ALMATEC

Operating manual



FUTUR T



FUTUR E



FUTUR H



FUTUR S/SH

Translation of original operating manual

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Preliminary remarks

ALMATEC air-operated diaphragm pumps are constructed in accordance with the state of the art and are safe to operate. However, incorrect operation or misuse may result in personal injury and/or damage to property. The pumps may only be used for their intended purpose and in a technically safe condition.

All persons performing work relating to the set-up, commissioning, operation or maintenance of ALMATEC air-operated diaphragm pumps must read this operating manual fully and carefully and must adhere to all the procedures and safety instructions described therein.

1. General description of the machine

1.1. Intended use and residual risks

FUTUR-series pumps are oscillating displacement pumps and operate according to the double diaphragm pump principle. The basic configuration consists of two external side housings and a central housing arranged between them. Pumped fluid flows through the inside of the FUTUR pumps, i.e., the fluid flows through the central housing, while an air control system and air chambers are arranged on the outside. This design ensures only one part of the housing comes into contact with the product, namely the central housing. The product chambers on both sides of the central housing are limited by a diaphragm in relation to the side housings. Regulated via a control system, the diaphragms move back and forth and the pumped liquid is sucked into or expelled from the product chambers.

The intended use of an ALMATEC air-operated diaphragm pump refers to the delivery of fluids, taking into account the operating parameters specified in this operating manual and in compliance with the prescribed conditions for commissioning, operation, assembly, disassembly and maintenance.

Even if all the necessary safety measures described in this manual have been taken, there is still a residual risk due to leaks or mechanical damage. Liquids can then escape uncontrollably from seals or screw connections.

2. Storage and continuous use

The ALMATEC air-operated diaphragm pump is generally shipped ready to use and packed. If the unit is not intended for immediate use, perfect storage conditions are vital to ensure smooth operation at a later stage. The pump must be protected against damp, cold, soiling, UV radiation and other mechanical influences. The following storage conditions are recommended:

- Uniformly ventilated storage room free from dust and vibrations
- Ambient temperature between 15°C and 25°C at a relative humidity below 65%
- Avoid direct exposure to heat (sunlight, heating)

Plastics are subject to ageing processes depending on the material, environmental and operating conditions. Chemical contact and/or increased temperatures may change the characteristics over the long term, especially the mechanical behaviour.

To ensure safety, we therefore recommend subjecting the pump at least every six months to a detailed visual inspection for visual changes as part of each maintenance (or if no maintenance is due) from the second year and afterwards. Check the seal edges for damage (e.g. after cleaning by running a finger over the edges), check that the housing components retain their shape (e.g. by

placing a ruler on a flat surface) and check that the threads are free moving. Replace defective parts.

3. Technical data

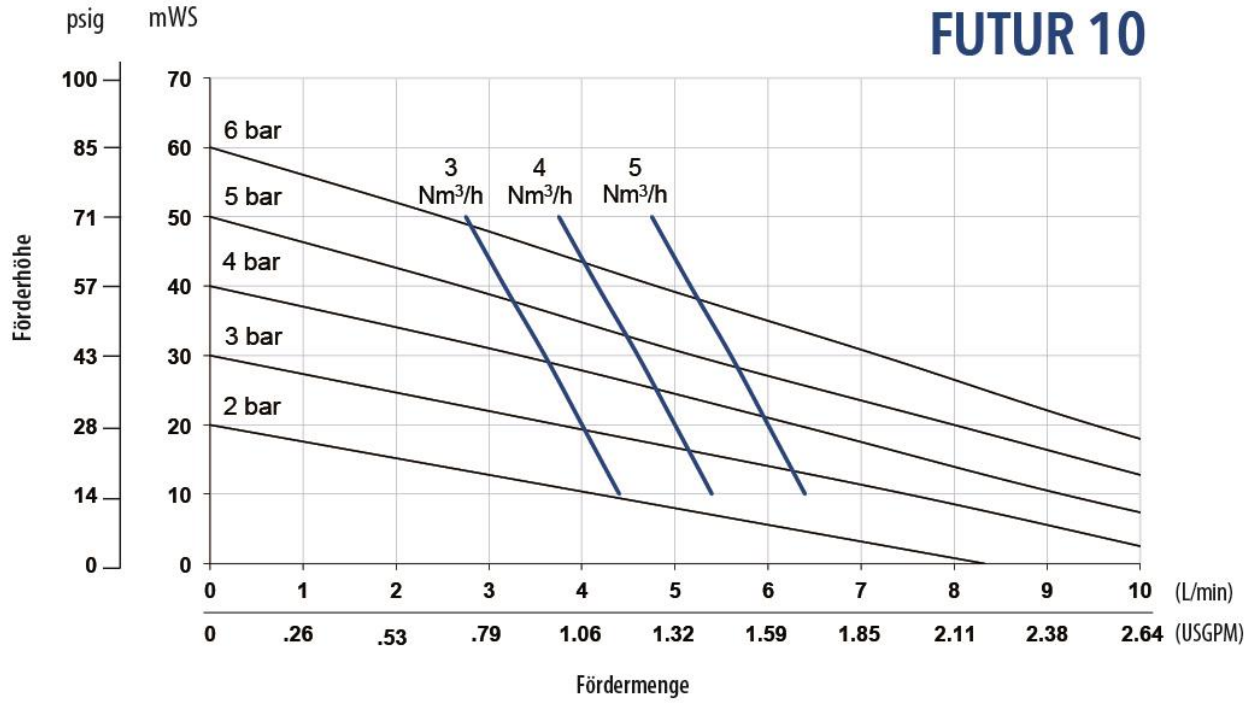
Pump size		10	20	50	100
Dimensions (mm),		See dimension sheet on page 19			
Connection nominal diameter (NPT)		3/8"	1/2"	1"	1 1/4"
Air connection (NPT)		1/4"	1/4"	1/4"	1/4"
Drive air purity classes acc. ISO-DIS 8573-1:					
	Solid component, class	2	2	2	2
	Water component, class	3	3	3	3
	Oil component, class	3	3	3	3
Weight (kg),	FUTUR T	3	5	10	19
	FUTUR H	3	6	12	-
	FUTUR E/F	-	4	7	13
	FUTUR S	-	10	16	-
	FUTUR SH	-	14	29	
Suction height, dry (mWS)		1	2.5	3.5	4
Suction height, liquid-filled (mWS)		8	9	9	9
Max. permissible drive pressure (bar)		6	6	6	6
Max. sound pressure level with full load in acc. with DIN 45635, Part 24 [dB(A)]		72	72	72	72

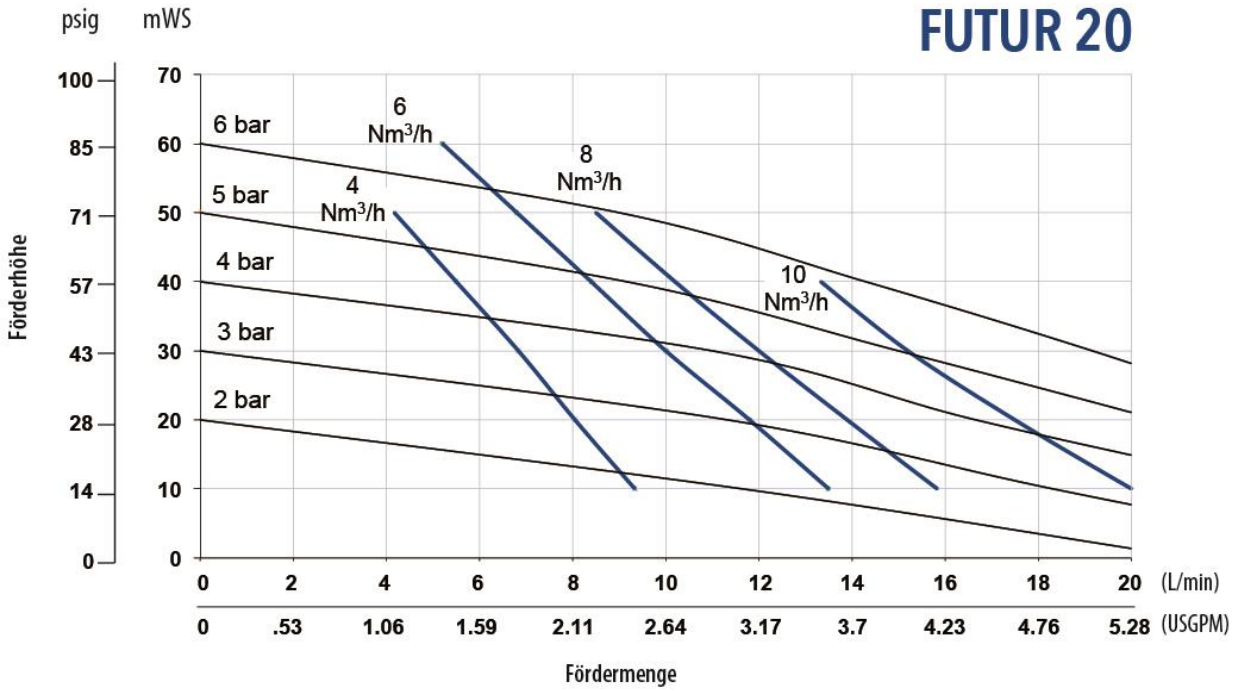
Maximum permissible media temperature in °C						
Material variant	FUTUR H	FUTUR T	FUTUR E	FUTUR S	FUTUR SH	FUTUR F
At max. 6 bar	100	100	70	80	130	60
At max. 5 bar	130	110	70	80	130	60
At max. 4 bar	150	120	70	80	130	60
At max. 3 bar	180	130	70	80	130	60
At max. 2 bar*[1]	200	130	70	80	130	60

*[1] In combination with equipment „G“ the max. pressure is 1,95 bar.

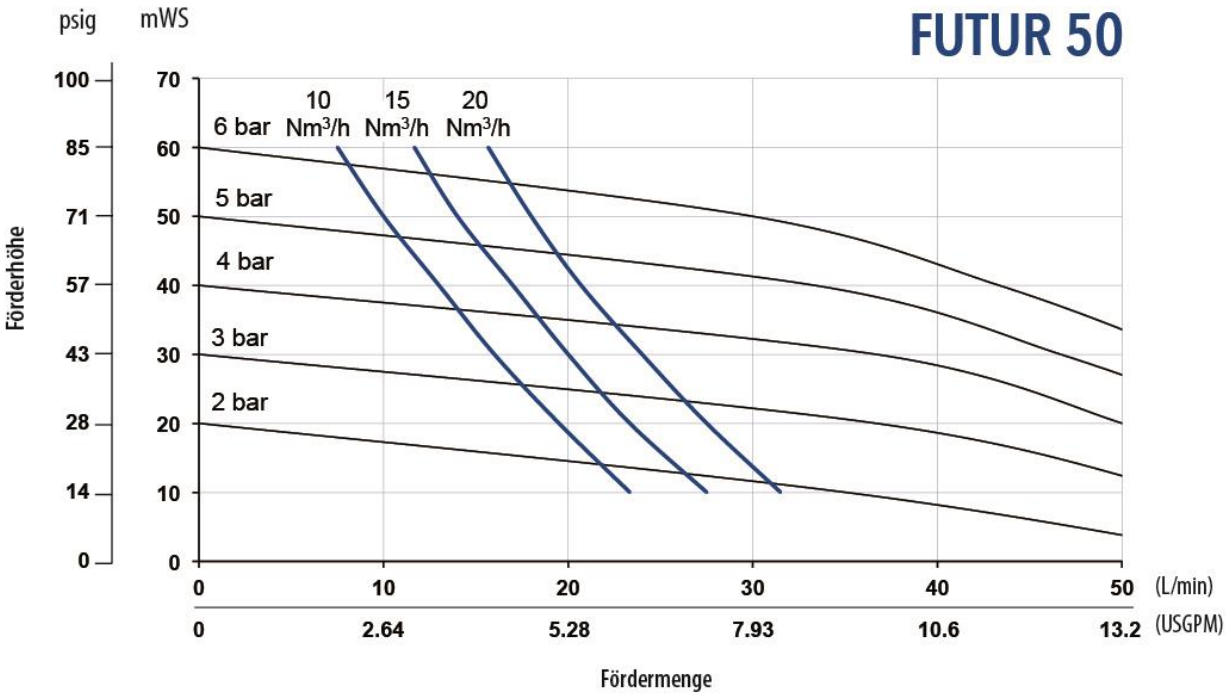
3.1. Performance ranges

The data relates to water at 20°C, without the use of a pulsation damper. ALMATEC guarantees the specified performance data in accordance with DIN EN ISO 9906 (vertical lines represent the air consumption).

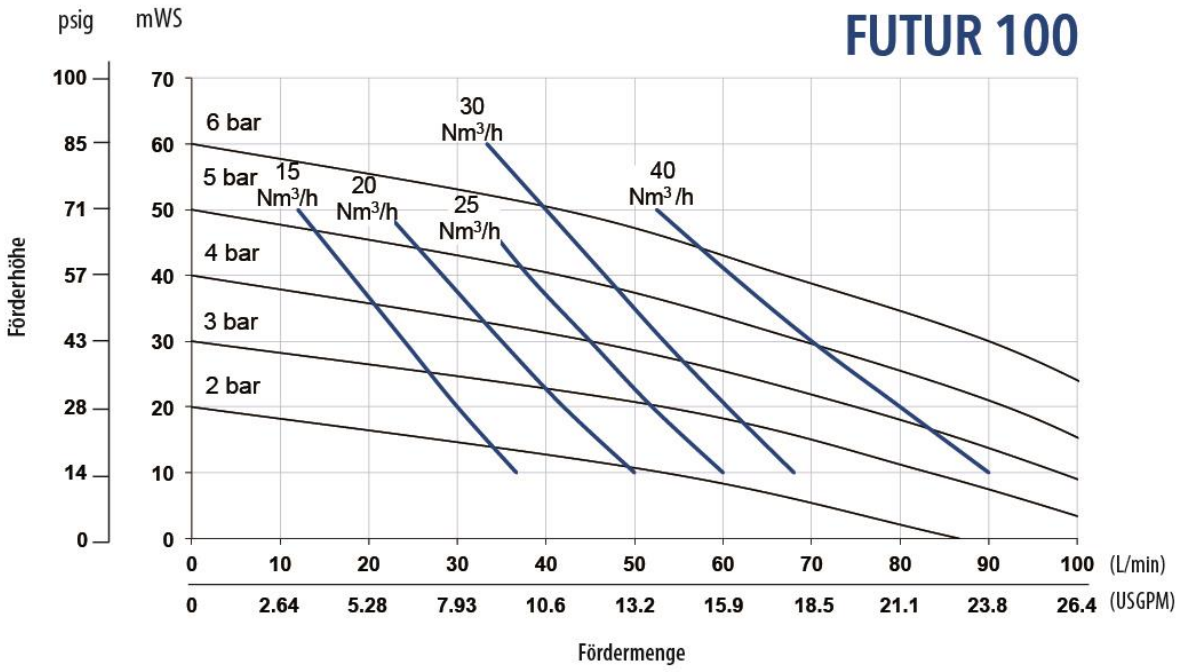




FUTUR 50



FUTUR 100



4. Commissioning

As a modern, quality-focussed enterprise, PSG Germany GmbH is DIN EN ISO 9001 and 14001 certified. All FUTUR-series pumps are subject to an extensive final inspection before being approved for dispatch. The performance data recorded for each individual pump is archived and can thus be accessed at any time.

In the following text, each individual part mentioned is labelled with a number in brackets. This number corresponds to the item number of this individual part in the spare parts list and the exploded diagram.

The FUTUR series was developed specifically for the requirements of the semiconductor industry. It includes air-operated diaphragm pumps that differ substantially from other pumps of this type available on the market. The pumps are assembled in a clean room with two-time precleaning of the individual parts and testing with DI water. Afterwards, they are double welded. They can therefore be taken straight into clean rooms with the intact inner casings.

Due to the major differences, it is also indispensable for users with experience of using air-operated diaphragm pumps to read this operating/assembly manual prior to commissioning the FUTUR. Special tools and equipment are not required for commissioning. A multi-purpose assembly tool [36] is enclosed with each pump.

If you do not have suitably equipped workshop facilities or would like to avoid contamination during a repair, which entails time-consuming flushing processes in the case of reuse in the system, you can also send your FUTUR to us at our plant in Duisburg. We carry out the relevant maintenance tasks quickly and cost-effectively under stringent cleanroom conditions.

As a general rule, only machines that have been found to comply with the provisions of the relevant Machinery Directive, harmonised standards, European standards and the corresponding national standards may be operated in EU Member States. The operator must therefore check whether the ALMATEC air-operated diaphragm pump, which has been properly manufactured and delivered on the basis of the order, fulfils these criteria for the intended application.

The parts of the housing of the FUTUR T and FUTUR H that come into contact with the product are made of PTFE, while those of the FUTUR E and F are made of UPPE (ultra pure polyethylene) and those of the FUTUR S/SH are made of 1.4404. Before commissioning, ensure that the pump and the materials used are suitable for the intended pumping tasks.

The maximum permissible drive pressure is 6 bar and the maximum permissible temperatures of the pumped liquid can be seen in the table on page 4. With the FUTUR H and FUTUR T, the maximum permissible limit values for drive pressure and temperature of the pumped liquid are interrelated.

When pumping aggressive fluids with increased cleanliness requirements, we recommend conditioning the pump before each start-up and after maintenance by circulating the intended fluid. This avoids contamination due to any residual deposits in the system and/or the pump from handling, test runs, etc.

4.1. Operation in hazardous areas or pumping of flammable liquids

X = ATTENTION! = Special operating conditions apply!



Attention: Pumps that are equipped with stroke count detection can't be used in Ex -environment!

The FUTUR F, S and SH model variants are suitable for pumping flammable liquids and for use in hazardous areas. The pumps must be earthed via a suitable connection on the back of the central housing. The earthing connection must have a minimum cross-section of 6 mm^2. All other housing parts are interconnected for conductive purposes. After installation, maintenance or repair of the pump, the continuous conductivity of all housing parts must be checked. A resistance of < 1MΩ to the equipotential bonding must be ensured.

ALMATEC air-operated diaphragm pumps are suitable for use in potentially explosive atmospheres subject to EU Directive 2014/34/EU in accordance with the marking on the pump.

For use in an Ex-environment, the pumps must be protected against direct sunlight and against UV light.

Pipes and product connections must be earthed separately. Repairs in potentially explosive atmospheres may only be carried out after performing a thorough feasibility check, only using appropriate tools, and must be performed by trained specialist personnel.

In rare cases or with malfunctions, adiabatic compressions or shock waves may occur, but should be avoided.

The ATEX marking in accordance with Directive 2014/34/EU can be found in the enclosed Declaration of Conformity and the corresponding sticker on the pump or damper.

SPECIAL OPERATING CONDITIONS	FUTUR S/SH/F D 20/50 S/100 U
Permissible ambient temperature (°C)	-10 - 40
Permissible temperature for drive compressed air (°C)	0 - 50
Maximum drive and operating pressure (bar)	6
Maximum operating temperature (X): Code S (°C): Code SH (°C): Code F (°C): Code U (°C):	 80 130 60 60
T-class	T4

The ATEX classification for gases is defined as follows in accordance with 2014/34/EU:

To enable the optimum and flexible design of an ATEX pump for the customer-specific application, a distinction is made in the labelling between the installation location of the pump (potentially explosive area outside the pump) and the inside of the pump (potentially explosive area inside the pump).

Equipment group G (gases, mists, vapours)

Installation location: Category G

Inside the pump: Category G

Conductive ALMATEC air-operated diaphragm pumps may generally be used in explosion group IIC at the installation location (potentially explosive area outside the pump), as the solid housings are made of conductive materials and the entire pump is earthed.

ATTENTION! Inside the pump, the explosion group may differ from the outside of the pump:

Inside the pump the explosion group IIB:

⟨Ex⟩ II 2 G Ex h IIB/IIC T6…T4 Gb X (inside of the pump/installation location)

Inside the pump the explosion group IIC:

⟨Ex⟩ II 2 G Ex h IIC T6…T4 Gb X (inside of the pump/installation location)

5. Installation in piping

The Futur T- and Futur E- pumps have to be protected against UV radiation to avoid embrittlement of the housing parts. Pumps must generally be connected mechanically without any tension. They cannot be used as an anchorage point for the piping. Non-compliance leads to leaks and potentially damage. If the pipeline system is likely to move or vibrate, we recommend the installation of expansion joints upstream and downstream of the pump. The FUTUR can be installed fixed using foundation anchor sockets [27] or be operated free-standing. The operator must ensure that the piping is sufficiently stable and is fastened in accordance with the state of the art. To simplify installation and maintenance work, shut-off devices should be provided directly upstream and downstream of the pump.

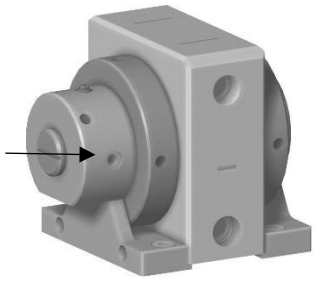
5.1. Connection of the suction and discharge line

The nominal diameter of the connection lines must be selected according to the pump connection:

Pump size	10	20	50	100
Nominal connection diameter (NPT)	3/8"	1/2"	1"	1 1/4"

A smaller diameter can result in cavitation (suction line) and impaired performance (suction and discharge line). A larger diameter may impair the suction capacity. The suction connection is located at the bottom in the central housing [1] and the pressure connection at the top. A suction line that rises steadily towards the pump prevents air pockets from forming and hindering suction. Optionally, the pumps can be fitted with Flaretek® connections for PFA pipe (special equipment code G) or with VCR connection fittings for FUTUR S/SH (special equipment code V).

Connection of the compressed air line



The bore hole for the air supply connection is located in the side housing on the left [16] opposite the silencer [20]. Before installation make sure that the air supply line is free from contamination. To be able to supply the pump with sufficient drive air, a suitable pipe cross-section must be provided, namely with the same nominal diameter as the pump connection (R 1/4). The PERSWING P® air control system used is a precision control system and therefore requires oil-free, clean and dry compressed air to function optimally. With regard to the drive air purity classes in accordance with ISO-DIS 8573-1, the following minimum requirements exist:

Solid component	Class 2
Water component	Class 3
Oil component	Class 3

If ambient air humidity is high, icing may occur from the outside despite the presence of dry compressed air. This can be remedied by an extended exhaust air duct (approx. 500 mm using a pipe or hose). When installing in cabinets or cupboards, ensure that no cold build-up can occur behind the silencer. In applications where the exhaust air side tends to freeze, preheating the drive air has proven successful in practice in order to increase the margin to the dew point. However, to avoid

expansion and clamping effects in the air area, ensure that the temperature of the drive air does not generally exceed 50°C.

6. Starting up and operating the pump

After connecting all pipes, the pump is ready to run. The air pressure should only be set as high as is necessary to achieve the desired operating point. Setting the pressure too high leads to increased air consumption and premature wear of the pump. To guarantee even and safe pumping, the drive air pressure should, however, not fall below 1.5 bar. The pump is infinitely variable by changing the air volume (needle valve). An empty pump should be operated slowly. With internal-flow air-operated diaphragm pumps, a dry run at high frequency and over an extended period must generally be avoided as otherwise the function of the unit is damaged. The pump starts automatically. FUTUR-series pumps are dry self-priming, so that it is not necessary to fill the suction line and the pump. However, the suction capacity of a pump filled with product is considerably higher. Throttling on the suction side can damage the pump. Short-term operation against a closed discharge line is permitted for pressure testing reasons. These kinds of necessary operating conditions (running against a closed valve) must be agreed with the manufacturer.

With normal operation of the pumps, the maximum permissible stroke rates listed in the table below must not be exceeded, as otherwise substantially increased wear is likely.

Size	10	20	50	100
Max. stroke rate/min. with rated power	400	320	210	240

7. Safety notes



- Installation, operation and maintenance of the pump may only be performed by qualified personnel.
- Prior to commissioning or after several operating hours, the tight fit of the union nuts [22] must be checked; tighten where necessary. This is also necessary after long downtimes, severe temperature fluctuations, transportation and disassembly of the pump.
- Before operating the air-operated diaphragm pump, everyone should familiarise themselves with the explanations regarding troubleshooting (pages 17/18). This ensures that the fault can be quickly recognised and rectified in the event of a malfunction. The manufacturer should be contacted in the event of faults that you cannot rectify yourself or whose causes are unclear.
- For all maintenance and inspection work on the diaphragm pump and accessories, the system must be shut down and secured against unintentional switch-on. This can be realised with a lockable emergency stop switch for the compressed air supply to the pump. In addition, a warning sign should be attached to prevent reactivation.
- Pressure testing of the system may only be performed with the pump shut off on the suction and pressure side or by pressure build-up by the pump itself. Strain caused by system pressure when the pump is stationary will result in damage.
- Depending on the system, do not operate the pump with inlet pressure.
- Depending on the operating conditions and operating mode of the pump, pumped fluid may escape at the silencer in the event of a diaphragm rupture (the silencer must be replaced

afterwards). For increased safety requirements, diaphragm monitoring is recommended as an optional extra.

- In the event of a diaphragm rupture, the medium may also leak into the air zone of the pump. In unfavourable situations – such as system pressure when the compressed air is switched off – liquid can also leak into the air supply line. To protect other components such as pulsation dampers or pneumatic valves, it is advisable to provide appropriate protection for the air line, for example via a non-return valve. This also prevents contamination of the compressed air line.

- The condition of the silencer must be checked regularly, as a clogged silencer can be pressed out of the pump. In such a case, damage to property and/or personal injury cannot be ruled out.

- When pumping hot media, a product-filled pump must not stand still for long periods of time, as this can lead to temporary leaks in the valve area and blockage of the air control.

- The applicable safety regulations must be observed.

- Any puddles of liquid in the immediate outer area of the pump must be checked for hazards before contact and protective measures taken if necessary.

- Avoid chemical and biological reactions in the pump product chamber (mixing of different substances) and freezing of the pumped fluid.

- Before starting to disassemble a pump, ensure that the pump has been emptied and flushed and that it is de-energised on the air and product side. The suction and pressure-side delivery lines must be closed and drained if necessary. If the unit leaves the system, a note about the conveyed medium must be attached.

- Approach to pump rinsing: Rinse the pump with neutral liquid, then turn upside down, followed by turning 90° to the side and finally back upside down. Repeat this rinsing process several times.

- Pumps that have been used to pump aggressive, hazardous or toxic media must only be dismantled in compliance with the relevant additional safety regulations (e.g. suitable protective equipment in accordance with the safety data sheet for the pumped fluid). In the event of a diaphragm rupture, residues of the pumped fluid may remain, especially behind the diaphragms, in the area of the air control system and on the silencer, despite extensive flushing. Therefore, appropriate protective clothing in accordance with the safety data sheet must be worn.

- Additional information on pumping sensitive fluids: If selected correctly, all components that come into contact with fluids are made of materials that are suitable for contact with your pumped fluid. However, a malfunction can lead to contact between the pumped fluid and components of the pump that do not normally come into contact with the medium (e.g. compressed air zone). Therefore, as usual with pumps, we recommend discarding the batch after an accident when pumping sensitive fluids to prevent any contamination.

- Even if the fluid-carrying materials of a FUTUR pump are mostly also suitable for food contact, the design of the pump is, however, NOT a “hygiene pump design”. We therefore advise against use for handling foodstuffs!

- After disassembling the pump, check it for leaks before starting up again.

- Air-operated diaphragm pumps can cause crushing when lifting, lowering or assembling. Appropriate aids and protective equipment must be used. Larger and heavy assemblies must be carefully attached to lifting gear and secured during transportation/replacement.

- Wear parts, such as diaphragms, should be replaced in the course of preventive maintenance, especially in the case of critical fluids.

- The use of non-original ALMATEC spare parts and any structural modifications made to the units will immediately invalidate the warranty and may result in personal injury and/or damage to property when the pump is in operation.

- It is possible to operate the pump with nitrogen as the drive gas. Sufficient ventilation must be provided in closed rooms.

- Any necessary electrical connections (e.g. when using special equipment with monitoring devices) may only be made by qualified electricians. The instructions of the respective manufacturers must be observed.

- Procedure for return pumps: In accordance with our requirements for 14001 certification, the decontamination certificate loosely attached to this operating manual must be completed for each unit sent to us. Otherwise, disassembly work on the pump required for diagnostic or maintenance purposes cannot be performed. Please observe the further safety instructions in the decontamination certificate.

8. Additional temperature information

The maximum temperatures and maximum pressures listed in the technical data on page 4 are based exclusively on the mechanical limit temperatures of the housing materials used. Depending on the pumped fluid, the safe maximum operating temperature for the respective application can be significantly reduced by the effect of chemicals.

At low temperatures, accelerated wear is generally to be expected below 0°C as the elastomers used in the pumps become brittle due to the cold. With regard to the housings, it should be noted that PE – unlike PP – remains mechanically stable even at cold temperatures and PTFE also retains its mechanical stability for a long time. ALMATEC pumps can also be operated safely at installation sites with very low temperatures; however, increased wear of the internal components is to be expected for liquids at temperatures below 0°C. In addition, care must be taken to avoid freezing, stagnation or crystallisation of the pumped fluid, especially inside the pump.

It should be noted that the viscosity and density of most pumped fluids change according to the temperature (usually increasing as the temperature decreases). Depending on the application, this can lead not only to a reduced pumping capacity but also cause the pump to no longer be capable of drawing in the more viscous and/or “heavier” medium.

9. Maintenance

Only use original ALMATEC spare parts for repairs and/or preventive maintenance work. Non-compliance will invalidate the CE and ATEX classification, the Declaration(s) of Conformity and the pump warranty.

All work on the pump may only be carried out using appropriate tools and by trained specialist personnel.

10. Disassembly

When disassembling a pump, the procedure and safety instructions on pages 11 to 13 must be considered.

On both sides of the pump, use a screwdriver to loosen the cheese-head screws [29,30] and remove the base frame [25]. Remove the air duct O-ring [26].

Unscrew the silencer [20] (with size 10 also the adapter silencer [21]) and black locking screw [18] from the side housing on the left [16]. Introduce a suitable rod into the bore hole of the union nut [22] of the left side housing [16] and unscrew the union nut [22]. Loosen the left side housing [16] from the union nut [22]. Remove the sliding ring [24] from the side housing on the left [16] and the union nut O-ring [23] from the union nut [22]. Unscrew the valve cover [19] using the assembly tool [36] from the side housing on the left [16]. Lay the side housing on the left [16] flat and, where necessary press out the PERSWING P® air control system [35] (without the pilot piston) completely towards the valve cover side. Remove the piston ring diaphragm bolt [15] from the side housing on the left [16]. Remove the pilot piston from the diaphragm bolt on the left [12].

Introduce a suitable rod into the bore hole of the union nut [22] of the right side housing [14] and unscrew the union nut [22]. Loosen the right side housing [14] from the union nut [22]. Remove the sliding ring [24] from the side housing on the right [14] and the O-ring union nut [23] from the union nut [22].

The central housing [1] sits upright with the product connections facing the front. Remove the external diaphragm O-ring [9] on both sides. Screw in the diaphragm bolt on the left [12] and diaphragm

bolt on the right [13] from the diaphragms [7]. Rotate a diaphragm [7] from the cascade sleeve [11]. Remove the second diaphragm [7] together with the cascade sleeve [11] and disassemble the two. Check the internal diaphragm O-ring [8] and replace if necessary (anti-rotation device). Remove diaphragm gaskets [10] (must generally be replaced).

Disassembly of the product valves for FUTUR T / H / E:

To remove the pressure valves, return the central housing [1] back into an upright position. Loosen the two pressure valve stroke limiters [6] located at the top in the central housing [1] using the assembly tool [36]. Remove the exposed valve bodies [4]. A suction valve stroke limiter [5] is located on the front of the central housing [1] (between the product connections) and on the rear side respectively. Loosen both with the assembly tool [36] and remove the valve bodies [4] from the side out of the central housing [1].

Disassembly of the product valves for FUTUR S/SH:

To remove the valve bodies, place the central housing back in an upright position. Loosen the two stroke limiters located at the top in the central housing using the assembly tool and remove the stroke limiter gaskets. First remove the exposed pressure valve bodies, then remove the valve housings and the valve housing gaskets. The suction valve bodies can now be removed.

11. Assembly

The individual assemblies are in principle installed in exactly the reverse order to that described in the Disassembly chapter. Only the following remarks are therefore included below.

Always make sure that damaged sealing elements are replaced in any case. Removed piston rings [15] and diaphragm gaskets [10] must no longer be used; new ones must be fitted. The piston rings [15] are slit and therefore easier to insert into the groove.

Press the entire cartridge of the PERSWING P® air control system [35] (without pilot piston) from the valve cover side into the side housing on the left [16] (Attention: Do not damage O-rings, moisten before insertion!).

The stroke limiters [5,6] must be pushed in far enough so that they finish flush with the central housing [1]. With the FUTUR S/SH, the valve housings must first be inserted so that the round windows in the top area release the fluid duct. The gaskets are then inserted; afterwards, the stroke limiters are then screwed in until they finish flush with the central housing.

Place the central housing [1] on the left side and carefully insert the diaphragm gasket [10]. Screw the diaphragm bolt on the right [13] into the diaphragm [7]. Screw the diaphragm [7] into the cascade sleeve [11] and insert into the central housing [1]. Insert the external diaphragm O-ring [9] into the diaphragm recess. The side housing on the right [14] must be positioned so that the straight surface with the air supply bore holes is parallel to the lower side of the central housing [1]. Put on the sliding ring [24]. Fit the union nut [22] with a union nut O-ring [23] and screw into the central housing [1]. When tightening the union nut [22], prevent the side housing on the right [14] from rotating by inserting a rod into a bore hole of the side housing on the right [14].

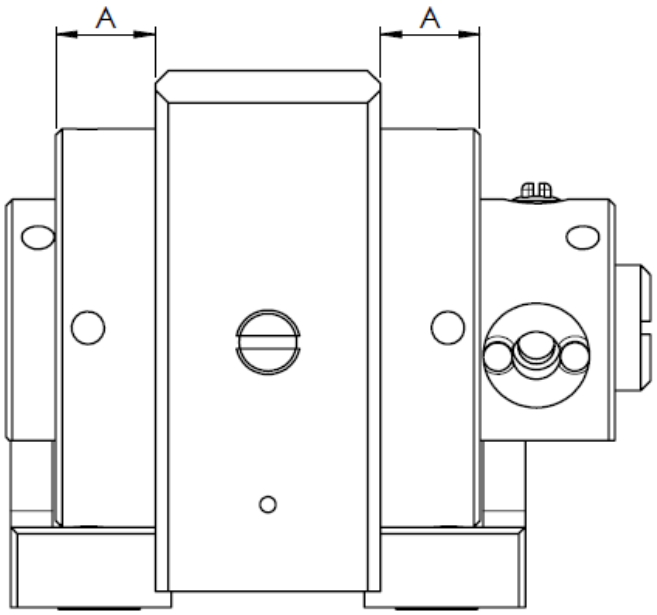
Carefully insert the diaphragm gasket [10] into the left side of the central housing [1]. To be able to fit the second diaphragm [7], compressed air must be applied to the diaphragm [7] that has just been installed. To do this, the centre air supply bore hole in the right side of the central housing must be used. The compressed air supply must be maintained until the left diaphragm [7] firmly contacts the central housing [1]. Screw the diaphragm bolt on the left [12] into the diaphragm [7] and insert the pilot piston of the air control system into the diaphragm bolt on the left [12]. The left side housing [16] is assembled in the same way as the procedure described for the right side housing [14]. Before

screwing in the valve cover [19], do not forget to insert the fifth control valve housing O-ring. Finally, insert the silencer [20] and locking screw [18].

As the two diaphragm gaskets [10] just inserted require a certain “settling time”, the assembly work on the pump must now be paused for at least two hours.

Pump size	10	20 (20S)	50 (50S)	100
Clearance in mm (Tolerance + 0.3 / - 0.5 mm)	28.8	31.3 (37)	35.5 (45.8)	41.3

Afterwards, tighten the two union nuts [22] in accordance with the nominal dimensions (distance outer edge of union nut to the central housing) in the above table; when doing so lock the side housings [14,16] as described and ensure parallelism with the central housing [1].

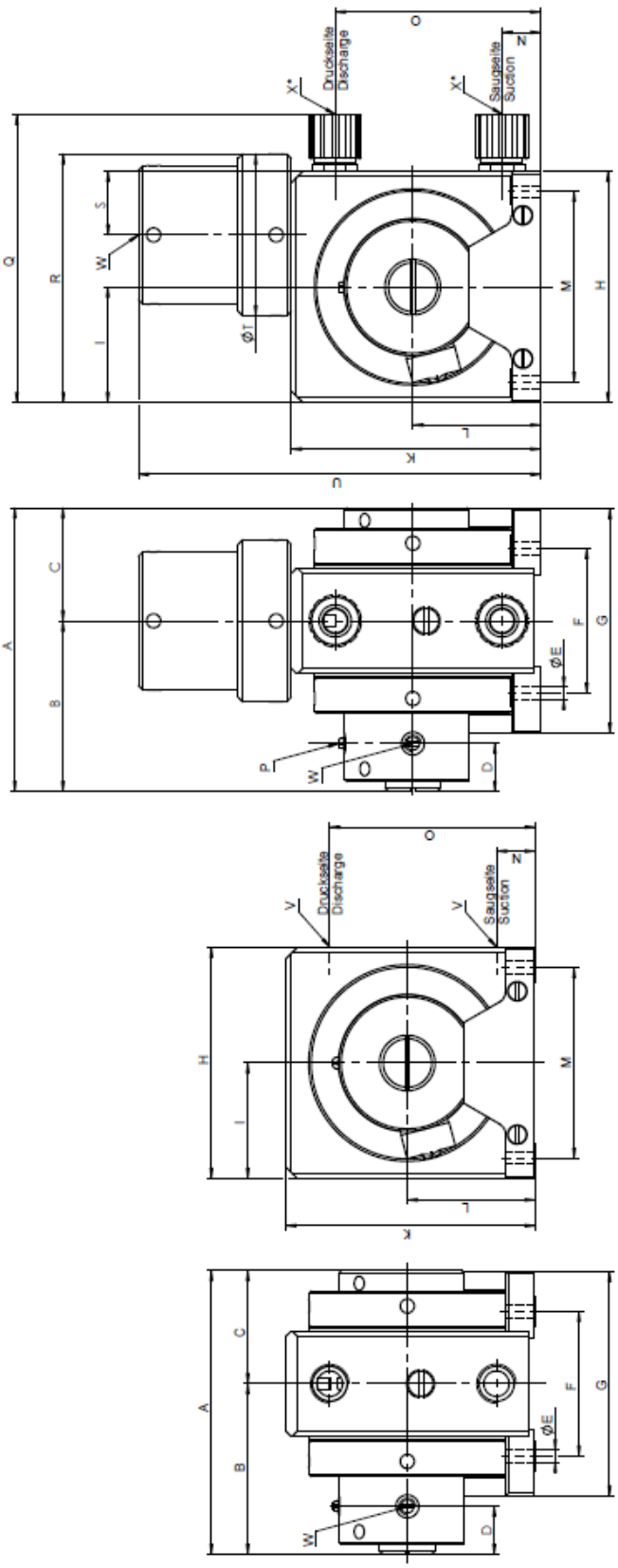


12. Troubleshooting

Malfunction	Possible cause	Remedy/comments
Pump does not operate	Supply line blocked/closed Silencer blocked Discharge line blocked/closed Working chambers blocked Air control defective	Open air supply clean or replace clean, open valve remove dirt replace air control
Pump operates irregularly	Piston rings worn Air control worn Diaphragm rupture Air control contaminated Valve body blocked due icing	Replace piston rings Replace air control Replace diaphragms, Clean pumpClean/replace con-trolClean, remove foreign bodies Improve air treatment
Air in pumped fluid	Suction line leakingTank with pumped liquid empty Diaphragm rupture Outgassing (cavitation)	Seal suction lineFill/new tank Replace diaphragms Adjust suction height, possibly provide suction air ves-sel
Pump does not generate enough pressure	Air pressure/volume too low Leak in air supply Leak in air control Valve body worn Number of consumers higher	Increase Rectify Replace air control Replace Increase air pressure/volume
Pumping capacity decreases	Air control contaminated Icing, dirt Air pressure drop Suction line/strainer contaminated Discharge line/filter contaminated Silencer blocked Valve body worn Viscosity/suction height change Number of consumers higher Number of consumers lower	Clean/replace Improve air treatment, dryer/filter Ensure air supply clean clean replace replace change and/or consider Increase air pressure/volume Pressure increase, slower run-ning
Pump stops	Air control iced Air pressure drop Air pressure too low Discharge line blocked Air filter blocked Valve closed Air control defective Wear, Blowing off control unit Diaphragm rupture Valve body blocked or worn	Improve air treatment Ensure air supply increase clean clean open replace Replace air control Replace diaphragms, Clean pump clean/replace

Malfunction	Possible cause	Remedy/comments
Pump running, insufficient suction power	Pump runs too quickly Physical limit exceeded Cavitation Pump capacity exceeded Air cushion in suction/discharge line Dry suction against delivery pressure Valve/filter in suction line closed Valve/filter in discharge line closed Tank with pumped liquid empty Negative pressure in tank Valve body wear Suction line leaking Suction line blocked Pressure cushion on the pressure side Valve body blocked	Start up slower Correct installation Check, cool Correct installation or use a larger pump Vent If necessary, first pump in the circuit, wet and vent in the circuit Open and/or clean Open and/or clean Fill/new tank Vent Replace Seal Clean Vent discharge line Clean/replace
Pump does not draw in after repair	Connections not properly tightened Valve body inserted incorrectly	Retighten, seal correct
Diaphragm overstretched	System pressure Excessive negative pressure Icing	Only generate pressure using a pump, Check system/valves, Replace diaphragms Check suction line, Open valve Improve air treatment
Leakage between housing parts	Diaphragms significantly overstretched	Replace
Silencer grey	Humidity too high, icing	Improve air quality, possibly heat feed air
Silencer black	Contaminated/oily compressed air	Improve air quality, Install ultra-fine filter upstream of pump in feed air line
Pump does not work, air is present	Air control clamped Foreign bodies/dirt Chemical impact (O-rings swollen) Valve in delivery line closed	Clean, replace clean, replace if necessary, ensure better air quality Check, eliminate open
Pumped fluid escapes at the silencer	Diaphragm breakage	Replace diaphragms, clean pump

13. Dimension drawing



* Speziell modifiziert für FUTUR und werkseitig eingebaut.
Specially modified for FUTUR and fitted by the manufacturer.

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P (C9)	Q	R	S	T	U	V	W (Luft, air supply)	X *
FUTUR 10	185	112	73	35,5	10,5	93	143	114	57	131	72	79	35	104	NPT 1/4"	~155	136	33	110	246	NPT 3/8"	NPT 1/4"	1/2" Rohr-AD, 1/2" Pipe-OD (Flaretek®)
FUTUR 20	201	119	82	35,5	10,5	105	160	150	75	168	88	115	33	140	NPT 1/4"	~196	161	44	110	283	NPT 1/2"	NPT 1/4"	3/4" Rohr-AD, 3/4" Pipe-OD (Flaretek®)
FUTUR 50	246	148	98	41,5	10,5	125	194	200	100	216	111	165	34	178	NPT 1/4"	~251	215	55	140	348	NPT 1"	NPT 1/4"	1" Rohr-AD, 1" Pipe-OD (Flaretek®)
FUTUR 100	303	184	119	51	10,5	149	236	260	130	266	136	225	39	223	NPT 1/4"	~313	286	74	200	429	NPT 1 1/4"	NPT 1/4"	1 1/4" Rohr-AD, 1 1/4" Pipe-OD (Flaretek®)
FUTUR 200	374	215	159	51	10,5	227	314	330	165	346	181	290	61	281	NPT 1/4"	-	345	95	220	578	NPT 1 1/2"	NPT 3/8"	-
FUTUR 20 S	201	119	82	35,5	10,5	93	160	124	59	154	80	89	29	126	NPT 1/4"	~152	140	34	100	266	NPT 1/2"	NPT 1/4"	1/2" (VCR)
FUTUR 50 S	246	148	98	41,5	10,5	105	194	170	80	196	101	125	33	159	NPT 1/4"	~209	190	45	130	318	NPT 1"	NPT 1/4"	1" (VCR)

14. Spare parts list FUTUR T / H / E

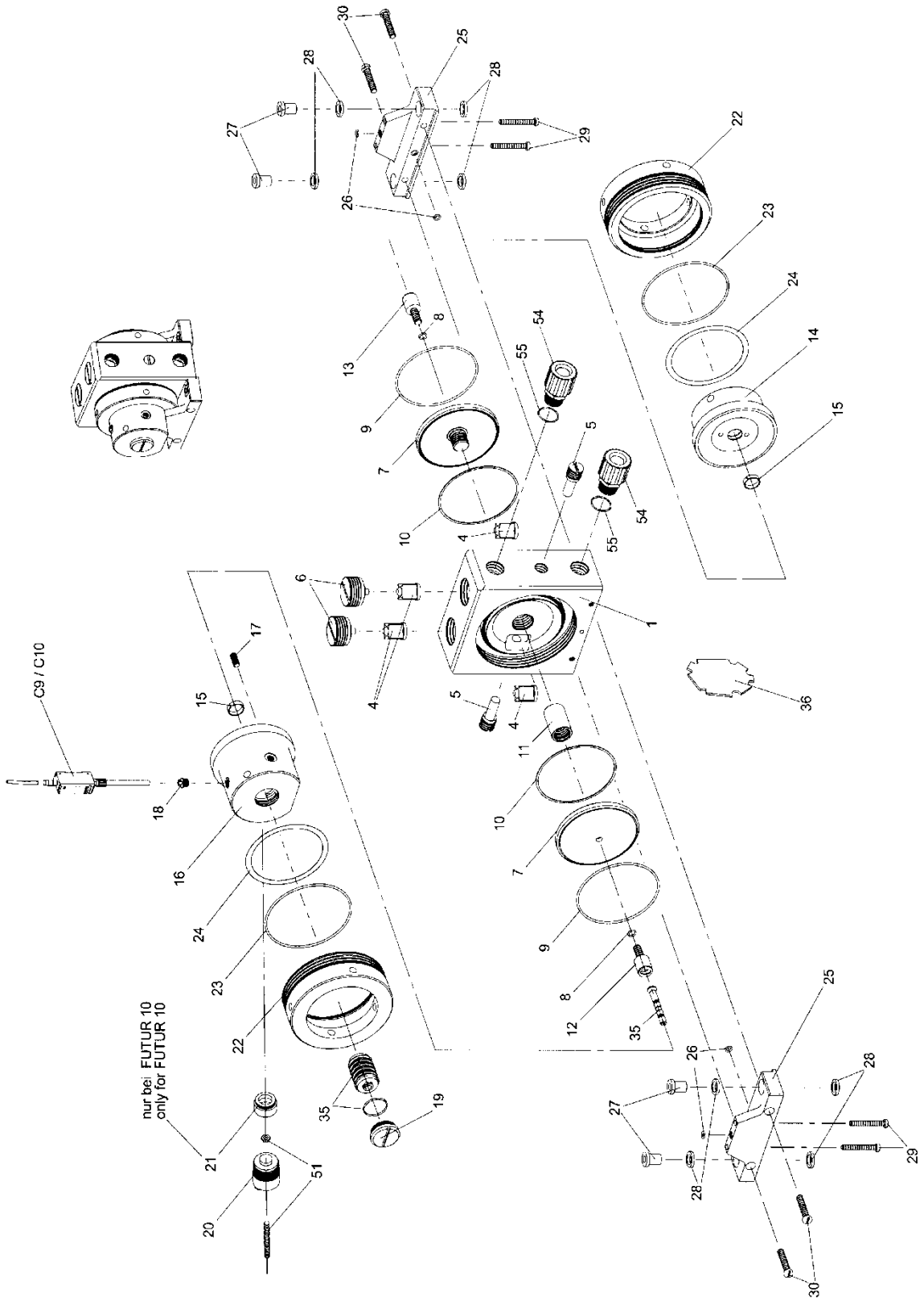
Size					FUTUR 10 T / H	FUTUR 20 T / H / E	FUTUR 50 T / H / E	FUTUR 100 T / E
It.	Pc.	Designation	Type code	Material	Part number	Part number	Part number	Part number
1	1	Central housing	T, H	PTFE	6 10 010 69	6 15 010 69	6 25 010 69	6 32 010 69
		Central housing	E	UPPE	-	6 15 010 52	6 25 010 52	6 32 010 52
4	4	Valve body	T, H	PTFE	8 10 011 69	8 15 011 69	8 25 011 69	8 32 011 69
		Valve body	E	UPPE	-	8 15 011 52	8 25 011 52	8 32 011 52
5	2	Stroke limiter, suction valve	T, H, E	PTFE	8 10 812 69	8 15 812 69	8 25 812 69	8 32 812 69
6	2	Stroke limiter, pressure valve	T, H, E	PTFE	8 10 813 69	8 15 813 69	8 25 813 69	8 32 813 69
7	2	Diaphragm	T, H	PTFE	6 10 020 69	6 15 020 69	6 25 020 69	6 32 020 69
		Diaphragm	E	PTFE	-	6 15 220 66	6 25 220 66	6 32 220 66
8	2	O-ring, diaphragm internal	T, H, E	FKM	9 04 593 74	9 06 538 74	9 10 544 74	9 15 546 74
9	2	O-ring, diaphragm external	T, H, E	FKM	9 66 533 74	9 90 586 74	9 99 609 74	9 99 612 74
10	2	Gasket, diaphragm	T, H, E	PTFE	6 10 026 69	6 15 026 69	6 25 026 69	6 32 026 69
11	1	Cascade sleeve	T, H, E	PTFE	6 10 032 69	6 15 032 69	6 25 032 69	6 32 032 69
12	1	Diaphragm bolt, on the left	T, H, E	PEEK	6 10 021 86	6 15 021 86	6 25 021 86	6 32 021 86
13	1	Diaphragm bolt, on the right	T, H, E	PEEK	6 10 023 86	6 15 023 86	6 25 023 86	6 32 023 86
14	1	Side housing, on the right	T, E	UPPE/ PA	6 10 014 52	6 15 014 52	6 25 014 52	6 32 014 52
		Side housing, on the right	H	PTFE cond.	6 10 014 65	6 15 014 65	6 25 014 69	-
15	2	Piston ring, diaphragm bolt	T, H, E	PTFE-PPS	8 10 825 61	8 15 825 61	8 25 825 61	8 32 825 61
16	1	Side housing, on the left	T, E	UPPE/ PA	6 10 015 52	6 15 015 52	6 25 015 52	6 32 015 52
		Side housing, on the left	H	PTFE cond.	6 10 015 65	6 15 015 65	6 25 015 69	-
17	1	Threaded pin DIN 551	T, H, E	PA	9 06 201 53	9 06 201 53	9 10 206 53	9 12 207 53
18	1	Locking screw GPN 730	T, H, E	PA	730 R 1/4	730 R 1/4	730 R 1/4	730 R 1/4
19	1	Valve cover	T, H, E	PE	8 15 731 52	8 15 731 52	8 25 731 52	8 32 731 52
20	1	Silencer, complete	T, H, E	PE	1 08 244 51	1 08 244 51	1 15 244 51	1 40 244 51

Size					FUTUR 10 T / H	FUTUR 20 T / H / E	FUTUR 50 T / H / E	FUTUR 100 T / E
It.	Pc.	Designation	Type code	Material	Part number	Part number	Part number	Part number
21	1	Adapter, silencer	T	PE	6 10 033 52	-	-	-
22	2	Union nut	T	PE	6 10 029 80	6 15 029 80	6 25 029 80	6 32 029 80
		Union nut	H	PEEK	6 10 029 86	6 15 029 86	6 25 029 86	-
		Union nut	E	PA	-	6 15 029 53	6 25 029 53	6 32 029 53
23	2	O-ring, union nut	T, H, E	FKM	9 73 660 74	9 98 661 74	9 99 662 74	9 99 663 74
24	2	Sliding ring	T, H, E	PTFE	6 10 030 60	6 15 030 60	6 25 030 60	6 32 030 60
25	2	Base frame	T, H, E	PE/PA	6 10 017 52	6 15 017 52	6 25 017 52	6 32 017 52
26	4	O-ring, air duct	T, H, E	FKM	9 06 538 74	9 06 538 74	9 08 541 74	9 10 544 74
27	4	Foundation anchor socket	T, H, E	PE	8 25 418 52	8 25 418 52	8 25 418 52	8 25 418 52
28	8	Damping ring	T, H, E	FKM	1 15 149 74	1 15 149 74	1 15 149 74	1 15 149 74
29	4	Cheese-head screw DIN 84	T, H, E	PA	9 06 226 53	9 06 227 53	9 08 227 53	9 08 227 53
30	4	Cheese-head screw DIN 84	T, H, E	PA	9 10 227 53	9 10 227 53	9 10 227 53	9 10 227 53
35	1	PERSWING P® Air control, compl.	T, H, E	PETP	6 10 201 84	6 15 201 84	6 25 201 84	6 32 201 84
36	1	Assembly tool	T, H, E	PA	6 10 000 53	6 10 000 53	6 10 000 53	6 10 000 53

15. Spare parts list FUTUR F

Size					FUTUR 100 F
Item	Pc.	Designation	Type code	Material	Part number
1	1	Central housing	F	PE-UHMW	63201056
2	4	Valve body	F	UPPE	83201152
3	2	Stroke limiter, suction valve	F	PTFE-TFM	83281268
4	2	Stroke limiter, pressure valve	F	PTFE-TFM	83281368
5	2	Diaphragm	F	PTFE	63222066
6	2	O-ring, diaphragm internal	F	EPDM	91554674
7	2	O-ring, diaphragm external	F	FKM	99961274
8	2	Gasket, diaphragm	F	PTFE	63202669
9	1	Cascade sleeve	F	PTFE-TFM	63203269
10	1	Diaphragm bolt, on the left	F	PEEK	63202186
11	1	Diaphragm bolt, on the right	F	PEEK	63202386
12	1	Side housing, on the right	F	PE-UHMW	63201456
13	2	Piston ring, diaphragm bolt	F	PTFE-PPS	83282561
14	1	Side housing, on the left	F	PE-UHMW	63201556
15	1	Threaded pin DIN 551	F	PA	91220753
16	1	Locking screw GPN 730	F	PA	730R1/4
17	1	Valve cover	F	PE-UHMW	83273156
18	1	Silencer, complete	F	PE	14024451
19	2	Union nut	F	PE-CFK30	63202949
20	2	O-ring, union nut	F	FKM	99966374
21	2	Sliding ring	F	PTFE	63203060
22	2	Base frame	F	PE/PA	63201756
23	4	O-ring, air duct	F	FKM	91054474
24	4	Foundation anchor socket	F	PE	82541852
25	8	Damping ring	F	FKM	11514974
26	4	Cheese-head screw DIN 84	F	PA	90822753
27	4	Cheese-head screw DIN 84	F	PA	91022753
28	1	PERSWING P® air control system, complete	F	PETP	63220184
29	1	Assembly tool	F	PA	61000053

16. Exploded view FUTUR T / H / E / F

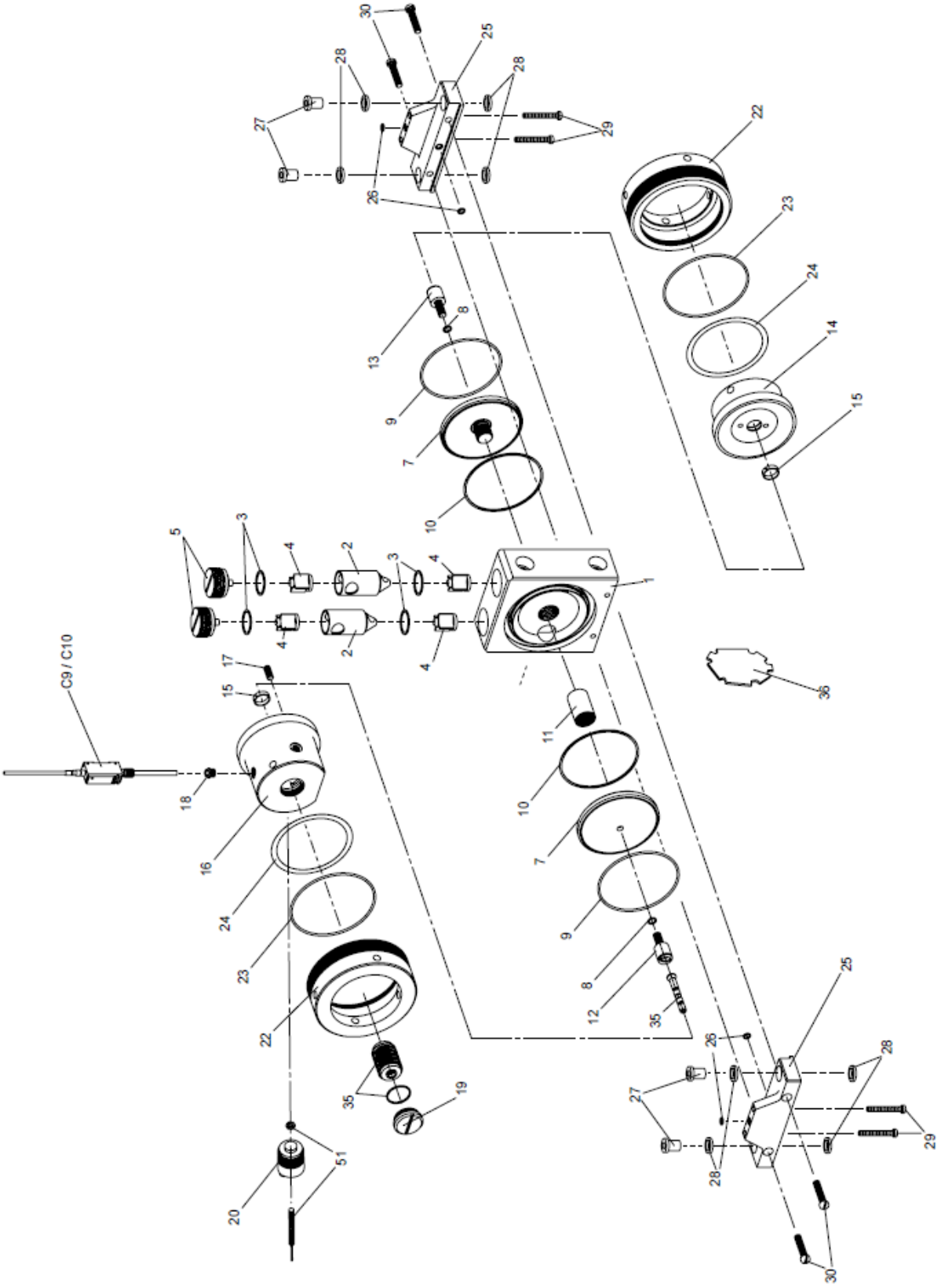


17. Spare parts list FUTUR S / SH

Size					FUTUR 20 S / SH	FUTUR 50 S / SH
Item	Pc.	Designation	Type code	Material	Part number	Part number
1	1	Central housing	S, SH	1.4404	6 15 110 23	6 25 110 23
2	2	Valve housing	S, SH	1.4404	8 15 912 23	8 25 912 23
3	2	Gasket, valve housing	S, SH	PTFE	8 15 928 60	8 25 928 60
4	4	Valve body	S, SH	PTFE	8 15 011 69	8 25 011 69
5	2	Stroke limiter	S, SH	1.4404	8 15 913 23	8 25 913 25
6	2	Gasket, stroke limiter	S, SH	PTFE	8 15 929 60	8 25 929 60
7	2	Diaphragm	S, SH	PTFE	6 15 420 69	6 25 420 69
8	2	O-ring, diaphragm internal	S, SH	FKM	9 06 538 74	9 10 544 74
9	2	O-ring, diaphragm external	S, SH	FKM	9 90 586 74	9 99 609 74
10	2	Gasket, diaphragm	S, SH	PTFE	6 15 026 69	6 25 026 69
11	1	Cascade sleeve	S, SH	PTFE	6 15 032 69	6 25 032 69
12	1	Diaphragm bolt, on the left	S, SH	PEEK	6 15 021 86	6 25 021 86
13	1	Diaphragm bolt, on the right	S, SH	PEEK	6 15 023 86	6 25 023 86
14	1	Side housing, on the right	S	PE conductive	6 15 014 56	6 25 014 56
		Side housing, on the right	SH	1.4305	6 15 014 22	6 25 014 22
15	2	Piston ring, diaphragm bolt	S, SH	PTFE-PPS	8 15 825 61	8 25 825 61
16	1	Side housing, on the left	S	PE conductive	6 15 015 56	6 25 015 56
		Side housing, on the left	SH	1.4305	6 15 015 22	6 25 015 22

Size					FUTUR 20 S / SH	FUTUR 50 S / SH
Item	Pc.	Designation	Type code	Material	Part number	Part number
17	1	Threaded pin DIN 551 Threaded pin DIN 551	S SH	PA PA	9 06 201 53 9 06 202 53	9 10 206 53 9 10 207 53
18	1	Locking screw GPN 730	S, SH	PA	730 R 1/4	730 R 1/4
19	1	Valve cover	S, SH	PE	8 15 731 52	8 25 731 52
20	1	Silencer, complete	S, SH	PE	1 08 244 51	1 15 244 51
22	2	Union nut	S, SH	1.4305	6 15 129 22	6 25 129 22
23	2	O-ring, union nut	S, SH	FKM	9 98 661 74	9 99 662 74
24	2	Sliding ring	S, SH	PTFE	6 15 030 60	6 25 030 60
25	2	Base frame	S, SH	PE con-ductive	6 15 117 56	6 25 117 56
26	4	O-ring, air duct	S, SH	FKM	9 06 538 74	9 08 541 74
27	4	Foundation anchor socket	S, SH	PE	8 25 418 52	8 25 418 52
28	8	Damping ring	S, SH	FKM	1 15 149 74	1 15 149 74
29	4	Cheese-head screw DIN 84	S, SH	PA	9 06 227 53	9 08 229 53
30	4	Cheese-head screw DIN 84	S, SH	PA	9 10 227 53	9 10 227 53
35	1	PERSWING P® Air control, compl.	S, SH	PETP	6 15 201 84	6 25 201 84
36	1	Assembly tool	S, SH	PA	6 10 000 53	6 10 000 53

18. Exploded view FUTUR S / SH



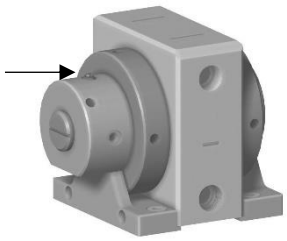
19. *Special equipment*

19.1. Pneumatic stroke rate detection (code C 9 / C 10)

The stroke rate detection is provided pneumatically with code C 9 / C 10. A pressure sensor registers the resulting pressure changes in the air chamber behind the left diaphragm and converts the pneumatic pulses into an electric signal.

The pneumatic stroke rate detection is available in two versions:

- C 9 consisting of:
  - Pressure sensor incl. 2.5 m cable and connector for pressure sensor
  - 2.5 m connecting hose DN 4/6 with screw-in fittings for hose 4/6, pump side and sensor side
  - Mounting bracket with screws
- C 10 consisting of:
  - as C 9, but including stroke counter



Some assembly instructions: Remove the black locking screw [18] (see arrow) from the additional air connection in the side housing on the left [16] and screw in the straight fitting. Attach the connecting hose to the fitting and pressure switch that have just been installed. Connect the socket to the electrical connection plug of the pressure switch and the cable to existing registration devices (code C 9) or to the enclosed stroke counter (code 10). Technical data, connection diagrams and further details can be found in the manufacturer's specifications for the pressure switch and the stroke counter.

A minimum counter-pressure of 1.5 bar is required for the pneumatic stroke rate detection to function properly!

19.2. Diaphragm sensor (Code D)

The diaphragm sensor built into the silencer of the pump records any liquid irrespective of its conductivity. This ensures an immediate response in the event that the diaphragm becomes damaged. Nevertheless, it must be taken into account that diaphragm monitoring may not be able to prevent pumped fluid from escaping at the silencer. If ambient air humidity is high, this may trigger a false alarm despite the presence of dry compressed air. The diaphragm monitoring is available in three variants:

- D 1 Diaphragm sensor, 2-wire Namur, intrinsically safe EEx ia IIC T6
- D 5** Diaphragm sensor, 3-wire [no longer available for new pumps]
- D 6** Diaphragm sensor, 3-wire with plug [no longer available for new pumps]

Further details can be found in the manufacturer's specifications.

19.3. Flaretek® connections for PFA pipe (Code G) for FUTUR T / H / E

Suction and pressure connection of the FUTUR T and FUTUR H can be fitted with the Flaretek® pipe coupling system for PFA pipe that is in widespread use in the semiconductor industry. Do not remove or replace these factory-fitted Flaretek® connections! They are modified specifically for the FUTUR and inserted with a gas-tight seal. Only with these original product connections is there a guarantee of proper functioning, leak tightness and cleanliness of the pumps!

19.4. VCR connections (Code V) for FUTUR S / SH

Suction and pressure connection of the FUTUR S/SH pumps can be fitted with stainless steel VCR connection fittings (external thread VCR connection for 1/2" pipe with 20 S or for 1" pipe with 50 S with gasket).

19.5. Spare parts list for special equipment

Size					FUTUR 10	FUTUR 20	FUTUR 50	FUTUR 100
It.	Pc.	Designation	Type code	Material	Part number	Part number	Part number	Part number
		C 9:						
18	1	Straight fitting	T, H, E, F	PP	1 00 877 51	1 00 877 51	1 00 877 51	1 00 877 51
	1	Hose 2.5 m	T, H, E, F	PE	1 00 876 51	1 00 876 51	1 00 876 51	1 00 876 51
	1	Pressure switch	T, H, E, F	Various	1 00 972 99	1 00 972 99	1 00 972 99	1 00 972 99
	1	Socket with cable 2.5 m	T, H, E, F	Various	1 00 973 99	1 00 973 99	1 00 973 99	1 00 973 99
		C 10:						
-	1	Stroke counter	T, H, E	Various	1 00 071 99	1 00 071 99	1 00 071 99	1 00 071 99
		D 1:						
51	1	Diaphragm sensor, 2-wire Namur	T, H, E, F	PBTP	1 00 773 99	1 00 773 99	1 00 773 99	1 00 773 99
		D 5:						
51	1	Diaphragm sensor 3-wire	T, H, E	PTFE	1 00 473 99	1 00 473 99	1 00 473 99	1 00 473 99
		D 6:						
51	1	Diaphragm sensor 3-wire with plug	T, H, E	PTFE	1 00 573 99	1 00 573 99	1 00 573 99	-
		G:						
-	2	Flaretek® connection for PFA pipe	T	PFA/PVDF	1 10 012 57	1 15 012 57	1 25 012 57	1 32 012 57
		Flaretek® connection for PFA pipe	H	PFA/PFA	1 10 312 57	1 15 312 57	1 25 312 57	-
-	2	O-ring, Flaretek® connection	T, H	FKM/FEP	9 16 559 74	9 18 501 74	9 28 534 74	9 30 582 59

Size					FUTUR 10	FUTUR 20	FUTUR 50	FUTUR 100
It.	Pc.	Designation	Type code	Material	Part number	Part number	Part number	Part number
		V:						
-	2	VCR connection fitting	S, SH	1.4404	-	8 15 638 23	8 25 638 23	-
-	2	Gasket for VCR	S, SH	PTFE	-	8 15 639 60	8 25 639 60	-

19.6. Cleaning based on SEMI F57-0622

ALMATEC can provide you with pumps, that are clean based on SEMI F57-0622. As confirmation, a certificate is included with the shipment, from which the values for the pump can be obtained in accordance with the specified requirements. In addition, the existing particle count and size of the pump in its delivery status will be mentioned. This based on exemplary requirements from the semiconductor industry.

The pumps are certified as complete assemblies and are delivered in packaging suitable for cleanroom environments.

Following products can be ordered:

- FUTUR T
- FUTUR H

Available sizes are FUT20 (1/2“) and FUT50 (1“), including Flaretek®-Connectors for PFA-Tubings that are assembled on both, inlet and outlet side.

The pumps provided are exclusively intended to be used in F57-certified environments. In other use cases the certificate is not applicable.

No spare parts including certification are offered. In addition the certificate expires in case of service activites.

20. *Use of a pulsation damper D series*

Oscillating displacement pumps have a pulsating flow due to their design. The FUTUR pump series has considerably less pulsation, especially also on the suction side, due to the corresponding design of the air ducts and air chambers as well as through the cascade seal. If the pressure-side residual pulsation is unacceptable for the specific use case, corresponding pulsation dampers (type D) are available for each pump size, which can be retrofitted at any time, even on installed pumps, without any modification of the product connections. It should always be noted that the use of a pulsation damper reduces the pumping capacity of the overall system depending on the operating point.

Before commissioning, ensure that the pulsation damper and the materials used are suitable for the intended pumping tasks.

In the following text, each individual part mentioned is labelled with a number in brackets. This number corresponds to the item number of this individual part in the spare parts list and the exploded diagram.

Safety Notes

The explanations and safety instructions for the pump (see pages 11 to 13 of this operating manual) must also be noted for the pulsation dampers with regard to the installation, commissioning, assembly and disassembly.

20.1. Installation and commissioning

The FUTUR pump and the D pulsation damper are supplied in separate packaging for safety reasons. To install the damper, remove the front pressure valve stroke limiter (if present) from the pump (see exploded drawing on page 23).

Check the seat of the damper housing O-ring [2] in the groove. If not yet done, place the pump upright and check the correct seat of the valve body in the pump. Now screw in the pulsation damper into the pump until it rests on the housing. Further tightening can damage the thread.

The hole for the air connection is located at the top of the damper head [3]. To function properly, the pulsation damper must have its own compressed air connection, starting from the pump's air connection. No shut-off or control valves may be installed between the pump and damper supply. The pump and damper must always be supplied with the same air pressure. As regards the quality of the drive air, the minimum requirements specified in the technical data on page 2 apply. A minimum counter-pressure of approx. 1 bar is required for proper functioning. Depending on the system, do not operate the pump and damper with inlet pressure.

An empty pulsation damper must be started up slowly together with the pump. It adapts automatically to all changing operating conditions.

20.2. Assembly and disassembly

Unscrew the pulsation damper from the FUTUR pump. Pay attention to the damper housing O-ring [2]. Disassemble the damper housing [1] and the damper head [3]. Carefully remove the external diaphragm O-ring [11]. Pull off the diaphragm [9] including the control rod [13]. Remove the diaphragm gasket [12]. Check the internal diaphragm O-ring [10] and replace if necessary (anti-rotation device). Disassemble the piston rings [5] and piston ring O-rings [6]. Remove the damper head O-ring [4].

The assembly is done in the reverse order to that described above. Only a few additional remarks are therefore included below.

Always make sure that damaged or contaminated sealing elements are replaced in any case. Removed gaskets and piston rings must no longer be used; new ones must be fitted. Bend the new piston ring [5] into a kidney shape and insert it into the groove. Then press the bulge of the piston ring [5] completely into the groove using a round object. When installing a new piston ring [5], always replace the O-rings [6] as well. Before inserting the diaphragm [9], place the external diaphragm O-ring [11] in the corresponding groove in the diaphragm [9].

As the diaphragm gasket [12] requires a certain “settling time” after installation, the additional work must be therefore paused for at least two hours once the pulsation damper has been fully assembled. After this time, firmly tighten the housing parts and only then fit the pulsation damper to the pump.

20.3. Technical data

Damper code	D 10/20/50/100 T/H/S/SH/U
Dimensions (mm)	See page 15
Air connection (NPT)	1/4"
Max. permissible drive pressure (bar)	6
Maximum weight (kg)	5

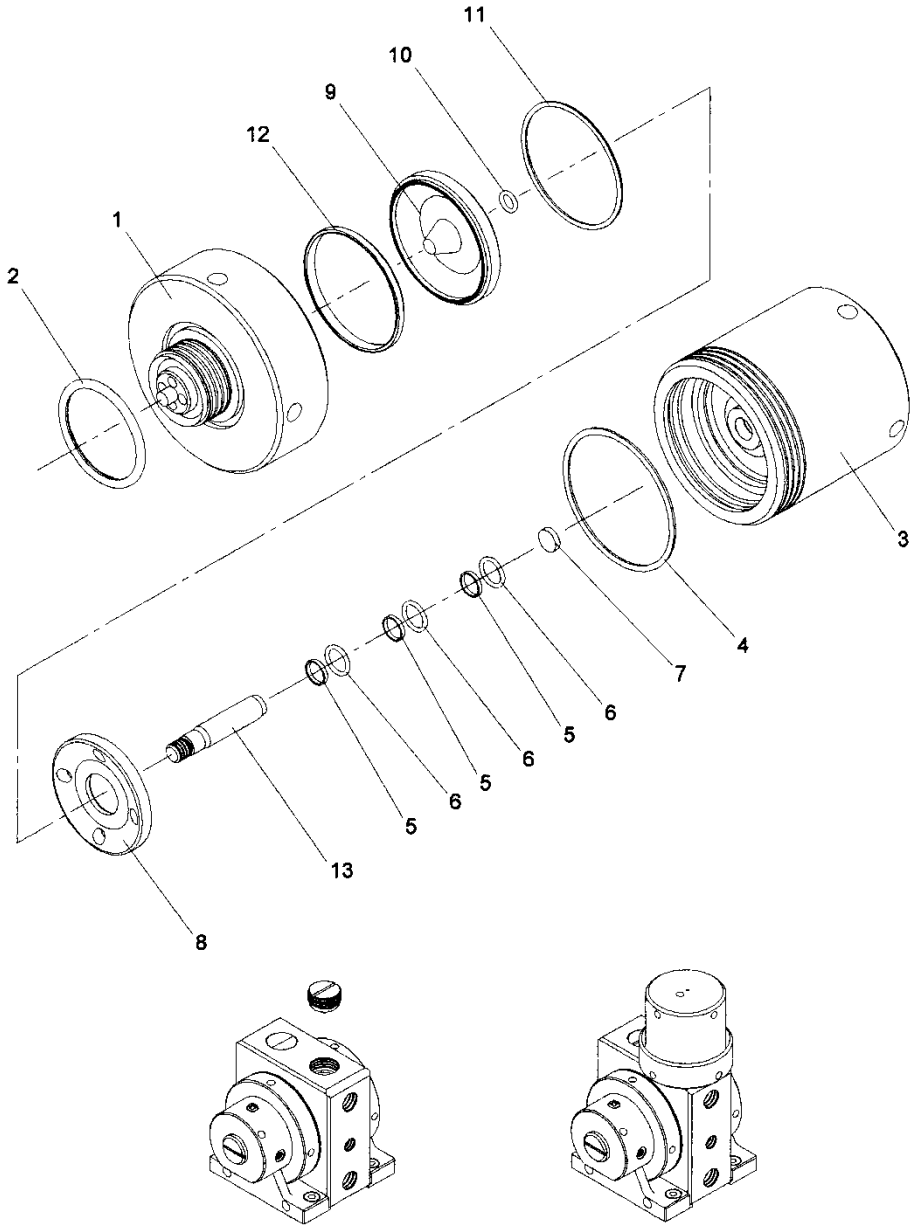
FUTUR E pumps are equipped with a damper T.
FUTUR F pumps must be equipped with a damper U.

20.4. Spare parts list pulsation damper

Size					D10 T/H	D20 T/H/S/SH	D50 T/S/SH	D 100 T/U
Item	Pc.	Designation	Type code	Material	Part number	Part number	Part number	Part number
1	1	Damper housing	T/H	PTFE-TFM	6 10 040 69	6 15 040 69	6 25 040 69	6 32 040 69
		Damper housing	S/SH	1.4404	-	6 15 140 23	6 25 140 23	-
		Damper housing	U		-	-	-	6 32 040 68
2	1	O-ring, damper housing	T/H	EPDM	9 42 540 72	9 51 513 72	9 65 516 72	9 78 530 72
3	1	Damper head	T	UPPE	6 10 041 52	6 10 041 52	6 25 041 52	6 32 041 52
		Damper head	H/S	PTFE conductive	6 10 041 65	6 10 041 65	6 25 041 65	-
		Damper head	SH	1.4305	-	6 10 041 22	6 25 041 22	-
		Damper head	U	-	-	-	-	6 32 041 56
4	1	O-ring, damper head	T/H/S/SH	FKM	9 73 660 74	9 73 660 74	9 98 661 74	9 99 662 74
5	3	Piston ring	T/H/S/SH	PTFE-PPS	1 08 153 61	1 08 153 61	1 08 153 61	8 25 431 61
6	3	O-ring, piston ring	T/H/S/SH	FKM	9 13 575 74	9 13 575 74	9 13 575 74	9 18 501 74
7	1	Silencer	T/H/S/SH	PE	1 08 644 51	1 08 644 51	1 08 644 51	8 32 644 51
8	1	Supporting ring	T/H/S/SH	PA	8 10 884 53	8 10 884 53	8 15 884 53	8 32 884 53
9	1	Damper diaphragm	T/H/S/SH	PTFE	6 10 043 69	6 10 043 69	6 25 043 69	6 32 043 69
10	1	O-ring, diaphragm internal	T/H/S/SH	FKM	9 08 541 74	9 08 541 74	9 08 541 74	9 10 544 74
11	1	O-ring, diaphragm external	T/H/S/SH	FKM	9 66 533 74	9 66 533 74	9 90 586 74	9 99 609 74
12	1	Gasket, diaphragm	T/H/S/SH	PTFE	6 10 026 69	6 10 026 69	6 15 026 69	6 25 026 69
13	1	Control rod	T/H/S/SH	PEEK	8 15 482 86	8 15 482 86	8 15 482 86	8 32 482 86

When ordering, always quote the pulsation damper serial number!

21. *Exploded drawing pulsation damper*



ALMATEC

PSG
a DOVER company

Subject to modifications 10/2026

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