-51 (2")  
 YY \*<sup>2</sup>

A PTFE>316L;  
 Gabel beschichtet / fork coated / Fourche revêtue /  
 Horquilla revestida / Rebbi rivestiti / Vork bekleed

B PTFE>316L;  
 komplett beschichtet / completely coated / entièrement revêtue /  
 completamente revestida / completamente rivestiti / Compleet bekleed

C ETFE>316L;  
 komplett beschichtet / completely coated / entièrement revêtue /  
 completamente revestida / completamente rivestiti / Compleet bekleed

2 316L; Ra ≤ 3.2 µm/80 grit, \*<sup>1</sup>

5 316L; Ra ≤ 0.8 µm/180 grit;  
 Gabel poliert / fork polished / Fourche polie /  
 Horquilla pulida / Rebbi lucidati / Vork gepolijst

7 316L; Ra ≤ 0.8 µm/180 grit;  
 Gabel + Rohr poliert / fork + tube polished / Fourche + tube polie /  
 Horquilla y tubo pulidos / Rebbi + tubo lucidati / Vork + buis gepolijst

9 \*<sup>2</sup>

A 155 mm/6 in; min. 10 g/l (0.7 lbs)  
 K 100 mm/4 in; min. 50 g/l (3 lbs)  
 Y \*<sup>2</sup>

1 FEM51; 19...253 V AC  
 2 FEM52; PNP, 10... 55 V DC  
 4 FEM54; DPDT, 19...253 V AC / 55 V DC  
 5 FEM55; 8/16 mA, 11... 36 V DC  
 7 FEM57; PFM  
 8 FEM58; NAMUR +  
 Prüftaster / test button / Touche test /  
 Botón de prueba / Pulsante di test / Testtoet

9 \*<sup>2</sup>

A Kompakt / compact / compact / compacto / compatta / compact  
 D 6 m > \*<sup>3</sup>  
 E 20 ft > \*<sup>3</sup>  
 G 6 m,  
 verstärkt / armoured / renforcé / armado / corazzato / versterkt > \*<sup>3</sup>

9



10

	<p>H 20 ft, verstärkt / armoured / renforcé / armado / corazzato / versterkt &gt; *<sup>3</sup></p> <p>Y *<sup>2</sup></p> <p>H T13, Aluminium, IP66/68 NEMA4X, getrennter Anschlussraum / separate connection compartment / compartiment de raccordement séparé / Compartimento de conexión separado / Vano di connessione separato / Gescheiden aansluitruimte</p> <p>Y *<sup>2</sup></p> <p>1 F16, Polyester, IP66/67 NEMA4X + Klarsichtdeckel / Transparent cover / Couvercle transparent / Cubierta transparente / Copertura trasparente / doorzichtig deksel</p> <p>3 F17, Aluminium, IP66/67 NEMA4X</p> <p>5 F13, Aluminium, IP66/68 NEMA4X</p> <p>7 F15, 316L, IP66/67 NEMA4X</p> <p>2 M20</p> <p>3 NPT 1/2</p> <p>4 G 1/2</p> <p>7 NPT 3/4</p> <p>9 *<sup>2</sup></p> <p>A *<sup>1</sup></p> <p>G Glasdeckel / Glass cover / Couvercle en verre / Cubierta de cristal / Copertura di vetro / doorzichtig deksel</p> <p>R SIL, *<sup>4</sup>, Glasdeckel / Glass cover / Couvercle en verre / Cubierta de cristal / Copertura di vetro / doorzichtig deksel</p> <p>S SIL, *<sup>4</sup></p> <p>Y *<sup>2</sup></p> <p>A *<sup>1</sup></p> <p>C EN10204-3.1, *<sup>5</sup></p> <p>D Temperaturdistanzstück / temperature spacer / Élément de refroidissement / Tramo disipador de temperatura / Distanziale per temperatura / Temperatuurreductiestuk ≤ 150 °C (≤ 300 °F)</p> <p>E Temperaturdistanzstück / temperature spacer / Élément de refroidissement / Tramo disipador de temperatura / Distanziale per temperatura / Temperatuurreductiestuk ≤ 150 °C (≤ 300 °F), EN10204-3.1, *<sup>5</sup></p> <p>F Hochtemperatur / high temperature / Haute température / Alta temperatura / Temperatura elevata / Hoge temperatuur ≤ 280 °C (≤ 540 °F)</p>
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Endress+Hauser



- H Hochtemperatur / high temperature / Haute température /  
Alta temperatura / Temperatura elevata / Hoge temperatuur  
≤ 280 °C (≤ 540 °F), EN10204-3.1, \*<sup>5</sup>
- J Hochtemperatur / high temperature / Haute température /  
Alta temperatura / Temperatura elevata / Hoge temperatuur  
≤ 230 °C (≤ 450 °F)
- K Hochtemperatur / high temperature / Haute température /  
Alta temperatura / Temperatura elevata / Hoge temperatuur  
≤ 230 °C (≤ 450 °F), EN10204-3.1, \*<sup>5</sup>
- Y \*<sup>2</sup>

- \*<sup>1</sup> ohne / without / sans / sin / senza / zonder
- \*<sup>2</sup> andere / others / autres / otros / altri / andere
- \*<sup>3</sup> Separatgehäuse / separate housing / Boîtier séparé /  
Cabezal separado / Custodia separata / Separate behuizing
- \*<sup>4</sup> Konformitätserklärung / declaration of conformity /  
Déclaration de conformité / Declaración de conformidad /  
Dichiarazione di conformità / Conformiteitsverklaring
- \*<sup>5</sup> Material (mediumberührt), Abnahmeprüfzeugnis /  
material (wetted parts), inspection certificate /  
Matériau (en contact avec le produit), certificat matière /  
Material (piezas mojadas), certificado de recepción /  
Materiale (a contatto con il prodotto), certificato di collaudo /  
Materiaal (in aanraking met medium), afnamecertificaat



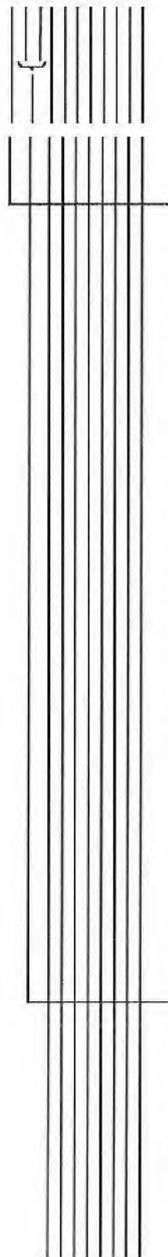
FTM51

de - Geräte-Identifikation  
 en - Device Identification  
 fr - Identification de l'appareil  
 es - Identificación del equipo  
 it - Identificazione dello strumento  
 nl - Instrument-identificatie



Order Code

FTM51-#####



- A \*1
- C CSA General Purpose, CSA C US
- D FM DIP-AIS Cl. II, III, Div. 1, Gr. E-G + CSA DIP Cl. II, III, Div. 1+2, Gr. E-G
- E IEC Ex iaD A20
- F FM IS Cl. I, II, III, Div. 1, Gr. A-G + NI + CSA IS Cl. I, II, III, Div. 1+2, Gr. A-G
- G IEC Ex tD [iaD] A21
- H FM XP-AIS Cl. I, Div. 1, Gr. A-D + CSA XP Cl. I, Div. 1+2, Gr. A-D
- S TIIS Ex d [ia] IIC T4
- T TIIS Ex ia IIC T3
- X NEPSI Ex ia IIC T6
- Z NEPSI Ex d [ia] IIC T6
- 8 NEPSI DIP A20 Ta, T4
- Y \*2
- 1 ATEX II 1 D, 1/2 GD, 1/3 GD Ex ia IIC T6
- 2 ATEX II 1/2 D Ex tD
- 3 ATEX II 3 D, ATEX II 3 G EEx nA/nL/nC
- 4 ATEX II 1/3 D Ex tD
- 5 ATEX II 1 D, ATEX II 1/2 G Ex de [ia] IIC T6
- 6 ATEX II 1 D, ATEX II 1/2 G Ex d [ia] IIC T6
- 7 ATEX II 1 D, II 1 G Ex ia T6 (XA)



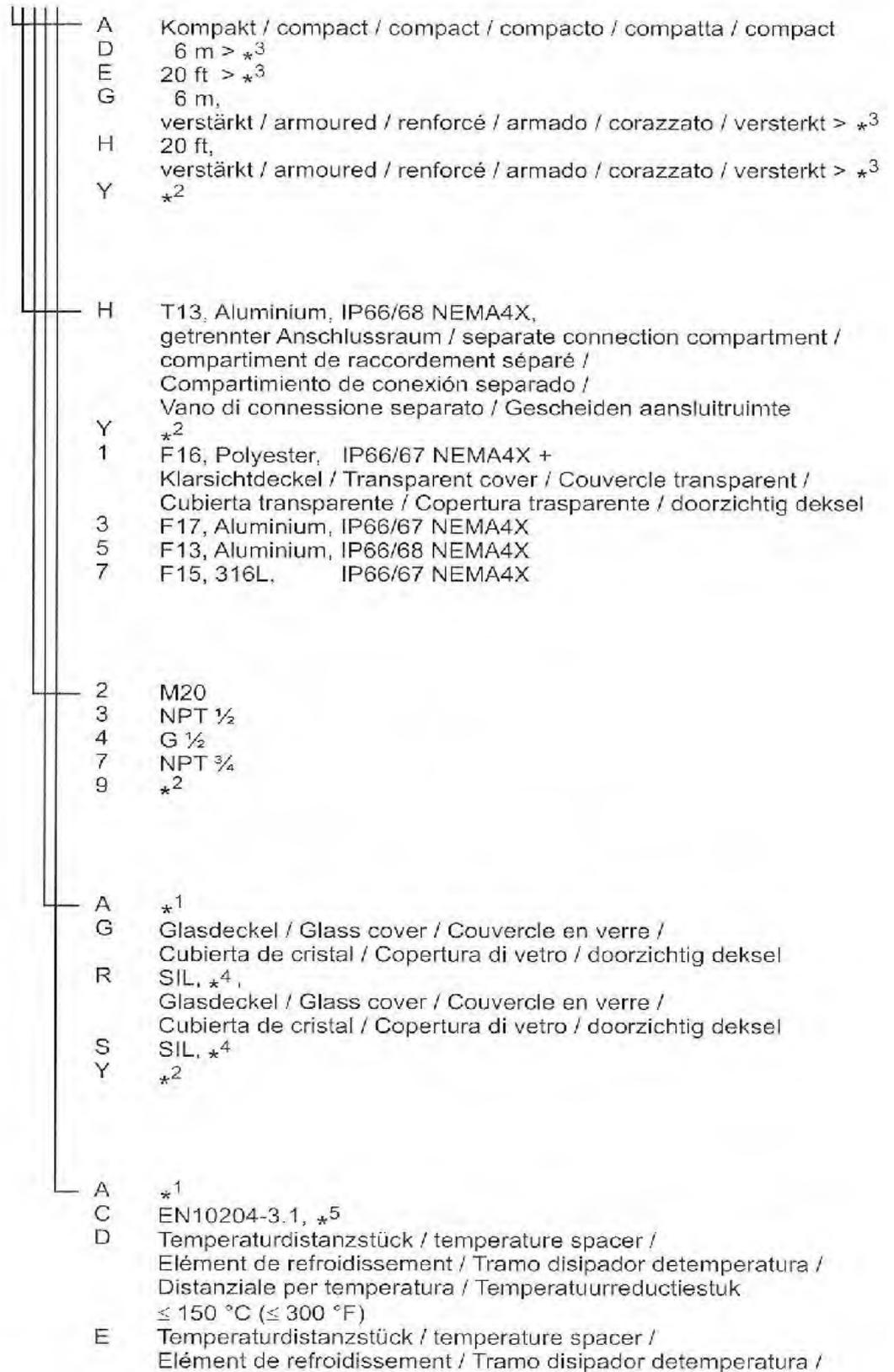
- AF 2", 150 lbs, RF, ANSI B16.5
- AG 3", 150 lbs, RF, ANSI B16.5
- AH 4", 150 lbs, RF, ANSI B16.5
- B3 DN50, PN25/40 A, EN1092-1 (DIN2527 B)
- BS DN80, PN10/16 A, EN1092-1 (DIN2527 B)
- BT DN100, PN10/16 A, EN1092-1 (DIN2527 B)
- GG EN10226, R 1½
- GJ ANSI, NPT 1½, d = 1.67"
- GK ANSI, NPT 1¼, d = 1.38"

Endress + Hauser





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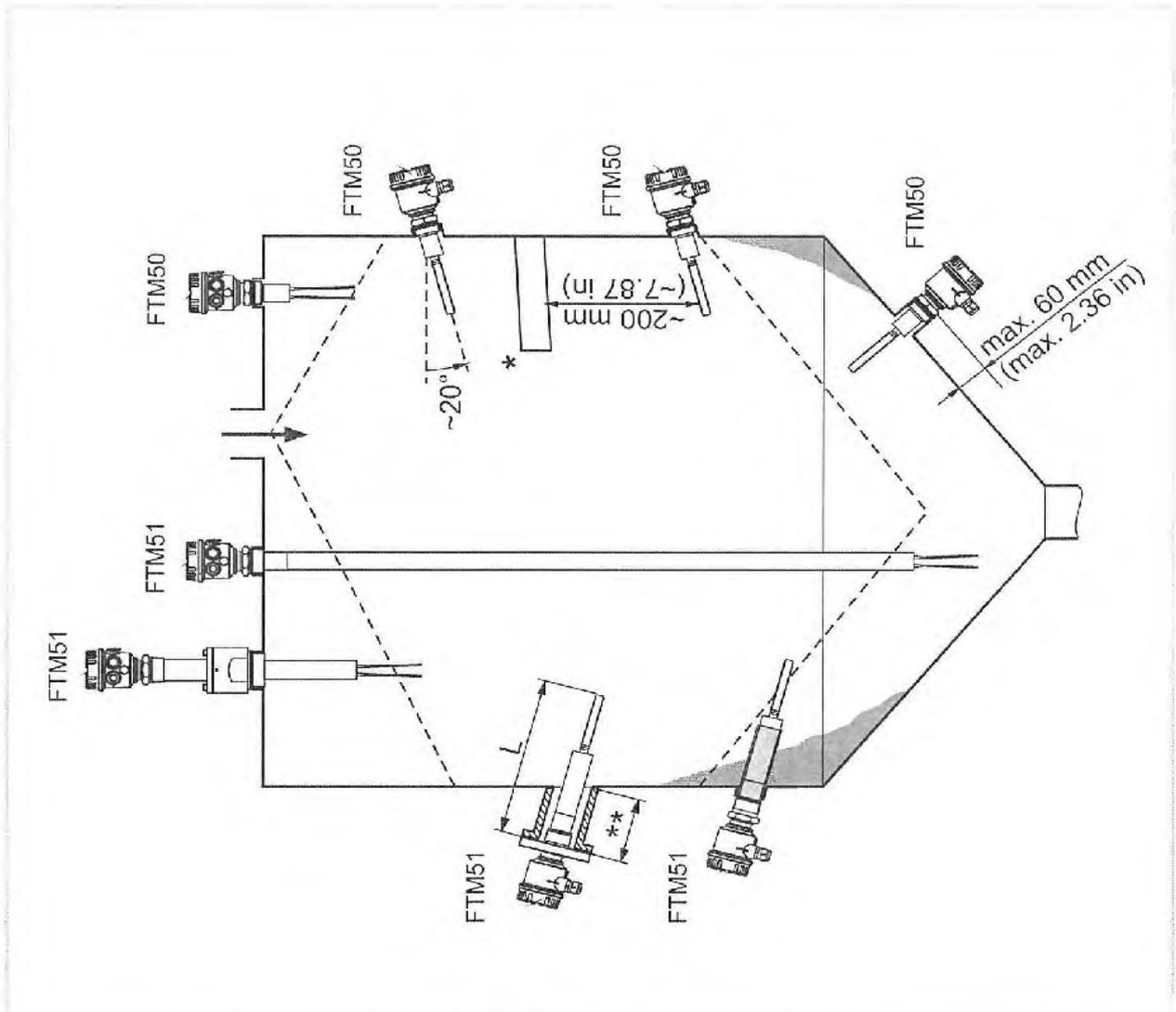


Endress+Hauser



- Distanziale per temperatura / Temperatuurreductiestuk  
 $\leq 150\text{ }^{\circ}\text{C}$  ( $\leq 300\text{ }^{\circ}\text{F}$ ), EN10204-3.1, \*<sup>5</sup>
- F Hochtemperatur / high temperature / Haute température /  
 Alta temperatura / Temperatura elevada / Hoge temperatuur  
 $\leq 280\text{ }^{\circ}\text{C}$  ( $\leq 540\text{ }^{\circ}\text{F}$ )
- H Hochtemperatur / high temperature / Haute température /  
 Alta temperatura / Temperatura elevada / Hoge temperatuur  
 $\leq 280\text{ }^{\circ}\text{C}$  ( $\leq 540\text{ }^{\circ}\text{F}$ ), EN10204-3.1, \*<sup>5</sup>
- J Hochtemperatur / high temperature / Haute température /  
 Alta temperatura / Temperatura elevada / Hoge temperatuur  
 $\leq 230\text{ }^{\circ}\text{C}$  ( $\leq 450\text{ }^{\circ}\text{F}$ )
- K Hochtemperatur / high temperature / Haute température /  
 Alta temperatura / Temperatura elevada / Hoge temperatuur  
 $\leq 230\text{ }^{\circ}\text{C}$  ( $\leq 450\text{ }^{\circ}\text{F}$ ), EN10204-3.1, \*<sup>5</sup>
- Y \*<sup>2</sup>

- \*<sup>1</sup> ohne / without / sans / sin / senza / zonder
- \*<sup>2</sup> andere / others / autres / otros / altri / andere
- \*<sup>3</sup> Separatgehäuse / separate housing / Boîtier séparé /  
 Cabezal separado / Custodia separata / Separate behuizing
- \*<sup>4</sup> Konformitätserklärung / declaration of conformity /  
 Déclaration de conformité / Declaración de conformidad /  
 Dichiarazione di conformità / Conformiteitsverklaring
- \*<sup>5</sup> Material (mediumberührt), Abnahmeprüfzeugnis /  
 material (wetted parts), inspection certificate /  
 Matériau (en contact avec le produit), certificat matière /  
 Material (piezas mojadas), certificado de recepción /  
 Materiale (a contatto con il prodotto), certificato di collaudo /  
 Materiaal (in aanraking met medium), afnamecertificaat
- \*<sup>6</sup> Oberflächenveredelung / surface refinement /  
 Finition de surface / Refinamiento de superficie /  
 Finitura di superficie / Oppervlak veredeling



de - Einbauhinweise  
 en - Mounting Notes  
 fr - Conseils pour le montage  
 es - Recomendaciones de montaje  
 it - Note al montaggio  
 nl - Inbouwtips

\* Schutzdach/protective roof/  
 Déflecteur/tejado protector/  
 tettuccio protettivo/Beschermdakje

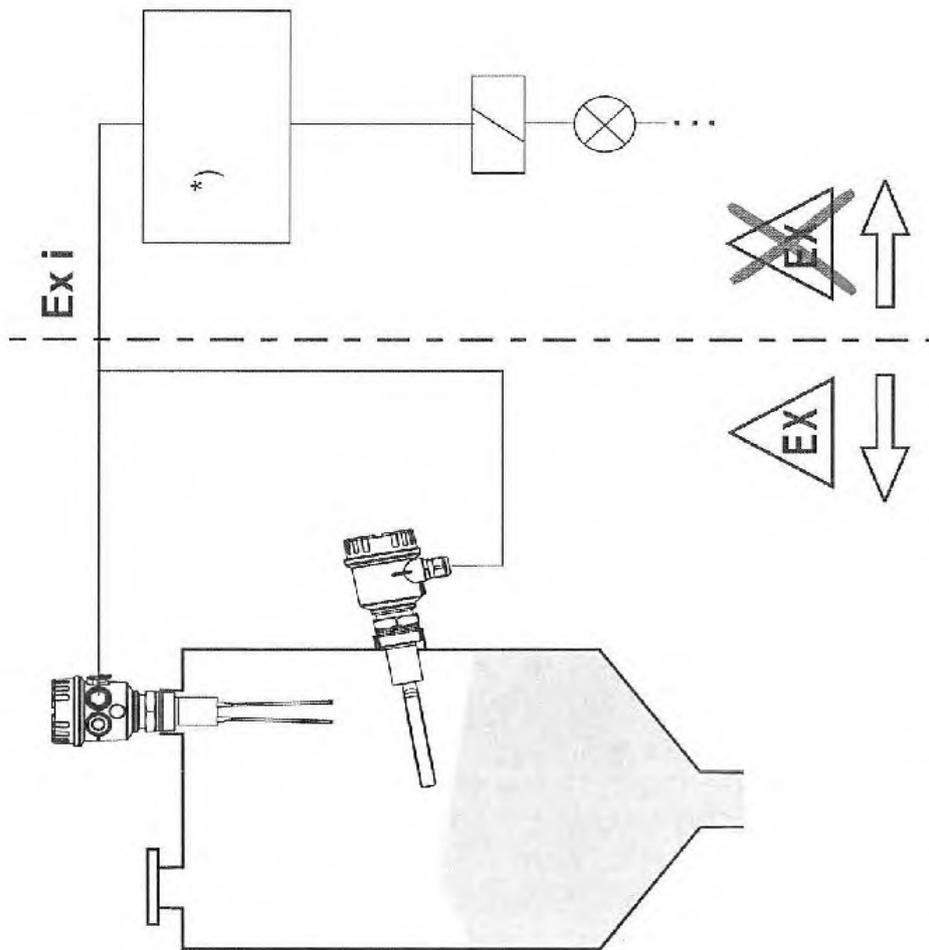
\*\* Stutzenlänge/nozzle length/  
 Longueur du piquage/  
 longitud de la tubuladura/  
 lunghezza tronchetto/tubelure lengte  
 max.: L – 200 mm (7.87 in)  
 Standardgabel / standard fork /  
 fourche standard / horquilla estándar /  
 forcilla standard / standaardvork  
 max.: L – 145 mm (5.71 in)  
 Kurzgabel / short fork /  
 fourche courte / horquilla corta /  
 forcilla corta /korte vork







- de - Messeinrichtung**  
für Anschluss über Schaltgerät
- en - Measuring system**  
for connection via switching unit
- fr - Ensemble de détection de niveau**  
pour raccordement via transmetteur
- es - Sistema de medida**  
para conexión con transmisores remotos
- it - Sistema di misura**  
per connessione mediante unità di commutazione
- nl - Meetopstelling**  
voor aansluiting aan een schakelversterker



\*) Schaltgerät, SPS, Trennverstärker, Segmentkoppler  
 Switching unit, PLC, isolating amplifier, Segment coupler  
 Transmetteur, API, convertisseur/ séparateur, Coupleur de segments  
 Interruttore, PLC, amplificador aislado, Acoplador segmento  
 Unità di commutazione, PLC, barriera di separazione, Segment coupler  
 Schakelversterker, PLC, scheidingsverstärker, segmentkoppeling



**de - Auswahl der Gabellänge**

Abhängig vom Schüttgewicht

**en - Selection of the fork length**

depending on the bulk density

**fr - Sélection de la longueur de fourche**

Exemple d'implantation en fonction de la densité de solides

**es - Selección de la longitud de la horquilla**

Ejemplos de montaje dependiendo de la densidad del sólido

**it - Selezione della lunghezza della forcella**

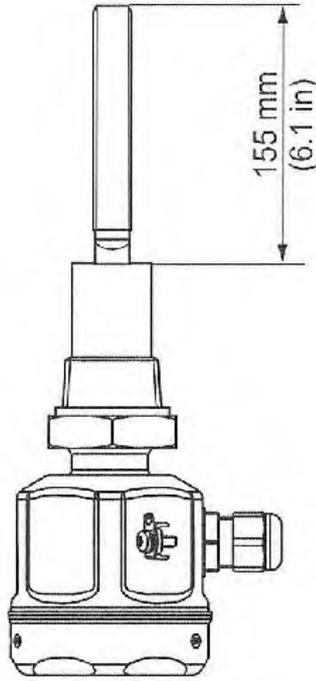
Esempi di montaggio in funzione della densità

**nl - Keuze van de vorklengte**

Afhankelijk van het stortgewicht

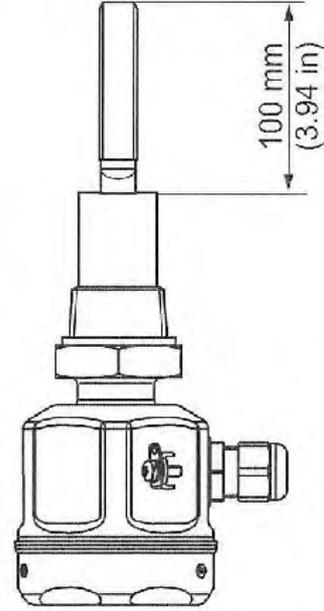
Schüttgewicht bei Standardgabel / bulk density with standard fork /  
 Densité avec fourche standard / Densidad del sólido con horquilla estándar /  
 densità prodotto con forcella standard / Stortgoed met standaard vork

≥ 10 g/l (≥ 0.7 lbs)



Schüttgewicht bei Kurzgabel / bulk density with short fork /  
 Densité avec fourche courte / Densidad del sólido con horquilla corta /  
 densità prodotto con forcella corta / Stortgoed met korte vork

≥ 50 g/l (≥ 3 lbs)





**de** - Ansatzbildung berücksichtigen.  
Schwinggabel darf Ansatz am Behälter nicht berühren.

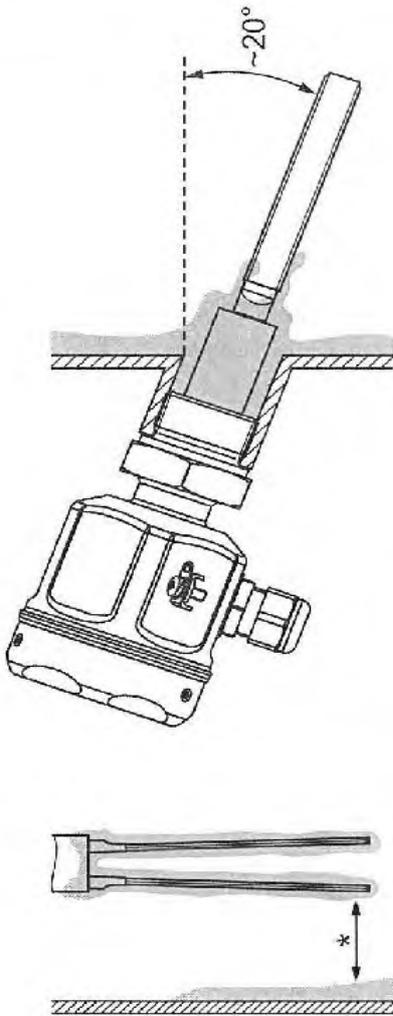
**en** - Consider build-up.  
Fork may not come into contact with build-up on tank.

**fr** - Tenir compte du colmatage.  
La fourche ne doit pas entrer en contact avec le dépôt sur le réservoir.

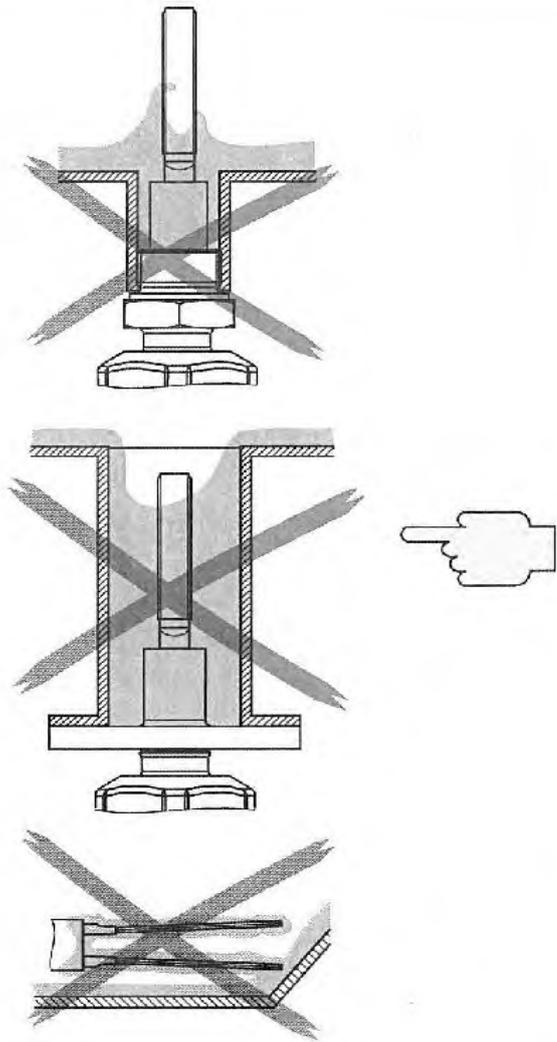
**es** - Tener en cuenta las adherencias.  
Las horquillas no deben estar en contacto con las adherencias del producto.

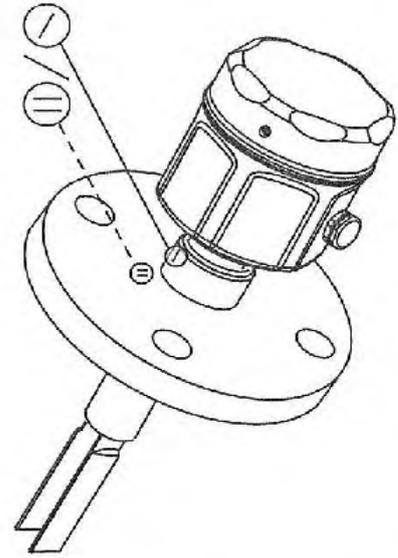
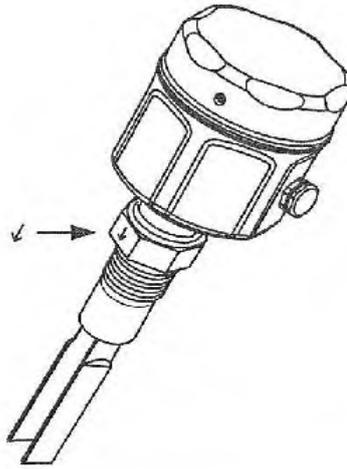
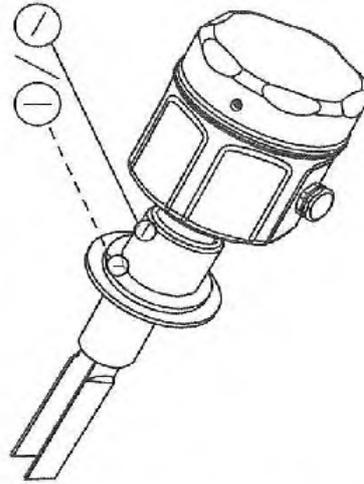
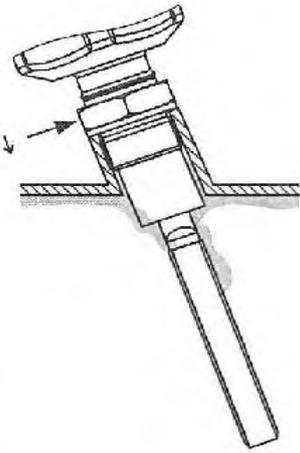
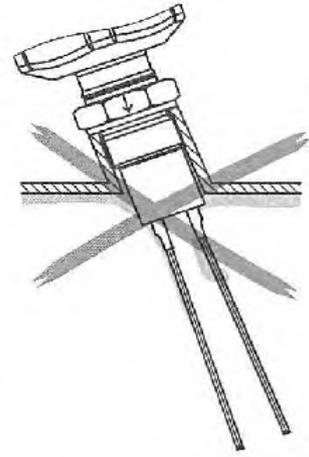
**it** - Tenere conto dei depositi.  
La forcella non deve entrare in contatto con i depositi sulle pareti.

**nl** - Rekening houden met aangroei.  
Trilvork mag de aangroei van de silo niet raken.



\* Abstand! / Distance! / ¡Distancia! / Distanza! / Afstand!





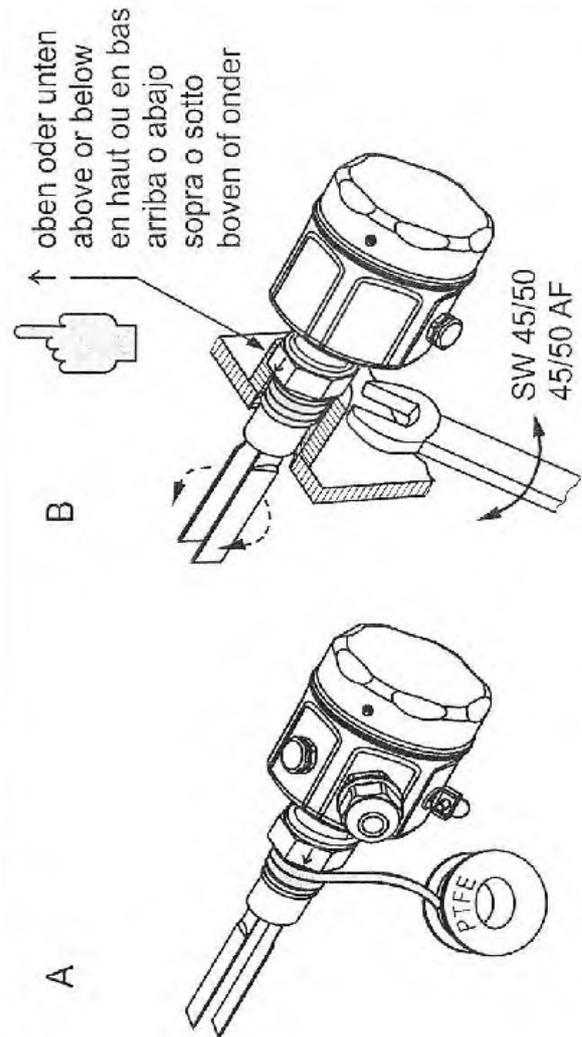
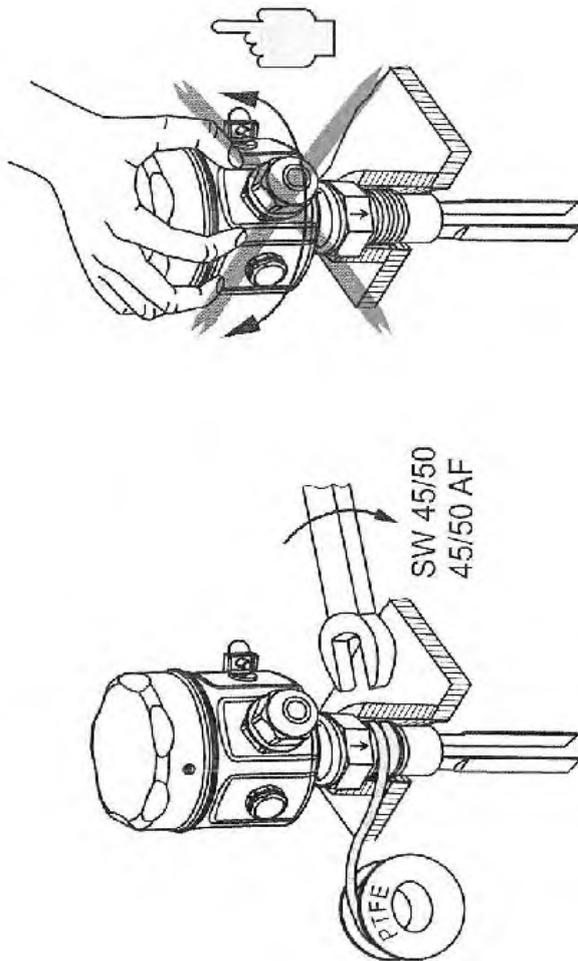
- de** - Schwinggabel ausrichten:  
Markierung oben oder unten
- en** - Orientation of fork tines:  
Marking above or below
- fr** - Orientation des lames vibrantes:  
Repères en haut ou en bas
- es** - Orientación de la horquilla:  
Marca arriba o abajo
- it** - Allineamento della forcella:  
Marcatura in alto o in basso
- nl** - Vork uitrichten:  
Markering boven of onder

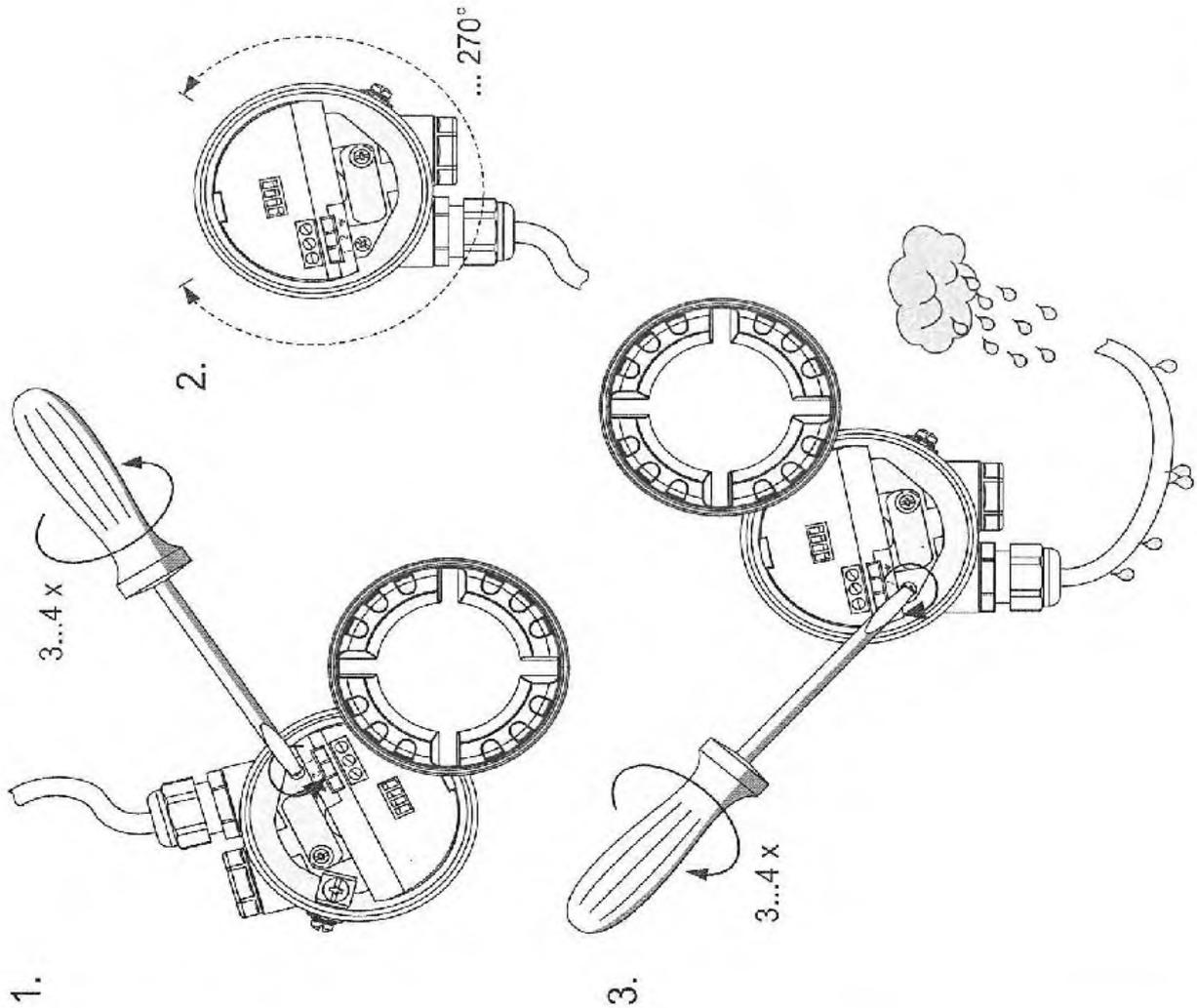


**de** - Soliphant einschrauben.  
**Nicht** am Gehäuse drehen.  
**en** - Screw Soliphant into process connection.  
**Don't** use housing to turn.  
**fr** - Visser le Soliphant.  
**Ne pas** se servir du boîtier.  
**es** - Roscar el Soliphant a la conexión a proceso.  
**No girar** el cabezal.  
**it** - Avvitare il Soliphant all'attacco di processo.  
 Allo scopo **non** utilizzare la custodia.  
**nl** - Schroef de Soliphant in de procesaansluiting.  
 Draai hierbij **niet** aan de behuizing.

SW 45, 45 AF:  
 1½ NPT, ø 36 mm (1.42 in)  
 1¼ NPT, ø 36 mm (1.42 in)

SW 50, 50 AF:  
 1½ NPT, ø 43 mm (1.69 in)  
 R 1½, ø 43 mm (1.69 in)





**de** – Kabeleinführung ausrichten  
**en** – Cable gland orientation  
**fr** – Orientation de l'entrée de câble  
**es** – Ajuste del prensaestopa  
**it** – Posizionamento del passacavo  
**nl** – Kabelinvoer uitrichten

Anzugsdrehmoment /  
 Torque /  
 Couple de serrage /  
 Esfuerzo de torsión /  
 Coppia di torsione /  
 Aandraaimoment

F16:  
 0.6 Nm (0.4425 lbf ft)  
 F15, F17, F13, T13:  
 0.9 Nm (0.6638 lbf ft)



de - Sicherheitsschaltung  
MIN/MAX

en - Fail-safe mode  
MIN/MAX

fr - Sécurité  
MIN/MAX

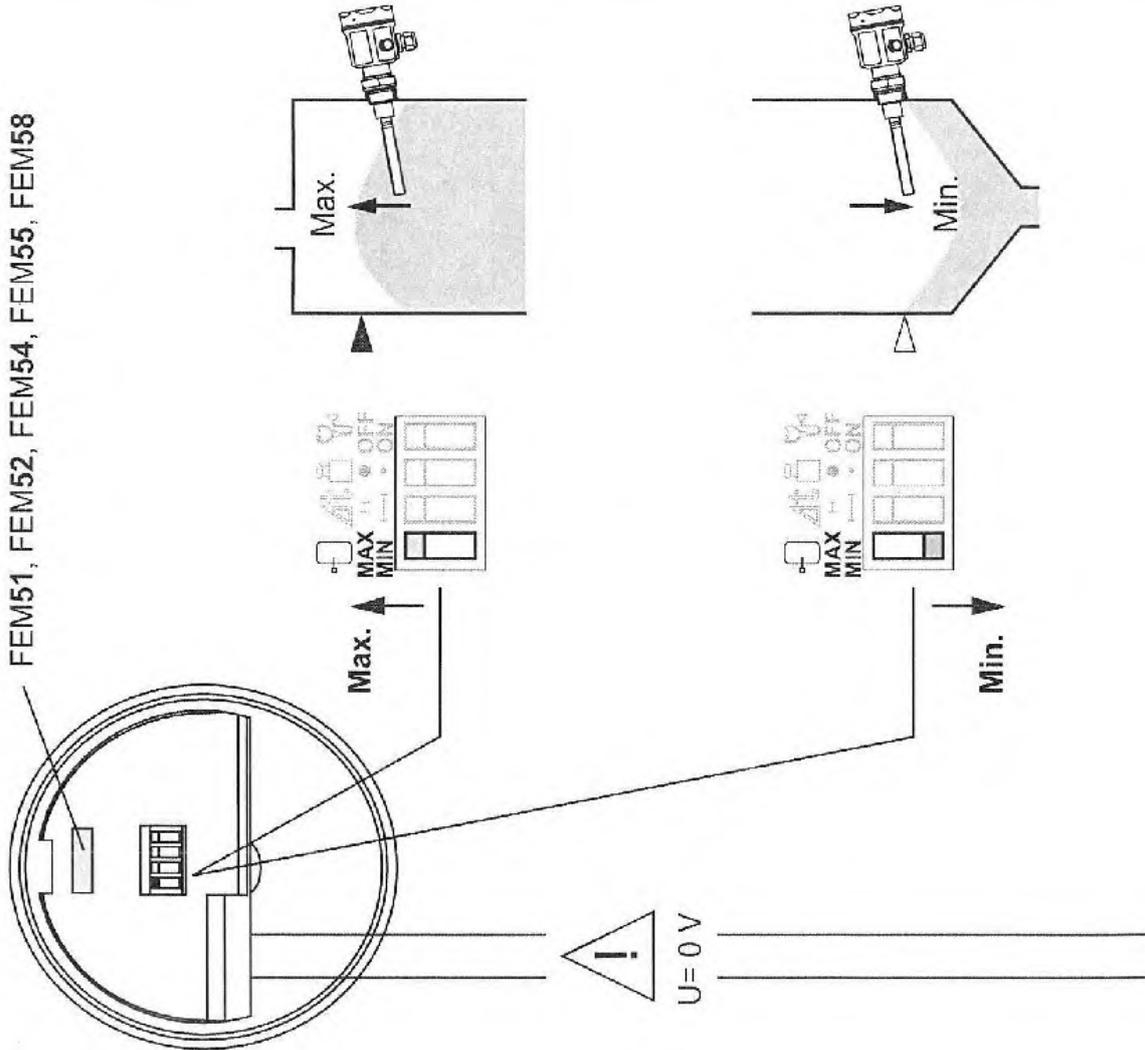
es - Conmutador de seguridad  
MIN/MAX

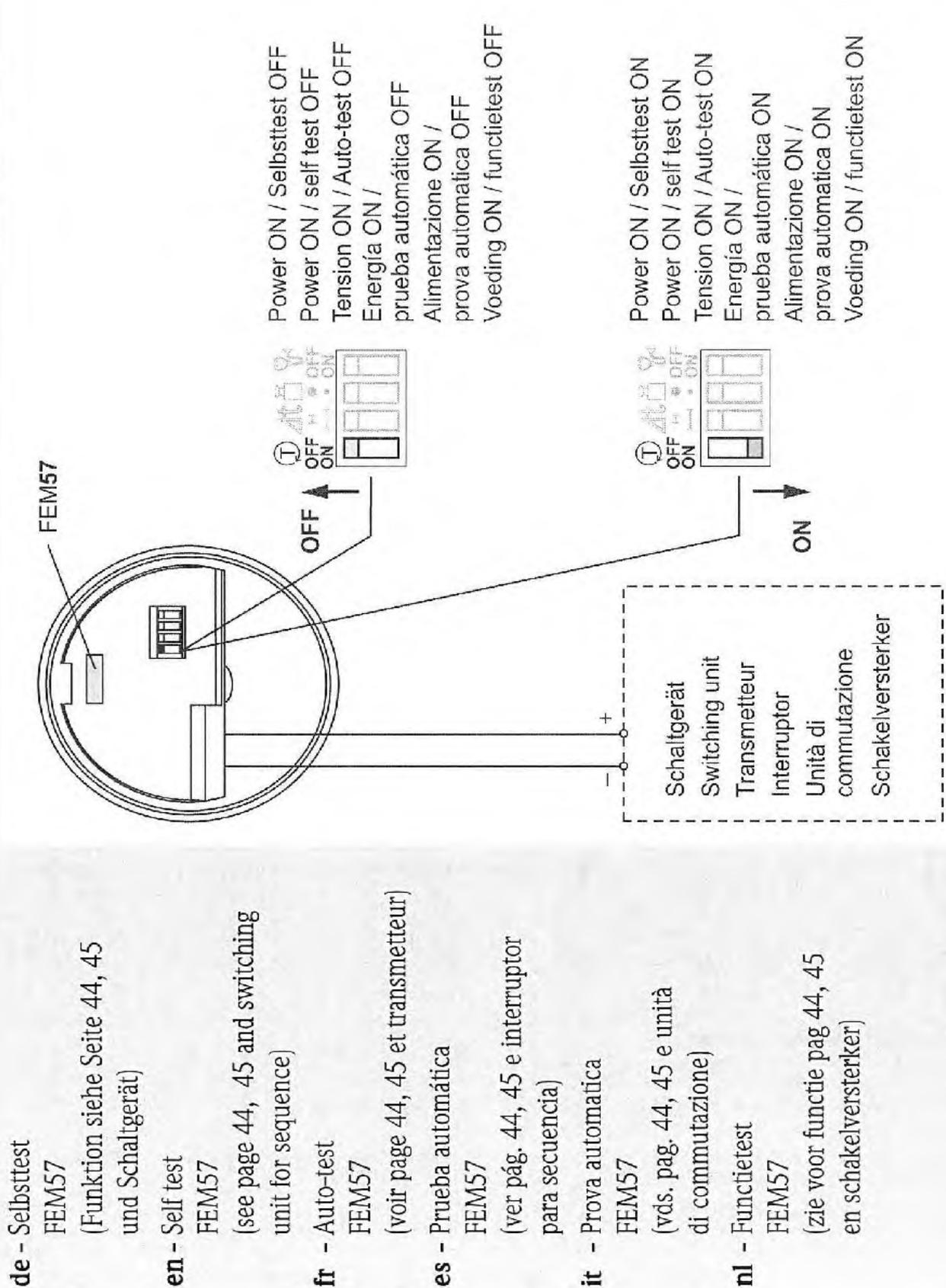
it - Selezione della modalità  
di sicurezza  
MIN/MAX

nl - Veiligheidsschakeling  
MIN/MAX



FEM51, FEM52, FEM54, FEM55, FEM58

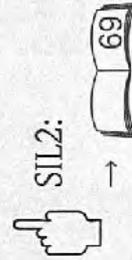
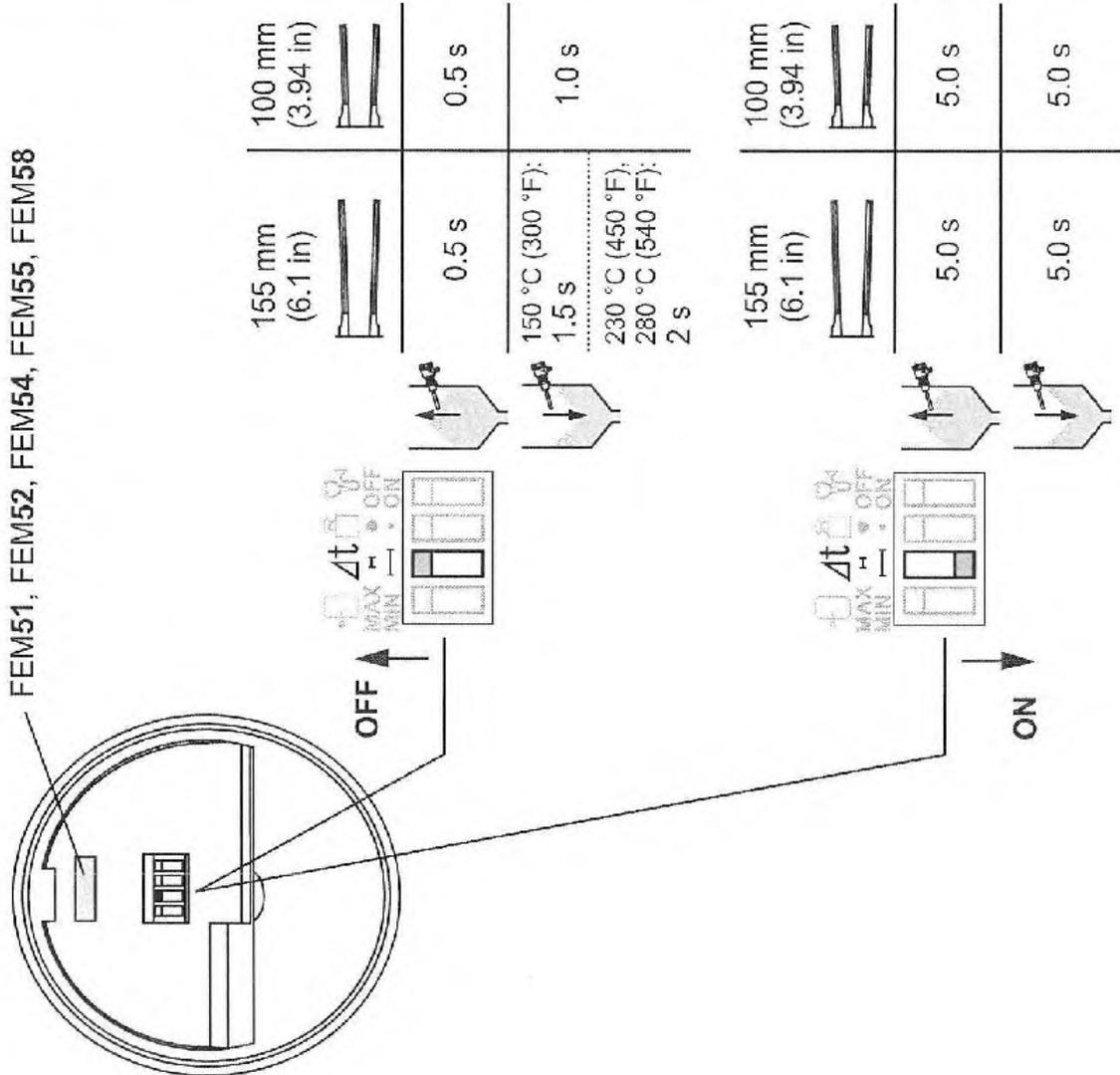






de - Schaltverzögerung  
 en - Switching delay  
 fr - Temporisation de la commutation  
 es - Retraso en la conmutación  
 it - Tempo di commutazione  
 nl - Schakelvertraging

FEM51, FEM52, FEM54, FEM55, FEM58





**de** - Dichteinstellung.  
Schüttgewicht gemessen in g/l.  
Für **Standardgabel**.

**en** - Solids density.  
Bulk density measured in g/l.  
For **standard fork**.

**fr** - Densité du produit.  
Densité mesurée en g/l.  
Pour **fourche standard**.

**es** - Densidad de los sólidos.  
Densidad del sólido medida en g/l.  
Para la **horquilla estándar**.

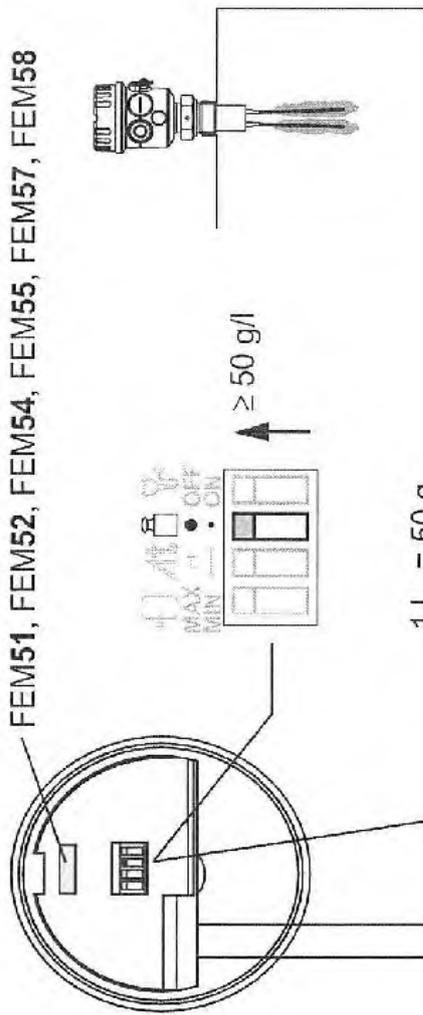
**it** - Densità del solido.  
Densità del solido misurata in g/l.  
Par la **forcella standard**.

**nl** - Stortgewicht.  
Stortgewicht gemeten in g/l.  
Voor **standaardvork**.

Sedimentation / Sedimentation /  
Sédimentation / Sedimentación /  
Sedimentazione / Sediment

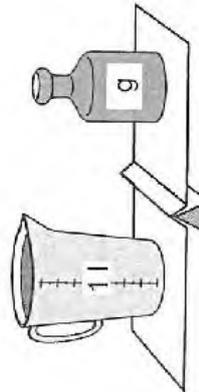
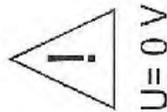


FEM51, FEM52, FEM54, FEM55, FEM57, FEM58

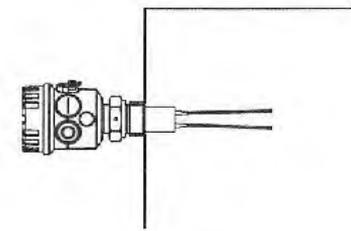


1 l = 50 g  
(1 ft<sup>3</sup> = 3 lbs)

Standard / Standard /  
Standard / Estándar /  
Standard / Standard



1 l = 10 g  
(1 ft<sup>3</sup> = 0.7 lbs)





**de** - DichteEinstellung.  
Schüttgewicht gemessen in g/l.  
Für **Kurzgabel**.

**en** - Solids density.  
Bulk density measured in g/l.  
For **short fork**.

**fr** - Densité du produit.  
Densité mesurée en g/l.  
Pour **fourche courte**.

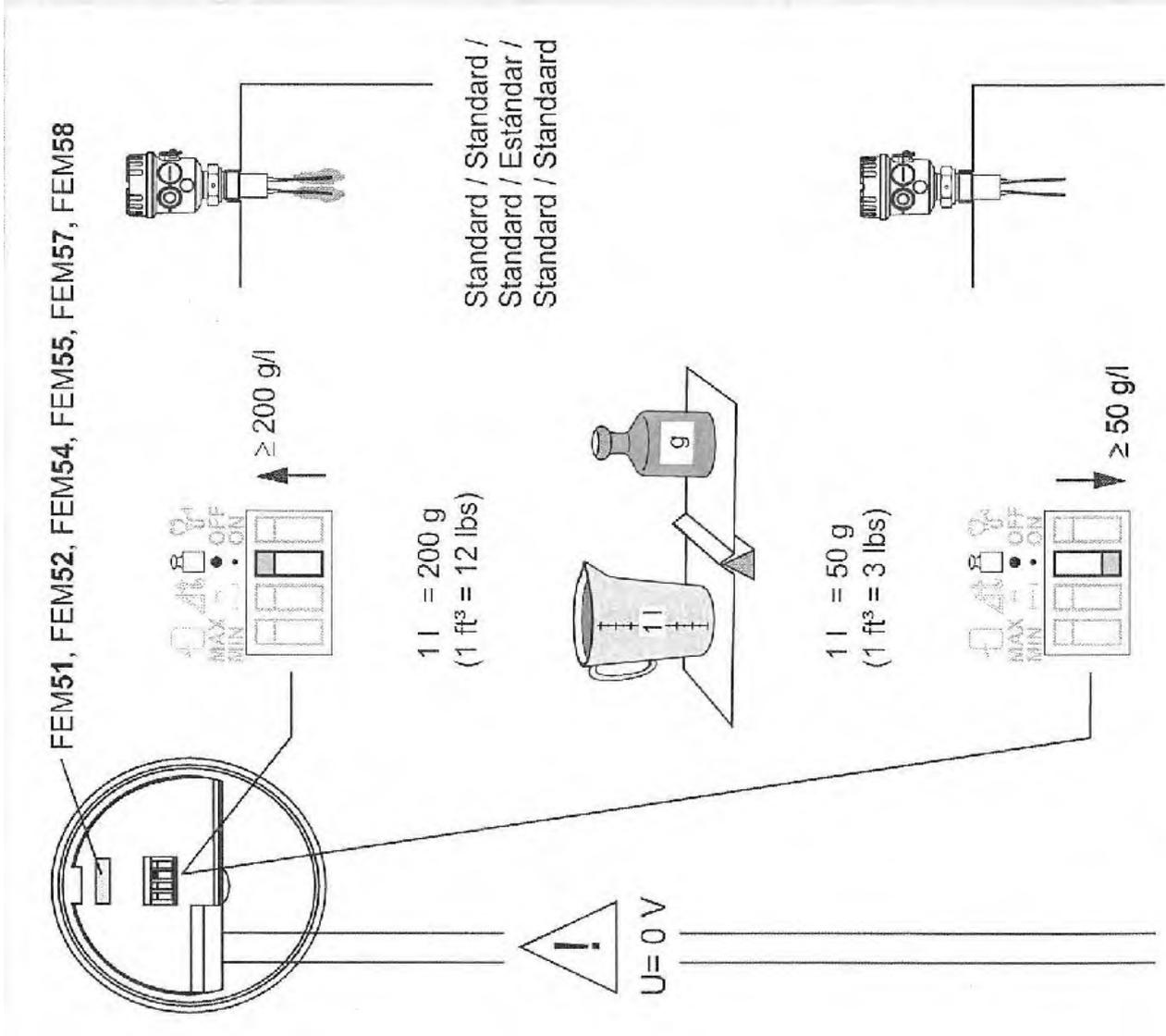
**es** - Densidad de los sólidos.  
Densidad del sólido medida en g/l.  
Para la **horquilla corta**.

**it** - Densità del solido.  
Densità del solido misurata in g/l.  
Par la **forcella corta**.

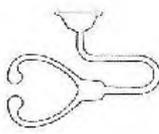
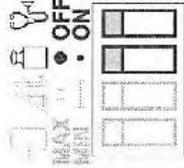
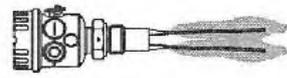
**nl** - Stortgewicht.  
Stortgewicht gemeten in g/l.  
Voor **korte vork**.

Sedimentation / Sedimentation /  
Sédimentation / Sedimentación /  
Sedimentazione / Sediment

→ 50



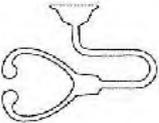
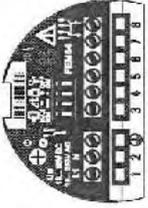
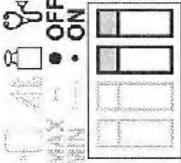
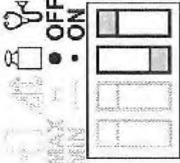
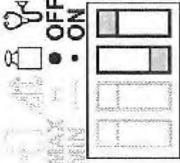
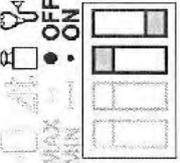
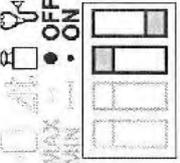
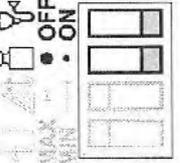
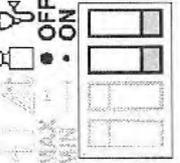


<p>de - Diagnose en - Diagnosis fr - Diagnostic es - Diagnóstico it - Diagnosi nl - Diagnose</p>			<p>Ansatz / Build-up / Colmatage / Adherencias / Depositi / Aangroei</p> 	<p>Abrasion / Abrasion / Abrasion / Abrasión / Abrasion / Abrasieve slijtage</p> 

Hinweise zur Symbolik /  
References to the symbolism /  
Symboles utilisés /  
Significado de los símbolos /  
Riferimento dei simboli /  
Verwijzing via symbolen

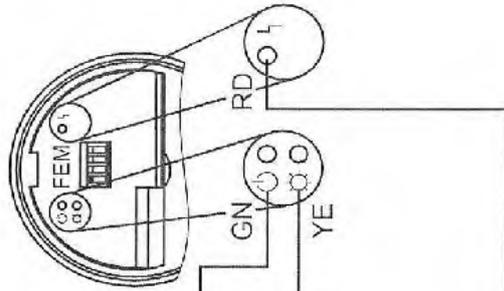




	<p>elektronische Störung /          electronic error /          défaut électronique /          error electrónico /          errore elettronico /          elektronische fout</p> 		<p>●      ☀</p> <p>Rote LED-Signale (Störung) /          Red LED signals (error) /          Signaux de DEL rouge (défaut) /          Señales rojas del LED (error) /          Segnali rossi del LED (errore) /          Rode LED signalen (fout)</p>
	<p>☀*</p> <p>⚡</p>		<p>☀*</p> <p>Elektronikeinsatz FEL58          (NAMUR) /          Electronic insert FEL58          (NAMUR) /          Electronique FEL58          (NAMUR) /          Electrónica FEL58          (NAMUR) /          Inserto elettronico FEL58          (NAMUR) /          Elektronica-insert FEL58          (NAMUR)</p>
	<p>☀*</p> <p>⚡</p>		<p>☀*</p> <p>Elektronikeinsatz FEL58          (NAMUR) /          Electronic insert FEL58          (NAMUR) /          Electronique FEL58          (NAMUR) /          Electrónica FEL58          (NAMUR) /          Inserto elettronico FEL58          (NAMUR) /          Elektronica-insert FEL58          (NAMUR)</p>
	<p>☀*</p> <p>⚡</p>		<p>☀*</p> <p>Elektronikeinsatz FEL58          (NAMUR) /          Electronic insert FEL58          (NAMUR) /          Electronique FEL58          (NAMUR) /          Electrónica FEL58          (NAMUR) /          Inserto elettronico FEL58          (NAMUR) /          Elektronica-insert FEL58          (NAMUR)</p>



de - Hinweise zur Symbolik  
 en - References to the symbolism  
 fr - Symboles utilisés  
 es - Significado de los símbolos  
 it - Riferimento dei simboli  
 nl - Verwijzing via symbolen



Leuchtdioden / LEDs / DEL / LEDs / LED / LED's



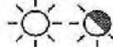
Betrieb / Stand-by / Fonctionnement /  
 Reposo / Attesa / stand-by



Schaltzustand (FEM57: Bedeckung) /  
 Switching status (FEM57: Covering) /  
 Etat de commutation (FEM57: Recouvrement) /  
 Estado conexión (FEM57: Cubierto) /  
 Stato di commutazione (FEM57: Copertura) /  
 schakelstand (FEM57: bedekking)



Störung, Alarm / Fault, alarm / Défaut, alarme /  
 Fallo, alarma / Guasto, allarme / storing, alarm



leuchtet / on / allumée / iluminado / on / aan



blinkt / flashes / clignote / parpadea / lampeggia / knippert



aus / off / éteinte / apagado / off / uit



Füllstand / level / Niveau / Nivel / livello / Niveau



Ausgangssignal / Output signal / Signal de sortie /  
 Señal de salida / Segnale uscita / uitgangssignaal



Laststrom (durchgeschaltet) / load current (switched through) /  
 Courant de charge (passant) / corriente de carga (a través de conmutador) /  
 corrente di carico (commutazione) / belastingsstroom (schakelstroom)

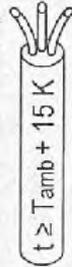
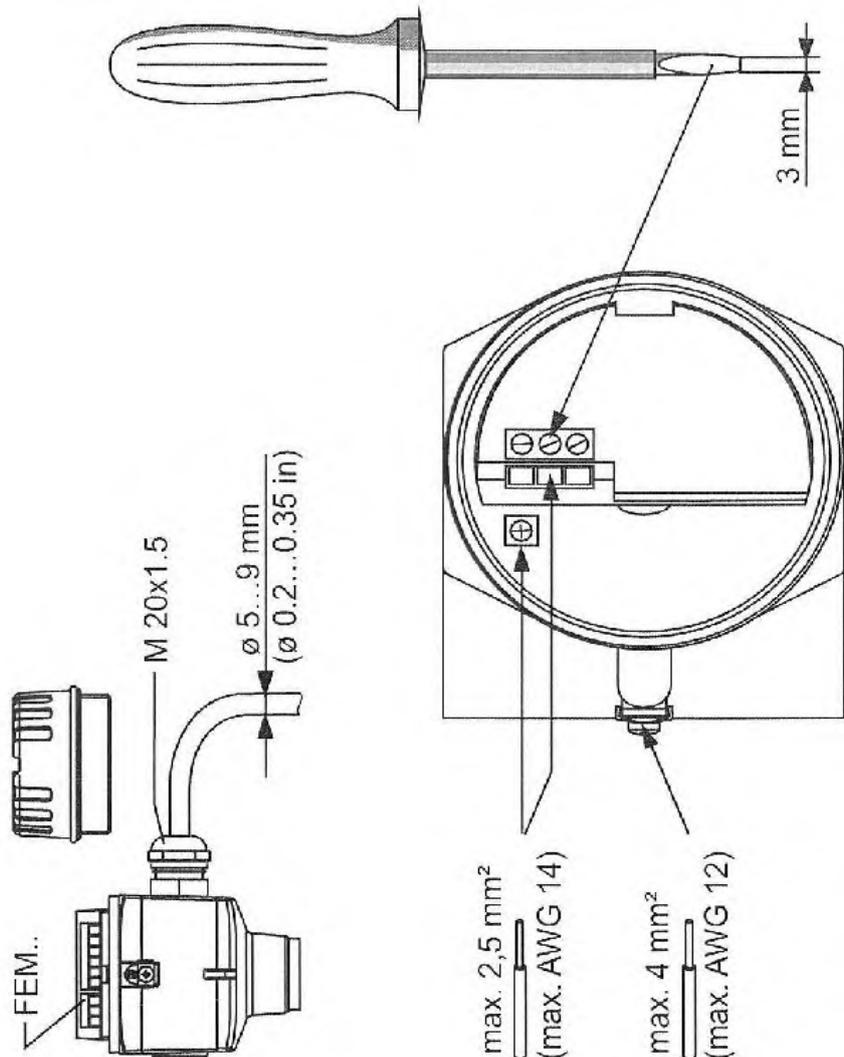


Reststrom (gesperrt) / residual current (blocked) /  
 Courant repos (non passant) / corriente residual (bloqueada) /  
 corrente residua (bloccata) / reststroom (geblokkeerd)



Nationale Normen und Vorschriften beachten!  
 Note national regulations!  
 Respecter les lois et règles locales en vigueur!  
 Considere reglamentaciones nacionales  
 Osservare le norme nazionali!  
 Nationale voorschriften in acht nemen!

de - Anschluss  
 en - Connections  
 fr - Raccordement  
 es - Conexiones  
 it - Collegamenti elettrici  
 nl - Aansluiting





**de** - Anschluss FEM51

Zweileiter-  
Wechselstromanschluss

**en** - Connections FEM51

Two-wire AC connection

**fr** - Raccordement FEM51

Raccordement 2 fils  
courant alternatif

**es** - Conexiones FEM51

Conexión a corriente alterna  
a dos hilos

**it** - Collegamenti elettrici FEM51

Collegamento bifilare  
con corrente alternata

**nl** - Aansluiting FEM51

2-draads  
wisselspanningsaansluiting

Externe Last R muss  
angeschlossen werden

External load R must  
be connected

Charge externe R doit  
être raccordée

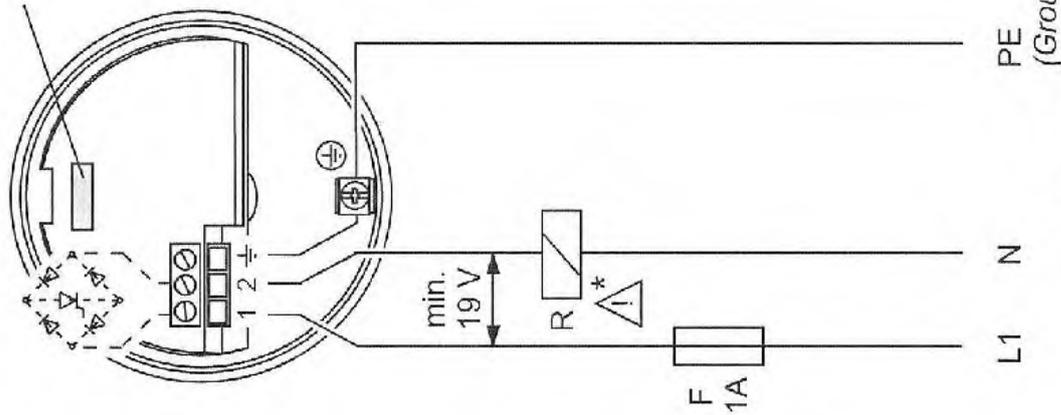
La carga externa R  
debe estar conectada

Il carico esterno R  
deve essere connesso

Externe belasting R  
moet aangesloten worden



FEM51



$I_L$ max. 1.5 A	
$I_L$ max. 350 mA	
max. 89 VA / 253 V	
max. 8.4 VA / 24 V	
min. 2.5 VA / 253 V (10 mA)	
min. 0.5 VA / 24 V (20 mA)	

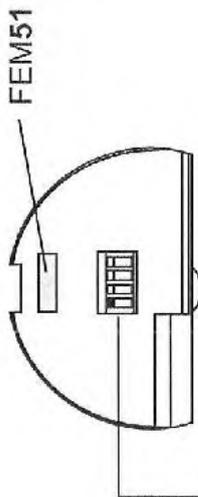


de - Funktion FEM51  
 en - Function FEM51  
 fr - Fonction FEM51  
 es - Funcionamiento FEM51  
 it - Funzione FEM51  
 nl - Functie FEM51

\*1 Wartungsbedarf /  
 Maintenance required /  
 Maintenance requise /  
 Requiere Mantenimiento /  
 Richiesta manutenzione /  
 Onderhoud gewensd

\*2 Geräteausfall /  
 Instrument failure /  
 Panne d'appareil /  
 Error de instrumento /  
 Strumento guasto /  
 Instrumentfout

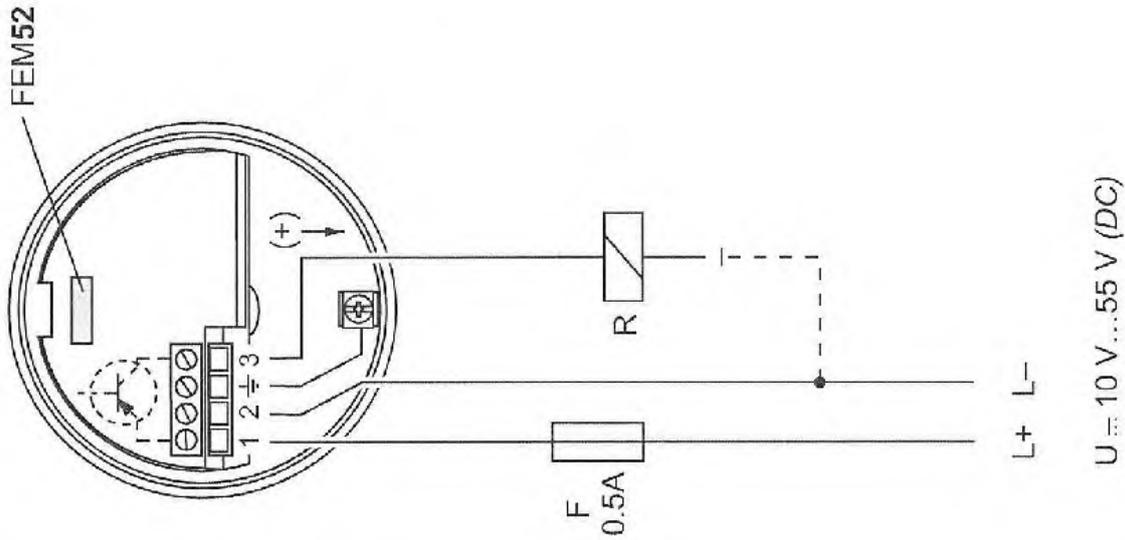
$\Delta U_{FEM51} = \text{max. } 12 \text{ V}$



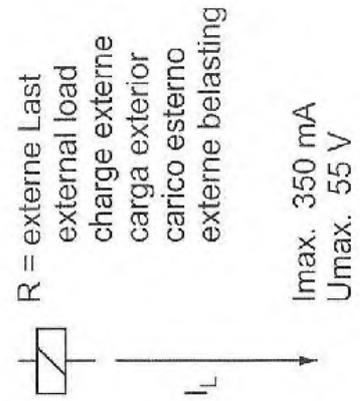
MAX												
MIN												
*1												
*2												



- de** - Anschluss FEM52  
Gleichstromanschluss (DC PNP)
- en** - Connections FEM52  
DC connection (DC PNP)
- fr** - Raccordement FEM52  
Courant continu (DC PNP)
- es** - Conexiones FEM52  
Alimentación CC (DC PNP)
- it** - Collegamenti elettrici FEM52  
Collegamento CC (DC PNP)
- nl** - Aansluiting FEM52  
Gelijkspanningsaansluiting  
(DC PNP)



auch für DI-Module  
also for DI modules  
également pour des modules DI  
también para módulos DI  
anche per moduli DI  
ook voor de DI module  
EN 61131-2



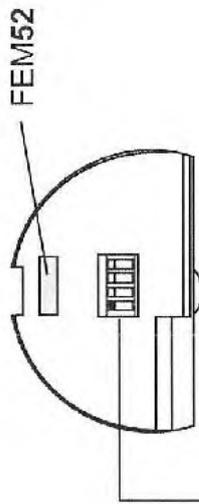


- de - Funktion FEM52
- en - Function FEM52
- fr - Fonction FEM52
- es - Funcionamiento FEM52
- it - Funzione FEM52
- nl - Functie FEM52

- \*1 Wartungsbedarf /  
Maintenance required /  
Maintenance requise /  
Reguiere Mantenimiento /  
Richiesta manutenzione /  
Onderhoud gewensd

- \*2 Geräteausfall /  
Instrument failure /  
Panne d'appareil /  
Error de instrumento /  
Strumento guasto /  
Instrumentfout

$\Delta U_{FEM52} = \text{max. } 3 \text{ V}$



		GN	YE	RD
MAX				
MIN				
*1				
*2				



**de** - Anschluss FEM54

Allstromanschluss  
Relaisausgang

**en** - Connections FEM54

Universal connection  
Relay output

**fr** - Raccordement FEM54

Tous courants  
Sorties relais

**es** - Conexiones FEM54

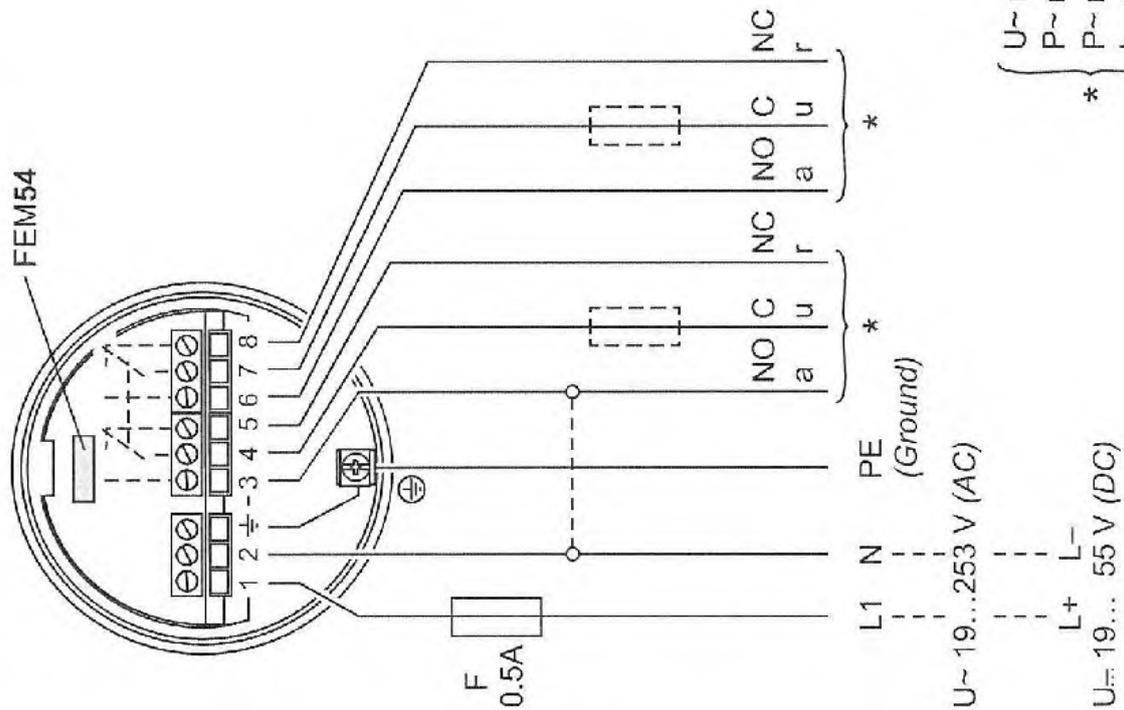
Conexión universal  
Salida por relé

**it** - Collegamenti elettrici FEM54

Collegamento corrente universale  
Uscita relé

**nl** - Aansluiting FEM54

Universele spanningsaansluiting  
Relaisuitgang



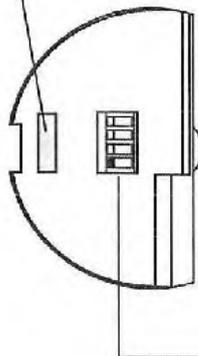


de - Funktion FEM54  
 en - Function FEM54  
 fr - Fonction FEM54  
 es - Funcionamiento FEM54  
 it - Funzione FEM54  
 nl - Functie FEM54

\*1 Wartungsbedarf /  
 Maintenance required /  
 Maintenance requise /  
 Requiere Mantenimiento /  
 Richiesta manutenzione /  
 Onderhoud gewensd

\*2 Geräteausfall /  
 Instrument failure /  
 Panne d'appareil /  
 Error de instrumento /  
 Strumento guasto /  
 Instrumentfout

FEM54



		FEM54	GN	YE	RD
MAX					
MIN					
*1					
*2					



**de** - Anschluss FEM55

Ausgang 8/16 mA

**en** - Connections FEM55

Output 8/16 mA

**fr** - Raccordement FEM55

Sortie 8/16 mA

**es** - Conexiones FEM55

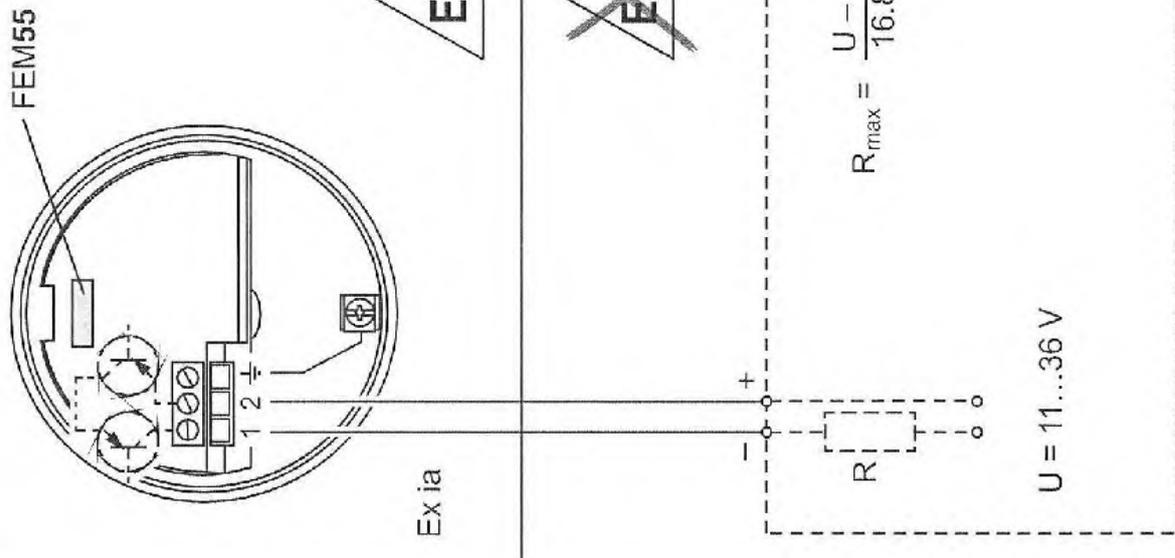
Salida 8/16 mA

**it** - Collegamenti elettrici FEM55

Uscita 8/16 mA

**nl** - Aansluiting FEM55

Uitgang 8/16 mA



z.B. SPS, AI-Module  
 e. g. PLC, AI modules  
 p. e. API, modules AI  
 por ej. PLC, módulos AI  
 p. e. PLC, AI modules  
 bijv. PLC, AI-module  
 4...20 mA  
 EN 61131-2



de - Funktion FEM55  
 en - Function FEM55  
 fr - Fonction FEM55  
 es - Funcionamiento FEM55  
 it - Funzione FEM55  
 nl - Functie FEM55

\*1 Wartungsbedarf /  
 Maintenance required /  
 Maintenance require /  
 Requiere Mantenimiento /  
 Richiesta manutenzione /  
 Onderhoud gewensd

\*2 Geräteausfall /  
 Instrument failure /  
 Panne d'appareil /  
 Error de instrumento /  
 Strumento guasto /  
 Instrumentfout

\*3 →

	FEM55	GN	YE	RD
MAX	FEM55 + 2 → ~16 mA → 1			
	FEM55 + 2 → ~8 mA → 1			
	FEM55 + 2 → ~16 mA → 1			
	FEM55 + 2 → ~8 mA → 1			
MIN	FEM55 + 2 → 8/16 mA → 1			
	FEM55 + 2 → 3.6 mA → 1			
	FEM55 + 2 → 3.6 mA → 1			



**de** - Anschluss FEM57

Ausgang PFM  
150 Hz / 50 Hz

**en** - Connections FEM57

PFM output  
150 Hz / 50 Hz

**fr** - Raccordement FEM57

Sortie PFM  
150 Hz / 50 Hz

**es** - Conexiones FEM57

Salida PFM  
150 Hz / 50 Hz

**it** - Collegamenti elettrici FEM57

PFM uscita  
150 Hz / 50 Hz

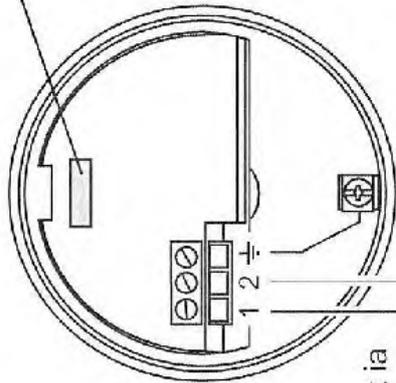
**nl** - Aansluiting FEM57

PFM uitgang  
150 Hz / 50 Hz

Funktion beachten!  
Note function!  
Voor functie!  
¡Atención función!  
Note di funzionamento!  
Let op functie!



FEM57



Ex ia



PFM  
50 Hz  
150 Hz

Nivotester

FTL120Z, FTL320  
FTL325P 1CH  
FTL325P 3CH

FTL170Z, FTL370/372

FTL375P 1CH

Eingang / Input / Entrée / Entrada / Entrada / Eingang: 1

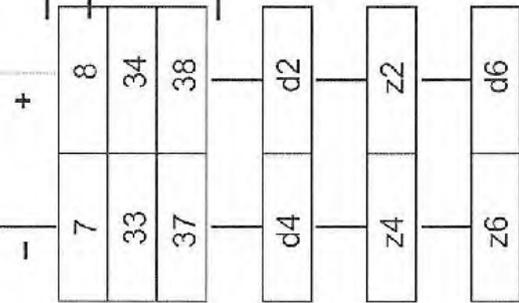
FTL170Z, FTL372

FTL375P 2CH

Eingang / Input / Entrée / Entrada / Entrada / Eingang: 2

FTL375P 3CH

Eingang / Input / Entrée / Entrada / Entrada / Eingang: 3



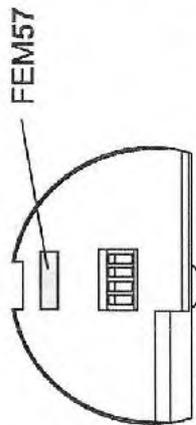


- de - Funktion FEM57
- en - Function FEM57
- fr - Fonction FEM57
- es - Funcionamiento FEM57
- it - Funzione FEM57
- nl - Functie FEM57

- \*1 Wartungsbedarf /  
Maintenance required /  
Maintenance requise /  
Requiere Mantenimiento /  
Richiesta manutenzione /  
Onderhoud gewensd

- \*2 Geräteausfall /  
Instrument failure /  
Panne d'appareil /  
Error de instrumento /  
Strumento guasto /  
Instrumentfout

\*3 →



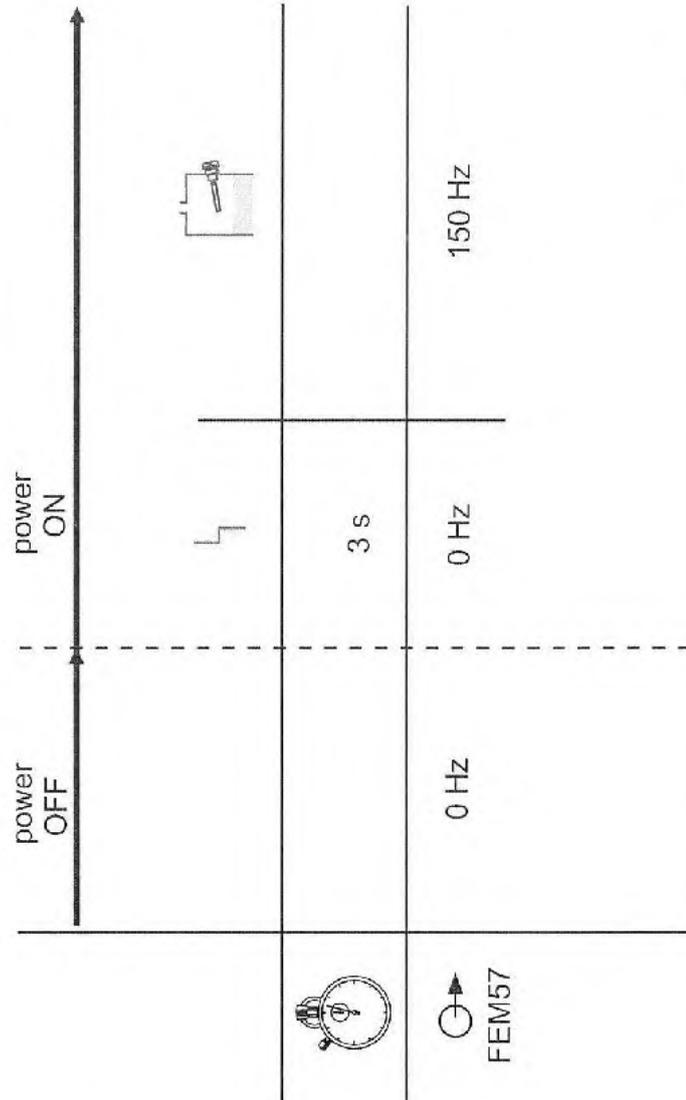
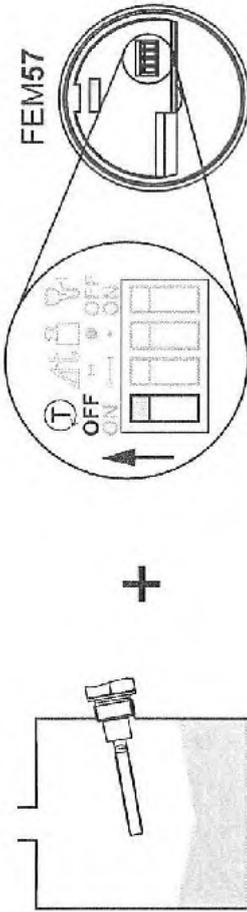
	FEM57	GN	YE	RD
	150 Hz			
	50 Hz			
*1	150 Hz			
	0 Hz			
*2	0 Hz			

Einschaltverhalten /  
Switch-on behaviour /  
Comportement à la mise sous tension /  
Comportamiento del cambio de estado /  
Comportamento accensione /  
Schakelstatus

→



- de** - Einschaltverhalten  
Selbsttest (OFF)
- en** - Switch-on behaviour  
Auto-test (OFF)
- fr** - Comportement à la mise  
sous tension  
Auto-test (OFF)
- es** - Comportamiento del cambio  
de estado  
Prueba automática (OFF)
- it** - Comportamento in fase di  
accensione  
Prova automatica (OFF)
- nl** - Inschakelgedrag  
Functietest (OFF)







**de** - Anschluss FEM58  
NAMUR-Ausgang H-L  
> 2,2 mA / < 1,0 mA

**en** - Connections FEM58  
NAMUR output H-L  
> 2.2 mA / < 1.0 mA

**fr** - Raccordement FEM58  
Sortie NAMUR H-L  
> 2,2 mA / < 1,0 mA

**es** - Conexiones FEM58  
Salida NAMUR H-L  
> 2,2 mA / < 1,0 mA

**it** - Collegamenti elettrici FEM58  
NAMUR uscita H-L  
> 2,2 mA / < 1,0 mA

**nl** - Aansluiting FEM58  
NAMUR uitgang H-L  
> 2,2 mA / < 1,0 mA

Ex ia

\* Prüffaste / Test button /  
Touche test / Botón de prueba /  
Pulsante di test / Testknop

→ 48 49

H 2.2...4.8 mA  
L 0.4...1.0 mA

Trennverstärker nach  
NAMUR (IEC 60947-5-6)  
Isolating amplifier to  
NAMUR (IEC 60947-5-6)  
Convertisseur / séparateur  
selon NAMUR (IEC 60947-5-6)  
Amplificador aislado según  
NAMUR (IEC 60947-5-6)  
Barriera di separazione  
secondo NAMUR (IEC 60947-5-6)  
Scheidingsverstërker conform  
NAMUR (IEC 60947-5-6)

z.B. / e. g. / p. e. / por ej. / p. e. / bijv.  
FXN421, FXN422, SIN100, SIN110  
FTL325N, FTL375N

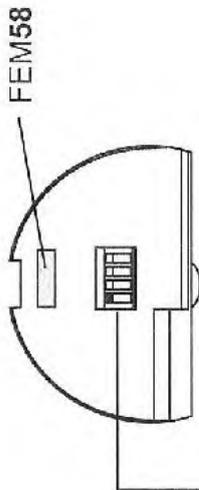
Multiplexer: Taktzeit min. 5 s  
Multiplexer: duty pulse cycle min. 5 s  
Multiplexeur: cycle d'impulsions min 5 s  
Multiplexer: ciclo de impulso min. 5 s  
Multiplexer: tempo di ciclo min. 5 s  
Multiplexer: pulstijd min. 5 s



- de - Funktion FEM58
- en - Function FEM58
- fr - Fonction FEM58
- es - Funcionamiento FEM58
- it - Funzione FEM58
- nl - Functie FEM58

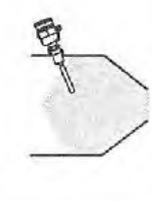
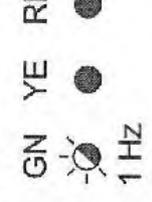
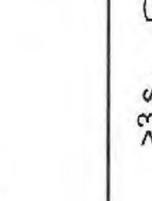
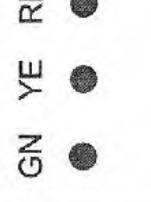
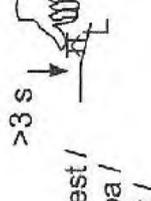
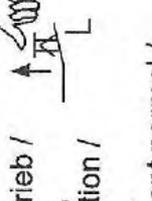
- \*1 Wartungsbedarf /  
Maintenance required /  
Maintenance requise /  
Requiere Mantenimiento /  
Richiesta manutenzione /  
Onderhoud gewensd

- \*2 Geräteausfall /  
Instrument failure /  
Panne d'appareil /  
Error de instrumento /  
Strumento guasto /  
Instrumentfout

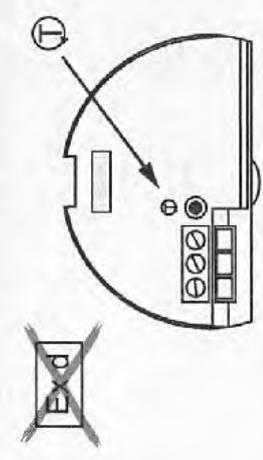


		FEM58	GN	YE	RD
MAX		+ 2 2.2 ... 4.8 mA → 1			
		+ 2 0.4 ... 1.0 mA → 1			
		+ 2 2.2 ... 4.8 mA → 1			
		+ 2 0.4 ... 1.0 mA → 1			
MIN	*1	+ 2 0.4 ... 4.8 mA → 1			
	*2	+ 2 0.4 ... 1.0 mA → 1			



 <p><b>MAX</b></p>		 <p>GN YE RD ● ● ● 1 Hz + 0.4... 1.0 mA → 1 2</p>	 <p>GN YE RD ● ● ● 1 Hz + 2.2... 4.8 mA → 1 2</p>
<p><b>1. Normaler Betrieb /</b> Normal operation / Fonctionnement normal / Funcionamiento normal / Funcionamento normale / Normaal bedrijf</p>	 <p>&gt;3 s</p> <p><b>2. Prüftaste drücken /</b> Press test button / Appuyer sur la touche test / Pulse el botón de prueba / Premere il pulsante test / Testknop indrukken</p>	 <p>GN YE RD ● ● ● 1 Hz + 0.4... 1.0 mA → 1 2</p>	 <p>GN YE RD ● ● ● 1 Hz + 2.2... 4.8 mA → 1 2</p>
<p><b>3. Prüftaste loslassen,</b> nach ~3 s normaler Betrieb / Release the test button, after ~3 s normal operation / Relâcher la touche test, après ~3 s fonctionnement normal / Deje de presionar el botón de prueba, después de ~3 s funcionamiento normal / Rilasciare il pulsante test, dopo ~3 s funzionamento normale / De testknop loslaten, na ~3 s normaal bedrijf</p>		 <p>GN YE RD ● ● ● 1 Hz + 0.4... 1.0 mA → 1 2</p>	 <p>GN YE RD ● ● ● 1 Hz + 2.2... 4.8 mA → 1 2</p>

- de** - Funktion Prüftaste FEM58  
Sicherheitsschaltung MAX
- en** - Function test button FEM58  
Fail-safe mode MAX
- fr** - Fonction touche test FEM58  
Sécurité MAX
- es** - Funcionamiento  
boton de prueba FEM58  
Conmutador de seguridad MAX
- it** - Funzione pulsante test FEM58  
Selezione della modalità  
di sicurezza MAX
- nl** - Functie testknop FEM58  
Veiligheidsschakeling MAX





**de** - Funktion Prüftaste FEM58  
Sicherheitschaltung MIN

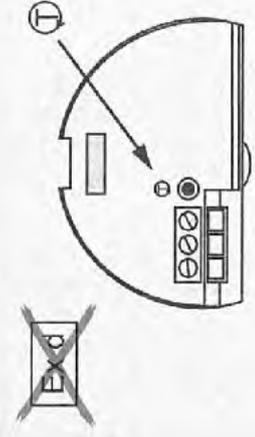
**en** - Function test button FEM58  
Fail-safe mode MIN

**fr** - Fonction touche test FEM58  
Sécurité MIN

**es** - Funcionamiento  
boton de prueba FEM58  
Conmutador de seguridad MIN

**it** - Funzione pulsante test FEM58  
Selezione della modalità  
di sicurezza MIN

**nl** - Functie testknop FEM58  
Veiligheidsschakeling MIN

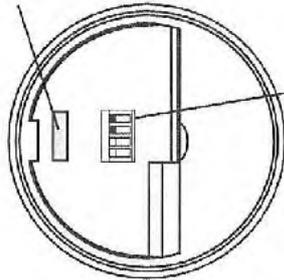


<p><b>MIN</b></p>			<p>1. Normaler Betrieb / Normal operation / Funcionamiento normal / Funcionamiento normal / Normaal bedrijf</p>	<p>GN YE RD ● ● ● 1 Hz + 2.2... 4.8 mA → 1 2</p>	<p>GN YE RD ● ● ● 1 Hz + 0.4... 1.0 mA → 1 2</p>
<p>2. Prüftaste drücken / Press test button / Appuyer sur la touche test / Pulse el botón de prueba / Premere il pulsante test / Testknop indrukken</p> <p>&gt;3 s</p>			<p>3. Prüftaste loslassen, nach ~3 s normaler Betrieb / Release the test button, after ~3 s normal operation / Relâcher la touche test, après ~3 s fonctionnement normal / Deje de presionar el botón de prueba, después de ~3 s funcionamiento normal / Rilasciare il pulsante test, dopo ~3 s funzionamento normale / De testknop loslaten, na ~3 s normaal bedrijf</p>	<p>GN YE RD ● ● ● 1 Hz + 2.2... 4.8 mA → 1 2</p>	<p>GN YE RD ● ● ● 1 Hz + 0.4... 1.0 mA → 1 2</p>

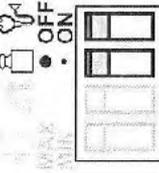


**de - Sedimentation**  
Der Schaltpunkt wird durch wasserähnliche Flüssigkeiten nicht beeinflusst

FEM51, FEM52, FEM54, FEM55, FEM57, FEM58



**en - Sedimentation**  
The switchpoint is not influenced by liquids similar to water

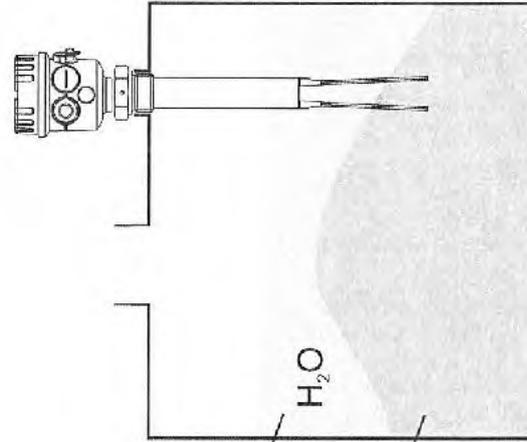


**fr - Sédimentation**  
Le point de commutation ne subit pas l'influence de liquides similaires à l'eau

**es - Sedimentación**  
Los líquidos similares al agua no afectan al punto de conmutación

**it - Sedimentazione**  
Il punto di commutazione non è influenzato da liquidi simili all'acqua

**nl - Sediment**  
Het schakelpunt wordt niet beïnvloedt door waterachtige producten



Feststoff unter Wasser /  
Solids under water /  
Solide sous eau /  
Sólidos bajo agua /  
Solidi in acqua /  
Vaste stoffen onder water



**de - Wartung**  
Dicke Krusten entfernen

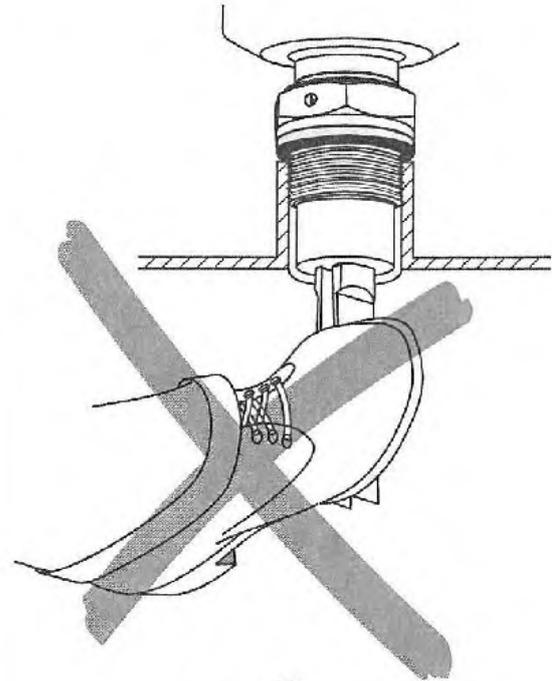
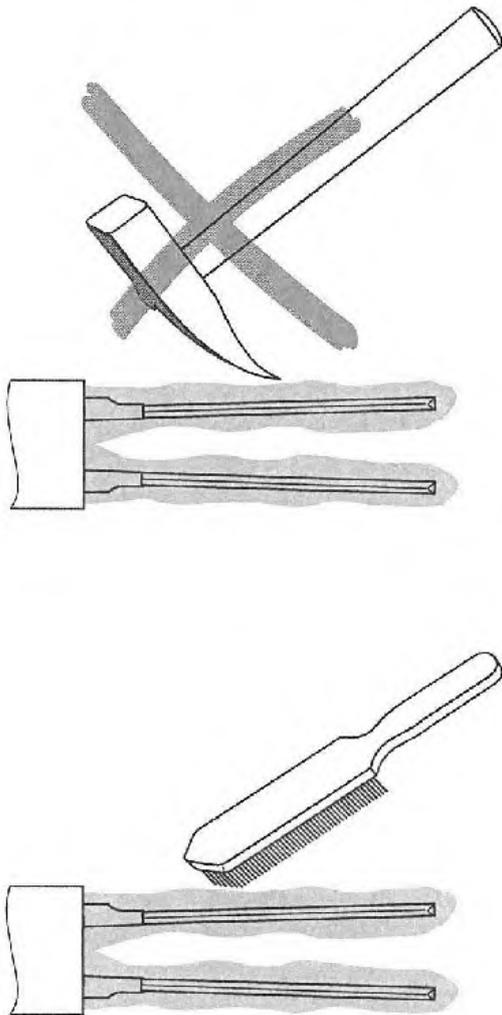
**en - Maintenance**  
Removal of thick encrustation

**fr - Maintenance**  
Enlever les dépôts et incrustations

**es - Mantenimiento**  
Eliminación de adherencias

**it - Manutenzione**  
Rimozione di depositi consistenti

**nl - Onderhoud**  
Aangroei verwijderen



**Nicht besteigen!**  
**Don't use as a step!**  
**Ne pas marcher**  
sur les lames vibrantes!  
**No usar como peldaño!**  
**Non usare come scalino!**  
**Niet op staan!**



**de - Technische Daten**

Umgebungstemperatur  $T_a$   
 Prozesstemperatur  $T_p$   
 Max. Betriebsdruck MWP

**en - Technical Data**

Ambient temperature  $T_a$   
 Process temperature  $T_p$   
 Max. working pressure MWP

**fr - Caractéristiques techniques**

Température ambiante  $T_a$   
 Température de process  $T_p$   
 Pression de service max. MWP

**es - Datos técnicos**

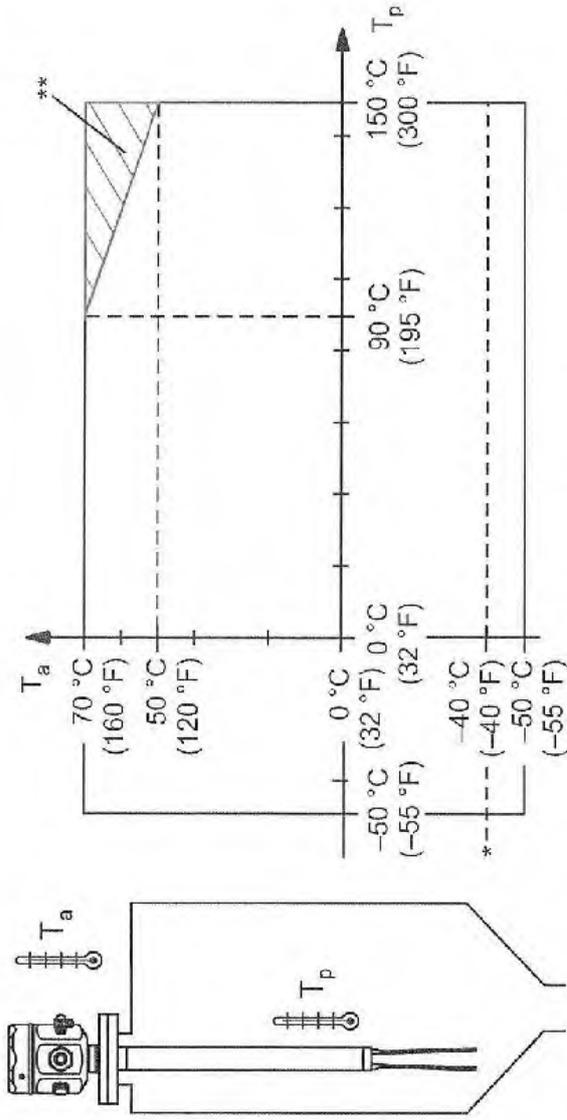
Temperatura ambiente  $T_a$   
 Temperatura de proceso  $T_p$   
 Presión de trabajo MWP máx.

**it - Dati tecnici**

Temperatura ambiente  $T_a$   
 Temperatura di servizio  $T_p$   
 Massima pressione di lavoro MWP

**nl - Technische gegevens**

Omgevingstemperatuur  $T_a$   
 Procestemperatuur  $T_p$   
 Maximale werkdruk MWP



\* bei F16-Gehäuse / for F16 housing / pour boîtier F16 / para cabezal F16 / per testa F16 / voor F16 behuizing

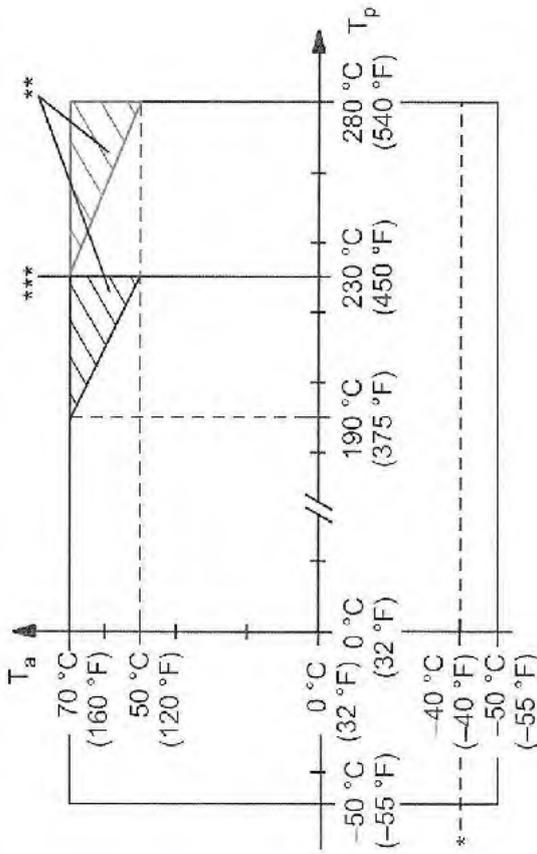
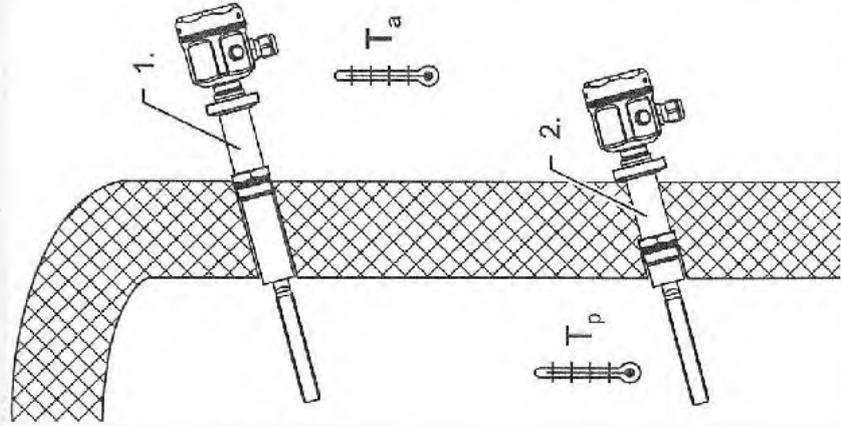
\*\* mit Temperaturdistanzstück / with temperature spacer / avec élément de refroidissement / con tramo disipador de temperatura / con distanziale di temperatura / met temperatuurreductiestuk

MWP = 25 bar (360 psi)  Prozessanschluss / Process connection / Raccord process / Conexión a proceso / Connessione al processo / Processaansluiting

Schüttgewicht / Bulk density / Densité / Densidad del sólido / Densità solidi / Stortgewicht  



**de** - Hochtemperatur  
**en** - High temperature  
**fr** - Haute température  
**es** - Alta temperatura  
**it** - Temperatura elevata  
**nl** - Hoge temperatuur



\* bei F16-Gehäuse / for F16 housing / pour boîtier F16 / para cabezal F16 / per testa F16 / voor F16 behuizing

\*\* mit Temperaturdistanzstück außerhalb der Isolation / with temperature spacer outside insulation / avec élément de refroidissement hors de l'isolation / con tramo disipador de temperatura fuera del aislamiento / con distanziale di temperatura all'esterno dell'isolamento / met temperatuurreductiestuk buiten de isolatie

\*\*\* Antihafbeschichtung / Antistick coating / Revêtement anti-adhésif / Rivestimento antiaderente / Antinechtcoating bis / up to / jusqu'à / hasta / sino a / tot : max. 230 °C (max. 450 °F)

1. außerhalb der Isolation / outside insulation / hors de l'isolation / fuera del aislamiento / all'esterno dell'isolamento / buiten de isolatie
2. innerhalb der Isolation / within insulation / dans l'isolation / dentro del aislamiento / all'interno dell'isolamento / binnen de isolatie

Endress+Hauser



**de - Zubehör**  
Schutzhaube  
für F13, F17 Gehäuse  
71040497

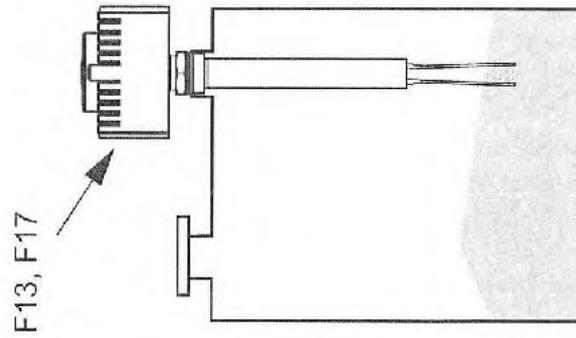
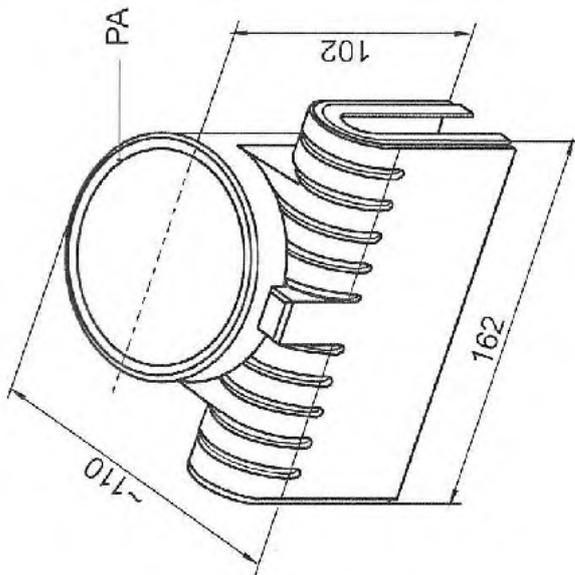
**en - Accessories**  
Protection cover  
for F13 and F17 housing  
71040497

**fr - Accessoires**  
Capot de protection  
pour boîtier F13 et F17  
71040497

**es - Accesorios**  
Cubierta protectora  
para carcasa F13 y F17  
71040497

**it - Accessori**  
Custodia di protezione  
per alloggiamenti F13 e F17  
71040497

**nl - Toebehoren**  
Beschermkap  
voor F13- en F17-behuizing  
71040497

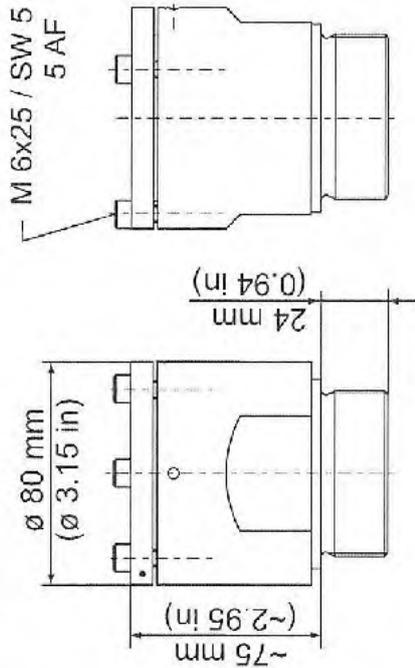


Endress + Hauser

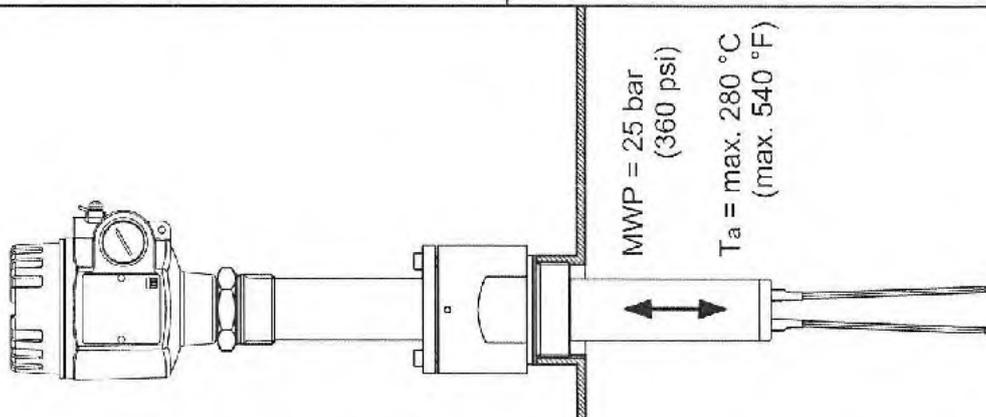
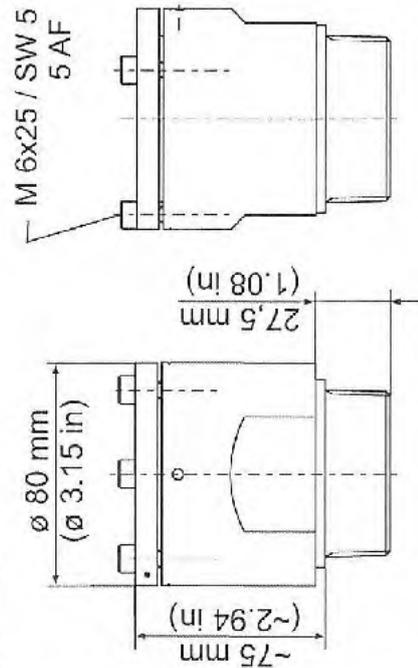


- de** - Schiebemuffe, druckbeaufschlagt für FTM51 mit Werkstoffausprägung A, 2, 5
- en** - Sliding sleeve, pressurised for FTM51 with material version A, 2, 5
- fr** - Manchon coulissant, pressurisé pour FTM51 avec catégorie de matériaux A, 2, 5
- es** - Manguito deslizante, presurizado para FTM51 con variante de material A, 2, 5
- it** - Manicotto scorrevole, per impieghi in pressione, per FTM51 materiale con resistenza al carico A, 2, 5
- nl** - Schuifmof, drukbestendig voor FTM51 met materiaal ingestansd A, 2, 5

**G 2**  
DIN ISO 228/1 (316L)  
52024631



**2 NPT**  
ANSI B 1.20.1 (316L)  
52024630



Endress + Hauser



## de - Fehlersuche

Ursache	Schaltet nicht	Schaltet falsch	Fehlschaltung, sporadisch	Anzeige Wartungsbedarf	Anzeige Geräteausfall
Keine Versorgungsspannung	Versorgungsspannung prüfen				
Verpolung	Anschlussbelegung prüfen				
Kurzschluss Ausgang				Anschlussbelegung prüfen	
Signalleitung defekt	Signalleitung prüfen				
Falsche Sicherheitsschaltung gewählt		MAX für Überfüllsicherung, MIN für Leerlaufschutz einstellen			
Extreme Funkstörung			geschirmte Anschlussleitung verwenden		
Wasser im Gehäuse			Deckel und Kabeldurchführungen reinigen und fest zuschrauben		
FEM51: Haltestrom des verwendeten Relais zu gering		Geeignetes Relais verwenden oder optional MVT 2Y1278 anfordern			
Schüttgewicht zu gering	Auf niedriges Schüttgewicht konfigurieren		Auf niedriges Schüttgewicht konfigurieren		
extreme Fremdreibungen			Schaltverzögerung auf 5 s einstellen		
Ansatzbildung			Auf hohes Schüttgewicht konfigurieren	Ansatz entfernen	
Elektronikeinsatz defekt					Elektronikeinsatz austauschen
Abrasion					Sensor austauschen
Keine Verbindung zum Sensor					Sensor austauschen



## en - Trouble-shooting

Cause	Does not switch	Switches incorrectly	Sporadic faulty switching	Display of maintenance	Display of instrument failure
No supply voltage	Check supply voltage				
Reversal of polarity	Check terminal assignment				
Short circuit of output				Check terminal assignment	
Faulty signal line	Check signal line				
Wrong fail-safe mode selected		Set MAX for overfill protection, MIN for dry running protection			
Extreme radio interference			Use screened cable		
Water in housing			clean cover and cable entries and tighten them securely		
FEM51: Holding current of the used relay too low		Use suitable relay or request MVT 2Y1278 optionally			
Bulk density too low	Adjust to lower bulk density		Adjust to lower bulk density		
Extreme external vibrations			Adjust switching delay to 5 s		
Build-up			Adjust to higher bulk density	Remove build-up	
Faulty electronic insert					Exchange electronic insert
Abrasion					Exchange sensor
No connection to sensor					Exchange sensor



## fr - Recherche de défauts

Cause	Ne commute pas	Commute mal	Commute mal de façon sporadique	Affichage maintenance requise	Affichage panne d'appareil
Pas de tension d'alimentation	Vérifier la tension d'alimentation				
Inversion de polarité	Vérifier l'occupation des broches				
Court-circuit sortie				Vérifier l'occupation des broches	
Câble signal défectueux	Vérifier le câble signal				
Mauvaise sécurité choisie		Régler MAX pour sécurité anti-débordement MIN pour marche à vide			
Parasitage externe			Utiliser un câble blindé		
Eau dans le boîtier			Nettoyer et bien serrer le couvercle et les entrées de câble		
FEM51 : Courant de maintien du relais utilisé trop faible		Utiliser un relais approprié ou demander en option MVT 2Y1278			
Densité trop faible	Configurer pour densité faible		Configurer pour densité faible		
Vibrations externes			Régler la temporisation de la commutation sur 5 s		
Colmatage			Configurer pour densité élevée	Supprimer le dépôt	
Electronique défectueuse					Remplacer l'électronique
Abrasion					Remplacer la sonde
Pas de liaison à la sonde					Remplacer la sonde

Erndress + Hauser



## es - Identificación de fallos

Causa	No conmuta	Conmuta incorrectamente	Fallo de conmutación esporádico	Indicación de mantenimiento	Indicación de errores del instrumento
Sin alimentación	Comprobar la alimentación				
Inversión de la polaridad	Compruebe la asignación de los terminales				
Cortocircuito de salida				Compruebe la asignación de los terminales	
Señal de línea defectuosa	Comprobar señal de línea				
Error en el modo selección a prueba de fallos		Seleccionar MAX para la protección de rebose / seleccionar MIN para proteger las bombas			
Interferencia de radio extrema			Usar cable apantallado		
Agua en el cabezal			Limpiar la tapa y el prensaestopas y ciérrelos bien		
FEM51: la corriente de mantenimiento del relé es muy baja		Utilizar el relé adecuado o pedir opcionalmente MVT 2Y1278			
Densidad del sólido demasiado baja	Ajustar a la densidad del sólido más baja		Ajustar a la densidad del sólido más baja		
Vibraciones externas extremas			Ajustar el tiempo de conmutación a 5 seg.		
Adherencia			Ajustar a la densidad del sólido más alta	Quitar la adherencia	
Electrónica defectuosa					Cambiar la electrónica
Abrasión					Cambiar el sensor
Sin conexión al sensor					Cambiar el sensor



## it - Individuazione e eliminazione delle anomalie

Causa	Non commuta	Commutazione errata	Sporadica commutazione errata	Richiesta manutenzione	Strumento guasto
No alimentazione	Verificare alimentazione				
Inversione di polarità	Verificare assegnazione terminali				
Cortocircuito in uscita				Verificare assegnazione terminali	
Errore segnale di linea	Verificare segnale di linea				
Incorretto errore-modo sicurezza selezionato		Settaggio MAX per protezione antiricambiamento / Settaggio MIN per protezione funzionamento a secco			
Elevate interferenze radio			Usare cavo schermato		
Acqua nella custodia			Pulire la chiusura e le entrate cavi, sigillanti in modo sicuro		
FEM51: presa di corrente del relè usato troppo bassa		Usare relè adatto o richiedere modulo MVT2Y1278			
Densità solido troppo bassa	Settare alla densità solido più bassa		Settare alla densità solido più bassa		
Elevate vibrazioni esterne			Settare il ritardo di commutazione a 5 s		
Incrostazioni			Settare alla maggior densità solido	Rimuovere incrostazioni	
Guasto all'inserto elettronico					Sostituire inserto elettronico
Abrasioni					Sostituire sensore
No connessione al sensore					Sostituire sensore

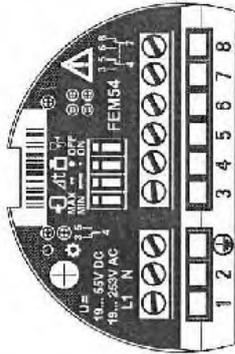


## nl - Fout zoeken

Oorzaak	Schakelt niet	Schakelt niet correct	Sporadisch fout schakelen	Onderhoudsadvies	Advies instrumentfout
Geen voedingsspanning	Kontroleer voedingsspanning				
Polariteit omgedraaid	Kontroleer aansluitklemmen			Kontroleer aansluitklemmen	
Kortsluiting van de uitgang					
Foutieve signaalverbinding	Kontroleer signaalverbinding				
Foutieve fail-safe keuze		Stel MAX in voor overvulbeveiliging/ MIN voor droogloopbeveiliging			
Externe stoorinvloed			Gebruik afgeschermd kabel		
Water in behuizing			deksel en wartels controleren, reinigen en goed vast draaien		
FEM 51: houdstroom van het gebruikte relais te laag		Gebruik een passend relais of optioneel MVT 2Y1278 aanvragen			
Stortgewicht te laag	Instellen op lager stortgewicht		Instellen op lager stortgewicht		
Extreme externe trilling			Stel schakelvertraging in op 5 s	Aangroei verwijderen	
Aangroei			Instellen op hoger stortgewicht		Elektronica insert vervangen
Elektronica insert defect					Sensor vervangen
Abrassieve slijtage					Sensor vervangen
Geen verbinding met de sensor					



- de - Ersatzteile**  
Elektronikeinsätze
- en - Spare parts**  
Electronic inserts
- fr - Pièces de rechange**  
Electroniques
- es - Repuestos**  
Electrónicas
- it - Ricambi**  
Inserti elettronici
- nl - Reserve-onderdelen**  
Elektronica inserts



FEM51	52026497
FEM52	52026498
FEM54	52026499
FEM55	52026500
FEM57	52026501
FEM58	52026502

**Installationsregel:** Bei der Installation ist zu beachten, dass die Elektronik-einsätze FEM57 und FEM58, die mit nichteigensicheren Stromkreisen gespeist wurden, grundsätzlich **nicht** mehr mit eigensicheren Stromkreisen zusammengeschaltet werden dürfen.

**Installation specification:** During installation, please keep in mind that the electronic inserts FEM57 and FEM58 which are powered by non-intrinsically-safe circuits may **no** longer be interconnected with intrinsically-safe circuits.

**Directive d'installation :** Lors de l'installation, tenir compte du fait que les électroniques FEM57 et FEM58, alimentées par des circuits sans sécurité intrinsèque **ne** doivent plus être connectées à des circuits à sécurité intrinsèque.

**Especificación de la instalación:** Durante la instalación tenga en cuenta que las electrónicas FEM57 y FEM58 que se alimentan con circuitos que no son de seguridad intrínseca **no** deben conectarse a lazos de seguridad intrínseca.

**Specifiche di installazione:** Durante l'installazione, tenere in considerazione che gli inserti elettronici FEM57 e FEM58, che sono alimentati da circuiti non a sicurezza intrinseca, **non** possono rimanere a lungo interconnessi con circuiti a sicurezza intrinseca

**Installatie specificaties:** S.v.p. er op letten dat de elektronica inserts FEM57 en FEM58 die gevoed zijn door niet intrinsiekveilige circuits, **niet** meer gebruikt mogen worden in intrinsiekveilige circuits.



Gehäuse / Deckelmaterial Housing / Cover material Boîtier / Matériau couvercle Cabezal / Material de la cubierta Testa / Materiale di copertura Behuizing / Materiaal van de deksel	Dichtungen / Seals / Joints / Juntas / Guarnizioni / Dichtingen	Teilenummer / Part number / Référence / Número de parte / Codice / Onderdeel Nr.
F16 / PA12	EPDM *	52025790
F13, F17 / Alu 	EPDM *	52027693
F13, F17 / Alu 	EPDM *	52002699
F13 / Alu 	EPDM *	52002698
F15 / 316L	VMQ/PTFE	52027000
F15 / 316L	VMQ/PTFE	52027708
Order Code FTM5# - # # # # # # # # # # ↓ D, 2, 3, 4		
F15 / 316L 	VMQ/PTFE	52027002
F15 / 316L 	VMQ/PTFE	52027709
Order Code FTM5# - # # # # # # # # # # ↓ D, 2, 3, 4		
T13 / Alu 	EPDM *	52006903
T13 / Alu	EPDM *	52007103

**de** - Gehäusedeckel,  
Dichtungen

**en** - Housing covers,  
seals

**fr** - Couvertcles de boîtier,  
joints

**es** - Cubiertas del cabezal,  
juntas

**it** - Coperture custodia,  
guarnizioni

**nl** - Behuizing deksels,  
dichtingen

\* Nur geeignete Schmiermittel  
verwenden /  
Only use suitable lubricants /  
Utiliser exclusivement des  
lubrifiants appropriés /  
Usar sólo lubricantes apropiados /  
Utilizzare solo lubrificanti adatti /  
Alleen geschikte smeermiddelen  
gebruiken



<b>de</b> - Ersatzteilsensoren	Die Ersatzteilsensoren FTM50X, FTM51X können über den Endress+Hauser Service bestellt werden! /
<b>en</b> - Replacement sensors	The FTM50X and FTM51X replacement sensors can be ordered through Endress+Hauser Service! /
<b>fr</b> - Capteurs de rechange	Les capteurs de rechange FTM50X, FTM51X peuvent être commandés auprès d'Endress+Hauser ! /
<b>es</b> - Sensores de recambio	¡Los sensores de recambio FTM50X, FTM51X se pueden pedir a través del Endress+Hauser Service! /
<b>it</b> - Sensori parte di ricambio	I sensori parte di ricambio FTM50X, FTM51X possono essere ordinati all'Organizzazione commerciale Endress+Hauser! /
<b>nl</b> - Reserversensors	De Reserversensors FTM50X, FTM51X kunnen via de Endress+Hauser Service worden besteld!



**de - Reparatur**  
bei Endress+Hauser

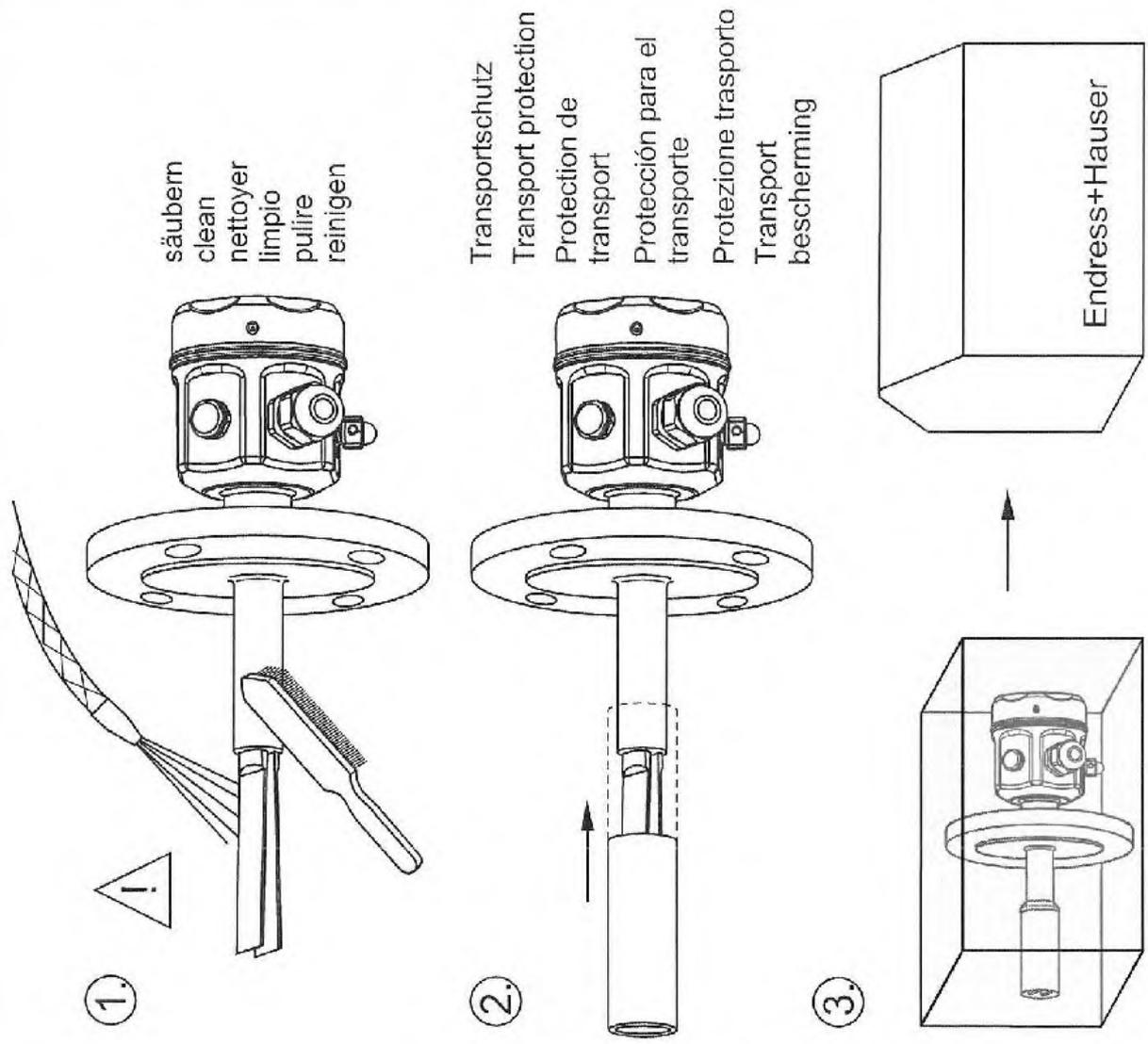
**en - Repair**  
at Endress+Hauser

**fr - Réparations**  
chez Endress+Hauser

**es - Reparaciones**  
en Endress+Hauser

**it - Riparare**  
presso la Endress+Hauser

**nl - Reparatie**  
bij Endress+Hauser





<b>de - Ergänzende Dokumentation</b>	Technische Information / Technical Information / Information technique / Información técnica / Informazioni tecniche / Technische Informatie
<b>en - Supplementary Documentation</b>	TI392F Soliphant M FTM50, FTM51, FTM52
<b>fr - Documentaire complémentaire</b>	Betriebsanleitung / Operating Instruction / Manuel de mise en service / Instrucciones de funcionamiento / Istruzioni operative / Inbedrijfstellingsvoorschrift
<b>es - Documentación suplementaria</b>	KA239F Soliphant M FTM51
<b>it - Documentazione supplementare</b>	Schiebemuffe, druckbeaufschlagt / Sliding Sleeve, pressurised / Manchon coulissant, pressurisé / Manguito deslizante, presurizado / Manicotto scorrevole, per impieghi in pressione / Schuifstof, drukbestendig
<b>nl - Aanvullende documentatie</b>	KA264F Soliphant M FTM50, FTM51, FTM52
	Separatgehäuse: Montage- und Kürzungsanleitung (Gehäuseseitig) / Separate housing: Instructions for mounting and shortening (On the housing side) / Boîtier séparé : Instructions de montage et de raccourcissement (Côté boîtier) / Cabezal separado: Instrucciones para el montaje y acortamiento (Lado del cabezal) / Custodia separata: Istruzioni di montaggio e accorciamento del cavo (Lato custodia) / Separate behuizing: Montage- en inkortbeschrijving (Zijde behuizing)



## KA265F Soliphant M FTM50, FTM51, FTM52

Separatgehäuse und Panzerschlauch: Montage- und Kürzungsanleitung  
(Gehäuseseitig) /

Separate housing and armored tube: Instructions for mounting and shortening  
(On the housing side) /

Boîtier séparé et flexible blindé : Instructions de montage et de raccourcissement  
(Côté boîtier) /

Cabezal separado y tubo flexible blindado: Instrucciones para el montaje y  
acortamiento (Lado del cabezal) /

Custodia separata e tubo armato: Istruzioni di montaggio e accorciamento del  
cavo (Lato custodia) /

Separate behuizing en pantserslang: Montage- en inkortbeschrijving  
(Zijde behuizing)

## KA273F Soliphant M FTM50, FTM51, FTM52

Separatgehäuse: Demontage und Montage des Sensors /

Separate housing: Demounting and mounting of the sensor /

Boîtier séparé : Démontage et montage du capteur /

Cabezal separado: Desmontaje y montaje del sensor /

Custodia separata: Smontaggio e montaggio del sensore /  
Separate behuizing: demontage en montage van de sensor



Sicherheitshinweise / Notes on Safety / Conseils de sécurité /  
 Notas sobre seguridad / Note sulla sicurezza / Veiligheidsinstructies

XA305F	<b>CE</b>	ATEX II 1 D, II 1/2 GD, II 1/3 GD	Ex ia IIC T6
XA319F	<b>CE</b>	ATEX II 1 D, II 1 G	Ex ia IIC T6 (X)
XA306F	<b>CE</b>	ATEX II 1 D, ATEX II 1/2 G	Ex d/de [ia] IIC T6
XA307F	<b>CE</b>	ATEX II 1/2 D, II 1/3 D	Ex tD
XA331F	<b>CE</b>	ATEX II 3 D, ATEX II 3 G	EEx nA/nL/nC
XA393F	NEPSI	DIP	
XA394F	NEPSI	Ex ia	
XA395F	NEPSI	Ex d [ia]	
XA391F	IEC Ex,	Ex ia	
XA392F	IEC Ex,	Ex tD	

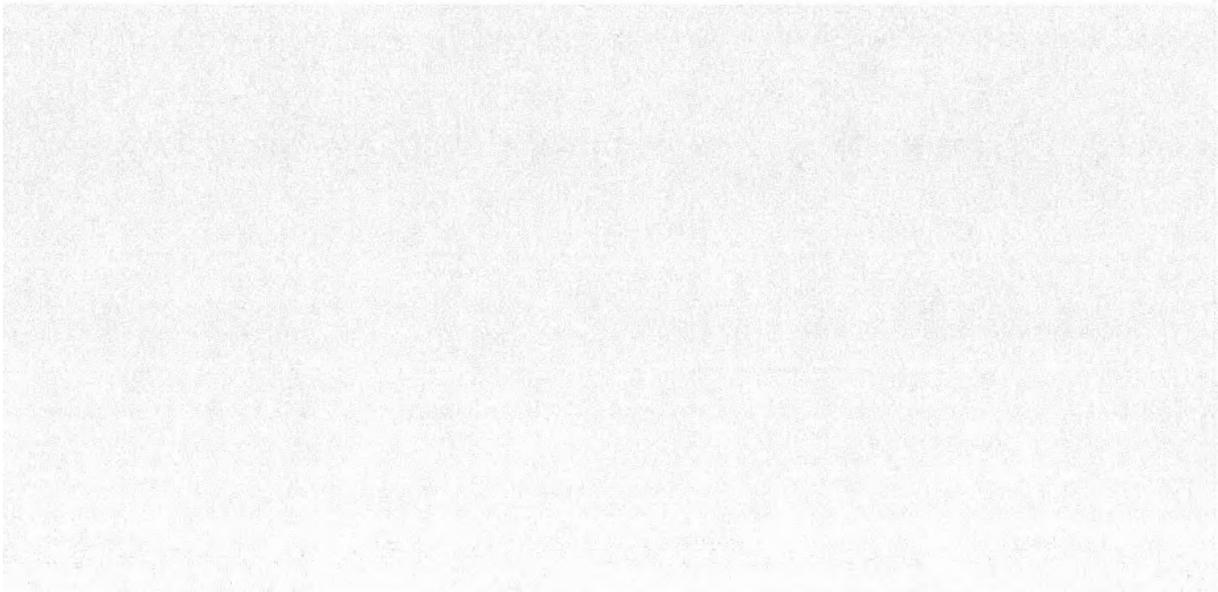
Zertifikate / Certificates / Certificats /  
 Certificados / Certificati / Certificaten

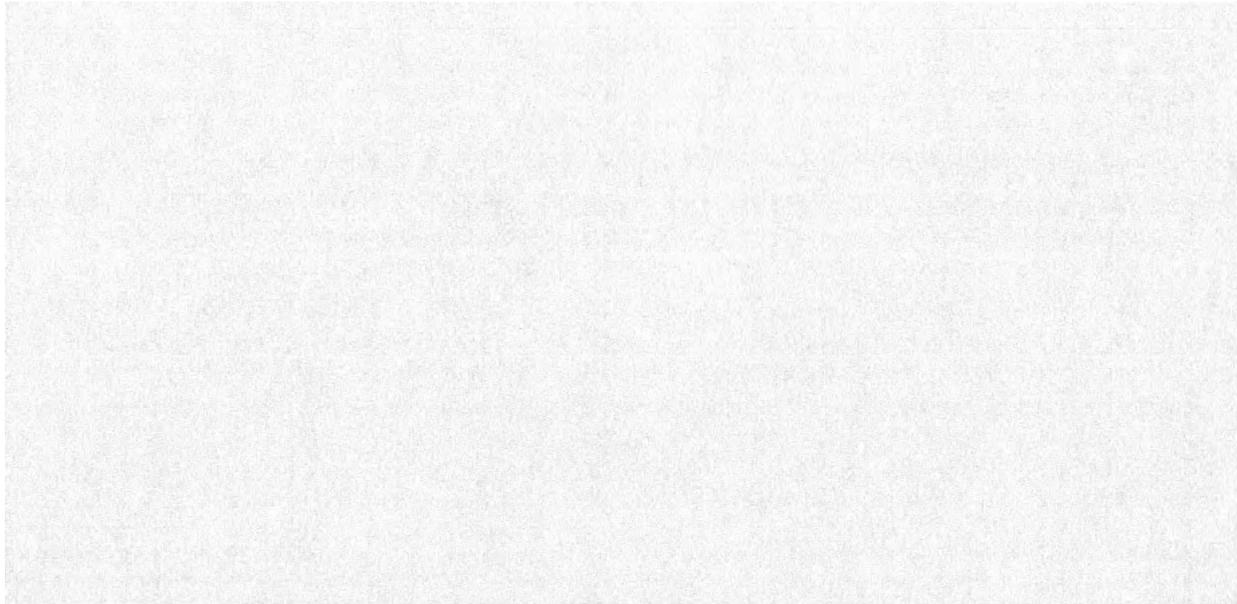
ZD218F	Soliphant M	FM
ZD219F	Soliphant M	CSA



Funktionale Sicherheit / Functional Safety / Sécurité fonctionnelle /  
Seguridad funcional / Sicurezza funzionale / Functionele veiligheid

SD203F	Soliphant M + FEM51
SD204F	Soliphant M + FEM52
SD205F	Soliphant M + FEM54
SD208F	Soliphant M + FEM55
SD207F	Soliphant M + FEM57 + Nivotester FTL325P
SD206F	Soliphant M + FEM58







[www.endress.com/worldwide](http://www.endress.com/worldwide)



KA229F/00/a6/06.07, 71036024, CCS/FM6



## 10 Operating instruction for pressure sensor

Conveyor A 500-HT empty, Line 1 (KKS: 01ETG20CPCP501)  
 Conveyor A 500-HT empty, Line 2 (KKS: 02ETG20CPCP501)

### Electronic pressure switch with display Model PSD-30, standard version Model PSD-31, with flush diaphragm

WIKA data sheet PE 81.67



#### Applications

- Machine tools
- Hydraulics and pneumatics
- Pumps and compressors
- Machine building

#### Special features

- Easily-readable, robust display
- Intuitive and fast setup
- Easy and flexible mounting configurations



Electronic pressure switch, model PSD-30

#### Description

##### Award-winning in design and functionality

The successful design and the excellent functionality of the WIKA switch family were already confirmed by winning the 'iF product design award 2009' for the PSD-30 pressure switch.

The robust LED display has been designed using 9 mm high characters (the largest possible) and with a slight incline in order to make reading the pressure as easy as possible from a long way off. A 14-segment display has been used, since it represents text very well.

The 3-key operation makes simple, intuitive menu navigation possible, with no need for additional assistance. The menu navigation conforms to the latest VDMA standard.

The VDMA standard for fluid sensors (24574-1, part 1 - pressure switches) has the aim of simplifying the use of pressure switches by standardising menu navigation and display.

The control keys have been designed as large as possible and are arranged ergonomically to ensure fast and easy adjustments. Operation without any additional assistance is made easier through the tactile feedback.

##### Customised installation

The installation of the PSD-30 and PSD-31 can be flexibly adapted to the individual mounting situation. Due to the almost unlimited rotation of the display and case by more than 300°, the display can be adjusted independently of the electrical connection. The display can thus always be aligned to face the operator, and the M12 x 1 connection positioned to suit the desired cable routing.

##### High quality

During development of the WIKA switch family a high value was placed on a robust design and the selection of appropriate materials suited to machine-building applications. For this reason the case and the threaded connection of the electrical connector are made from stainless steel. Overwinding or tearing off the connector is therefore virtually impossible.

##### IO-Link

With the optional output signal in accordance with the IO-Link communication standard, the PSD-30 and PSD-31 allow a fast integration into modern automation systems. IO-Link offers an even faster installation, parameterisation and higher functionality of the PSD-30 and PSD-31.



## Measuring ranges

Relative pressure								
bar	0 ... 1 <sup>1)</sup>	0 ... 1.6 <sup>1)</sup>	0 ... 2.5	0 ... 4	0 ... 6	0 ... 10	0 ... 16	0 ... 25
	0 ... 40	0 ... 60	0 ... 100	0 ... 160	0 ... 250	0 ... 400	0 ... 600	
psi	0 ... 15 <sup>1)</sup>	0 ... 25 <sup>1)</sup>	0 ... 30 <sup>1)</sup>	0 ... 50	0 ... 100	0 ... 160	0 ... 200	0 ... 300
	0 ... 500	0 ... 1,000	0 ... 1,500	0 ... 2,000	0 ... 3,000	0 ... 5,000	0 ... 8,000	

Absolute pressure								
bar	0 ... 1 <sup>1)</sup>	0 ... 1.6 <sup>1)</sup>	0 ... 2.5	0 ... 4	0 ... 6	0 ... 10	0 ... 16	0 ... 25
psi	0 ... 15 <sup>1)</sup>	0 ... 25 <sup>1)</sup>	0 ... 30 <sup>1)</sup>	0 ... 50	0 ... 100	0 ... 160	0 ... 200	0 ... 300

Vacuum and +/- measuring range								
bar	-1 ... 0 <sup>1)</sup>	-1 ... +0.6 <sup>1)</sup>	-1 ... +1.5	-1 ... +3	-1 ... +5	-1 ... +9	-1 ... +15	-1 ... +24
psi	-14.5 ... 0 <sup>1)</sup>	-14.5 ... +15 <sup>1)</sup>	-14.5 ... +30	-14.5 ... +50	-14.5 ... +100	-14.5 ... +160	-14.5 ... +200	-14.5 ... +300

1) Not available for PSD-31.

### Overpressure limit

2 times

1.7-fold for the relative pressure measuring ranges 160 psi, 1,000 psi and 1,500 psi

## Display

14-segment LED, red, 4-digit, 9 mm character size

Display can be turned electronically through 180°

Update (adjustable): 100, 200, 500 or 1,000 ms

## Output signals

Switching output		Analogue signal
SP1	SP2	
PNP	-	4 ... 20 mA (3-wire)
PNP	-	DC 0 ... 10 V (3-wire)
PNP	PNP	-
PNP	PNP	4 ... 20 mA (3-wire)
PNP	PNP	DC 0 ... 10 V (3-wire)

Optionally also available with an NPN instead of a PNP switching output

### IO-Link, revision 1.0 (option)

IO-Link is optionally available for all output signals.

With the IO-Link option, switching output SP1 is always PNP

### Zero offset adjustment

max. 3 % of span

### Switching thresholds

Switch point 1 and switch point 2 are individually adjustable

### Switching functions

Normally open, normally closed, window, hysteresis

Freely adjustable

### Switching voltage

Power supply - 1 V

### Switching current

■ without IO-Link: max. 250 mA

■ with IO-Link: SP1 max 100 mA

SP2 max. 250 mA

### Settling time

Analogue signal: 3 ms

Switching output: ≤ 10 ms

### Load

Analogue signal 4 ... 20 mA: ≤ 0.5 kΩ

Analogue signal DC 0 ... 10 V: > 10 kΩ

### Service life

100 million switching cycles





## Process connections

### Available connections, model PSD-30

Standard	Thread
DIN 3852-E	G 1/4 A G 1/2 A
EN 837	G 1/4 B G 1/4 female G 1/2 B
ANSI / ASME B1.20.1	1/4 NPT 1/2 NPT
ISO 7	R 1/4
KS	PT 1/4
-	G 1/4 female (Emeto compatible)

Other connections on request.

### Available connections, model PSD-31

Standard	Thread
-	G 1/2 B with flush diaphragm

## Sealings

### Process connection per DIN 3852-E

Standard	NBR
Option	without
Option	FPM/FKM

### Process connection per EN 837 <sup>1)</sup>

Standard	without
Option	Copper
Option	Stainless steel

<sup>1)</sup> Process connections per EN 837 with female threads do not include any seal.

## Electrical connections

### Connections

- Circular connector M12 x 1 (4-pin)
- Circular connector M12 x 1 (5-pin) <sup>1)</sup>

<sup>1)</sup> Only for version with two switching outputs and additional analogue signal

### Electrical safety

Short-circuit resistance: S+ / SP1 / SP2 vs. U-  
 Reverse polarity protection: U+ vs. U-  
 Insulation voltage: DC 500 V  
 Overvoltage protection: DC 40 V

### Connection diagram

#### Circular connector M12 x 1 (4-pin)



U+	1
U-	3
S+	2
SP1	4
SP2	2

#### Circular connector M12 x 1 (5-pin)



U+	1
U-	3
S+	5
SP1	4
SP2	2

### Legend:

U+ Positive supply voltage  
 U- Reference potential  
 SP1 Switching output 1  
 SP2 Switching output 2  
 S+ Analogue output

## CE conformity

**Pressure equipment directive**  
 97/23/EC

**EMC directive**  
 2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (industrial application)

**RoHS conformity**  
 2011/65/EU

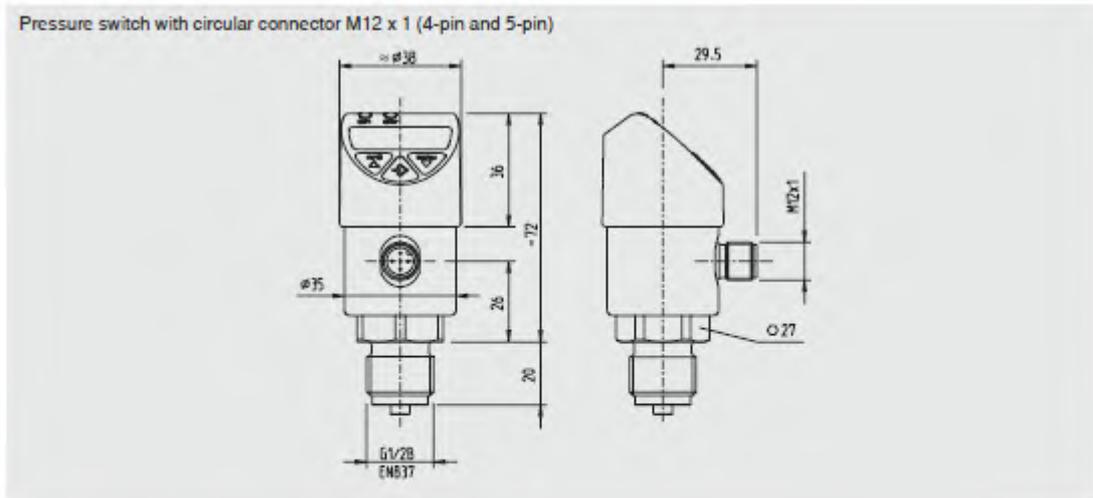
## Approvals

- cULus, safety (e.g. electr. safety, overpressure, ...), USA, Canada
- GOST-R, import certificate, Russia
- CRN, safety (e.g. electr. safety, overpressure, ...), Canada

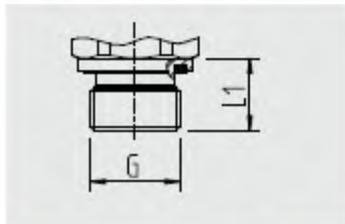
Approvals and certificates, see website



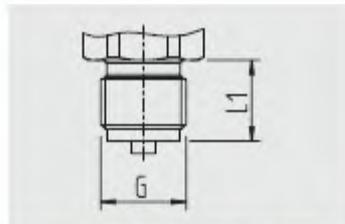
## Dimensions in mm



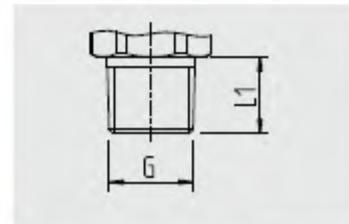
## Process connections, model PSD-30



G	L1
G 1/4 A DIN 3852-E	12
G 1/2 A DIN 3852-E	14

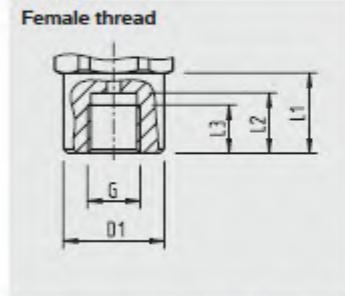


G	L1
G 1/4 B EN 837	13
G 1/2 B EN 837	20

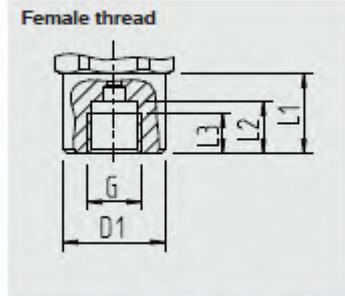


G	L1
1/4 NPT	13
1/2 NPT	19
R 1/4	13
PT 1/4	13

## Process connections, model PSD-30

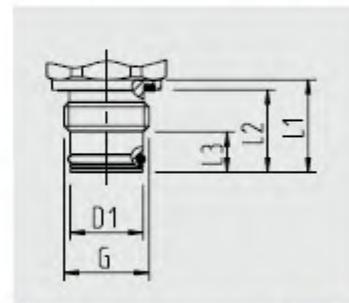


G	L1	L2	L3	D1
G 1/4 1)	20	15	12	∅ 25



G	L1	L2	L3	D1
G 1/4, EN 837	20	13	10	∅ 25

## Process connection, model PSD-31



G	L1	L2	L3	D1
G 1/2 B flush 2)	23	20.5	10	∅ 18

1) Ermato compatible  
2) Welding sockets recommended as defined counter thread (see accessories)



## Accessories and spare parts

Welding socket		
	Description	Order no.
	G 1/2 B female, outer diameter 50 mm, material 1.4571	1192299

Sealings		
	Description	Order no.
	NBR profile sealing G 1/4 A DIN 3852-E	1537857
	FPMFKM profile sealing G 1/4 A DIN 3852-E	1576534
	NBR profile sealing G 1/2 A DIN 3852-E	1039067
	FPMFKM profile sealing G 1/2 A DIN 3852-E	1039075
	Copper G 1/4 B EN 837	11250810
	Stainless steel G 1/4 B EN 837	11250844
	Copper G 1/2 B EN 837	11250861
	Stainless steel G 1/2 B EN 837	11251042

Connectors with moulded cable				
	Description	Temperature range	Cable diameter	Order no.
	Straight version, cut to length, 4-pin, 2 m PUR cable, UL listed, IP 67	-20 ... +80 °C	4.5 mm	14086880
	Straight version, cut to length, 4-pin, 5 m PUR cable, UL listed, IP 67	-20 ... +80 °C	4.5 mm	14086883
	Straight version, cut to length, 4-pin, 10 m PUR cable, UL listed, IP 67	-20 ... +80 °C	4.5 mm	14086884
	Straight version, cut to length, 5-pin, 2 m PUR cable, UL listed, IP 67	-20 ... +80 °C	5.5 mm	14086886
	Straight version, cut to length, 5-pin, 5 m PUR cable, UL listed, IP 67	-20 ... +80 °C	5.5 mm	14086887
	Straight version, cut to length, 5-pin, 10 m PUR cable, UL listed, IP 67	-20 ... +80 °C	5.5 mm	14086888
	Angled version, cut to length, 4-pin, 2 m PUR cable, UL listed, IP 67	-20 ... +80 °C	4.5 mm	14086889
	Angled version, cut to length, 4-pin, 5 m PUR cable, UL listed, IP 67	-20 ... +80 °C	4.5 mm	14086891
	Angled version, cut to length, 4-pin, 10 m PUR cable, UL listed, IP 67	-20 ... +80 °C	4.5 mm	14086892
	Angled version, cut to length, 5-pin, 2 m PUR cable, UL listed, IP 67	-20 ... +80 °C	5.5 mm	14086893
	Angled version, cut to length, 5-pin, 5 m PUR cable, UL listed, IP 67	-20 ... +80 °C	5.5 mm	14086894
	Angled version, cut to length, 5-pin, 10 m PUR cable, UL listed, IP 67	-20 ... +80 °C	5.5 mm	14086896

Cooling element for screwing G 1/2 female / G 1/2 male (for instruments with process connection G 1/2 B)		
	Description	Order no.
	Max. medium temperature 150 °C at an ambient temperature of max. 30 °C Max. operating pressure 250 bar	14055439
	Max. medium temperature 200 °C at an ambient temperature of max. 30 °C Max. operating pressure 250 bar	14055438



Instrument mounting bracket		Order no.
Description		
	Mounting bracket for PSD-30, aluminium, wall mounting	11467887

#### Ordering information

Model / Measuring range / Output signal / Process connection / Accessories and spare parts

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We reserve the right to make modifications to the specifications and materials.

WIKA data sheet PE 81.67 - 01/2014

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## 11 Operating instruction for ball valves

11.1 Description ball valve

11.2 Ball valve for conveyor outlet, KGH 65



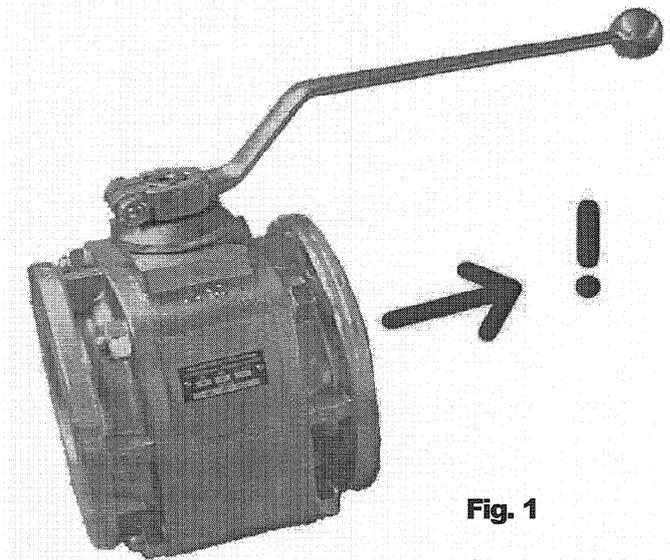
## 11.1 Description ball valve

### Installation, Maintenance, Repair



#### Installation

**PROKOSCH** ball valves are directly connected to the system via a flanged or threaded connection. The valve must be mounted free of tension and vibration. With jam-free ball valves (type FA), it is important to note the medium's direction of flow. The ball valve must always flow from the sealed side to the unsealed side. The unsealed side is indicated by a radial groove on the outlet flange (Fig.1).



**Fig. 1**

#### Safety



*These instructions do not supersede local safety regulations or the relevant hazardous regulations, which must take precedence.*  
**Caution! Risk of injury! Disconnect the power supply to the drives before starting any repair or maintenance work on automated armatures.**  
*Repairs must be properly performed with original replacement parts only. Observe all operating limits regarding pressure, temperature, materials used and medium. If our ball valves come with accessories from outside manufacturers, the maintenance and operating instructions of such manufacturers must also be observed.*

#### Operating limits per Directive 97/23/EC (Pressure Equipment Directive)

**PROKOSCH** ball valves are used to block off bulk materials, non-hazardous gases and hazardous liquids as per Art. 9, 97/23/EC within the pressure range indicated on the rating plate. Additional national or international regulations must be expressly observed during use. The operating limits regarding resistance to the materials used must be observed and can be requested from the factory in case of doubt. Ball valves are expressly NOT for use to regulate the flow of bulk materials. Such operation causes impermissibly high wear and nullifies the warranty.



## Installation, Maintenance, Repair

### Temperature resistance and seal material specifications

PTFE + Buna-N:	Tmax = 80°C
PTFE + Viton:	Tmax = 180°C
Special steel + Viton:	Tmax = 230°C

### Maintenance

All **PROKOSCH** ball valves are designed for maintenance-free operation. Thus no special maintenance is required.

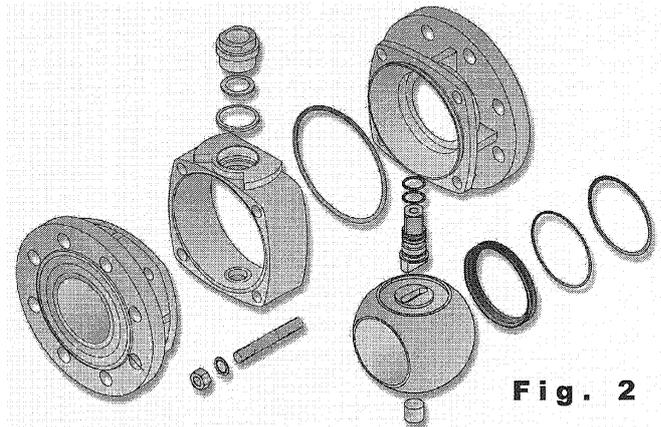
### Storage

Always store **PROKOSCH** ball valves in the completely open or completely closed position to prevent permanent deformation of the sealing elements. For long-term storage, it is advisable to apply corrosion protection treatment specific to the material.

### Repair

All **PROKOSCH** ball valves are easy to disassemble without any special tools. To replace the seals, remove the flanges mounted with several stud bolts from the body (*Fig. 2*). The seals to be replaced can then be lifted out with a scribe or a screwdriver. Depending on the design and nominal width, the armatures may differ in certain details from the illustration. For exact specifications, see the replacement parts list of the specific type. Clean the seal seats thoroughly before reassembly.

After the flange and spindle bearing assembly (gray cast iron or brass bush) have been disassembled, the ball can be removed from the body. For **PROKOSCH** ball valves DN 150 and above, remove the bearing cover from the side opposite the spindle. Remove the bearing pin and spindle. Fill the bearing area with commercial grease before replacing the ball. To reassemble, follow the above steps in reverse order.



**Fig. 2**

### Automation

When connecting electrical or pneumatic actuators with our adapter sets, no transverse force must act on the actuator or ball valve, as this can lead to impermissibly high wear on the spindle seal of the ball valve or the shaft seal of the actuator. Check that the armature opens and closes completely. Adjust using the end stops or end switches of the actuator. The procedure for this depends on the manufacturer and can be found in the operating instructions of the actuator.





## Declaration of Conformity

### Declaration of Conformity

according to Annex VII of Directive 97/23/EC

We,

**PROKOSCH - PUMPEN und ARMATUREN GmbH**  
In der Breitwiese 9

**D-76684 Östringen, Germany**

declare, that the product

**Ball valve PN 16/DN 65, DN 80, DN 100, DN 125, DN 150**  
**Type 400, 410, 440, 450, 460**

to which this declaration is referring to, is in compliance with the directive 97/23/EC

and was subjected to the following conformity assessment procedure:

**Internal production control**

M. Prokosch, managing director

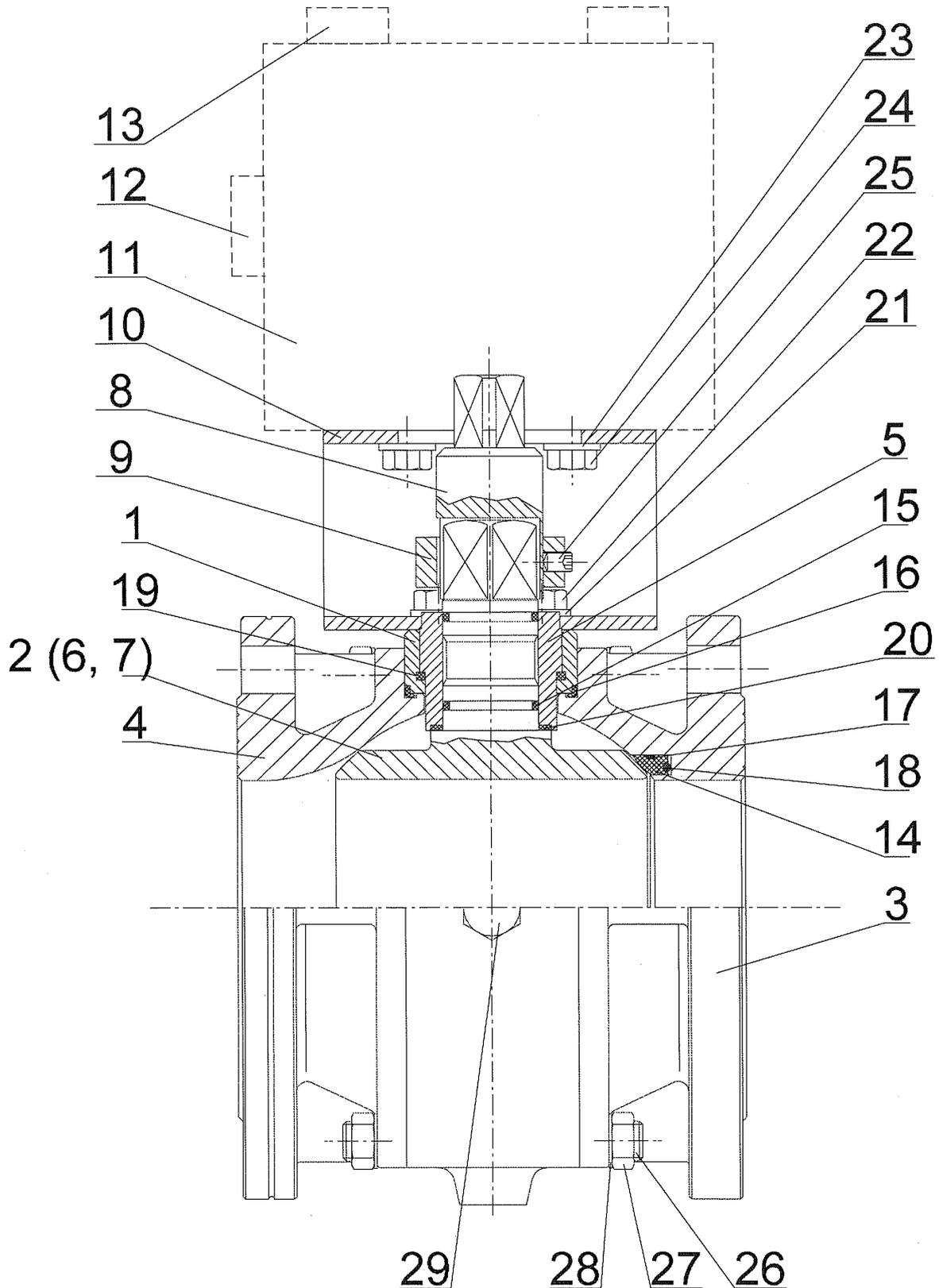
Odenheim, 12.12.2001



## 11.2 Ball valve for conveyor outlet, KGH 65

Drawing ball valve DN 50 - 125,

drawing-no.: 205000112





Spares list for KGH06500076 ball valve 400/65/2/SO/FA drawing-no. 2 05 000 112

pos	piece	quantity	designation/drawing-no.
0001	GEH00000021	1,000 ST	body for ball valve DN65, cast iron 3 05 001 006
0002	KUG00000005	1,000 ST	ball DN 65, cast iron, hard chrome-plated 3 05 002 031
0003	FLA00000007	1,000 ST	flange,DIN 2501,DN 65/PN16,cast iron 3 05 003 092
0004	FLA00000011	1,000 ST	flange,DIN 2501,DN 65/PN16/FA, cast iron 3 05 003 096
0005	BUC00000002	1,000 ST	bearing bush M45x1,5x25, brass 4 05 005 002
0014	ELA00000002	1,000 ST	liner DN 65, PTFE + 25% glass 4 05 006 083
0015	ELA00000029	2,000 ST	o-ring 20,3x2,4, FKM
0016	ELA00000057	1,000 ST	o-ring 105x4, FKM
0017	ELA00000044	2,000 ST	o-ring 72x4, FKM
0019	ELA00000082	1,000 ST	flat packing 45x38x2,5, FKM
0020	ELA00000076	1,000 ST	flat packing 35x25x2, FKM
0026	NOR00000001	4,000 ST	stud bolt M12x90-8.8 DIN 938
0027	NOR00000006	8,000 ST	hexagon nut M12-8 DIN 934
0028	NOR00000027	8,000 ST	tooth lock washer M12 DIN 6797

Rev. 14/08

**Remark!**

**For temperatures over 80°C all elestomeres are Viton**



Spares list for SET00000157 mounting kit ISO5211 F07/DN65+DN80 stainless steel  
drwg. 2 05 000 112

pos	piece	quantity	designation/drawing-No.
0008	WEL000000046	1,000 ST	coupler wrench size 19/ISO5211 F07, stainless steel
0010	KON000000025	1,000 ST	bracket ISO 5211 F07+F10/DN65+DN80, stainless steel
0021	NOR000000041	4,000 ST	washer, A 8,4 DIN 125
0022	NOR000000020	4,000 ST	hex. head cap screw M8x16-8.8 DIN 933
0023	NOR000000041	4,000 ST	washer, A 8,4 DIN 125
0024	NOR000000019	4,000 ST	hex. head cap screw M8x12-8.8 DIN 933

Rev. 08/14



## 12 Operating instruction for butterfly valve

### Maintenance- / operation and assembly instructions for butterfly valves type BA / N / B / L / S



#### **IMPORTANT!!!**

Please read this instructions carefully  
before starting initial operation phase!



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## 0. Introduction

The armatures, described as follows, can only be used for industrial applications. These operating instruction complies with applicable EN safety standards as well as codes of practice applicable in the Federal Republic of Germany. If the armatures are used outside the Federal Republic of Germany, the operator must ensure that valid national codes of practice are complied with.

**The employment within the highly combustible (ATEX) range is forbidden, if this is not expressly certified (to auxiliary references pay attention)!**

**Armatures for EX-Zones have a separate test plate with the  sign. It defines the allowed use of the armature.**

**For the area of application in accordance with Pressure Equipment Directive only armatures may be used, which were marked by the manufacturer CE. (Consider the category.)**

This instruction should be helpful for assembly, operating and maintenance of butterfly valves.

**Please read it carefully. Hints and specially warning hints have to be regarded.**

In this instruction the following pictorial symbols are used, which mark warnings and important notes:



Gefahr  
Danger

Not regarding this warning hint means, that death, severe damage to the body or machinery **will** occur, if you do not care of corresponding precautionary measures.



Warnung  
Warning

Not regarding this warning hint means, that death, severe damage to the body or machinery **can** occur, if you do not care of corresponding precautionary measures



Vorsicht  
Caution

Not regarding this warning hint means damage to the body or machinery, if you do not care of corresponding precautionary measures

### **ATTENTIONS!!**

**When removing and / or in case of disguising our nameplate, all guarantee will expire. If the nameplate should be replaced by the customer, it is in his responsibility to document all relevant data!**

**It is not allowed to remove CE type plates from butterfly valves which are marked CE.**



## 1. Description

Butterfly valves can be used for

- blocking / dosing
- discharging

of bulk material (fluids, gas), with different physical features.

The butterfly valves can be attached to silos, pipelines or material handling machines.



Warnung  
Warning

**A condition for this is that the butterfly valves are assembled and manufactured due to customer specification. Material, types of actuation and driving power must be adapted to respective case of application.**

In the following cases of application under the designation "system", specified above, are summarized.

### 1.1 Validity for this operating instructions

**This operating instruction is valid for all butterfly valves types BA / N / B / L / S.**

Included are the following different types of operation:

- Without factory-installed actuation
- Manually operated
- Strange operated



Warnung  
Warning

**Butterfly valves used in ATEX-Zone have to be regarded under the valid special hints for ATEX.**

### 1.2 Responding documents

The form for offer/business order provided to each butterfly valve and all associated documents are applicable part of the internal documentation

It contains the following information:

- Medium / pressure / temperature / condition of aggregation / ATEX-Zone
- Ident.-No. or part of plant (if demanded)
- Nameplate
- Technical specification concerning the butterfly valve and the case of application.

#### Further responding documents:

- Assembly-, operating- and maintenance instructions for all specified attached parts
- Manufacturer's certificate
- Certificate of conformity
- ATEX-certificate for all attached equipment.



## 2. Determination of use

**Not regarding corresponding precaution measures could mean severe damage to life and machinery.**



When assembled in the system, butterfly valves have the only purpose to block, dose or discharge medium.

Each butterfly valve is exclusively designed to the order acknowledgement.

A change of use or application must be approved by Burgmer Apparatebau GmbH.

**It is not allowed to exceed the allowed temperature- and pressure-range of the butterfly valves.**



**Butterfly valves and attached equipment, which have certificate due to ATEX, can only be used for the approved purpose. (Please regard the type plate.)**

**The defined time limits for maintenance works on butterfly valves have to be regarded. Please regard section 3 "Safety hints".**

## 3. Safety hints

### 3.1 General safety hints

Safety hints valid for the whole system are equally valid for the assembled butterfly valves.

This instruction describes only safety hints concerning butterfly valves.

Furthermore the operation- and maintenance instructions of attached equipment have to be regarded as well.



### 3.2 Safety hints for the operator

The following listed hints are in the responsibility of the operator:

- Take care that all safety precautions valid for the country and / or for the plant have to be regarded.
- The operation of the butterfly valve has to correspond to the description chapter 2 "Determination of use".
- The total system has to be installed and proved by skilled workers.
- **It must be prevented by suitable measures that by moving parts of the system member masses are gotten jammed!!!**
- **If necessarily warnings or shut-off positions must be set up!**
- **An unintentional start-up and/or putting out of operation of the system must be absolutely prevented!**
- The design of wall thickness of butterfly valves corresponds with correct installed pipelines concerning the balance of moments.
- Only skilled workers are allowed to assemble the butterfly valve.
- Initial operation of butterfly valves is only allowed after assembly and can only be done by authorised persons or skilled workers.





Warnung  
Warning

- The rate of flow in the system has to be in normal dimensions.
- Abnormal terms of operating like oscillation, cavitation and water hammer are not allowed.
- Operating temperature lower than - 20° C and higher than + 50° C: in this case the butterfly valve has to be covered with a contact protection.



Vorsicht  
Caution

We point out expressly that there are still risks for the user of butterfly valves despite the fact that they are produced with highest possible care.  
Damage to persons and parts of plant can only be a result of inexpert handling.

### 3.3 Special hazards



Gefahr  
Danger

- The system has to be without pressure when disassembling butterfly valves and / or attached equipment.
- Pipes, vessels have to be free of medium.

#### Attention!

The system and dead rooms of butterfly valves could be covered with bottoms

## 4. Transport and storage



Vorsicht  
Caution

### **Butterfly valves have to be handled, transported and stored carefully!**

The storage should happen in closed rooms. All parts should be protected against corrosion - there should be a none aggressive atmosphere.

Butterfly valves should be transported as parcelled goods to their destination. The storage should be done in a slight opened position.

Butterfly valves attached with a single acting - position closed - pneumatic actuator can be stored for max. 2 weeks. When exceeding this time, actuator and valve have to be separated.

## 5. Assembly, initial operation, handling, disassembly

### Safety instructions



Warnung  
Warning

**Before assembling or disassembling butterfly valves, it is important and necessary to read chapter 2 "Supposition for operating" and chapter 3 "Safety hints".**



## 5.1 Assembling

Burgmer - butterfly valves are used for installation between flanges according DIN 2501 (PN 6, PN 10, PN 16), also agreed with the customer special flanges after assay.

Butterfly valves, whose sealing profile conclude lateral with the cage, must installed with double sided flange sealing. These flange sealing should cover max. 2/3 with it's flange facing the elastic sealing of the butterfly valve. The sealing surface of the cage must be flat and clean.

By collar II sealing, the sealing concurrent affects as flange sealing. Attention to, that the diameter of counter flange is elected in such manner, that the collar II sealing of the butterfly valve can be held.

The inner diameter of the counter flange should the collar II sealing min. 2/3 and max. cover the bore of the gate valve.  
Do not use added flange sealing!



Vorsicht  
Caution

**The flange must not be welded on, when the butterfly valve is assembled with the system. (Destruction of the sealing when burning!)**

### Assembly hints:



Warnung  
Warning

- Check on butterfly valves concerning damage due to transport. Damaged parts are not allowed to be assembled
- **It has to be secure that the assembled butterfly valves are due to the defined specification as well as to the installation specification.**
- The butterfly valve has to be assembled in closed position to provide damages on the disc and the sealing.
- The clearance of the adapters must leave sufficient place for the opened flap disk, so that this is not damaged when opening.
- The assembling position has no influence on material flow direction.
- The butterfly valve has to be centred between the counter flanges.
- Huge and heavy actuators should be supported.
- Facing flanges have to be cleaned - if using additional flange sealing - they need to have the same quality as the valve sealing.
- Flanges have to be arranged coplanar and connection screws need to be tightened crosswise. **Regard max. torque of connection screws.**
- **Attention!**  
**If the butterfly valve is attached with a ground connector it is necessary to connect the ground connector. The dimension of cross section-ground connection has to be due to valid specifications.**
- Install expansion joints to compensate for thermal expansion of the system.



Vorsicht  
Caution



Vorsicht  
Caution

### Hints to connect pneumatic / hydraulic / actuators:

- Using pneumatic / hydraulic actuators the system pressure has to be checked.



Vorsicht  
Caution



## Hints to connect electric actuators:



- The plant connection voltage has to be equal to the actuator connection voltage. Regard type plate.
- After connecting the actuator, the direction of rotation has to be checked. (Phase equilibrium) Regard rotation indicator.
- Due to specification of the actuator take care of rotary switch /thermal switch. The safety precautions against overload have to be integrated into control system.

## Hints to connect attached equipment:

- Connecting solenoid valves, positioners, limit switches and specified actuators (pneumatic / hydraulic / electric) the added instructions for this equipment has to be regarded.

### 5.2 Initial operation phase

**There should be no foreign body in the system before initial operation phase starts!**

The first initial operation phase should be done without product.

If there should be any leakage while doing a test run, regard chapter 5.5 "Disturbance"!

After successful test run the butterfly valve can be used for production purpose.



### 5.3 Handling

The butterfly valve can be opened / closed either using a hand lever or an actuator. Using a hand lever normal force is satisfactory to operate the armature.

The correct function of the butterfly valve can be attended by inductive or mechanical limit switches.



**The use of extensions to increase torque is not allowed!**

### 5.4 Dismounting

**The disassembly of butterfly valves must be done by skilled workers after release by an accountable department. (Decision operating plant)**

**Forceful the system has to be free of material!**



**Butterfly valves with actuators (pneumatic / hydraulic / electric) must be closed before disassembling. It has to be done by skilled workers, regarding the national IEMour protection law.**



Warnung  
Warning

Flange connecting screws release carefully. (Attention to pressure in pipes, vessels!)

Disassembling butterfly valves from pipe, vessel in closed position.

## 5.5 Disturbance

The essential reason for disturbances and the elimination of a deficiency are listed as follows:



Gefahr  
Danger

Attention!!! Butterfly valves used and specified for ATEX-Zones: It must be provided that there are no foreign metallic bodies between disc and sealing. This might produce sparking.

Disturbance	reason	Elimination of a deficiency
Flange connection leaky	butterfly valve not centered between counter flanges	<ul style="list-style-type: none"> <li>- pipe free of material and pressure</li> <li>- disassembly of butterfly valve</li> <li>- check sealing (damage)</li> <li>- assembling butterfly valve according assembly instruction</li> <li>- operational test</li> </ul>
Flange connection leaky	flange diameter too great	<ul style="list-style-type: none"> <li>- pipe free of material and pressure</li> <li>- disassembly of butterfly valve</li> <li>- check sealing (damage)</li> <li>- check flange diameter</li> <li>- assembling flange with correct diameter</li> <li>- assembling butterfly valve according assembly instruction</li> <li>- operational test</li> </ul>
Flange connection leaky	burned sealing	<ul style="list-style-type: none"> <li>- pipe free of material and pressure</li> <li>- disassembly of butterfly valve</li> <li>- check sealing and assembling a new one</li> <li>- assembling butterfly valve according assembly instruction</li> <li>- operational test</li> </ul>
Butterfly valve cannot be locked	solid body between sealing and flap disc	<ul style="list-style-type: none"> <li>- pipe free of material and pressure</li> <li>- disassembly of butterfly valve</li> <li>- delete solid body</li> <li>- check sealing and flap disc ( damage ) and if necessary assembling a new one</li> <li>- assembling butterfly valve according assembly instruction</li> <li>- operational test</li> </ul>



Disturbance	reason	Elimination of a deficiency
Butterfly valve cannot be locked	sealing porous  piping auxiliary forces are too large! Butterfly valve struts.	<ul style="list-style-type: none"> <li>- check operation temperature and compare with the specification .</li> <li>- pipe free of material and pressure</li> <li>- disassembly of butterfly valve</li> <li>- check sealing and assembling a new one</li> <li>- assembling butterfly valve according assembly instruction.</li> <li>- operational test</li> <li>- see chapter 3.2</li> </ul>
Butterfly valve cannot be locked	pressure of the medium in pipe to high  the cross section of the pneum. lines is too small.  throttle at the single solenoid valve clogs.	<ul style="list-style-type: none"> <li>- check operational pressure</li> <li>- compare with specification</li> <li>- drive power too low</li> <li>- examination of the lines and if necessary exchange.</li> <li>- remove throttle and clean.</li> </ul>
Flap disc leaky in locked position remove	worn sealing (Natural wear)  drivingmoment of the drive too largely. Shaftend thereby rotates or bent  condition of flap disc and position indicator or control of the valve disaccord	<ul style="list-style-type: none"> <li>- pipe free of material and pressure</li> <li>- disassembly of butterfly valve</li> <li>- check sealing and assembling a new one</li> <li>- assembling butterfly valve according assembly instruction</li> <li>- operational test</li> <li>- attention to maintenance rate and shorten if necessary</li> <li>- use a drive with smaller drive moment.</li> <li>- let the shaft exchange.</li> <li>- check position of the flap disc</li> <li>- marking on the front of the over shaft ( "0" ) has to be align with markings of valve neck ("0" ) and flap disc ("0")</li> <li>- butterfly valves with pneumatic, electric, hydraulic actuators. check final position of actuators (according to operation manual)</li> <li>- polished or coated flap discs: marking ("0") on the armature exterior has to be align with marking ("0") on the front side of the shaft</li> </ul>



Disturbance	reason	Elimination of a deficiency
Flap disc leaky in locked position remove	inside diameter of the adapters too small. flap disk impacts in position "open" against the flanges.	- flanges and if necessarily damaged shaft and flap disk exchange.

**Attention:** When working on the butterfly valve regard all safety precautions listed in chapter 3 !

## 6. Maintenance

**Burgmer – butterfly valves, not used in ATEX-Zone** without actuators, are maintenance free in order to proper operation

**Advisory message :** Extensive maintenance and repair should be done by the manufacturer in order to avoid costs of stand still.

Burgmer-butterfly valves used in ATEX-Zone. **The basic armature without operation has to be checked - scheduled service!**



**Specification:** Maintenance and repair has to be done in manufacturers plant!!!

### 6.1 Security hints



Any kind of work on the butterfly valve should be done only by skilled workers – specially concerning electrical components.

- **before starting to work, inform the safety officer**
- **cut off all electrical and pneumatic supply**
- **do not grasp into the inside open diameter of the butterfly valve**
- **butterfly valves mounted under vessels have to be secured by a emergency shut down before working on them**
- **when doing extensive maintenance or repair works on the butterfly valve keep vessels, tubes and part of plant free off product**
- **avoid after running of product take convenient action**





## 6.2 Maintenance hints

Action	weekly	4 weeks
● Visual control of the butterfly valve pneumatic and electric connections		
● Check air-tightness of solenoid valves and pneumatic connections		
● Check mechanical connections – screws at flanges		
● Armatures used in ATEX-Zones Dust contents have to be cleaned with a moist cloth		
● Armatur im Bereich des Wellenaustrittes auf Dichtheit prüfen		

### Attention!



Gefahr  
Danger

Armatures used in ATEX-Zones have to be proofed by manufacturer latest every 2 years.  
Shaft bearings and rotary shaft seals will be proofed and in case of damage exchanged.

### Attention!



Gefahr  
Danger

In case of any defect concerning the butterfly valves or the attached equipment, the system must be stopped immediately. A restart of the system is allowed after solving the defect.



## 13 Operating instruction for pneumatic actuators

airpower europe



### Operating Instructions

Pneumatic actuator twintorque



#### **Safety Notes**

The mounting, compressed air connections and commissioning of these actuators may only be carried out by suitably trained and qualified persons and in strict accordance with these operating instructions. Incorrect handling or non-adherence to the designed use leads to annulment of the guarantee.

Pneumatic actuators can produce extremely large torques. For this reason alone, it is absolutely necessary to adhere to the valid national and international safety regulations, in order to avoid accidents and injury.

Always make sure the compressed air supply is isolated before doing any mounting or maintenance work.

Before installing, i.e. commissioning the actuator, make sure that the technical parameters, especially the pressure, torque and temperature are compatible between actuator, valve and air supply.

Make sure that the actuator rotates in the correct direction.

Make sure that the maximum pivoting angle is set so that travel to the valve seals is not exceeded past the seals, otherwise they can be destroyed.



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Pneumatic connection to the actuator	6
End position settings	7
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Screws and tools	13
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## Introduction

The pneumatic actuators twintorque from ape are designed for use in the automation of valves with a rotating angle of 90° or 180°. These can have either purely 90 / 180° pivoting movement or a regulating application.

The actuator is available in either double-acting (APD) or as single-acting (APS) with spring return for both rotational directions. The rack & pinion movement is especially suited for this type of force transmission onto rotational valves.

Housed in a cylindrically pressed profile, the pistons are arranged opposite each other. Driven by compressed air (standard air) they move towards or away from each other, transmitting their force via rack to the pinion which in turn provides the rotary movement required.

The pairing of materials here is selected especially to secure balanced operation and therefore long working life.

During design, attention and adherence to the technical fundamentals and specifications for the safety of machines have been fulfilled. In line with the European Guidelines, the danger analyses have been performed and are correspondingly included as warnings in the operating instructions.

The manufacture of the actuator was carried out by a company certified under and according to ISO 9001.

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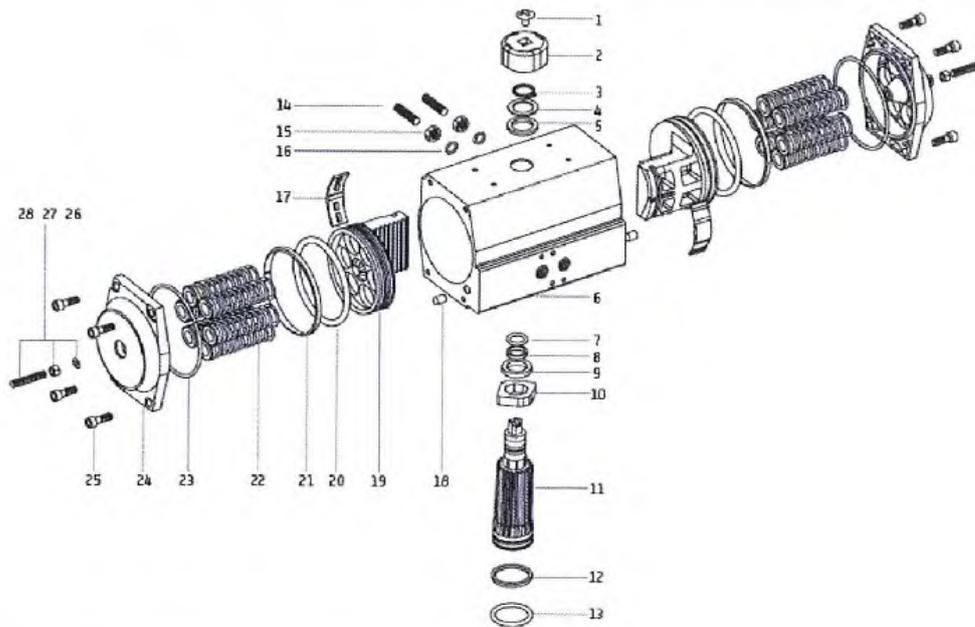
## Technical Data

	Standard Version	Option
Costruction features	Double cylinder actuator acc. to the rack & pinion principle with self-centering piston guide inside a housing. Single-acting: with captive springs	
Design	Pneumatic double-piston pivoting action Type APD = double-acting Type APS = single-acting	3-position actuator (3P)
Mounting position	arbitrary	
Standards	Interface actuator-signal unit: acc. to VDI/VDO3845 (Namur) and VDI/VDO3847 Interface actuator- control valve: acc. to Namur i.e. VDI/VDE 3845 Interface actuator-valve: 4 i.e. 8 female thread in housing as well as pinion with internal 4-sided(8-sided) acc. to EN ISO5211	Differing dimensions possible  Drive pinion option with internal duplex acc. to client wishes  Internal duplex also acc. to EN DIN5211
Materials	Housing: Al alloy, hard anodized, PE-coated Cover: Al alloy, PE-coated Pistons: Al alloy, hard anodized Pinion: steel, corrosion-protect. Seals: NBR (Perbunan) Bearings: plastic, (POM) Screws: stainless steel AISI304	Other housing coatings possible  Pinion: in stainless steel AISI304 or316
Ambient temperature	-35° to +80°	High temp.: -15 - +150°C
Rated pivoting angle	90°, from +5° to -5° adjustable additional 1 direction: +5° to -30° adjustable	180° drive: 180°-120° adjustable
Torque	2.4 Nm to 2105Nm	High torques
Control pressure	2 – 8 bar	Higher control pressures upon request
Control medium/Quality	Filtered air min. acc. to DIN/ISO 8573-1, class 4	Other non-aggressive, gaseous or liquid mediums



## List of single parts

1 screw	8 sliding bush	15 lock-nut	22 springs
2 visual display	9 shim	16 O-ring	23 O-ring
3 securing ring	10 end-stop cam	17 guide segment	24 cover
4 washer	11 pinion	18 plug	25 end-cap screw
5 slide ring	12 sliding bush	19 piston	26 threaded pin
6 housing	13 O-ring	20 O-ring	27 locknut
7 O-ring	14 threaded pin	21 piston guide	28 O-ring



## Spare parts

### Spare parts set No. 1 seals- wearing parts

Parts: 3,4,5,7,8,9,12,13,16,17,18,20,21,23

### Spare parts set No. 2 piston, complete

Parts: 17,19,20,21

### Spare parts set No. 3 pinion, complete

Parts: 3,4,5,7,8,9,11,12,13

### Spare parts set No. 4 cover, complete

Parts: 23,24,25,26,27,28



## Mounting the actuator onto the valve

Before mounting onto the valve following is to be performed:

- Check whether the valve spindle and the drive pinion are parallel
- Check whether the mounting flange on the valve adapts to the actuator housing with regard to the need for additional adaptors ( bridges, shaft, adaptors, reduction pieces).

Insert the screws provided and tighten accordingly. Important: check rotational direction and the model type is correct before commissioning.

<p><b>Standard: clockwise "CLOSED" acc. to DIN EN 15714-1</b></p> <p>90° Switch position      0° Basic position      Assembly variation</p> <p><b>H</b></p> <ul style="list-style-type: none"> <li>- Actuator along pipework</li> <li>- Valve clockwise closing</li> <li>- Safety position: spring-closing</li> </ul>	<p><b>antidclockwise "CLOSED"</b></p> <p>90° Switch position      0° Basic position      Assembly variation</p> <p><b>E</b></p> <p>For client-specific applications e.g. double/triple-eccentric butterflies</p> <ul style="list-style-type: none"> <li>- Actuator along pipework</li> <li>- Valve anticlockwise opening</li> <li>- Safety position: spring-opening</li> </ul>
<p><b>clockwise "OPEN"</b></p> <p>90° Switch position      0° Basic position      Assembly variation</p> <p><b>G</b></p> <ul style="list-style-type: none"> <li>- Actuator along pipework</li> <li>- Valve anticlockwise closing</li> <li>- Safety position: spring-closing</li> </ul>	<p><b>antidclockwise "OPEN"</b></p> <p>90° Switch position      0° Basic position      Assembly variation</p> <p><b>F</b></p> <p>For client-specific applications e.g. double/triple-eccentric butterflies</p> <ul style="list-style-type: none"> <li>- Actuator along pipework</li> <li>- Valve anticlockwise opening</li> <li>- Safety position: spring-opening</li> </ul>



## Pneumatic Connection of the Actuator

Solenoid valve acc. to NAMUR direct onto the flange. Connections 2 and 4 from the actuator correspond to connections 4 and 2 on the solenoid valve.

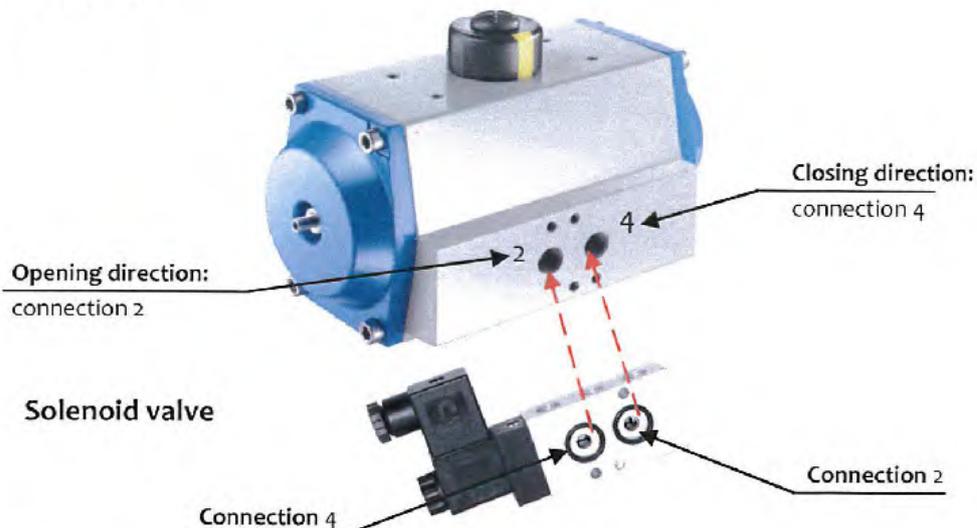
Single-acting actuators are fitted with a silencer (connection 4).

This is to be removed before fitting a NAMUR control valve.

If the control valve is to be mounted separately in the switching cabinet, then the airway leads (4 and 2) from the control valve are to be fitted to connections 2 and 4 on the actuator.

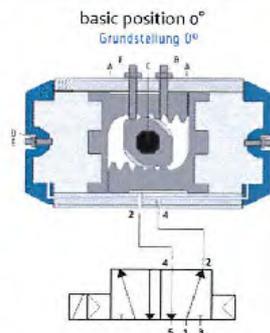
Please note here that the connection 2 is standard for opening with the actuator, and connection 4 for closing.

## Actuator



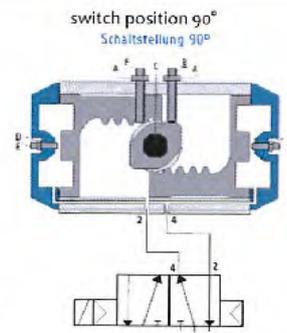
## Connection diagram:

Actuator with solenoid valve in basic position 0°



## Connection diagram:

Actuator with solenoid valve in switch position 90°





## Setting the End Positions



Isolate the actuator from the air supply before adjusting the end positions.

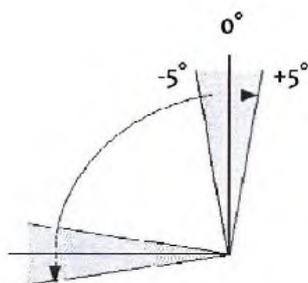
Never use the adjusting screws to press against the operating pressure.

Adjustment of the end positions is performed via screws "F" and "B" in the housing.

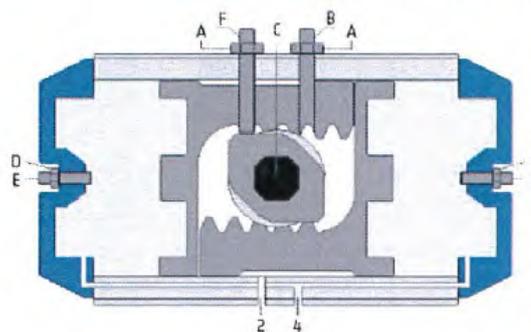
Take the pistons together in which pressure is applied to connection 4. The actuator is now in position **basic position 0°**.

Loosen the locknut at the side and then turn the end position screw "F" inwards until the desired position is reached.

Secure the position by tightening the locknut.



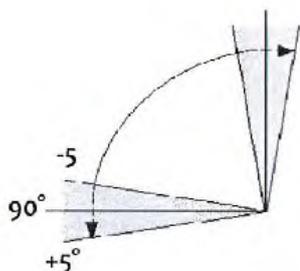
Grundstellung 0° basic position 0°



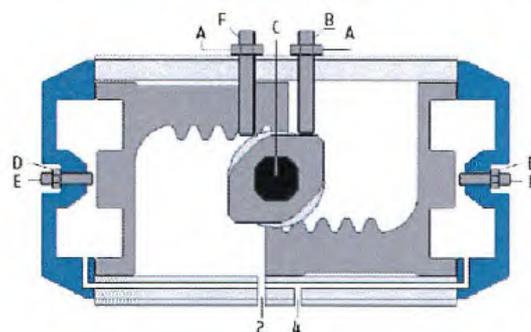
Take the pistons apart in which pressure is applied to connection 2. The actuator is now in position **switch position 90°**.

Loosen the locknut at the side and then turn the end position screw "B" inwards until the desired position is reached.

Secure the position by tightening the locknut.



Schaltstellung 90° switch position 90°





## Setting the stroke Limits



Isolate the actuator from the air supply before adjusting the end positions.

Never use the adjusting screws to press against the operating pressure.

Adjustment of the stroke limitation is performed via screws "E" in the cover.

Take the pistons apart in which pressure is applied to connection 2. The actuator is now in position **switch position 90°**.

Loosen the locknut "D" (at one end cover) and then turn the end position screw "E" inwards until the desired end position of the actuator is reached.

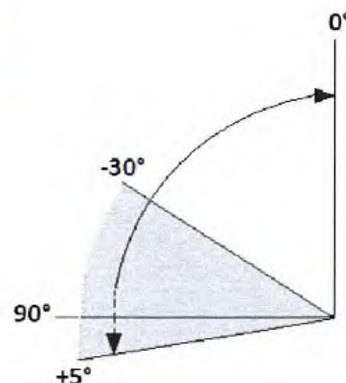
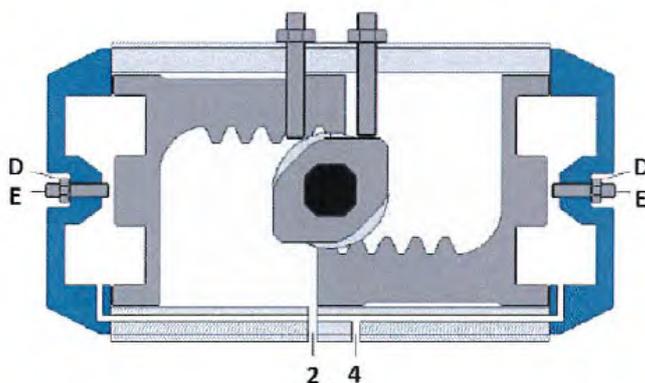
Secure the position by tightening the locknut.

Hold the actuator in this position as you apply air pressure to connection 2 (2 bar max.), or use an open-ended spanner which fits perfectly to the pinion.

Loosen the locknut "D" (at the other end cap) and then turn the end position screw "E" inwards until the screw just begins to apply pressure to the piston inside.

Secure this position of the screw by tightening the locknut.

### Schaltstellung 90° switch position 90°





## Actuator - Dismantling and Assembly



### Attention! Danger of Injury!

Before doing any work whatsoever on the actuator- isolate it from the air supply.

Never use compressed air to push the pistons out of the housing.

For single-acting actuators- remove the springs first.

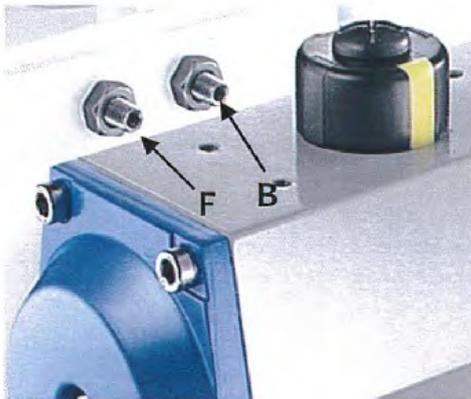
The circlip must not be stretched.

## Removing the piston

Unscrew and remove the end position adjustment screws ("F" and "B") from the housing.

Remove the end cover from the actuator. For single-acting actuators, remove the springs.

Rotate the pinion shaft to push out the cylinders.





## Removing the pinion shaft

Dismantle the visual display.

Remove the circlip and the 2 below-lying washers.

Press the pinion shaft downwards and out of the housing.

Remove the stop-dog and the distance washer from the housing





## Assembly with the pistons

Place the pistons inside the housing. Take care to ensure that the teeth on each of the piston racks fit in with the teeth on the pinion, so that both pistons are taken inwards together.

Place the end covers in position, insert the screws and tighten in position.

Take care here to see that the "O" rings are correctly positioned.





### Inserting the springs

#### Attention!

-  Mount the cover only in a pressure-free situation
-  Remove the cover from the actuator.

Place the selected number of springs into the holes in the piston. The positioning in the holes is done according one of the systems shown in illustration "1".

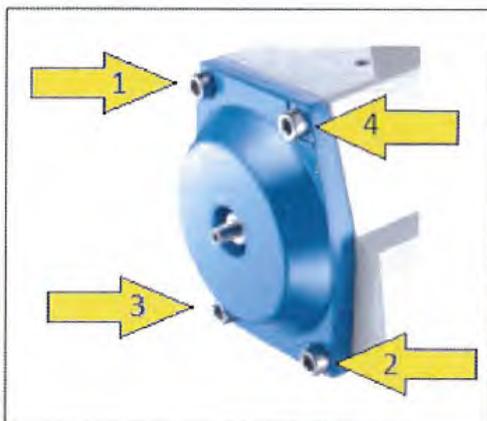
Place the end covers in position, insert the screws and tighten in position.

When tightening the screws, make sure to keep to the tightening sequence as shown in illustration "2" (for tightening torques- please consult page 13).

### Illustration „1“

No. springs	Piston right	Piston left	No. springs	Piston right	Piston left
4			7		
5			8		
6			9		
			10		
			11		
			12		

### Illustration „2“

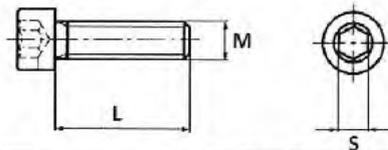




## Screws and Tools for the twintorque Actuator

Screw tightening for the twintorque	
Screw size	Torque in Nm
M5	5 -6
M6	8 - 10
M8	20 -23
M10	44 -48
M12	78 -82
M16	125 -129

### End cover screws

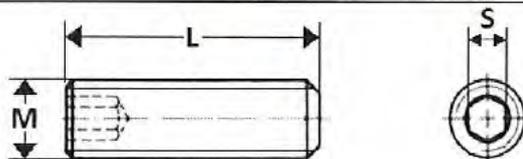


Typ	M	L	S
APD - 040	M5	12	4
APD / APS - 050	M6	16	5
APD / APS - 060	M6	20	5
APD / APS - 070	M6	20	5
APD / APS - 080	M6	20	5
APD / APS - 090	M6	25	5
APD / APS - 110	M8	25	6
APD / APS - 130	M10	30	8
APD / APS - 140	M10	30	8
APD / APS - 160	M10	35	8
APD / APS - 190	M12	55	10
APD / APS - 210	M16	65	14

End position setting screws and locknuts

Endlagen - Einstellschrauben und Kontermuttern

Hubeinstellschrauben und Kontermutter  
Stroke limiting screws and locknuts



### End position setting screws

Type	M	L	S	Locknut
APD - 040	M6	25	3	
APD/APS-050	M6	30	3	M6
APD/APS-060	M6	30	3	M6
APD/APS-070	M8	45	4	M8
APD/APS-080	M8	52	4	M8
APD/APS-090	M8	38	4	M8
APD/APS-110	M8	41	4	M8
APD/APS-130	M10	50	5	M10
APD/APS-140	M12	63	6	M12
APD/APS-160	M12	75	6	M12
APD/APS-190	M16	80	8	M16
APD/APS-210	M16	85	8	M16

### Stroke limiting screws

Type	M	L	S	Locknut
APD/APS-050	M6	40	3	M6
APD/APS-060	M6	26	3	M6
APD/APS-070	M6	35	3	M6
APD/APS-080	M6	35	3	M6
APD/APS-090	M8	50	4	M8
APD/APS-110	M8	45	4	M8
APD/APS-130	M10	50	5	M10
APD/APS-140	M10	65	5	M10
APD/APS-160	M10	80	5	M10
APD/APS-190	M16	90	8	M16
APD/APS-210	M16	90	8	M16



## Safety

### In General

The operating instructions contain essential details about installation, maintenance and operation, which have to be adhered to. These instructions have to be read and fully understood by operators (mechanics, electricians and maintenance personnel) before the actuator is commissioned.

Actuators are customer-specific and designed for special applications, which means they are exclusively designed for specific purposes.

Not only the details about safety in general, contained in the chapter "Safety" but also those in other safety-related situations are to be read, understood and implemented, even those also contained in product-specific safety regulations.

---

### Safety Note

**Mounting, dismantling and maintenance work may only be carried out by suitably trained and certified personnel.**

In the case of newly-installed compressed air systems, the technical requirements recommended are to be adhered to and the newly-installed pipework is to be thoroughly cleaned before connection to the actuator. This ensures that there is no grease, foreign bodies or other material which could impair the operation of the actuator. Finally, the compressed air supply system is to be organised so that there is no possibility for the formation of condensed water.

### Signs and their significance



General safety notices contained in the operating instructions, which indicate that there is a possibility of danger, if the persons do not take heed of the warnings indicated.



Sign to be always used where maintenance or repair work is being carried out.



Wear personal protection



## Dangers of non-adherence to the Safety Instructions

Not keeping to the safety instructions can lead to the loss of every protection the guarantee offers.

The most important disadvantages of not keeping to the safety instructions are:

- Loss of the most important functions
- Danger to the lives of persons through the effects of electrical, pneumatic and mechanical forces

---

## Sources of Danger

If you keep to the instructions for mounting, maintenance and operation, then there can normally be no causes for danger involved with the machine.



Isolate compressed air & electricity supplies and lock in them position before starting maintenance and/or cleaning work.

Do not forget that there is a real danger of injury when testing the function of mounted actuators, especially when switching.

---

## Operators

Operators are only allowed to commission the actuator, when they have read and fully understood the contents of the operating instructions

---

## Owner/Operator

The owner/operator commits himself to only allow persons to work on the actuator, who have read and are familiar with the fundamental stipulations laid down in the laws regulating safety at work and the prevention of accidents.

Additionally, the owner/operator is to ensure that all maintenance, mounting & assembly as well as other ancillary activities concerned with the actuator are carried out by qualified and authorized skilled persons, who have proved their ability to carry out such activities via successfully-completed training in all implications and consequences of these operating instructions.

The owner/operator has to



Ensure that the operating instructions and protective clothing are permanently available to operators

Regularly check the safety-related work of the operating personnel.



## Independent & Unauthorized Changes and Spare Parts

Alterations and changes to actuators are only possible, i.e. permitted under express permission from the company airpower Europe GmbH.

These conditions are concerned purely and simply with safety. Those who use non-authorized components lose the protection of our warranty- they are responsible themselves.

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## Transport & Storage

### Instructions for transport

Actuators arrive from the factory packaged & protected against shock. It is best they remain packaged until usage, i.e. mounting and commissioning.

Preparation for mounting, i.e. usage can be best carried out on a wooden object, usually a pallet. This avoids unnecessary damage.

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### Storage & Long-term Storage

Actuators are to be stored dry and free from dust. It is best to store the actuator in the packaging it was delivered in until the time of use.

If these rules are kept to, then no other measures are necessary.



## 14 Operating instruction for limit switches

14.1 Description limit switch

14.2 Limit Switch box



## 14.1 Description limit switch

### ESB mit induktiven Näherungsschaltern, 3-Draht PNP ESB with inductive proximity switches, 3-wire PNP

#### Varianten Versions



IFM, IS5001



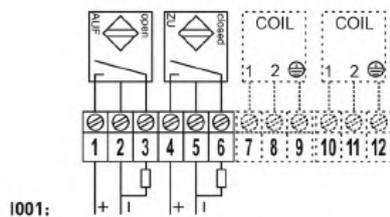
P+F, NBB2-V3-E2



Turck, Bi2-Q10S-AP6X

#### Technische Daten Technical features

<b>Endschalterfabrikat</b> Producer switch	IFM	P+F	Turck
<b>Endschaltertyp</b> Switch type	IS5001 (PNP N. O.)	NBB2-V3-E2 (PNP N.O.)	Bi2-Q10S-AP6X (PNP N.O.)
<b>Spannung</b> Voltage	10-36 V DC	10-30V DC	10-30V DC
<b>Stromaufnahme</b> Maximum current	0-200 mA	100 mA	15-150 mA
<b>Schaltfrequenz</b> Frequency	800 Hz	1000 Hz	2000 Hz
<b>Leerlaufstrom</b> No-load suppl. current	15 mA	15 mA	15 mA
<b>Anzeige</b> Output indicator	LED gelb LED yellow	LED gelb LED yellow	LED gelb LED yellow
<b>Schutzart Schalter (IP-Code)</b> Enclosure switch	IP67	IP67	IP67
<b>Temperatur</b> Temperature	-25°C ... +80°C	-25°C ... +70°C	-25°C ... +70°C
<b>Bestellnummer</b> Ordering code	EPP2101-7, EPE2101-7 EAP2101-7, EAE2101-7	EPP2101, EPE2101 EAP2101, EAE2101	EPP2101-78, EPE2101-78 EAP2101-78, EAE2101-78



## 14.2 Limit Switch box

Flexible plastic limit switch box with stainless steel bracket  
PA6 / PC / 1.4301

### Beschreibung Description

- Kompakte und flexible Endschalterbox aus Polyamid PA6 mit Deckel aus Polykarbonat (PC) transparent flach (Optional: 3D- oder 3D1-Anzeige)
- Verstellbare Edelstahl-Montagebrücke MBHV (1.4301) für einfache Montage auf Norm-Antriebe gemäß VDI/VDE 3845:  
Bohrbilder: 80x30mm und 130x30mm (Optional: 50x25mm)  
Wellenhöhen: 20, 30, 40 und 50mm
- Dichtheit IP67 gemäß DIN EN 60529
- Kabelverschraubung M20x1,5 schwarz (für Kabel Ø 6-12mm)
- Dichtungen EPDM und NBR, Schrauben Edelstahl 1.4301, Welle Edelstahl 1.4305
- Andere Gehäuse-Farben auf Anfrage
- Anwendung: Standardanwendungen ohne explosionsfähige Atmosphäre.  
1-4 mechanische Endschalter oder induktive Sensoren in V3 Bauform,  
1-3 Schlitzinitiatoren,  
1-2 zylindrische Sensoren Ø 8-18mm
- Compact and flexible limit switch box made of polyamide PA6 with flat cover made of polycarbonate (PC) (optional: 3D or 3D1 indicator)
- Adjustable stainless steel mounting bracket MBHV (AISI 304) for simple assembly on actuators according to VDI/VDE 3845:  
Hole spacings: 80x30mm and 130x30mm (optional: 50x25mm)  
Shaft heights: 20, 30, 40 and 50mm
- Enclosure IP67 according to DIN EN 60529
- Cable gland M20x1,5 black (for cable Ø 6-12mm)
- Sealings EPDM and NBR, Screws AISI 304, Shaft stainless steel AISI 303
- Other colours of casing available on request
- Application: Standard applications without explosive atmosphere.  
1-4 mechanical switches or proximity sensors in V3 design  
1-3 slot type sensors,  
1-2 cylindrical sensors Ø 8-18mm

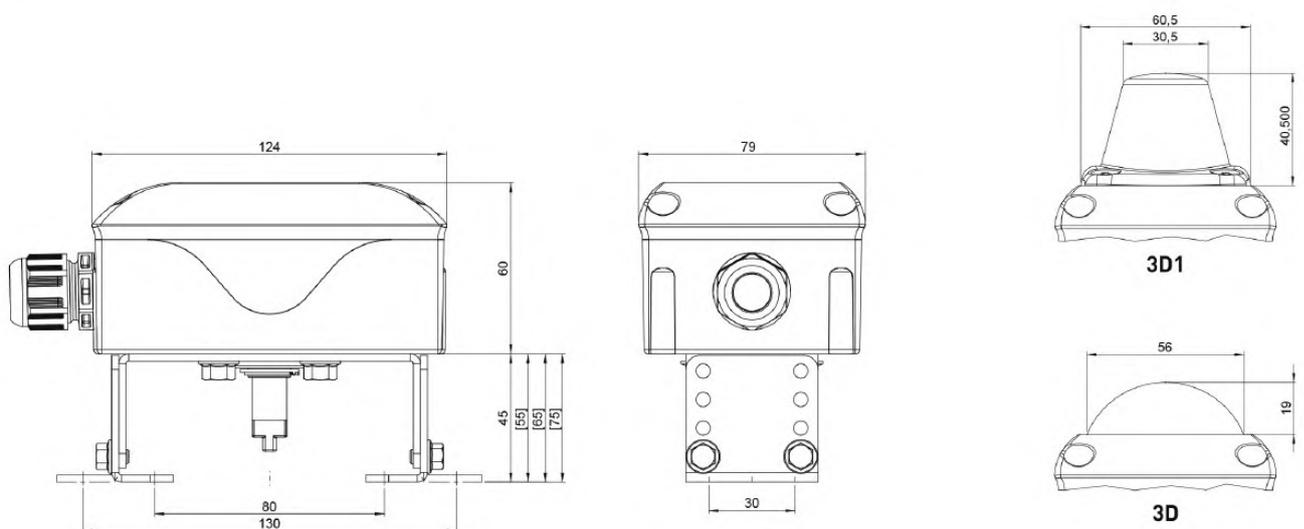
Model: EPB



IP67  
-25°C...+80°C



### Maßzeichnung Dimensions





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## 15 Manufacturer's Declaration

15.1 Manufacturer's Declaration HENSEL GmbH

15.2 Operating Manual Pressure Vessel A 500-HT

15.3 Danger Analysis A 500-HT

15.4 Manufacturer's Certificate Safety valve for conveyor



## 15.1 Manufacturer's Declaration HENSEL GmbH

### within the meaning of the EC Machinery Directive 2006/42/EEC, Annex II 1B

We herewith declare that the the Rotamill fan in the version put into circulation by our works is destined for being assembled with other machines to one machine. It shall be forbidden to put it into operation until it has been established that the machine constructed by assembly corresponds to the directions of the guiding machine rule EC Machinery Directive 2006/42/EEC, Annex II 1B.

This declaration becomes void if the machine is subjected to alterations not coordinated with ourselves.

- |    |              |  |
|----|--------------|--|
| 1. | Description  | <b>Pneum. conveying system for residues</b>  |
| 2. | Manufacturer | <b>HENSEL GMBH<br/>Eisenhüttenstraße 26<br/>D - 57074 Siegen</b>                               |
| 3. | Type         | <b>Pneum. Conveyor A 500-HT, Serial No. 1178<br/>Pneum. Conveyor A 500-HT, Serial No. 1179</b> |
| 4. | Built        | <b>2014</b>  |

Relevant EC directives:	EC Machinery Directive	2006/42/EEC9
	Pressure equipment directive	97/23/EG
	EC Low Voltage Directive	2006/95/EG
	EC Electromagnetic Compatibility Directive	2004/108/EG

Applied harmonized standards, specifically	DIN EN 12100, EN 13857:2008 EN 60204-1
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Applied national standards and technical specifications, specifically VDMA 14461, VBG 5, VBG 5 DA

Authorized person for technical documents: Manufacturer:	Herr Matthias Hensel, Managing Director HENSEL GmbH Eisenhüttenstr. 26 57074 Siegen
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Siegen, the 04<sup>th</sup> of Sep, 2014

Signature: .....  
**Hensel, Matthias**



## 15.2 Operating Manual Pressure Vessel A 500-HT

### according EC Pressure Equipment Directive 97/23/EC

Pressure device:	<b>Pneumatic conveyor</b>	Certificate-No.:	<b>201678AA</b>
Vessel-No.:	<b>1178 and 1179</b>	Model:	<b>2014</b>
Volume (V):	<b>650 Ltr.</b>	Module:	<b>G</b>
Allowable working pressure(PS):	<b>6 bar</b>	Categorie:	<b>IV</b>
Test pressure:	<b>appr. 12,4 bar</b>	Fluid-group:	<b>2</b>
Allowable min/max temp(TS):	<b>-10° / +180°C</b>	Pressure variation range:	<b>p min-p max.-p min.: 0-5-0</b>

This pressure vessel is designed and delivered as a single component without safety equipment according the operation conditions of the purchaser according own construction constructional drawings of the manufacturer.

The pressure vessel has to be use only observing the above mentioned technical datas. Another use is not allowed due to safety reasons.

The provider is responsible for the making up of a working instruction for the pressure vessel as part of a complete plant in the language used in the country of destination.

#### 1) Mounting instructions

- This pressure vessel is designed only for the assembly according the agreement with the purchaser-
- The assembly has to be carried out that flange connections , fittings, measuring devices and inspections openings can be reached easily.
- The vertical and horizontal mounting and fixation has to be carried out on the provided fastening elements
- No additional forces have to be charged to the vessel sides over the mountings.
- Stresses due to vibrations on the vessel have to be avoided by appropriate measures
- For protection against outside influences a protections has to be mounted
- Weldings or heat treatments are not allowed on the pressure carrying walls of the vessel.
- The vessel has to be opened only in depressurized state.

#### 2) Initiation

- For avoiding to increase the allowed limits (above mentioned), the pressure equipment has to be design with the according safety advices
- This safety devices as installation of the pressure control, safety valves and eventual devices for temperature control are not included in the manufacturer's delivery range.
- The safety devises has to be constructed that the pressure does not increase the maximum allowed pressure during operation (PS) shoritime for 10 %.
- Before assembly the safety divices of the pressure vessel have to be controlled according the national rules before initiation by an authorized Organisation

#### 3) Maintenance and inspection by the operator

- The operator is responsible for the maintenance and announcement of inspections
- The range and frequency of the inspections depends on the national rules and have to be asked by the appropriate authorities
- The manufacturer recommed the following inspection periods by mainly static load
 

Internal inspection	every 1 years
Pressure inspection	every 10 years



## 15.3 Danger Analysis Pressure Vessel A 500-HT

According to EC-Pressure Equipment Directive 97/23/EC

	Danger	Elimination of danger	Remark
<b>Assembly</b>	Screw thread and connections	Checking cleanness of threads and remove eventual residues	Follow international standards for sealings and connections.
	Wrong bolt connections	Use appropriate screws 5.6/5 galvanized	Assembly of vessel stressless.
	Wrong seals	Use Novaphit SSTC with interior sheets	Tighten screws crosswise.
	Raised and flat faces	Test and clean	
<b><u>Operating Maintenance</u></b>	Deenergize and open with pressure	Depressurize plant	Reliability of operation and international standards have to be followed.
<b>Using</b>	temperature Pressure	Check protections apparatus as well as adjustments of the fittings.	Reliability of operation and international standards have to be followed. Beside this the limit values and checking periods have to be obtained.

All necessary safety advises have to be applicated.  
 Welding repairs have to be carried out by HENSEL personal only.  
 The according operation instruction has to be read.  
 HENSEL Certificate No.: **201678AA** for Product.No. **1178 and 1179**



## 15.4 Manufacturer's Certificate Safety valve for pressure vessel



### Bescheinigung Certificate

Über die Zuerkennung eines Bauteil-  
kennzeichens für

for the grant of a type-test approval  
mark in respect of

#### Sicherheitsventile

Aufgrund einer Bauteilprüfung -  
Prüfbericht des

In virtue of a type-test -  
test report by

TÜV Rheinland vom 30.03.1995 und des TÜV Süddeutschland vom 29.06.2000

wird dem Antragsteller, der Firma the applicant, the company

**Automation and Control Solutions Honeywell GmbH**  
Hardhofweg; 74821 Mosbach

zuerkannt das Bauteilkennzeichen-Nr. is granted the type-test approval mark No.

TÜV . SV . 05-340 . d<sub>0</sub> . D/G . 0,73 . p

für for

**direkt wirkendes Sicherheitsventil, federbelastet**

Typ type

**S 245 B mit Weichsitz**

**S 245 BAO mit Weichsitz**

**S 245 BFO mit Weichsitz ohne Anlüfteinrichtung**

**S 245 BH mit Hartsitz**

**S 245 BHC mit Hartsitz**

**S 245 BHF mit Hartsitz ohne Anlüfteinrichtung**

Die Zuerkennung erfolgt in Anwendung der

The adjudication is made pursuant to

AD 2000-Merkblatt A 2; DIN EN ISO 4126-1; VdTÜV-Merkblatt „Sicherheitsventile 100“;  
Richtlinie 97/23/EG

Sie ist bis zum 31.03.2010  
befristet und kann widerrufen werden.

It expires on 2010-03-31

and is revocable.

Die Bescheinigung vom 03.07.2001  
wird hierdurch ersetzt.

The certificate dated 2001-07-03

is replaced herewith.

Hinweis: Der Hersteller oder Importeur ist ver-  
pflichtet, den zuständigen Sachverständigen zu  
beauftragen, Armaturen aus der laufenden Ferti-  
gung auf Übereinstimmung mit dem Baumuster  
einmal jährlich stichprobenweise zu überprüfen.

Note: The manufacturer or importer is obliged  
to the competent Authorized Inspector to conduct  
a random check on the accessories concerning  
identity to the type once a year. The accessories  
have to be taken from the current production.

Essen, 31. Januar 2005

Sta/Pra 3.19.3

Verband der  
Technischen Überwachungs-Vereine e.V.  
Geschäftsbereich Anlagentechnik, Arbeitswelt, Systemsicherheit  
- Zertifizierungen und Registrierungen -

*Staudt*  
Staudt

Verband der Technischen Überwachungs-Vereine e.V. · Kurfürstenstraße 56 · 45139 Essen · Telefon (02 01) 89 87-0