

Translation of original instructions with installation instructions
Automatic backflush filter with internal pressure cleaning and
integrated cyclone effect
AF 112 G2

Material No. of Instruction Manual
70355343



1 Contents

1	Contents.....	2	15	Maintenance.....	13
2	General safety instructions	3	15.1	Inspection and maintenance schedule	13
2.1	Safety instructions for installation and operating personnel	3	15.2	Removing the filter insert	14
2.2	Warning structure.....	3	15.3	Removing the backflush channel	15
2.3	Warning symbols used.....	3	15.4	Cleaning the filter	16
2.4	Other symbols used	3	15.4.1	Cleaning the filter insert	16
3	Glossary.....	4	15.4.2	Cleaning the filter housing	16
4	General information	4	15.5	Replacing the segmented element.....	16
4.1	Manufacturer.....	4	15.5.1	Removing the segmented element	16
4.2	Information about the Instruction Manual	4	15.5.2	Installing the segmented element	18
4.3	ATEX type key	4	15.6	Replacing the element seals and guides.....	19
5	Intended application	5	15.7	Replacing the shaft seals and shaft guide.....	19
6	Functional description.....	5	16	Exploded view	20
6.1	Process principle of the AF 112 G2	5	17	List of parts.....	21
6.2	Main components of the AF 112 G2	6	18	Spare parts.....	22
6.3	Functional principle of the AF 112 G2.....	6	19	Declaration of incorporation	23
7	Technical data	7	20	Declaration of conformity.....	24
7.1	General data of the AF 112 G2 (without options).....	7	21	Index	28
7.2	Order-specific data.....	7			
7.2.1	Name-plate for filter with Ex protection ..	7			
7.2.2	Name-plate for filter without Ex protection	7			
8	Transport and storage	7			
9	Installation instructions.....	7			
9.1	Installation.....	8			
9.2	Installing the pipes and selecting the pump	8			
9.3	Backflushing	8			
9.4	Mechanical installation.....	8			
9.5	Electro-pneumatic connections	9			
9.5.1	Connection to customer's controller.....	9			
9.5.2	Connection to FG controller (optional) ...	9			
9.6	Control variants of the AF 112 G2.....	10			
9.6.1	Control variant 1	10			
9.6.2	Control variant 2	10			
9.6.3	Other control options	10			
10	Start-up	10			
10.1	Functional test	10			
10.2	Operating settings.....	11			
11	Normal operation	12			
11.1	To rinse the drain line	12			
11.2	Rinsing the cleaning line	12			
12	Shutting down the automatic filter	12			
12.1	Temporary shut-down	12			
12.2	Prolonged shut-down (> 48 h).....	12			
12.3	Emergency shut-down	12			
13	Notes on cooling lubricant filtration.....	12			
14	Troubleshooting.....	12			

2 General safety instructions

2.1 Safety instructions for installation and operating personnel

This Instruction Manual contains important safety instructions which must be heeded at all times during installation, normal operation and maintenance.

Non-observance can result in the following risks to persons and the environment as well as in damage to the machine or system:

- ⇒ Failure of critical functions of the machine or system or of its component parts.
- ⇒ Danger to persons from electrical or mechanical effects as well as from chemical reactions.
- ⇒ Danger to the environment owing to the leakage of hazardous substances.

Before installation/start-up:

- Read the Instruction Manual carefully.
- Make sure that installation and operating personnel are adequately trained.
- Make sure that the contents of the Instruction Manual are fully understood by the responsible persons.
- Define areas of responsibility and competence.
- Prepare a maintenance schedule.

During operation of the system:

- Keep the Instruction Manual handy at the place where the system is used.
- Heed the safety instructions. Always operate the machine/system in accordance with its ratings.

If in doubt:




- Consult the manufacturer.

2.2 Warning structure

Where possible, warnings are structured according to the following system:

Signal word	
Possibly with symbol	Nature and source of the danger ⇒ Potential consequences of non-observance. • Action to avert the danger.

2.3 Warning symbols used

 DANGER!
Immediate danger! ⇒ Non-observance will result in serious or fatal injury.
 WARNING!
Potentially dangerous situation! ⇒ Non-observance can result in serious or fatal injury.
 CAUTION!
Potentially dangerous situation! ⇒ Non-observance can result in minor or moderate injuries.
CAUTION! (without a symbol)
Potentially dangerous situation! ⇒ Non-observance can result in property damage.

2.4 Other symbols used

	Danger from high voltage
	Danger information about explosion protection
	Information about environmental protection
	Wear protective clothing!
	Wear goggles!
	Wear a respirator!
	Hand symbol: Indicates general information and recommendations
•	Bullet: Indicates the order in which actions are to be carried out
⇒	Arrow: Indicates responses to actions

3 Glossary

Agglomerate:

Structure made up of several small particles which have formed a ball (conglomerated) as a result of physical forces.

Aerosol:

Distribution of minute liquid droplets (or solid particles) in a gas.

Cleaning:

The segmented element is cleaned. It is turned for this purpose. Filtered fluid or the external pressure medium flows outward through the segmented element and cleans the segments one at a time.

Concentrate:

Quantity of residues enriched with solids. Is discharged from the filter periodically. Further treatment may be necessary, depending on the application.

Cooling lubricant:

Cooling lubricant acc. to DIN 51385.

Differential pressure (delta p):

Difference between the pressure on the dirty side and the clean side.

Draining:

The drain valve is opened. The solids that have been collected in the collection cone are discharged.

Filter cake:

Layer that is built up by the solids retained on the surface of the segmented element.

Filtered fluid:

Substance that is filtered.

Filtration mode:

The automatic filter operates normally and the valves are closed.

Homogenisation:

A system of substances is given a uniform composition.

Initial differential pressure:

Differential pressure at the start of the filtration process (when the segmented element is "clean").

Precontrol:

5/2-way magnetic valves actuated by the controller, which switch pneumatic control valves.

Segmented element:

Cylindrical structure consisting of two concentric, profiled elements. The actual filter medium is located between the profiled elements. The suspension that must be filtered flows inward. Solids are retained on the outer surface of the segmented element.

Siphon:

U-shaped pipe. A siphon cannot be discharged without a valve.

Suspension (raw suspension):

System of substances that must be filtered, generally consisting of solids in a liquid.

4 General information

4.1 Manufacturer

Filtration Group GmbH
Schleifbachweg 45
D-74613 Öhringen
Phone +49 7941 6466-0
Fax +49 7941 6466-429
fm.de.sales@filtrationgroup.com
www.fluid.filtrationgroup.com

4.2 Information about the Instruction Manual

FG Mat. No.: 70355343

Date: 12.07.19

Version: 08

4.3 ATEX type key



II	2	G	c	T3
1.	2.	3.	4.	5.
1.	II	Valid for use above ground		
2.	Use in:	Zone 1 2	Zone 2 3	
3.	Atmosphere G = Gas D = Dust	G	G	
4.	Types of protection c = Constructional safety			
5.	T3 = The maximum surface temperature on the filtration device is 200°C.			

(Space for ATEX name-plate)

The Ex type of protection is only valid in conjunction with the declaration of conformity.

5 Intended application

DANGER!

PROHIBITED:

- Use for other purposes without prior consultation with the manufacturer.
- Use in potentially explosive atmospheres, unless explicitly mentioned in the contract documentation.
- Use with smouldering, burning or adhesive particles.
- Use with highly explosive dusts (e.g. aluminium dust, explosives, etc.).

CAUTION!

This FG automatic filter is only allowed to be used in accordance with the operating conditions specified in the contract documentation and in the Instruction Manual. All forms of use which deviate from or exceed the limits of use described above are considered to be contrary to the intended purpose. The manufacturer shall not be liable for any damage resulting from such use.

CAUTION!

Conditionally allowed:

- Use of solvents in consultation with the manufacturer.

FG automatic filters are designed for filtering solids out of low-viscosity liquids.

Main applications:

- Cooling lubricant filtration
- Product filtration
- Preseparation in a filter cascade
- Protective filtration before or after certain process steps
- Process filtration
- Destruction of unwanted agglomerates

6 Functional description

6.1 Process principle of the AF 112 G2

The tangential inflow causes coarse and heavy particles in the suspension to be sedimented into the collection cone. This relieves the load in the segmented element.

When the liquid flows inward through the segmented element, the particles contained in the suspension settle on the filter medium, where they create a differential pressure. A back pressure – the internal pressure – is built up by means of a control throttle at the filtered fluid outlet.

The segmented element is cleaned when the preset differential pressure is reached or after a defined time interval has elapsed.

The segmented element is turned past the backflush channel by the gear motor. The backflush valve is opened. The particles are removed from the filter medium one segment at a time by the internal pressure cleaning action and guided out of the filter through the backflush channel.

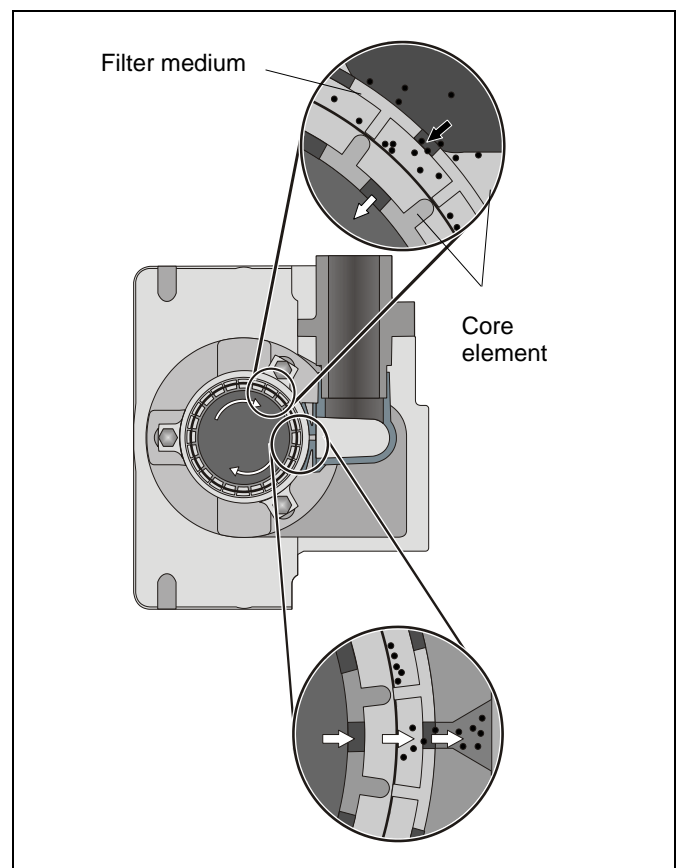


Fig. 1: Separating and cleaning principle on the segmented element

To start a cleaning process

A cleaning process can be started in the following ways:

- Manually
- By means of a differential pressure switch
- By means of a time switch
- By means of a higher-level controller

6.2 Main components of the AF 112 G2

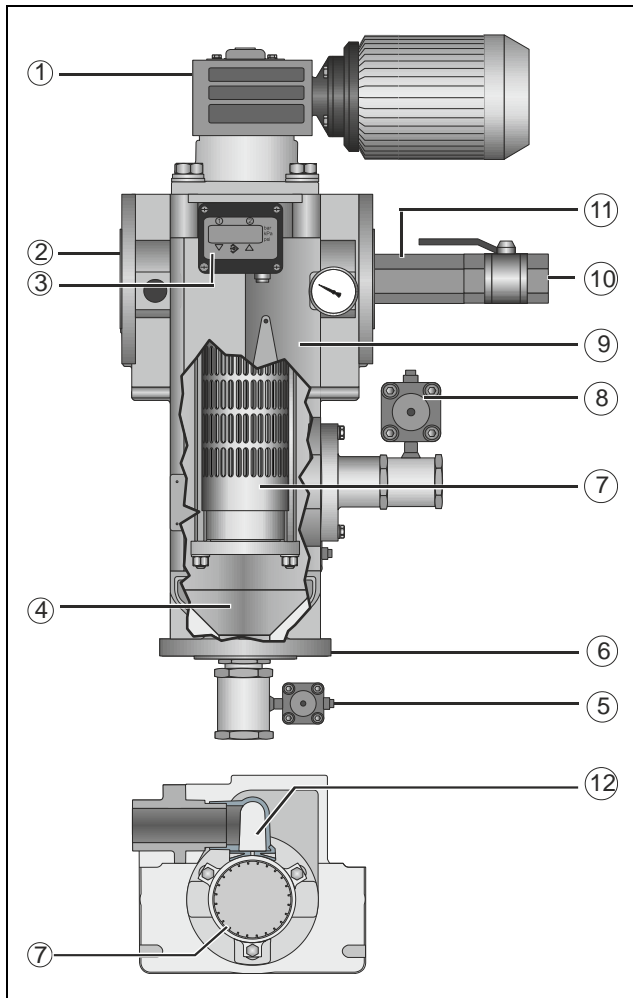


Fig. 2: Diagram of the main components

1	Electric cleaning drive
2	Inlet connection
3	Differential gauge / switch (optional)
4	Collection cone
5	Electro-pneumatic drain valve (optional)
6	Drain opening
7	Segmented element
8	Electro-pneumatic backflush valve (optional)
9	Filter housing
10	Outlet connection
11	Control throttle cleaning flow rate with gauge (optional)
12	Backflush channel

6.3 Functional principle of the AF 112 G2

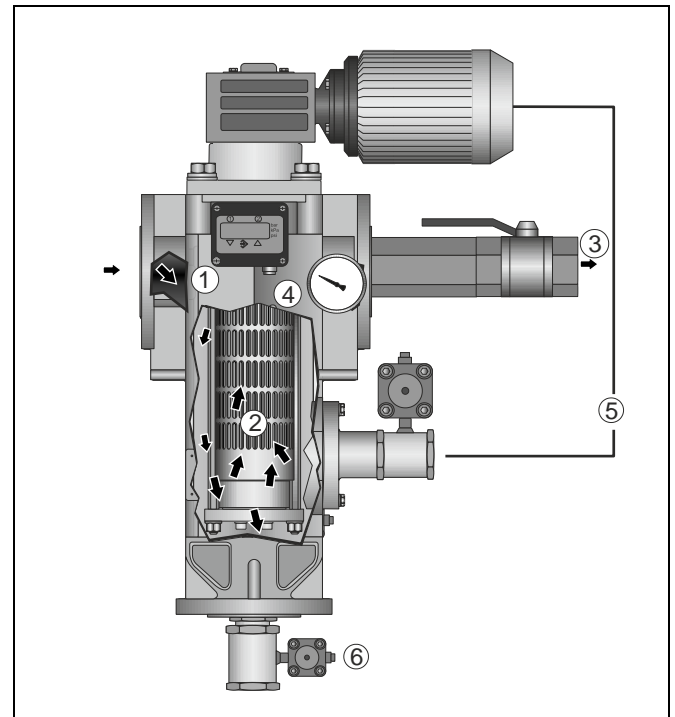


Fig. 3: Functional principle of an automatic filter

- 1**
The suspension flows tangentially downwards into the filter housing.
The cyclone effect cause coarse solids to be sedimented into the collection cone prior to the actual filtration process.
- 2**
The suspension flows through the segmented element.
The particles contained in the suspension settle on the outside of the element.
- 3**
The filtered fluid enters the clean side and exits the filter.
A back pressure – the internal pressure – is built up by means of the “throttling point” mounted at the outlet.
- 4**
A cleaning process is started when the maximum differential pressure is reached (if an optional differential gauge/switch is installed) or after a preset time.
- 5**
The gear motor begins to turn the segmented element. The backflush valve is opened. The particles are removed from the filter medium one segment at a time by the internal pressure cleaning action and guided out of the filter through the backflush channel.
The cleaning effect can be adjusted by means of the control throttle (optional). The filtered fluid pressure and/or volumetric flow are reduced for the duration of the cleaning process. The filtration process is not interrupted.
- 6**
The enriched particles in the collection cone can be discharged periodically either manually or automatically.


7 Technical data

7.1 General data of the AF 112 G2 (without options)

Electrical energy consumption*: 230 V/400 V
Peak noise emission: < 70 dB(A)
Dimensions: See data sheet
Min. dismantling clearance above filter: 380 mm
Total dry weight: 41 kg
Max. operating temperature: 120°C
Max. permissible operating pressure up to 100°C: 16 bar
Max. permissible differential pressure: 10 bar

*See also name-plate on gear motor

7.2 Order-specific data

	<p>The name-plate is rendered invalid if the segmented element or the filter insert are modified.</p> <ul style="list-style-type: none">• Please request a new name-plate from the manufacturer.
---	--

This data is order-specific and can be taken from the name-plate.

7.2.1 Name-plate for filter with Ex protection

FGC.com		Filtration Group GmbH Schleitbachweg 45 D-74613 Öhringen fm.de.service@filtrationgroup.com	
Made in Germany			
TYP		AUFTRAGSHUMMER	
TYPE		JOB NO.	
MATERIALNUMMER		BAUJAHR	
PART NO.		YEAR	
MAX. ZUL. BETRIEBSDRUCK	PS	PRÜFDATUM	MM/YYYY
MAX. ALLOWABLE PRESS.	PS	TEST DATE	MM/YYYY
PRÜFDRUCK	PT	HERSTELLERCODE	
TEST PRESSURE	PT	MANUFACTURE CODE	
BETR. TEMP.	MINMAX TS	HERSTELLER BEHÄLTER NR.	
OPER. TEMP.	MINMAX TS	MANUFACTURE VESSEL NO.	
VOLUMEN			
VOLUME			
L			
○ FILTERELEMENT			
FILTER ELEMENT			

7.2.2 Name-plate for filter without Ex protection

FGC.com		Filtration Group GmbH Schleitbachweg 45 D-74613 Öhringen fm.de.service@filtrationgroup.com	
Made in Germany			
TYP		AUFTRAGSHUMMER	
TYPE		JOB NO.	
MATERIALNUMMER		BAUJAHR	
PART NO.		YEAR	
MAX. ZUL. BETRIEBSDRUCK	PS	PRÜFDATUM	MM/YYYY
MAX. ALLOWABLE PRESS.	PS	TEST DATE	MM/YYYY
PRÜFDRUCK	PT	HERSTELLERCODE	
TEST PRESSURE	PT	MANUFACTURE CODE	
BETR. TEMP.	MINMAX TS	HERSTELLER BEHÄLTER NR.	
OPER. TEMP.	MINMAX TS	MANUFACTURE VESSEL NO.	
VOLUMEN			
VOLUME			
L			
○ FILTERELEMENT			
FILTER ELEMENT			

8 Transport and storage


Transport

- Always transport horizontally in the original packaging
- Avoid vibrations


Storage

- Always store horizontally in the original packaging
- Always store in a dry, frost-free room





	Seaworthy packaging is specified in the contract documentation as an option.
---	--


9 Installation instructions

⚠ DANGER!	
	Explosion hazard! ⇒ Risk of injury to persons or damage to property. <ul style="list-style-type: none">• This FG automatic filter is only allowed to be installed and operated in the category specified in the contract documentation (offer/order confirmation).• If no category is specified: Do not operate the FG automatic filter in a hazardous area!• The owner is responsible for zoning.• The owner of the plant is solely responsible for implementing the appropriate explosion protection measures!• If in doubt, please consult the responsible authorities.
	⚠ DANGER!
	Explosion hazard! ⇒ Risk of injury to persons or damage to property. <ul style="list-style-type: none">• The system is only allowed to be installed, accepted and tested by a suitably qualified person (99/98/EC).
	⚠ WARNING!
	If the system is installed by unauthorised persons ⇒ Risk of injury ⇒ All warranty claims are rendered invalid <ul style="list-style-type: none">• The system must be installed by a suitably trained person!

9.1 Installation

⚠ DANGER!	
	Explosion hazard! ⇒ Risk of injury to persons or damage to property. <ul style="list-style-type: none"> • Check the conductivity between all components! • Note the maximum permissible resistance: $R < 10 \Omega$. • Make sure that earthing is provided by the customer.
	 It must be possible to remove the filter insert in order to carry out maintenance work.

- Prepare a suitable seat on which to mount the filter (e.g. supports, see data sheet).
- Be sure to allow the required clearance for dismantling and discharging (see data sheet).
- Lift up the automatic filter by the eyebolts using suitable hoisting gear and remove it from the packaging.

⚠ DANGER!	
	If the filter topples over ⇒ Risk of injury to persons or damage to property. <ul style="list-style-type: none"> • Secure the filter seat firmly in position.

- Screw the automatic filter to the prepared seat.
- Remove the caps from the connections.
- Connect the pipes.

Pressure relief

- Design measures must be incorporated to prevent inadmissible excess pressure on the dirty side.
- Install a pressure relief device if necessary.

9.2 Installing the pipes and selecting the pump

- The filter must always be installed on the pump discharge side.
- Check the pump characteristic.
- Make sure that the pump suction opening is positioned well below the liquid level.
- Adjust the filtered fluid pressure with the control throttle if necessary.
- If required, install the control throttle in the cleaning line in order to reduce the cleaning flow rate to a minimum.
- Ensure a minimum inlet pressure of 1.0 - 2.0 bar.
- Ensure a minimum filtered fluid pressure of 1.0 - 2.0 bar.

9.3 Backflushing

The maximum permissible static pressure for the AF 112 G2 is a pressure rating of PN 16. The normal operating pressure for backflush filters with internal pressure cleaning is between 1 and 4 bar. Suitable devices, such as throttles, pressure reducing valves or locks, must be installed to ensure reliable operation at higher pressures. At high operating pressures the backflush volume increases.

9.4 Mechanical installation

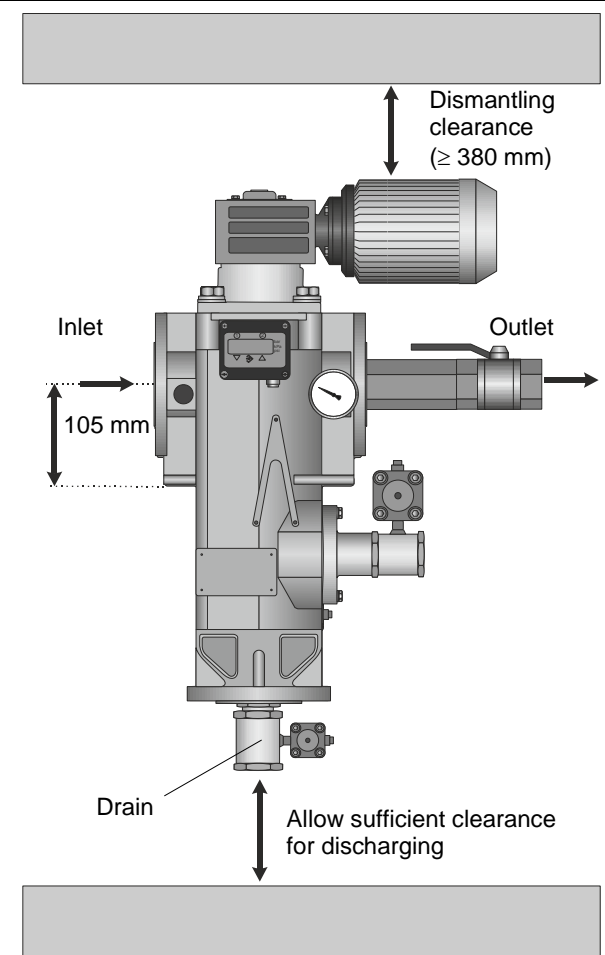
⚠ CAUTION!	
High pressure at the drain valve! ⇒ Risk of injury to persons or damage to property <ul style="list-style-type: none"> • Depressurise prior to mounting and dismantling. 	
Special mounting instructions for the drain lines <ul style="list-style-type: none"> • Make sure that the drain line is securely fastened. • Provide splash protection if necessary. • Lay the pipes without a siphon if possible, to prevent any risk of clogging due to sedimented concentrate. 	
	

Fig. 4: Mechanical installation

9.5 Electro-pneumatic connections

DANGER!



Danger of electric shock!

- ⇒ Risk of serious or fatal injury in case of contact with electrical components.
- All electrical installation work must be carried out by a suitably qualified electrician.

9.5.1 Connection to customer's controller

Gear motor

- Refer to the name-plate and/or the contract documentation for details of the ratings (see also terminal box connection diagram).
- Install a suitable motor circuit-breaker.
- Connect the gear motor.

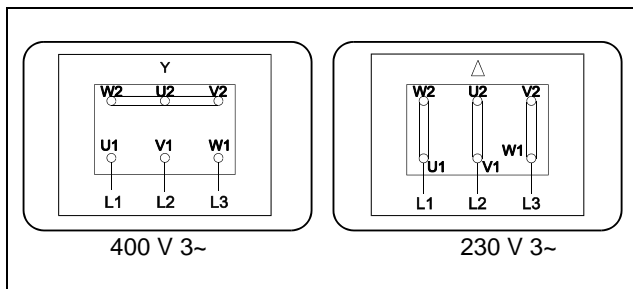


Fig. 5: Standard gear motor connections

Differential gauge / switch (optional)

- Refer to the enclosed manufacturer's documentation for details of the connections.

Automatic valves (optional)

- Connect the precontrol valve (5/2-way magnetic valve) to the compressed air supply (approx. 6 bar).
- Connect the solenoid to the power supply.



Refer to the contract documentation for special versions.

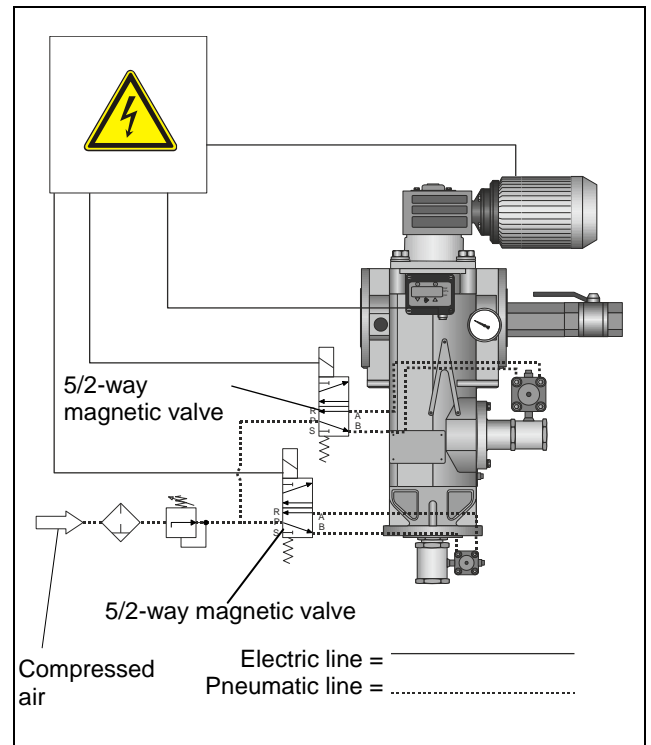


Fig. 6: Electro-pneumatic connections





Required on the switch box:

- Manual release for cleaning

9.5.2 Connection to FG controller (optional)

- Connect the incoming feeder, gear motor, external pressure valve, differential gauge / switch (optional) and precontrol valve (optional) in accordance with the enclosed circuit diagram.

9.6 Control variants of the AF 112 G2

	If the delta p signal is still present after cleaning, the cleaning process is repeated.
	The drain valve must remain closed for the duration of the cleaning cycle.

The cleaning process is controlled differently according to the application. The control variants described here are examples and are simply intended to serve as a guide.

9.6.1 Control variant 1

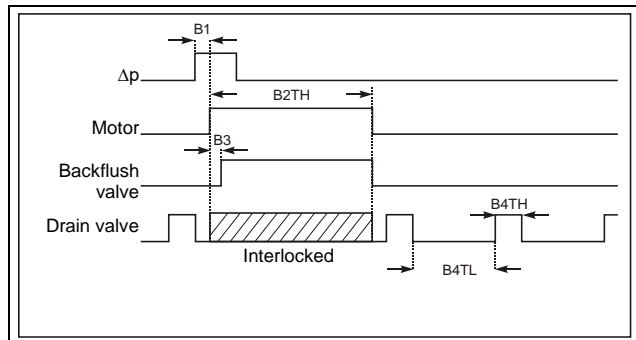


Fig. 7: Control variant 1

Parameter	Description	Recommended value
B1	Suppress differential pressure peaks	1 s
B2TH	Motor running time	7 s
B3	External pressure valve ON delay	0.5 s
B4TH	Drain valve pulse time	2 s
B4TL	Drain valve interval time	1 h

9.6.2 Control variant 2

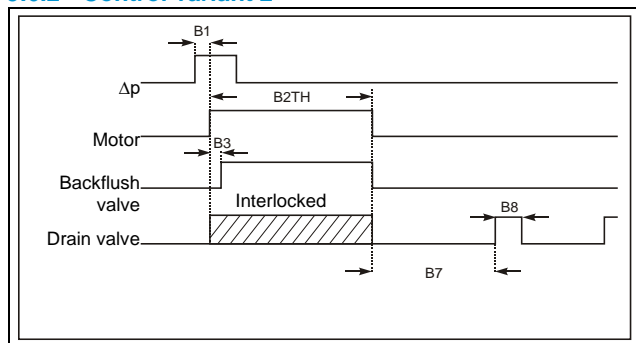


Fig. 8: Control variant 2

Parameter	Description	Recommended value
B1	Suppress differential pressure peaks	1 s
B2TH	Motor running time	7 s
B3	External pressure valve ON delay	0.5 s
B7	Drain valve starting delay	5 s
B8	Drain valve pulse time	2 s

9.6.3 Other control options

Other control options, such as „continuous flushing“ or control adapted to the process sequence, can also be implemented.

10 Start-up

DANGER!

This FG automatic filter is not allowed to be put into operation until it has been established that the machine/system in which it is to be installed complies with the requirements of the applicable EC directives, harmonised standards, European standards or equivalent national standards.

DANGER!



Explosion hazard!

- ⇒ Risk of injury to persons or damage to property.
- The FG automatic filter must be completely vented prior to start-up for use with all media which are capable of forming explosive gases.
- The FG automatic filter must be completely filled with liquid.
- Take steps to prevent air pockets.

DANGER!

Danger due to high pressure in the filter!

- ⇒ Risk of injury to persons or damage to property
- Do not allow concentrate to spatter into the atmosphere!

Make sure that:

- All caps are removed from the connections.
- All foreign bodies are removed from the filter.
- All pipe connections are tightened securely.
- All screws are tightened.
- All pipes and the filter are rinsed.

10.1 Functional test

To check the direction of rotation of the gear motor

- Remove the screws on the cover of the gear motor.
- Remove the cover of the gear motor.
- Start up the gear motor briefly (< 1 s).
- Compare the actual direction of rotation of the shaft with that indicated by the arrow (clockwise rotation).
- Reverse the terminal connections of the gear motor if necessary.
- Fit the gear motor cover again and screw it tight.

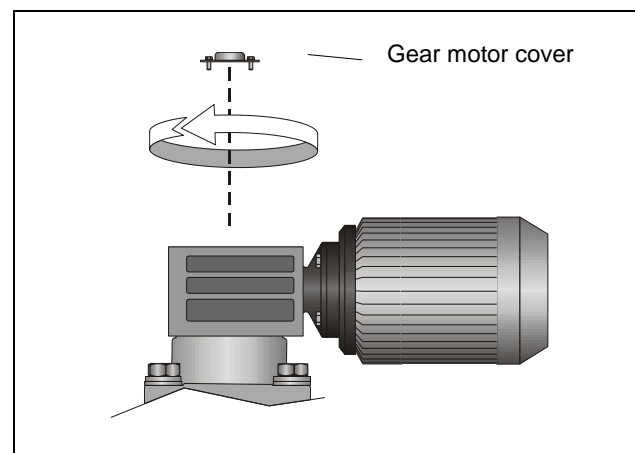


Fig. 9: Direction of rotation of the gear motor

To check the differential gauge / switch (optional)

- Refer to the enclosed manufacturer's documentation.

To check the function of the drain valve (optional)

- Supply compressed air to the precontrol valve.
- Operate the manual release for the precontrol valve.
- ⇒ The drain valve is opened.
- Set the manual release for the precontrol valve to the OFF position.
- ⇒ The drain valve is closed.
- Refer to the enclosed manufacturer's documentation.

To check the function of the backflush valve (optional)

- Supply compressed air to the precontrol valve.
- Operate the manual release for the precontrol valve.
- ⇒ The backflush valve is opened.
- Set the manual release for the precontrol valve to the OFF position.
- ⇒ The backflush valve is closed.
- Refer to the enclosed manufacturer's documentation.

10.2 Operating settings

- Switch on the controller.
- Slowly open the inlet.
- Make a note of the initial differential pressure.
- Set the pressure of the external medium to the required value using a suitable throttle valve.

Settings for time-controlled cleaning

- Set the times according to the operating conditions and correct them if necessary.

Settings for differential pressure-controlled cleaning with a differential gauge / switch

- Refer to the manufacturer's documentation of the differential gauge.
- Adjust the set differential pressure to the setpoint (see contract documentation).

Initial differential pressure

The initial differential pressure varies according to the application.

General guide:

Installation on discharge side: $\Delta p \leq 0.1 \text{ bar}$

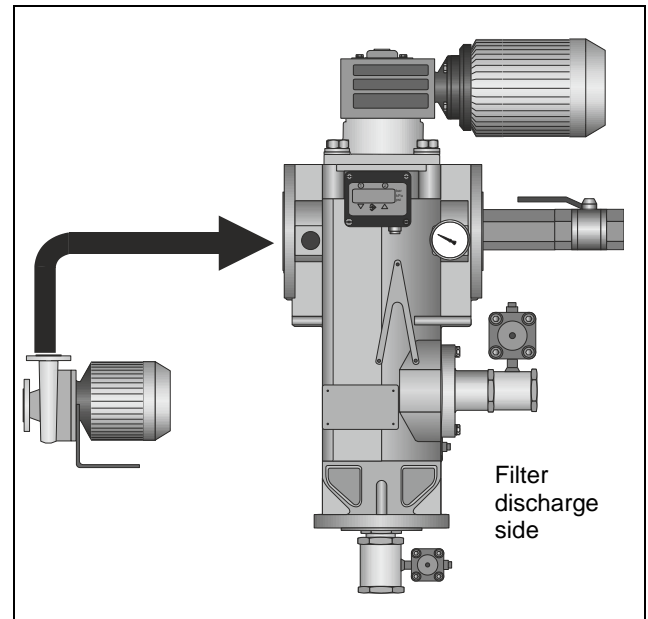




Fig. 10: Initial differential pressure



After a cleaning cycle, the differential pressure must return almost to the original initial differential pressure. If it does not, the cleaning function is faulty (in this case, please consult the manufacturer).


11 Normal operation

 DANGER!	
Danger due to high pressure in the automatic filter! ⇒ Risk of injury to persons or damage to property	
<ul style="list-style-type: none"> Do not allow concentrate to spatter into the atmosphere! 	
	Always dispose of concentrate in a manner which does not pollute the environment! Consult the responsible authorities before deciding upon the most suitable disposal method.

The following must be monitored daily during normal operation:


- Differential pressure
- Controller functions

11.1 To rinse the drain line

 CAUTION!	
A high proportion of fine dirt particles in a long pipe can lead to clogging! ⇒ Risk of injury to persons or damage to property	
<ul style="list-style-type: none"> Rinse the drain line daily / weekly, depending on the application. 	

- Open the drain valve manually for approx. 10 - 15 s.
- ⇒ The drain line is rinsed.

11.2 Rinsing the cleaning line

 CAUTION!	
A high proportion of fine dirt particles in a long pipe can lead to clogging! ⇒ Risk of injury to persons or damage to property	
<ul style="list-style-type: none"> Rinse the cleaning line daily/weekly, depending on the application. 	

- Slowly adjust the control throttle until it is completely closed.
 - Open the backflush valve manually for approx. 10 – 15 s.
- ⇒ The pipe is rinsed.
- Adjust the control throttle to the OFF position again.

12 Shutting down the automatic filter

12.1 Temporary shut-down

On the installed automatic filter controller:

- Switch OFF the main switch.

12.2 Prolonged shut-down (> 48 h)

- Start a cleaning process manually.
- Remove the filter insert (section 15.2).
- Clean the filter insert (section 15.4.1).
- Reinstall the filter insert.
- Fill the automatic filter completely with liquid.
- Switch OFF the main switch.

12.3 Emergency shut-down

- Switch OFF the main switch.
- ⇒ The power supply is interrupted.

13 Notes on cooling lubricant filtration

- Do not attempt to filter magnetic chips. Exercise caution when grinding grey cast iron or steel.
- Install a suitable preseparator (800 - 1000 µm).
- Treat the cooling lubricant carefully. Take steps to prevent excessive bacterial or fungal attack.
- Cooling lubricant that has been used for the cleaning process must be treated separately. There is a risk of enrichment with fine dirt if it is returned to the cooling lubricant cycle.
- Provide a constant-pressure valve in the drain line if the pressure on the filtered fluid side varies between 4 and 16 bar. The rinsing effect is impaired if the pressure difference is too high during the cleaning process.

14 Troubleshooting

Fault	Possible cause	Remedy
Gear motor does not turn	Motor circuit-breaker tripped	RESET the motor circuit-breaker
	Filtered fluid solidified	Check the gear motor Clean the filter
Valves do not open	Not enough compressed air	Increase the pressure
	Precontrol valve defective	Check the precontrol valve
	Precontrol valve connected incorrectly	Check the electrical and pneumatic connections
	Same compressed air line used for external pressure and valves	Provide a separate compressed air line for the valves
Initial differential pressure no longer reached	Solids concentration too high	Use a suitable prefilter
	Cleaning time too short	Increase the cleaning time (at least 1 - 2 revolutions of the gear motor)
	External pressure too high/low	Reduce/increase the external pressure
	External pressure valve dirty/defective	Clean/replace the external pressure valve
	Backflush valve dirty/defective	Clean/replace the backflush valve
Increased concentration of dirt on clean side	Segmented element defective	Check the segmented element and if necessary renew it
	Seals brittle	Check the seals and if necessary renew them
Excessive leakage on shaft seal	Shaft seal defective	Renew the shaft seal
	Shaft seal incorrectly mounted	Check the seat of the shaft seal

15 Maintenance

⚠ DANGER!

Explosion hazard!

⇒ Risk of injury to persons or damage to property.

- Work is only allowed to be carried out in hazardous areas if appropriate safety precautions are implemented.
- Safety precautions must be implemented by the owner.

⚠ WARNING!

If the system is maintained by unauthorised persons

⇒ Risk of injury

⇒ All warranty claims are rendered invalid

- The system must be maintained by a suitably trained person!

Before all maintenance work:

- Shut down the automatic filter (section 12).
- Take steps to prevent the machine/system from being switched on again by unauthorised persons.



- Wear protective clothing and equipment appropriate to the hazard potential of the medium (e.g. goggles, respirator, protective clothing, etc.).
- Carry out the maintenance work.
- Start up the automatic filter again (section 10).

15.1 Inspection and maintenance schedule

- Refer also to the contract documentation.

Interval	Component	Activity
Weekly	Automatic filter	Check for leakage Check the differential pressure
	Pipes	Clean
Monthly	Segmented element	Check for wear and if necessary clean
	Backflush channel moulding z	Check for wear and if necessary clean
	Automatic filter	Check the conductivity between all components. Note the maximum permissible resistance: $R < 10 \Omega$
Yearly or when cooling lubricant replaced	Bearings	Check the clearance
	Valves	Check correct functioning
	Segmented element	Clean
	Automatic filter	Clean
	Seal kit	Check for leakage
	Check valve	Check correct functioning and if necessary clean
		The necessary maintenance work is dependent on the particular application. Please consult the manufacturer if necessary.

15.2 Removing the filter insert

⚠ DANGER!

The automatic filter is pressurised!

- ⇒ Risk of injury to persons or damage to property
- Make sure that the pipe is depressurised prior to opening the automatic filter.



The numbers indicated in parentheses correspond to those used in the spare parts drawing.

1

- Make sure that the pipe is depressurised prior to opening the automatic filter.
- Close the filter inlet and outlet.

2

- Open the drain valve.
 - Open the vent screw.
- ⇒ The automatic filter is discharged.

3

- Turn off the compressed air supply.

4

- Switch OFF the main switch.
- Disconnect the gear motor.

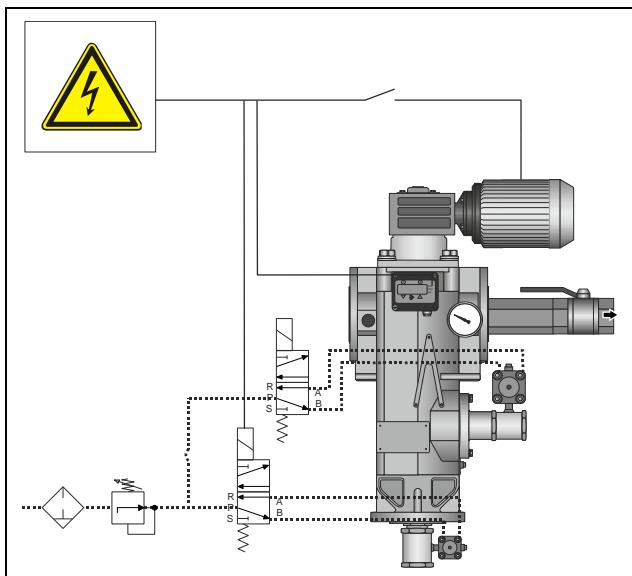


Fig. 11: Disconnecting the gear motor

5

- Loosen and remove the hexagon screws (pos. 11) and the spring washers on the bell housing of the gear motor.
- Pull the gear motor (pos. 1) vertically off of the shaft.

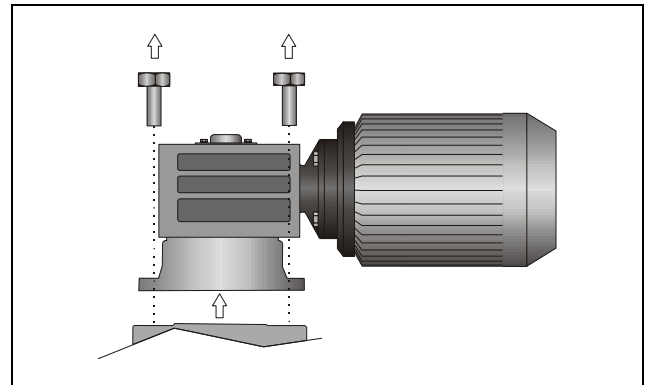


Fig. 12: Removing the gear motor

2

- Apply a large screwdriver to the notch.
- Lever off the filter cover.

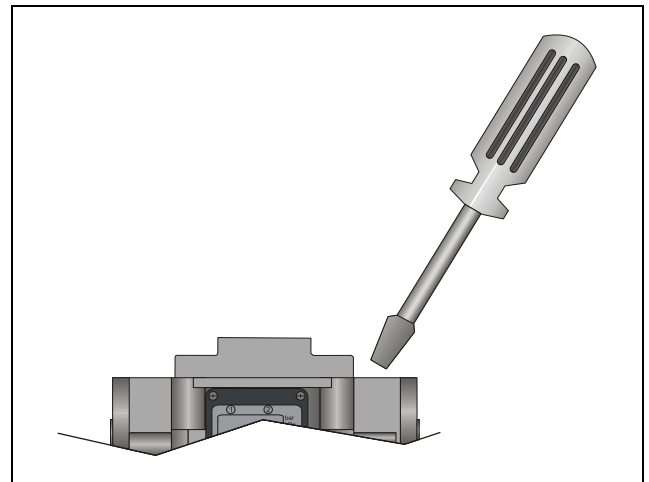


Fig. 13: Lever off the filter cover

3

- Lift up the filter insert by the eyebolts and withdraw it vertically.

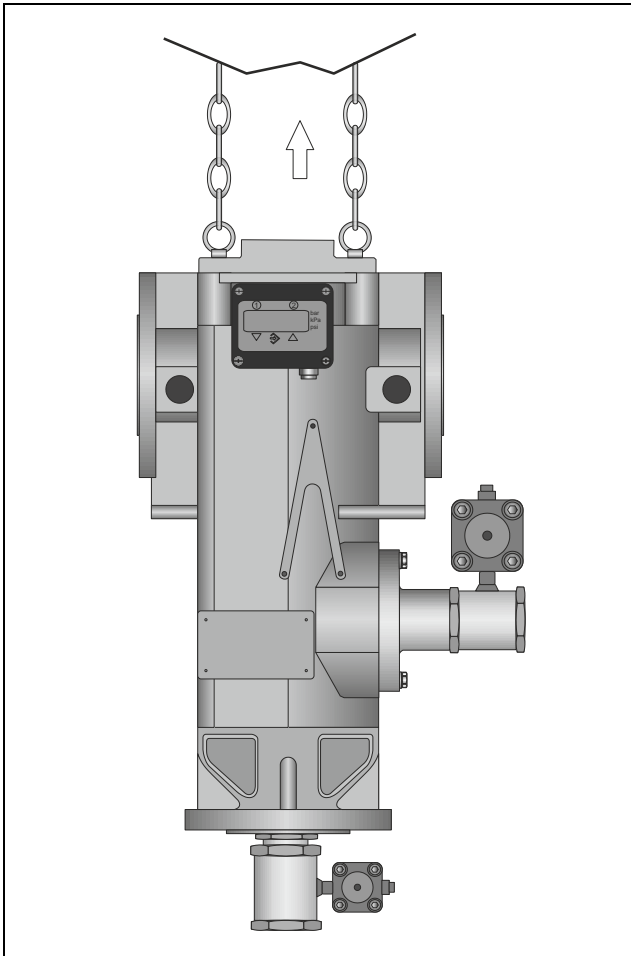


Fig. 14: Withdrawing the filter insert

- Lay the filter insert down carefully on a level surface, taking care not to damage the segmented element.

⇒ The filter insert can now be maintained.

- Install in reverse order.
- Lower the filter insert into position, making sure it is absolutely straight.

15.3 Removing the backflush channel

⚠ WARNING!

If the system is maintained by unauthorised persons

- ⇒ Risk of injury
- ⇒ All warranty claims are rendered invalid
- The system must be maintained by a suitably trained person!



The numbers indicated in parentheses correspond to those used in the spare parts drawing.



The segmented element can be dismantled and mounted again more easily if it is stood upright on the cover (element on top).

- Loosen countersunk screws (pos. 4.7).

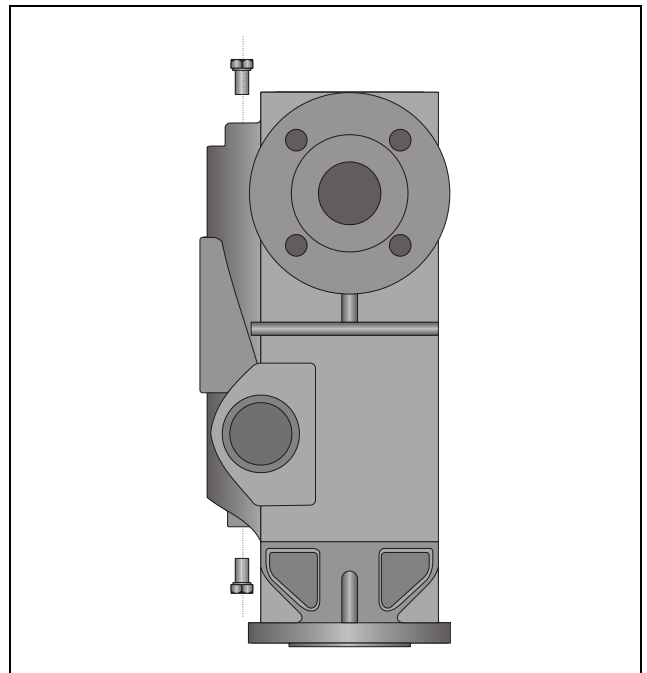


Fig. 15: Loosen countersunk screws

- Removing the backflush channel (pos. 45).

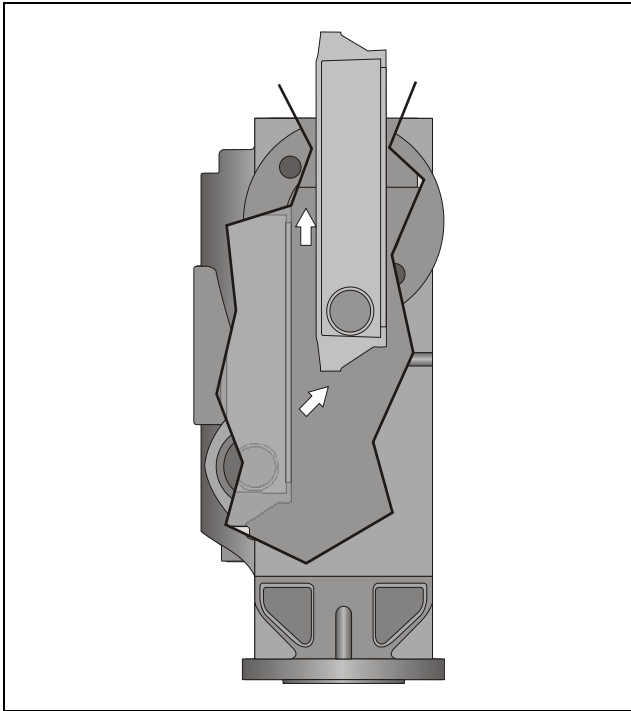


Fig. 16: Removing the backflush channel

15.4 Cleaning the filter

- Remove the filter insert (section 15.2).

15.4.1 Cleaning the filter insert

⚠ WARNING!

Danger of aerosol formation!

- All work must be carried out in a room with a suitable extraction system!



- Wear protective clothing and equipment appropriate to the hazard potential of the medium (e.g. goggles, respirator, protective clothing, etc.).
- Remove any coarse impurities by mechanical means.
- Wash the filter insert in a suitable cleaning solution.
- Carefully blow out the filter insert with a steam jet or compressed air.
- Clean (or if necessary renew) and oil the seals.

15.4.2 Cleaning the filter housing



- Wear protective clothing and equipment appropriate to the hazard potential of the medium (e.g. goggles, respirator, protective clothing, etc.).
- Remove any coarse impurities by mechanical means.
- Wash the filter housing in a suitable cleaning solution.

15.5 Replacing the segmented element

⚠ WARNING!

If the system is maintained by unauthorised persons

- ⇒ Risk of injury
- ⇒ All warranty claims are rendered invalid
- The system must be maintained by a suitably trained person!

15.5.1 Removing the segmented element



The numbers indicated in parentheses correspond to those used in the spare parts drawing.



The segmented element can be dismantled and mounted again more easily if it is stood upright on the cover (element on top).

- Remove the filter insert (section 15.2).
- Clean the filter (section 15.4).

1

- Loosen the hexagon screws (2.6) and remove them together with the spring washers (2.5).

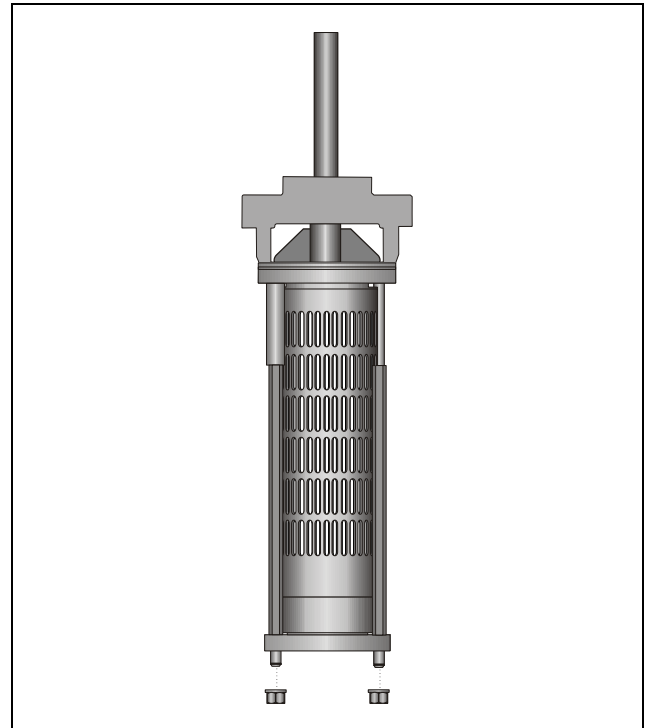


Fig. 17: Removing the hexagon screws and the spring washers

2

- Remove the centre flange (2.1).

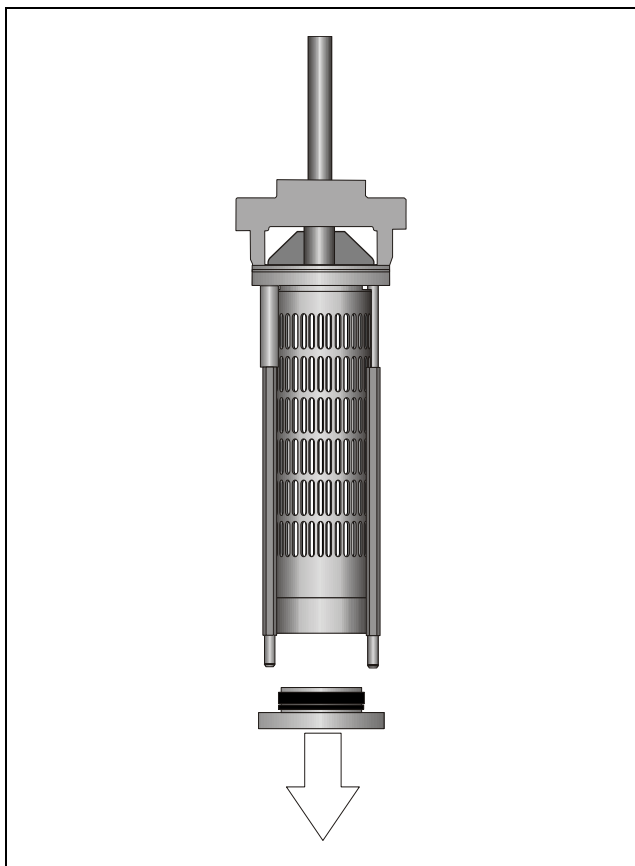


Fig. 18: Removing the centre flange

4

- Carefully remove the segmented element.

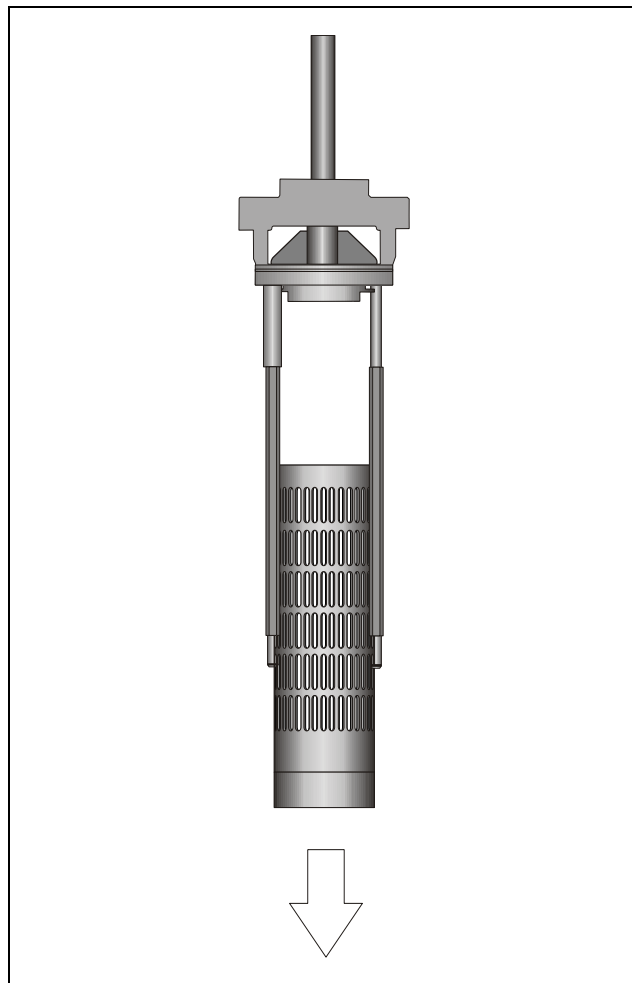


Fig. 19: Removing the segmented element

5

- Clean all dismantled components.
- Replace the element seals and guides (section 15.6).

15.5.2 Installing the segmented element



The numbers indicated in parentheses correspond to those used in the spare parts drawing.

- Check the seals for completeness.

1

- Carefully insert the segmented element into the cover (2.2).

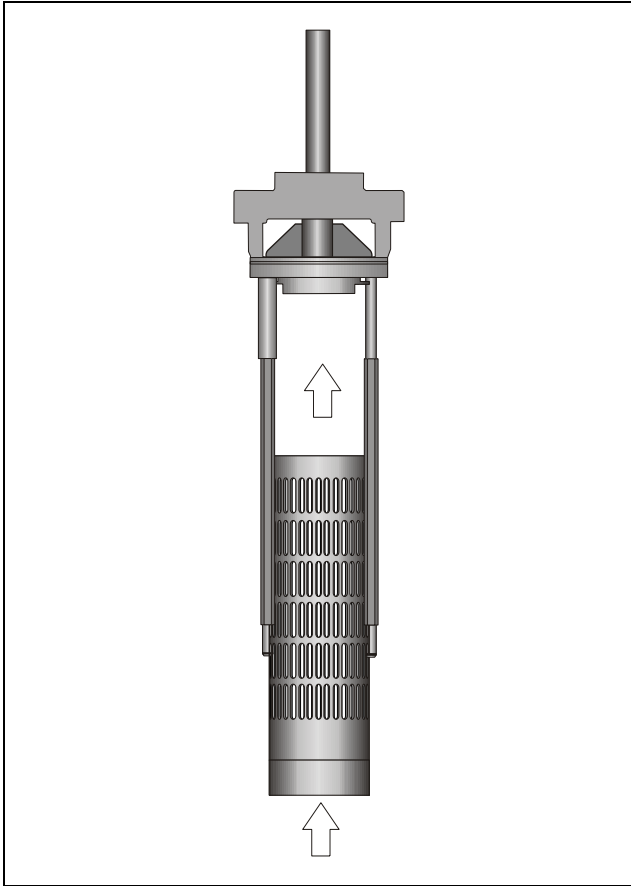


Fig. 20: Inserting the segmented element into the cover

2

- Carefully insert the centre flange (2.1) in the segmented element.
- Screw the hexagon screws (2.6) and the spring washers (2.5) tight.

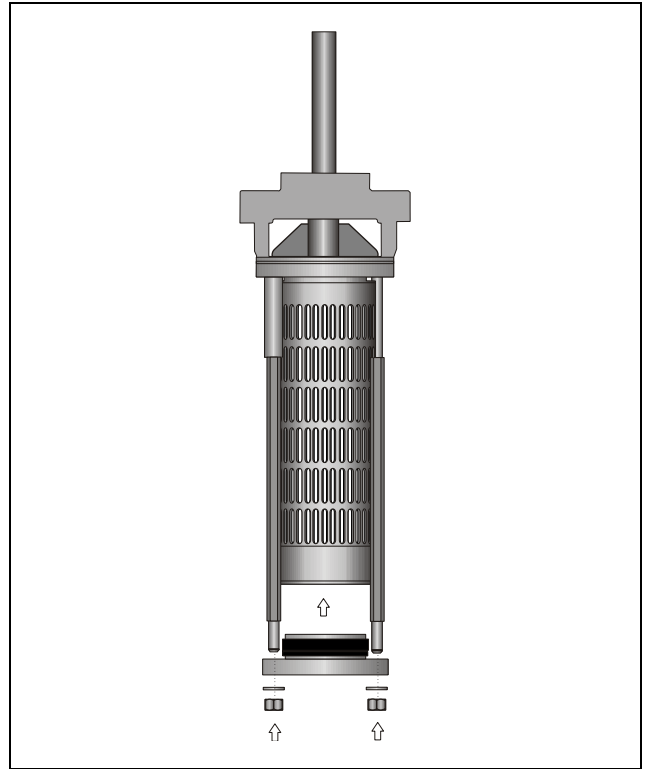


Fig. 21: Inserting the centre flange

15.6 Replacing the element seals and guides

⚠ WARNING!

If the system is maintained by unauthorised persons

- ⇒ Risk of injury
- ⇒ All warranty claims are rendered invalid
- The system must be maintained by a suitably trained person!



The numbers indicated in parentheses correspond to those used in the spare parts drawing.

- Remove the filter insert (section 15.2).
- Clean the filter (section 15.4).
- Remove the segmented element (section 15.5).

⇒ The seals can now be replaced.

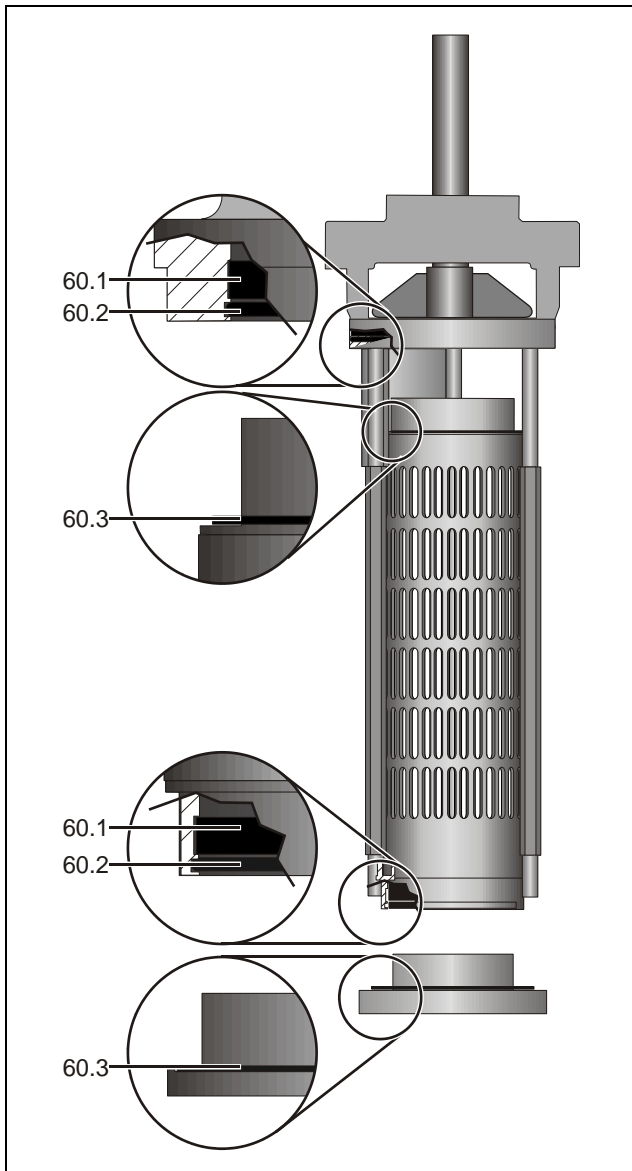


Fig. 22: Replacing the element seals and guides

15.7 Replacing the shaft seals and shaft guide

⚠ WARNING!

If the system is maintained by unauthorised persons

- ⇒ Risk of injury
- ⇒ All warranty claims are rendered invalid
- The system must be maintained by a suitably trained person!



The numbers indicated in parentheses correspond to those used in the spare parts drawing.

- Remove the filter insert (section 15.2).
- Clean the filter (section 15.4).
- Remove the segmented element (section 15.5.1).
- Replace the lip-seal (75.1).
- Replace the o-ring (75.2).
- Clean the shaft seal attachment, drive shaft and backflush adapter.
- Oil the new sealing and guiding elements lightly and install them.
- Install in reverse order.

16 Exploded view

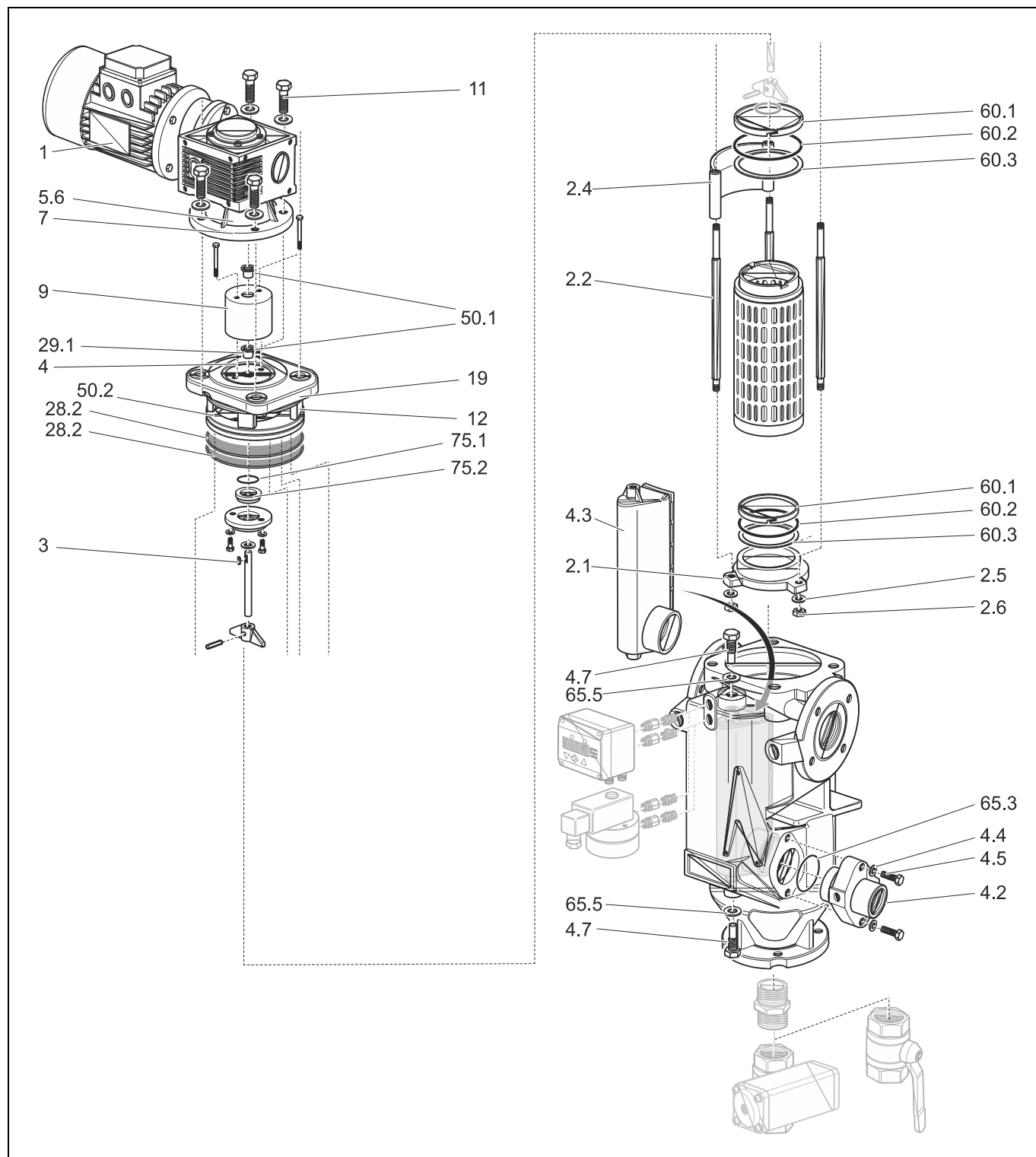



Fig. 23: Exploded view

17 List of parts

Ser.no.	Parts name/DIN designation	Qty.	Benennung/DIN Bezeichnung
1	Cover	1	Deckel Z AF 1324_1724_G2
1.1	Cover	1	Deckel Af 152-152 Guss
1.4	Drive shaft AF 132	1	Antriebswelle AF132 Guss
1.5	Washer DIN 125	4	Unterlegscheibe DIN 125
1.6	Hexagon screw	8	Sechskantschraube M8x30 DIN24017
1.7	Spring washer	4	Federring DIN 128 – A8
1.8	Feather key	1	Passfeder 6x6x30
2.1	Centre ring AF 172	1	Zentrierflansch AF 172
2.2	Distance bolt AF 172	3	Distanzbolzen AF 172
2.3	Pressure channel housing AF 132-152	1	Verteiler Z AF 132-152
2.4	Baffle plate AF 172	1	Leitblech AF 172
2.5	Washer DIN 125	5	Unterlegscheibe DIN 125
2.6	Hexagon nut	3	Sechskantmutter ISO 4034 M 8
2.7	Cylinder head screw	2	Zylinderschraube M6x16
4	Housing	1	Gehäuse Z AF 1724.-221
4.1	Housing	1	Gehäuse AF 1724.-221
4.2	Connecting flange	1	Anschlussflansch AF 172
4.3	Backflush channeln Z AF 172	1	Rückspülkanal Z AF 172
4.3.2	Backflush channel AF 172	1	Rückspülkanal AF 172
4.4	Washer DIN 125	2	Unterlegscheibe DIN 125
4.5	Hex screw grade	2	Sechskantschraube M6x20 AB DIN
4.7	Screw	2	Kanalschraube M10 AF 172
5	Bell housing with screws Z AF 132-172	1	Motoraufnahme Z AF 132-172
5.1	Bell housing AF Vario	1	Motorblock AF Vario
5.2	Spring washer DIN 128	4	Federring DIN 128
5.3	Hex screw grade	4	Sechskantschraube M8x20
5.4	Cylinder head screw	4	Zylinderschraube M6x200
6	Gear motor	1	Getriebemotor
55	Bearing bush kit AF 132-172	1	Buchsensatz AF 132-172
50.1	Bearing bush 35x19	2	Buchse 35x19
50.2	Axial bearing disc	1	Anlaufscheibe
60	Seal-kit element AF 132-172	1	Dichtungssatz Element AF132-172
60.1	Radial bearing ring	2	Führungsring 61,5 PTFE
60.2	O-ring	2	O-Ring 62,00x2,00 FPM
60.3	Axial bearing disc	2	Anlaufscheibe 70x62x1,5 PTFE
65	Seal-kit housing AF 112-172	1	Dichtungssatz Gehäuse AF112-172
65.1	O-ring	2	O-Ring 98,02x3,53 FPM
65.2	Seal-ring	1	Dichtring A 14x18x1,5 DIN 7603
65.3	O-ring	1	O-Ring 52,07x2,62 FPM
65.4	Sealing ring	2	Dichtring A21x26x1,5 DIN 7603
65.5	Sealing ring	4	Dichtring A10x13,5 DIN 7603
75	Seal-kit shaft AF132-152	1	Dichtungssatz Welle AF 132-152
75.1	Lip seal	1	Lippendichtung D=18
75.2	Back up ring	1	O-Ring 17,8 x 2,4 FPM
75.3	O-ring	1	O-Ring 34,29x5,33 FPM
75.4	O-ring	1	O-Ring 44,04x3,53 FPM
75.5	O-ring	1	O-Ring 53,57x3,53 FPM
75.6	O-ring	2	O-Ring 38,70x2,65 FPM
75.7	O-ring	1	O-Ring 29,82x2,62 FPM

18 Spare parts

No.	Designation	Material-no.	Benennung
1.4	Drive shaft AF 132 (carbon steel)	70307837	Antriebswelle AF 132 (C-Stahl)
1.4	Drive shaft AF 132 (stainless steel)	70307837	Antriebswelle AF 132 (Edelstahl)
4.3	Backflush channeln Z AF 172 (carbon steel)	70345207	Rückspülkanal Z AF 172 (C-Stahl)
4.3	Backflush channeln Z AF 172 (stainless steel)	70345207	Rückspülkanal Z AF 172 (Edelstahl)
55	Bearing bush kit AF 112-172 (FPM)	70308169	Buchsensatz AF 132-172 (FPM)
55	Bearing bush kit AF 112-172 (PTFE)	70308169	Buchsensatz AF 132-172 (PTFE)
60	Seal-kit element AF 112-172 (FPM)	70349580	Dichtungssatz Element AF 132-172 (FPM)
60	Seal-kit element AF 112-172 (PTFE)	on request	Dichtungssatz Element AF 132-172 (PTFE)
65	Seal-kit housing AF 112-172 (FPM)	70356777	Dichtungssatz Gehäuse AF 112-172 (FPM)
65	Seal-kit housing AF 112-172 (PTFE)	on request	Dichtungssatz Gehäuse AF 112-172 (PTFE)
60-65	seal-kit complete	70368610	Dichtungssatz komplett
75	Seal-kit shaft AF112 (FPM)	79778077	Dichtungssatz Welle AF 132-152 (FPM)
75	Seal-kit shaft AF112 (PTFE)	on request	Dichtungssatz Welle AF 132-152 (PTFE)
	Segmented element → See name-plate		Segmentelement → siehe Typenschild
 Please request a separate spare parts drawing and list of spare parts for special versions.			

19 Declaration of incorporation

As defined by the EC Machinery Directive

EU – Einbauerklärung
EU Declaration of incorporation
Déclaration relative au montage UE



Der Hersteller
The manufacturer
Le producteur

Filtration Group GmbH
Schleifbachweg 45
74613 Öhringen
Telefon 07941 6466-0
Telefax 07941 6466-429

erklärt hiermit, dass das folgende Produkt
hereby declares that the following product
déclare par la présente que le produit suivant

Produktbezeichnung:
Product designation:
Désignation du produit :

Automatik-Kantenspaltfilter
Automatic metal edge filter
Filtres automatiques à fentes

Typenbezeichnung:
Type designation:
Désignation du type :

AF 132 G, AF 152 G, AF 172 G, AF 112 G

Funktionsbeschreibung:
Machine description:
Description du fonctionnement :

Filtration von Feststoffen
Filtration of solids
Filtration de solides

den in der Anlage dargestellten grundlegenden Anforderungen der Richtlinie 2006/42/EU entspricht.
conforms to the essential requirements of the Machinery Directive 2006/42/EU pursuant to the Annex.
répond aux exigences fondamentales de la directive 2006/42/UE, décrites en annexe.

Die unvollständige Maschine darf erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass die Maschine, in die die unvollständige Maschine eingebaut werden soll, den Bestimmungen der Richtlinie 2006/42/EU über Maschinen entspricht.
The partly completed machinery must not be put into service until the relevant machinery into which this partly completed machinery is to be incorporated has been declared in conformity with the Machinery Directive 2006/42/EU.
La machine incomplète ne doit être mise en service qu'après avoir déterminé que la machine, dans laquelle la machine incomplète doit être montée, correspond aux dispositions de la directive machines 2006/42/UE.

Folgende harmonisierten Normen wurden angewandt:
The following harmonised standards have been used:
Les normes harmonisées ci-dessous ont été appliquées :

DIN EN ISO 12100:2011-03, DIN EN ISO 4414:2011-04

Der Hersteller verpflichtet sich, die speziellen Unterlagen zur unvollständigen Maschine, einzelstaatlichen Stellen auf Verlangen schriftlich zu übermitteln. Die zur Maschine gehörenden speziellen technischen Unterlagen nach Anhang VII Teil B wurden erstellt.
The manufacturer undertakes to transmit any specific documentation on the partly completed machinery to the appropriate national authorities in writing on request. All specific technical documentation belonging to the machinery has been compiled pursuant to Annex VII Section B.
Le fabricant s'engage à transmettre les documents spécifiques à la machine incomplète par écrit aux administrations nationales respectives sur leur demande. Les documents techniques spécifiques selon Annexe VII partie B faisant partie de la machine ont été établis.

Dokumentationsverantwortlicher/Abteilung:
Responsible for documentation/department:
Responsable de la documentation/Service :

Filtration Group GmbH
Schleifbachweg 45
74613 Öhringen

Unterzeichner:
Signatory:
Signataire :

Wolfram Zuck
Dipl.-Ing. (FH) Industrial Engineering
Managing Director, Plant Manager Öhringen

Öhringen,

17.7.17
Datum/Date/Date

[Signature]
Unterschrift/Signature/Signature

Anlage/Annex/Annexe

3 Seiten/pages/pages



The filter is only allowed to be started if the complete machine is also started up!

20 Declaration of conformity

EU – Konformitätserklärung
EU declaration of conformity
Déclaration de conformité UE



Der Hersteller
The manufacturer
Le producteur

Filtration Group GmbH
Schleifbachweg 45
74613 Öhringen
Telefon 07941 6466-0
Telefax 07941 6466-429

erklärt hiermit, dass das folgende Produkt
hereby declares that the following product
déclare par la présente que le produit suivant

Produktbezeichnung:
Product designation:
Désignation du produit :

Automatik-Kantenspaltfilter
Automatic metal edge filter
Filtres automatiques à fentes

Typenbezeichnung:
Type designation:
Désignation du type :

AF 132 G, AF 152 G, AF 172 G, AF 112 G

Funktionsbeschreibung:
Machine description:
Description du fonctionnement :

Filtration von Feststoffen
Filtration of solids
Filtration de solides

allen einschlägigen Bestimmungen der Druckgeräterichtlinie 2014/68/EU, Anhang 1 entspricht.
conforms to all relevant provisions of the pressure equipment directive 2014/68/EU, annex I.
répond à toutes les dispositions applicables de la directive équipements sous pression 2014/68/UE , annexe I .

Angewendete harmonisierte Normen, insbesondere
Applied harmonized standards in particular
Normes harmonisées utilisées, notamment

AD 2000

Angewendete nationale Normen und technische Spezifikationen, insbesondere
Applied national norms and techn. specifications, especially
Normes et spécifications nationales utilisées, notamment

HP0, TRD/TRB

Und allen wesentlichen Schutzanforderungen der Ex-Richtlinie 2014/34/EU entspricht.
Conforms to all the basic requirements of the Ex-directive 2014/34/EU.
Répond à toutes les exigences essentielles de la Ex-directive 2014/34/UE .

Folgende harmonisierten Normen wurden angewandt:
The following harmonised standards have been used:
Les normes harmonisées ci-dessous ont été appliquées :

EN 1127-1 und EN 13463-1

Unterzeichner:
Signatory:
Signataire :

Wolfram Zuck
Dipl.-Ing. (FH) Industrial Engineering
Managing Director, Plant Manager Öhringen

Öhringen,

17.7.17
Datum/Date/Date

Unterschrift/Signature/Signataire



- The enclosed declaration of conformity only applies to discharge casings with a CE mark for categories I - IV or to complete filters in accordance with the Ex directive for categories 3G/2G.
- The standard version is designed for Group 2 liquids as defined by the EC Pressure Equipment Directive 97/23/EC Article 9.

Anlage zur Einbauerklärung gemäß Richtlinie
2006/42/EU für Automatik-Kantenspaltfilter
Annex to the Declaration of Incorporation pursuant to
the Machinery Directive 2006/42/EU for automatic metal
edge filter



Annexe à la déclaration de montage selon la directive
2006/42/UE pour filtres automatiques à fentes
Beschreibung der grundlegenden Sicherheits- und Gesundheits-
schutzanforderungen (soweit zutreffend) gemäß 2006/42/EU, An-
hang 1, die zur Anwendung kommen und eingehalten wurden.
List of the essential health and safety requirements (where applicable)
pursuant to 2006/42/EU, Annex 1, applied and fulfilled.
Description des exigences fondamentales relatives à la sécurité et à
la protection de la santé (si applicables) selon 2006/42/UE, annexe 1,
appliquées et respectées.

Grundlegende Anforderung Essential requirements Exigence fondamentale	Erfüllt Fulfilled Remplie
Grundsätze für die Integration der Sicherheit Principles of safety integration Principes d'intégration de la sécurité	ja yes oui
Materialien und Produkte Materials and products Matériaux et produits	ja yes oui
Konstruktion der Maschine im Hinblick auf die Handhabung Design of machinery to facilitate its handling Construction de la machine au regard de sa manipulation	ja yes oui
Steuerungen und Befehlseinrichtungen Control systems Commandes et dispositifs de commande	nein no non
Risiko des Verlusts der Standsicherheit Risk of loss of stability Risque de perte de la stabilité statique	ja yes oui
Bruchrisiko beim Betrieb Risk of break-up during operation Risque de rupture en fonctionnement	ja yes oui
Risiken durch herabfallende oder herausgeschleuderte Gegenstände Risks due to falling or ejected objects Risques dus à la chute ou à l'éjection d'objets	ja yes oui
Risiken durch Oberflächen, Kanten und Ecken Risks due to surfaces, edges or angles Risques dus aux surfaces, arêtes et angles	ja yes oui
Risiken durch Änderung der Verwendungsbedingungen Risks related to variations in operating conditions Risques dus à la modification des conditions d'utilisation	ja yes oui
Risiken durch bewegliche Teile Risks related to moving parts Risques dus à des parties mobiles	ja yes oui
Wahl der Schutzeinrichtung gegen Risiken durch bewegliche Teile Choice of protection against risks arising from moving parts Choix du dispositif de protection contre les risques dus à des parties mobiles	ja yes oui
Risiko unkontrollierter Bewegungen Risks of uncontrolled movements Risque de mouvements incontrôlés	ja yes oui
Anforderungen an Schutzeinrichtungen Required characteristics of guards and protective devices Exigences relatives aux dispositifs de protection	nein no non
Elektrische Energieversorgung Electricity supply Alimentation électrique	ja yes oui
Statische Elektrizität Static electricity Electricité statique	ja yes oui

Nichtelektrische Energieversorgung Energy supply other than electricity Alimentation en énergie non-électrique	ja yes oui
Montagefehler Errors of fitting Erreurs de montage	ja yes oui
Extreme Temperaturen Extreme temperatures Températures extrêmes	ja yes oui
Brand Fire Incendie	ja yes oui
Explosion Explosion Explosion	ja yes oui
Lärm Noise Bruit	ja yes oui
Vibrationen Vibrations Vibrations	ja yes oui
Strahlung Radiation Rayonnement	ja yes oui
Strahlung von außen External radiation Rayonnement depuis l'extérieur	ja yes oui
Emission gefährlicher Werkstoffe und Substanzen Emissions of hazardous materials and substances Emission de substances et matériaux dangereux	ja yes oui
Risiko, in eine Maschine eingeschlossen zu werden Risk of being trapped in a machine Risque de se faire enfermer dans une machine	nein no non
Ausrutsch-, Stolper- und Sturzrisiko Risk of slipping, tripping or falling Risque de dérapage, de trébuchement et de chute	nein no non
Blitzschlag Lightning Foudre	nein no non
Wartung der Maschine Machinery maintenance Entretien de la machine	nein no non
Zugang zu den Bedienungsständen und den Eingriffspunkten für die Instandhaltung Access to operating positions and servicing points Accès aux postes de commande et aux points d'intervention pour la maintenance	nein no non
Trennung von den Energiequellen Isolation of energy sources Séparation des sources d'énergie	nein no non
Eingriffe des Bedienungspersonals Operator intervention Interventions des opérateurs	ja yes oui
Reinigung innen liegender Maschinenteile Cleaning of internal parts Nettoyage de parties internes de la machine	nein no non
Informationen und Warnhinweise an der Maschine Information and warnings on the machinery Informations et avertissements sur la machine	ja yes oui
Warnung vor Restrisiken Warning of residual risks Avertissement quant aux risques résiduels	ja yes oui
Kennzeichnung der Maschinen Marking of machinery Marquage des machines	nein no non

Betriebsanleitung Instructions Mode d'emploi	ja yes oui
Nahrungsmittelmaschinen und Maschinen für kosmetische oder pharmazeutische Erzeugnisse Foodstuffs machinery and machinery for cosmetics or pharmaceutical products Machines pour denrées alimentaires et machines pour produits cosmétiques ou pharmaceutiques	nein no non
Handgehaltene und/oder handgeführte tragbare Maschinen Portable hand-held and/or hand-guided machinery Machines tenues à la main et/ou portables guidées à la main	ja yes oui

21 Index

A		
Aerosol.....	4	
B		
Backflush valve.....	6, 11, 12	
C		
Cleaning.....	5, 6, 9, 10, 11	
Concentrate.....	4, 10, 12	
Conductivity.....	8, 13	
Contract documentation.....	5	
Controller.....	9	
Cooling lubricant filtration.....	5	
D		
Differential pressure.....	11	
Differential pressure switch.....	5	
Direction of rotation of gear motor.....	10	
Discharge clearance.....	8	
Dismantling clearance.....	8	
Drain valve.....	4, 11, 12, 14	
E		
Environmental protection.....	3	
F		
Filter cake.....	4	
Filter insert.....	15, 16	
Filter seat.....	8	
G		
Gear motor.....	6, 9, 10, 12, 14	
I		
Initial differential pressure.....	11	
Inlet.....	11	
Installation on discharge side.....	11	
L		
Leaks.....	3	
M		
Manual release.....	9, 11	
Manufacturer.....	3, 5	
Maximum permissible resistance.....	8	
P		
Precontrol.....	4	
Preseparation.....	5	
Pressure relief.....	8	
Protective equipment.....	13	
R		
Ratchet.....	6	
Risks.....	3	
S		
Safety instructions.....	3	
Seaworthy packaging.....	7	
Segmented element.....	6, 18	
Siphon.....	4	
Splash protection.....	8	
Supports.....	8	
Suspension.....	4, 6	
T		
Time switch.....	5	
Total dry weight.....	7	
V		
Valves.....	4	
W		
Warnings.....	3	

