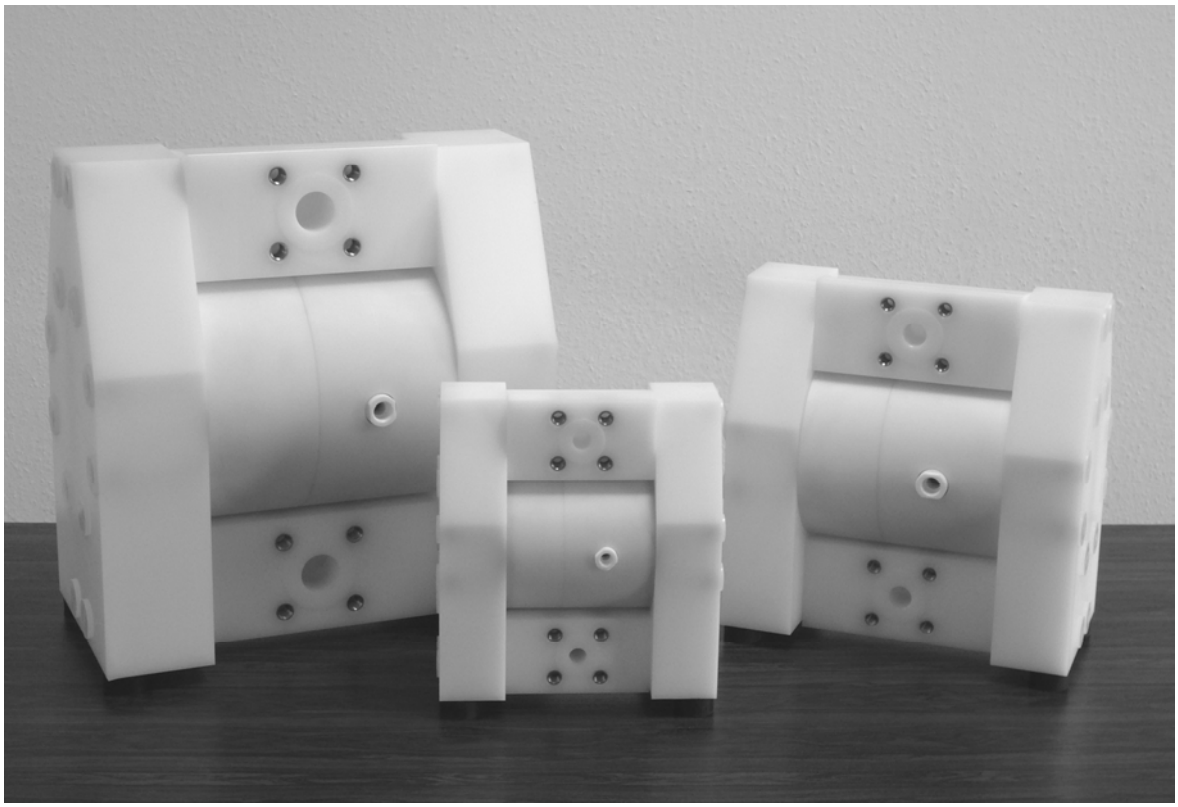
ALMATEC Series AH

AH 15 – AH 40

High Pressure Diaphragm Pumps made of Plastic



Operating and Installation Instructions

ought to be studied before installing the pump

CE

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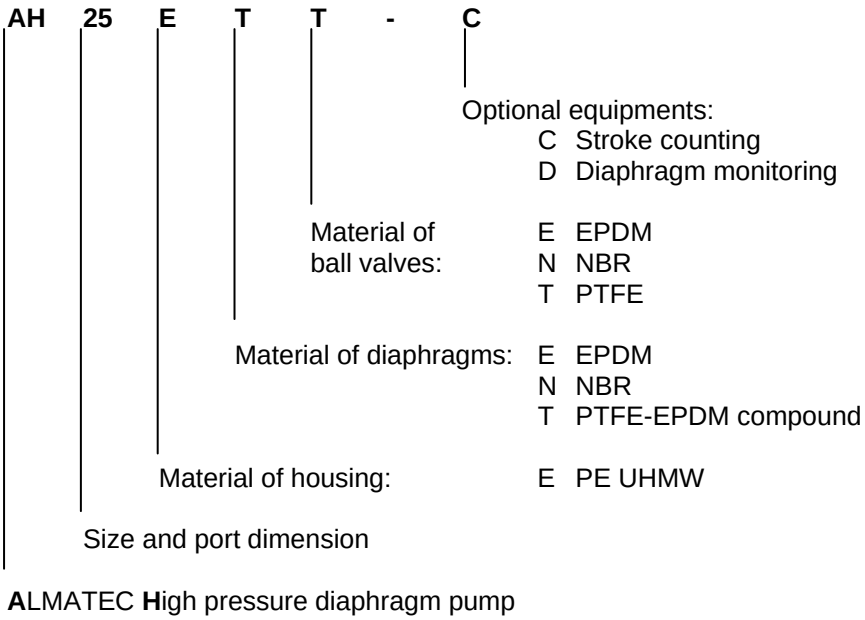
1. Introduction

The ALMATEC Maschinenbau GmbH is certified as a modern, quality-orientated enterprise according to DIN EN ISO 9001:2000 and 14001:2005. Before release for dispatch, any series AH pump has to undergo an extended final control. The performance data registered during this are archived in our records and can be read back at any time.

Based on the ALMATEC pneumatic diaphragm pump range, ALMATEC high pressure pumps AH 15, AH 25, AH 40 have especially been developed for the requirements of feeding filter presses. Due to the integrated pressure transmission, they can achieve a discharge pressure of 15 bar with an air pressure of 7 bar.

Before putting any pump into operation, make sure, that the materials of construction are resistant to the chemical to be pumped. To check this, the exact pump code is required. This code, the serial number and the year of construction are noted on the identification plates on the pump itself.

Here is an example to illustrate the system of the ALMATEC pump codes:

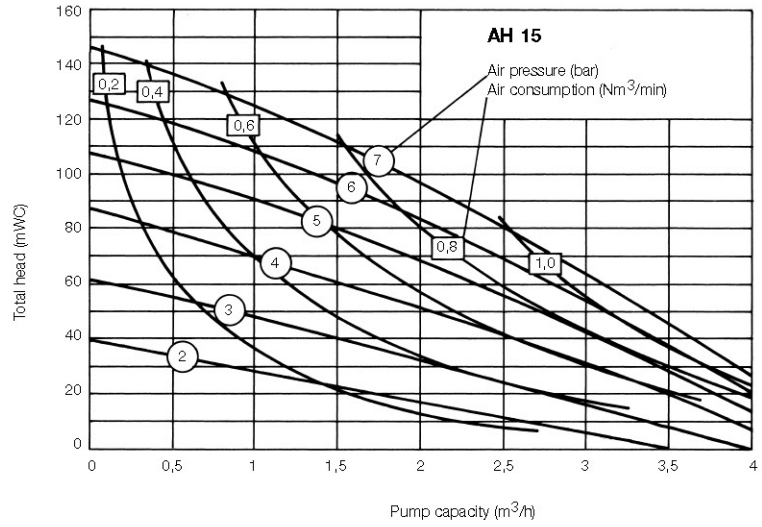


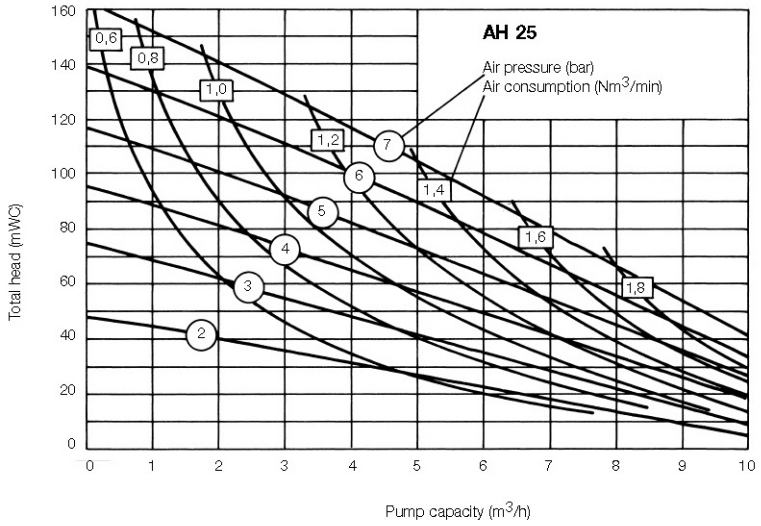
2. Technical data

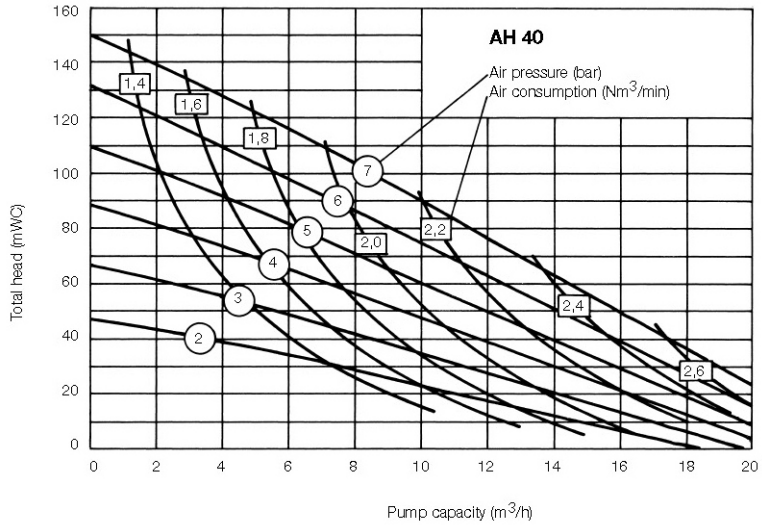
Size	AH 15	AH 25	AH 40
Dimensions (mm): length	282	382	490
width	179	256	296
height	320	400	534
Flange connections, port	DN 15/PN 16	DN 25/PN 16	DN 40/PN 16
Air connection	R 1/4	R 1/2	R 1/2
Weight (kg)	11	30	58
Max. particle size of solids (mm)	4	5	8
Suction lift, dry (mWC):			
EPDM/NBR-ball valves	3	5	5
PTFE- ball valves	1,5	2	2
Suction lift, wet (mWC)	9,5	9,5	9,5
Max. driving air pressure (bar)	7	7	7
Max. operating temperature (°C)	70	70	70
Sound pressure level acc. to DIN 45635, part 24, depending on the operating data [dB (A)]: driving pressure 3 bar	68-77	76-86	72-84
driving pressure 5 bar	68-84	78-88	74-85
driving pressure 7 bar	68-85	79-88	75-87

Performance charts

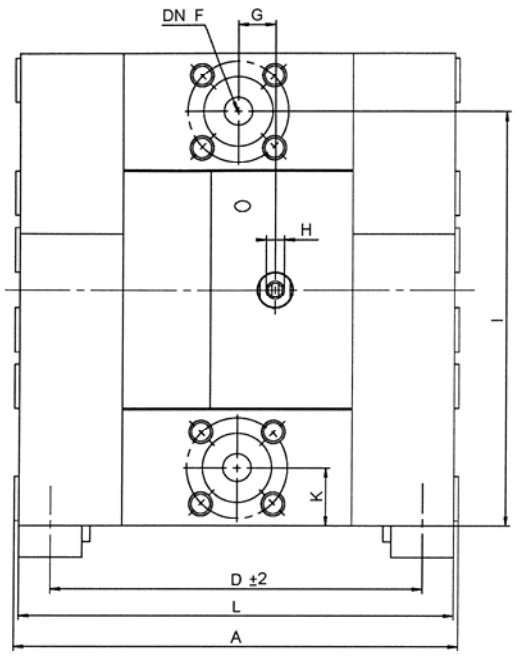
Performance data are in accordance with DIN EN ISO 9906. The data refer to water (20°C), without using of a pulsation damper.

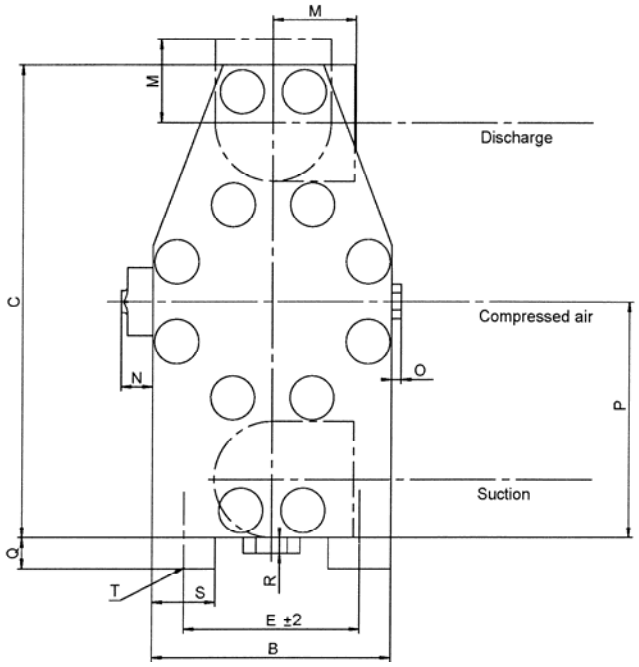






Dimensions (in mm)





	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S	T
AH 15	282	152	300	235	112	DN 15	24	1/4” BSP	263	37	276	53	21	6	150	20	10	40	M 8
AH 25	382	200	380	335	160	DN 25	36	1/2” BSP	336	44	376	56	48	8	190	20	12	40	M 8
AH 40	490	270	514	433	220	DN 40	47	1/2” BSP	454	60	484	70	18	8	257	20	12	50	M 10

3. Installing the pump

The number in brackets, which is added to every part mentioned in the following explanations, refers to its position in the spare part list and the exploded view.

3.1. Installation into the piping system

Each of the shock absorbers [11] the pump is standing on is equipped with a female thread at its bottom for easy installation of the pump. Before connecting the pump, the blind plugs have to be removed from the suction and discharge manifolds [2] as well as the air inlet [18].

3.1.1. Product ports

In general, the pumps have to be connected load free. Neglecting this causes leakage and maybe even damages. They cannot serve as a fixing point within a piping system. To avoid vibrations compensators on both sides of the pump are recommended. Alternatively, hoses for suction and discharge help absorbing vibrations. These would as well avoid the transfer of pulsation and noise onto pipes, tanks and other parts of a plant, besides the conveyance is more gentle. These hoses have to carry an appropriate armourment to avoid diminishing the diameter of the suction pipe by the vacuum the pump develops.

The nominal width of the connection pipes has to be chosen in accordance to the connections of the pump. A smaller piping can cause cavitation (suction line) as well as a loss of performance (suction and discharge line). In case the pipe is too big, the dry suction capacity of the pump can decrease. Using flanges according to DIN DN 15/25/40 PN 16, the suction line has to be connected to the lower manifold [2], the discharge to the upper one. The position of the manifolds can be varied in steps of 90° for a horizontal or vertical connection. To do so, the corresponding two housing bolts [10] have to be taken out beforehand. After turning the manifold [2], the bolts have to be fixed and tightened again.

Seal the suction line diligently to avoid air intrusion. A suction line continuously rising will prevent the formation of air locks in the line which would affect the suction lift.

If pressurised air chambers are positioned beyond the pump discharge, these have to be disconnected from the pump by non-return valves. As the ALMATEC high pressure pumps regulates itself automatically according

to the pressure of the filter press, additionally influencing the pump by a pressurised regulated air chamber cannot be permitted on principle.

3.1.2. Connecting the air supply

The air inlet [18] is located in the middle of the center blocks [16]. To supply the pump with driving air sufficiently, an appropriate diameter of the air supply line is required, at least the same nominal size as the air inlet of the pump (AH 15: 1/4", AH 25/40: 1/2"). We recommend to connect the pump via a hosepipe with adapter and sealing. If this is not available, a direct connection via pipe thread and sparingly attaching some sealing tape is possible. Please note: The air inlet [18] is made of plastic to protect the center block [16], seal in carefully. Take care that no dirt or particles can intrude into the pump during the connection, as these can accumulate inside the pump and can cause malfunctions. An air filter [19] directly behind the air inlet [18] prevents the entry of bulk particles.

The following regulators should be included in the air supply line:

- Pressure regulator with maintenance unit/separator for condensed water (**no** oil supply)
  The pressure regulator is used to adjust the final pressure the press will stop at. As a rough orientation a doubling pressure can be assumed, e. g. with 5 bar air supply, the pump will stop at a pressure of 10 bar inside the filter press. Please note: The time required for pressing increases along with the pressure. A higher pressure means a more dry filter cake and higher stress for all materials involved. A general guiding value cannot be given, the correct pressure has to be found out for every single application.
- Air throttle (e.g. needle valve)
  This is helpful to limit the flow rate when starting to fill the press (without limiting the velocity, the pump will start very fast which results in a lower quality of the filter cake and increased wear of the pump). At the choice of the valve a sufficient pass-through capacity of the valve as well as an easy fine tuning has to be taken care of.

Besides, the following elements can be installed in the air supply line:

- Solenoid valve: depending on the automatisation; optimally installed before the pressure regulator, as mostly regulated.
- Micro filter: protects the pump from remains of dirt and oil in the compressed air. A micro filter can replace an air maintenance unit.
- Pressure relief valve: prevents irregular regulation of the pump and filter press.

The integrated air control system *PERSWING P*® is a precision-control that requires oil-free, dry and clean compressed air for optimal function. The quality of the driving air for the pump depends on the operating conditions (e.g. flow rate at the beginning, final pressure of the filter press). For a rough orientation, we recommend to lean against the following quality classes of ISO-DIS-8573-1: solids - class 2, dew point - class 4-3, oil - class 3. Eventual icing of the muffler or the whole pump most often results from insufficiently dried driving air. A muffler [20] soiled after short period of operation indicates soiled driving air which can be helped by a micro filter chosen according to the max. air flow. In humid surroundings, icing from the outside may occur despite the driving air is dried. If so, a prolonged waste-air-exhaust (ca. 500 mm by pipe or hose) can be helpful. When installing the pump into boards or cabinets, it has to be ensured that cold air does not get caught behind the muffler. ALMATEC high pressure pumps do not require any lubrication. It has to be secured, that no oil can enter the pump.

3.2. Start-up and operation of the pump

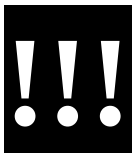
When starting to install the pump, the housing bolts [10] have to be tightened. This has to be done before the pump develops a decent discharge pressure. The bolts [10] should be tightened crosswise and alternately starting with those arranged in the circle of the diaphragm. The aim of this is to work against the effect of housing parts "settling" after manufacture (e.g. during transport) because of varying temperatures.

The housing bolts [10] have to be fixed according to the torque data of the following schedule. At the beginning, the bolts need to be checked regularly and fixed if necessary. It can also be necessary after longer periods of stoppage, at extreme temperature variations, after transport and dismantling the pump. Once the pump is leaking because of insufficient tension of the bolts, it cannot be sealed completely by just tightening the bolts without cleaning the surfaces. The pump has to be opened and the sealing surfaces have to be cleaned carefully. Especially the round sealing groove in the side housing [1] needs to be cleaned diligently.

Size	**AH 15**	**AH 25**	**AH 40**
Torque values for housing bolts (Nm)	8	13	17

The pressure of the driving air should be limited to the amount required to meet the performance needed. Excessive pressure increases both the air consumption and the wear of the pump. The pump is regulated by tuning the flow rate of the air. An empty pump has to be driven slowly (e.g. via a needle-valve). The pump starts automatically. Pumps of the series AH are self-priming when dry, thus it is not necessary to fill the suction line of the pump. The suction lift capacity of a liquid-filled pump, however, is much higher. The pump is appropriate for running dry during slow operation. Dry running at high stroke frequency causes premature wear. The maximum permissible stroke frequencies can be found in the following table. The pumps can briefly (up to max. one hour) be operated against a closed discharge line. Throttling on the suction side may damage the pump.

Size	**AH 15**	**AH 25**	**AH 40**
Max. number of strokes/min. at nominal performance	240	160	140



- Before putting the pump into operation as well as after some hours of pumping, the housing bolts [10] have to be fixed according to the torque data of the following schedule, as the elements of construction "settle". Fixing the bolts is necessary as well after periods of stoppage, at temperature variations, after transport and dismantling the pump.
- Pressure tests of the plant a pump is included in may only be carried out with the pump disconnected from the pressure on both ports or by using the pressure the pump develops while operating. The load of a pressure in the plant may damage the pump.
- The pump must not be operated with a positive suction pressure.
- Depending on the conditions of operation, the liquid conveyed might escape from the pump through the muffler in case of a diaphragm rupture.
- The state of the muffler has to be inspected regularly, as a blocked muffler can be forced out of the pump. If this happens, damages of properties and/or persons cannot be excluded.
- If your product tends to sediment, the pump has to be flushed regularly.
- When blowing out the filter press, the pump has to be protected against the pressure by a valve or a slide.
- The relevant effective security advises have to be respected.
- Pumps of the AH-Series must not be submerged.
- Pools of liquid which appear in the near outer area of the pump have to be inspected on danger potential, if necessary safety measures are to be taken.
- Chemical and biological reactions in the product chamber of the pump (mixture of different substances) and the freezing of the liquid have to be avoided.
- Especially when deliver critical liquids, wear parts, like diaphragms, should be replaced within a preventive maintenance.
- The use of non-original ALMATEC spare parts and structural changes lead to the lapse of the warranty immediately. When operating such a pump, damages of properties and/or persons cannot be excluded.
- The operation of the pump with nitrogen as driving gas is possible. In closed rooms sufficient ventilation must be provided.
- According to the requirements of our 14001-certification, every unit which is send to ALMATEC for diagnosis or maintenance reasons has to be accompanied by a filled out decontamination-sheet. Otherwise a processing is not possible. The decontamination-sheet is enclosed to this manual. Please pay attention to the further safety regulations.

The ideal combinative effect of ALMATEC high pressure pumps and filter presses is illustrated very well by the automatic adaptation to pressure and flow rate. When beginning to fill the empty press, the low discharge pressure results in a high flow velocity for fast filling. Because of the pressure of the press increasing along with the amount of sludge inside, the flow rate of the pump automatically reduces until standstill at final pressure without any regulating or additional security devices. In contrast to a mechanically driven diaphragm pump, the ALMATEC high pressure pump stops itself without any further air consumption. This "integrated" automatic regulation permits operating the pump within its capacity without any danger of over-pressure.

4. Disassembly of the elements of construction

The general design of the ALMATEC high pressure pumps is simple. Every pump comes along with a mounting tool for the air-valve system [22]. Further special tools are not required.

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- Take care that the pump has been emptied, rinsed and cut off from the air-supply before starting to dismantle the pump.
- Please respect the relevant additional security advises, if the pump has been used for aggressive, dangerous or toxic liquids.

Take out the muffler [20] installed onto the center block [16] before dismantling the pump to protect it against damages during the disassembly.

4.1. Side housings and manifolds

After taking the plugs out of the side housings [1] the housing bolts [10] are accessible. At first, loosen those bolts [10] at the top and at the bottom using a wrench and take them out. After that, unscrew the remaining housing bolts [10] and draw them out to the left until they are left of the right hand side diaphragm [14]. Now, the right side housing [1] can be taken away (if necessary carefully help it move with a rubber hammer). Draw out both manifolds [2] and remove the O-rings [8,9].

4.2. Suction and discharge valves

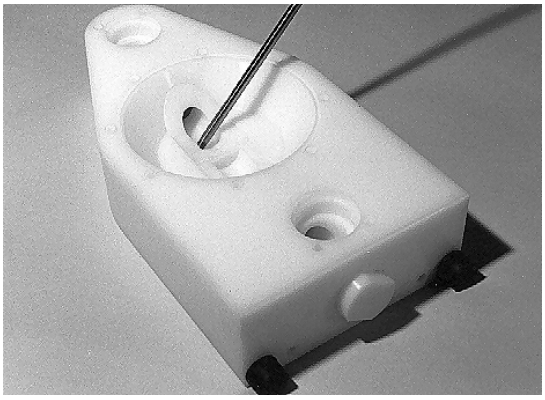


Image 1

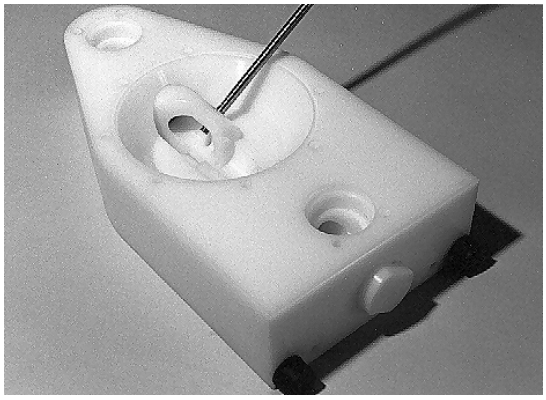


Image 2

Lay down the side housing [1] on its outer surface. Turn the discharge valve [5] along its longitudinal axis by 180° using a suitable round bar (Image 1). After ca. 70° change the bar to the other side of the discharge valve [5] (Image 2) and keep on turning the remaining 110°. Take care not to damage the sealing surface for the diaphragm (V-groove) during this. Draw the discharge valve [5] downwards and take it out (Image 3). withdraw O-Ring, valve [37]. The discharge valve ball [15] can be taken out easily now. The valve stop [6] can be shoved downwards to take it out (Image 4).

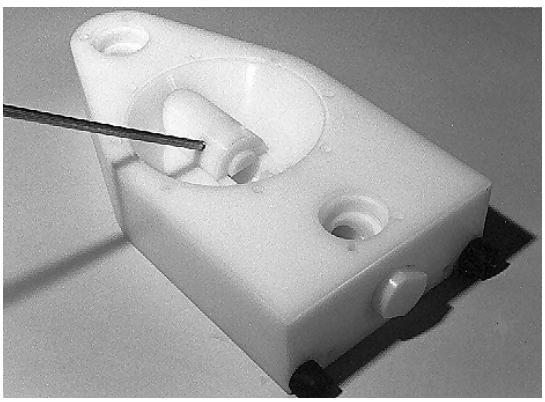


Image 3

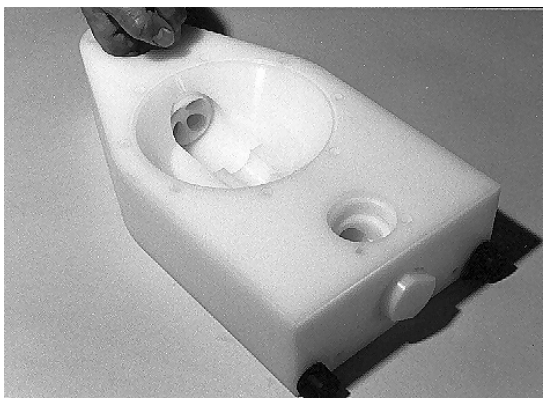


Image 4

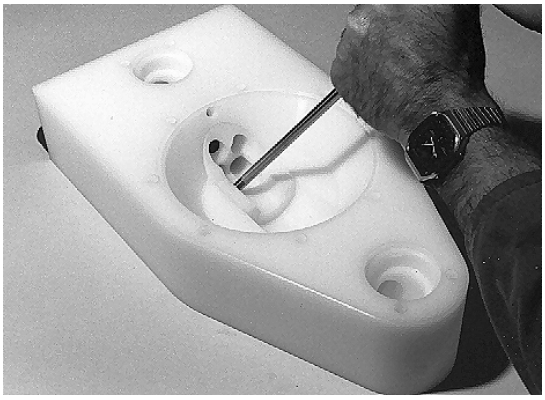


Image 5

Turn the side housing around for 180°. Insert a round bar into the bore whole of the suction valve [3] (Image 5), draw it out of its seat and take the valve as well as the suction valve ball [15] out. Grabbing into the bore for the suction manifold, the valve seat [4] can be pushed downwards to take it out (similar to valve stop, discharge). Draw of O-Ring, valves [37].

4.3. Diaphragms

After following the instructions above you will now have a unit consisting of the left side housing [1] the center block [16] and the dual stage housing [12] with the housing bolts [10] partly torn out to the left.

To disassemble the diaphragms [14] reach behind the right diaphragm [14] and screw it off the shaft [29]. Take out the diaphragm disc [38] afterwards. Insert two long suitable screws (e.g. two housing bolts) into the threaded bores of the supporting disc [21] for approximately 10 mm. Position a round bar as a handle in between them and loosen the supporting disc (do not yet screw off completely) (Image 6). Take the remaining housing bolts [10] out of the left side housing [1] and remove the housing (disassembly of the suction and discharge valves as described above [4.2]). Turn off the left diaphragm [14] as well.

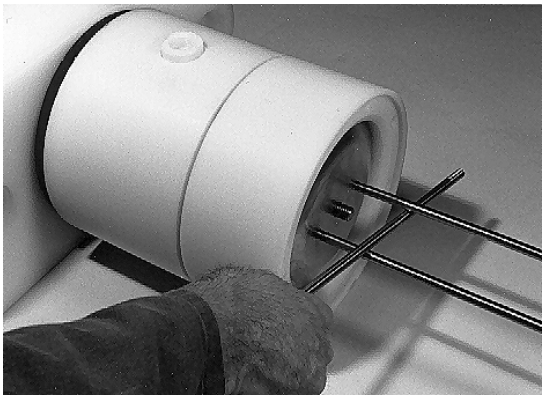


Image 6

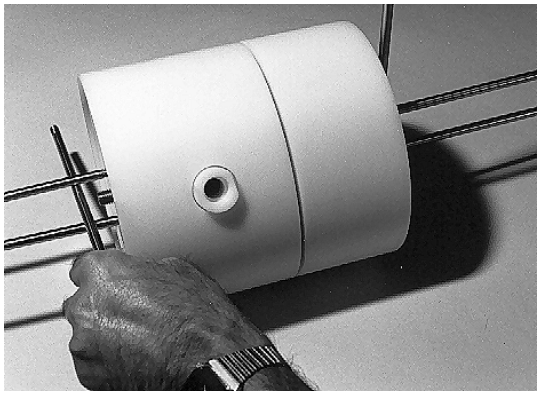


Image 7

Now, a supporting disc [21] is visible on each side which can be disassembled as follows: Screw two suitable screws (e.g. two housing bolts) as well approx. 10 mm deep into the threaded bores of the on the left side hand supporting disc [21]. Attach a round bar in between those to unscrew the supporting disc [21] on the right and to fix the other disc (Image 7). Shove the shaft [29] into the right side and unscrew the other supporting disc [21] as well. Take out the shaft [29] and separate the center block [16] and the dual stage housing [12]. Take care not to damage the O-Ring dual stage bushing [33] when disassembling the shaft [29], lead the thread through this O-Ring by screwing.

4.4. Dual stage housing

The dual stage housing [12] is the smaller of both blocks in the middle of the pump. Loosen the dual stage bushing [13] along with the dual stage piston [32] from the dual stage housing [12] and push the dual stage piston [32] out of the dual stage bushing [13]. Take out the shaft bushing, short [30]. The sealing elements [31,33,34,35] have to be replaced in case they are soiled or damaged. As far as the piston rings are concerned, we refer to their own chapter 4.5.1. within this manual.

4.5. Center block

Take the shaft bushing, long [36] out first and lay the center block [16] plainly onto a soft base (do not damage the sealing edges!).

4.5.1. Shaft piston rings

Remove both parts of the shaft piston rings [17] from their grooves carefully (do not damage the edges in the center housing) A re-assembly of the same piston rings is impossible; they have to be replaced. Handle the piston rings in the dual stage housing the same way.

4.5.2. Air control system *PERSWING P®*

Screw off both end caps of the PERSWING P® air control system using the plastic mounting tool delivered with the pump. Take out main and pilot piston. Press out the air-valve housing with the mounting tool turned around.

4.5.3. Air filter

To take out the air filter [19] the air inlet [18] has to be screwed off first, afterwards the filter [19] can be unscrewed easily with a big screw driver.

5. Assembly of the elements of construction

5.1. Center block

5.1.1. Air control system *PERSWING P®*

To install the air control system *PERSWING P®*, first screw in one end cap flushly into the center block [16]. Insert one of the six O-rings, air-valve housing [24] into the end cap from the inside. Moisten the four O-rings [24] of the air-valve housing with a bit of water and push the housing into the center block [16] using the mounting tool. Take care that it slips in softly. Do never insert the housing violently with a hammer. In case the housing cocks or hardly gets in, take it out again completely and start again. Insert the main piston and the pilot piston. Lay the sixth O-Ring [24] on the edge of the air-valve housing and screw in the second end cap.

5.1.2. Shaft piston rings

The O-Rings located underneath the piston rings [17] have to be installed first. A re-assembly of the used piston rings is impossible; they have to be replaced! To assemble piston rings [17], carefully shape them like kidneys with locking ring pliers and insert the rings into the grooves in the center housing [2]; completely press the rings into the grooves smoothly using a clean housing bolt [10]. Insert the shaft bushing, long [36] on side of the center block were the big O-Ring dual stage bushing [35] is located.

5.2. Dual stage housing

Install piston rings [rings and O-Rings,17] as described. Insert the shaft bushing, short [30] on the side of the big O-Ring dual stage bushing [35]. Insert the O-rings, dual stage bushing into their grooves in the dual stage housing [12] respectively the center block [16]. Lay the dual stage bushing [13] into the dual stage housing [12] and afterwards insert the dual stage piston [32] with the conic side at first (corresponding to the shape of the dual stage housing [12]) into the dual stage bushing [13].

5.3. Diaphragms

At first, the center block [16] and the dual stage housing [12] have to be put together and the shaft [29] has to be shoved in rotatingly with care. The threads on both sides of the shaft differ in their lengths. Screw the first supporting disc [21] onto the shaft [29] up to its block at the side where the thread is the shorter. Attach the

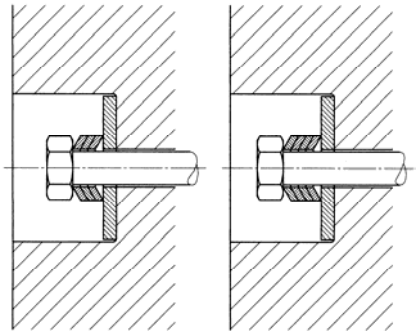
other supporting disc [21] tightly on the other end and tighten the fist disc as well (for tightening the discs, follow the disassembly instructions 4.3). Take the screws used for fixing (e.g. two housing bolts) out of the supporting discs [21]. Align the bore holes in center block [16] and dual stage housing [12]. Put on the diaphragm discs [38] on both sides.

Screw a diaphragm [14] on one side onto the shaft [29] until it blocks. Take care that the bore holes for the housing bolts are aligned between the diaphragm [14], the center block [16] and the dual stage housing [12]. Insert three housing bolts [10] carefully as an assembly auxiliary. Push the diaphragm [14] into the center block [16] resp. dual stage housing [12] as far as possible. Screw the second diaphragm [14] up to its block onto the other end of the shaft (watch out for all bores to be aligned, if necessary, slightly turn back the diaphragm). Shove in the remaining housing bolts [10] finally.

The sealing surfaces of the diaphragms [14] and the side housings [1] have to be absolutely clean and undamaged; mere small scratches can cause leaking.

5.4. Suction and discharge valves

The inner parts of the side housings [1] have to be re-assembled exactly vice versa to the way described for the disassembly. Ensure that the suction [3] and discharge valves [5] are pushed into their extreme position and that the bores in the side housings [1] (at the bottom of the liquid camber) and the suction valves [3] fit to each other.



5.5 Housing bolts with spring washers

When assembly the housing bolts pay attention to the correct arrangement of the spring washers. The pump sizes AH 15 / AH 25 have 3 spring washers on both housing bolt sides and the AH 40 have 4 pieces. The arrangement represented in the drawings makes an improvement of power and way possible. Already used spring washers may not be installed again.

5.5. Side housings and manifolds

All the sealing elements [8,9] of the manifolds [2] should always be replaced, moisturising the rings helps to ease the assembly. Draw the inner O-Ring [9] onto the manifold [2] and press the outer O-Ring [8] into the side housing [1]. Set the manifolds [2] on the plainly lying side housing [1] slightly rotating them. Put the central unit mounted before [center block, dual stage housing, diaphragms, housing bolts] and the side housing [1] lying on its side with the manifolds [2] standing upwards together, namely in the way that the air inlet [18] ends up right of the dual stage housing [12].

Mount the second side housing [1]. Now, both the upper and lower pair of housing bolts [10] can be inserted. Attach nuts and washers to the ends of the bolts and fix the housing bolts [10] crosswise evenly according to the given torque values until the side housings [1] are situated on the center block [16] respectively the dual stage housing [12]. Any further tightening of the bolts does not improve sealing but can deform the housing!

Finally screw the muffler [20] into the center block [16]. The pump can be operated now.

6. Testing advises

6.1. Air valve

The correct function of the air distribution can easily be checked for an assembled center unit consisting of a center block [16] completely and dual stage housing [12] equipped with all inner parts: Attach the air supply. Move the pilot piston back and forth while the bores where the air leaves the center block [16] are blocked. Now, the switching and the movement of the main piston have to be audible.

6.2. Correct function and sealing

The fully assembled ALMATEC high pressure pump has to be equipped with an air supply as well as temporary suction and discharge lines both leading to a water containment. The dry suction capacity can be checked with a vacuum gauge by closing the suction line carefully complete. Slowly closing the discharge has to cause standstill of the pump. The pressure in the discharge line has to correspond to the air pressure (Attention: the maximum permissible air pressure is 7 bar; which evokes a max. operating pressure of 15 – 16 bar!). The pump switches to the other product chamber by scarcely opening the discharge for a short time. No liquid may escape from the pump in both positions. After finishing the test, the air supply has to be closed at first, after that the discharge line has to be opened slowly to let the pump empty itself while the suction line is opened.

7. Troubleshooting

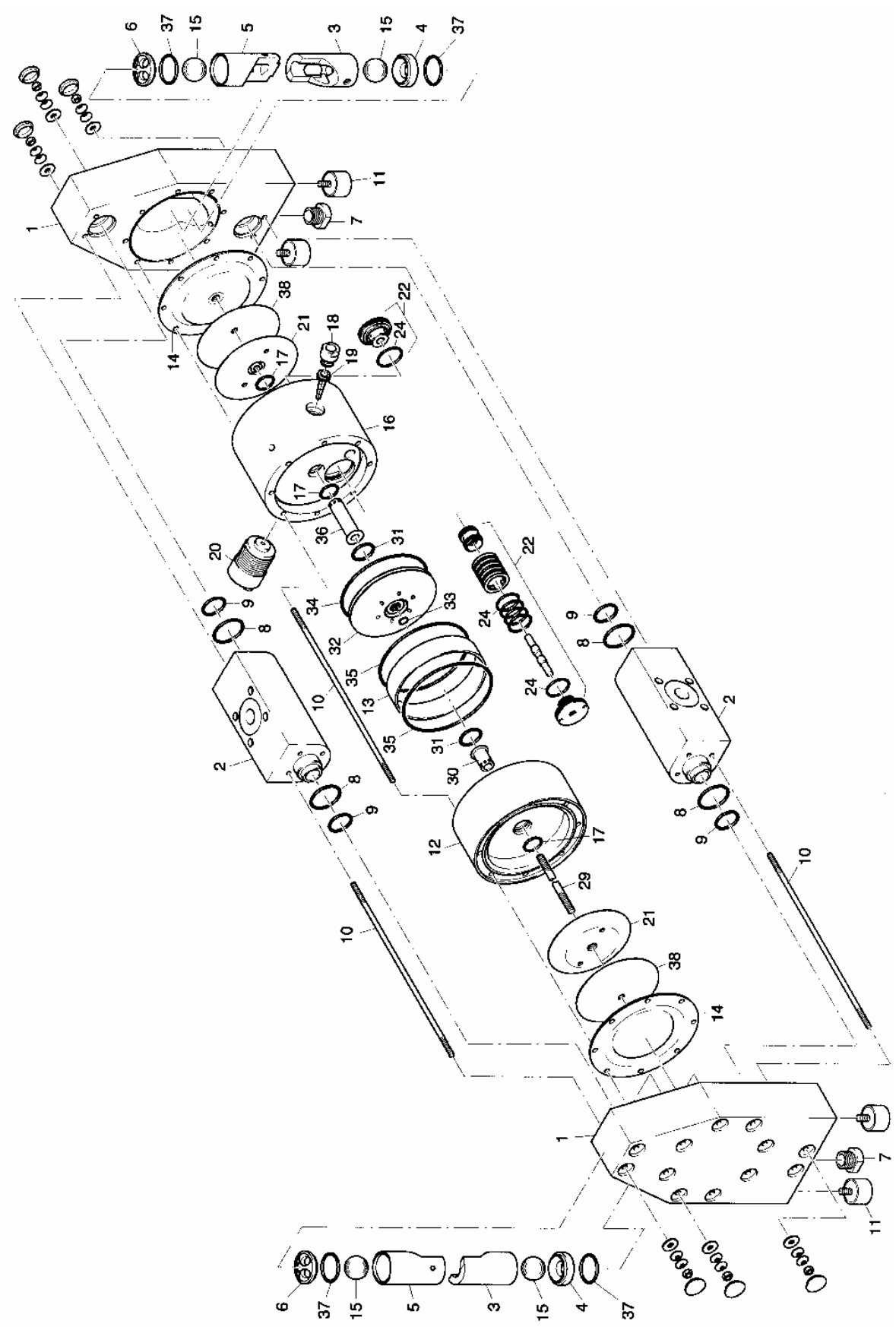
Failure	***possible reasons***
Pump does not start:	Air supply line blocked, air filter soiled and blocked, muffler soiled and blocked, pump blocked by sedimented solids in the chambers of the pump, air valve defective.
Pump works, but does not suck in liquid:	Suction line leaky, suction line blocked, plug leaky, ball valves blocked, ball valves worn.
Pump works irregularly:	ball valves blocked, air valve worn, piston rings worn, diaphragm rupture.
Flow rate decreases:	Air valve frozen in, drop in air pressure, suction line blocked, discharge line blocked, air filter soiled and blocked, muffler soiled and blocked, ball valves worn, change in viscosity of the liquid conveyed.
Air within the liquid:	Diaphragm rupture.
Liquid leaves the pump via the muffler:	Diaphragm rupture.
Pump stops working:	Air valve frozen in, drop in air pressure, discharge line blocked, air filter soiled and blocked, muffler blocked or frozen in, pressure inside the system exceeds air pressure, air valve defective, diaphragm rupture.

8. Spare part list

Pump size				AH 15	AH 25	AH 40
Item	**Piece**	**Description**	**Material**	**Part-No.**	**Part-No.**	**Part-No.**
1	2	Pump housing	PE UHMW	3 15 110 52	3 25 110 52	3 40 110 52
2	2	Suction/discharge port	PE UHMW	3 15 011 52	3 25 011 52	3 40 011 52
3	2	Suction valve	PE UHMW	3 15 013 52	3 25 013 52	3 40 013 52
4	2	Suction valve seat	PE UHMW	3 15 014 52	3 25 014 52	3 40 014 52
5	2	Discharge valve	PE UHMW	3 15 015 52	3 25 015 52	3 40 015 52
6	2	Ball retainer	PE UHMW	3 15 016 52	3 25 016 52	3 40 016 52
7	2	Plug	PE UHMW	1 25 017 52	3 25 017 52	1 40 017 52
8	4	O-Ring, ports, outside	EPDM	9 37 528 72	9 42 540 72	9 65 516 72
9	4	O-Ring, ports, inside (code EEE/ENN)	EPDM	9 33 526 72	9 33 526 72	9 51 513 72
		O-Ring, ports, inside (code ETT)	FEP/FKM	9 33 553 59	9 33 553 59	9 50 554 59
10	12	Housing bolt	1.4301	3 15 120 22	3 25 120 22	3 40 120 22
11	4	Shock absorbers	NR	1 15 322 85	1 15 322 85	1 40 322 85
12	1	Dual stage housing	PA	3 15 148 53	3 25 148 53	3 40 148 53
13	1	Dual stage bushing	PETP	3 15 049 84	3 25 049 84	3 40 049 84
14	2	Heavy duty diaphragm (code EEE)	EPDM	3 15 031 72	3 25 031 72	3 40 031 72
		Heavy duty diaphragm (code ENN)	NBR	3 15 031 71	3 25 031 71	3 40 031 71
		Heavy duty diaphragm (code ETT)	PTFE	3 15 031 67	3 25 031 67	3 40 031 67
15	4	Valve ball (code EEE)	EPDM	1 25 032 72	3 25 032 72	3 40 032 72
		Valve ball (code ENN)	NBR	1 25 032 71	3 25 032 71	3 40 032 71
		Valve ball (code ETT)	PTFE	1 25 032 60	3 25 032 60	3 40 032 60
16	1	Center block	PA	3 15 140 53	3 25 140 53	3 40 140 53
17	3	Shaft piston ring, cpl.	PTFE	1 40 041 64	1 50 041 64	3 40 041 64
18	1	Air inlet	PETP	1 15 047 84	1 40 047 84	1 40 047 84
19	1	Air filter	PE	1 15 043 51	1 40 043 51	1 40 043 51
20	1	Muffler	PE	1 15 244 51	1 40 244 51	1 50 244 51
21	2	Supporting disc	AL	3 15 033 31	3 25 033 31	3 40 033 31
22	1	*PERSWING P*® air control system, cpl.	PETP	2 15 001 84	2 40 001 84	2 50 001 84
24*	6	O-ring, air valve housing	NBR	9 36 504 71	9 46 515 71	9 66 533 71
29	1	Shaft	1.4301	3 15 030 22	3 25 030 22	3 40 030 22
30	1	Shaft bushing, short	1.4301	3 15 035 22	3 25 035 22	3 40 035 22
31	2	O-ring, shaft bushing	NBR	9 24 514 71	9 30 510 71	9 36 591 71
32	1	Dual stage piston	AL/MS	3 15 034 31	3 25 034 31	3 40 034 32
33	1	O-ring, dual stage piston	FKM/NBR	9 10 507 74	9 12 506 71	9 17 557 74
34	1	Piston ring, cpl.	PE	3 15 037 52	3 25 037 52	3 40 037 52
35	2	O-ring, dual stage bushing	NBR	9 99 567 71	9 99 562 71	9 99 573 71
36	1	Shaft bushing, long	1.4301	3 15 036 22	3 25 036 22	3 40 036 22
37	4	O-ring, valves (code EEE/ENN)	EPDM	9 37 603 72	9 48 604 72	9 72 605 72
		O-ring, valves (code ETT)	PTFE	9 37 603 60	9 48 604 60	9 72 605 60
38	2	Diaphragm disc	PTFE	3 15 039 60	3 25 039 60	3 40 039 60
* included in item						

The serial number of the pump is required when ordering spare parts!

9. **Exploded view**



10. Optional equipments

ALMATEC high pressure diaphragm pumps are available with various optional equipments. These can be derived from the pump code.

10.1. Stroke counting (optional equipment code C)

10.1.1. Code C 2 / C 3

A sensor is installed in the center block of the pump to count the strokes. The diaphragm movement is scanned without contact by this sensor: a safe form of monitoring totally independent of external influences and the pump's mode of operation. The issued sensor pulses can be output to existing detectors or to a stroke counter (can also be supplied). When the preset value is reached, the stroke counter outputs a signal which can then be processed further, for instance in order to shut down the pump via a solenoid valve.

The stroke counting system is available in two variations:

- C 2 Stroke sensor (Namur), also for explosion-proof zone
- C 3 Stroke counting system complete with sensor and stroke counter

In case only the sensor is included (code C 2), it has to be connected to an existing controller with Namur inlet. The wiring diagram and technical data can be found on the electric units themselves. For further details, please refer to the data delivered by the manufacturers of the components. The controllers have to be installed in a suitable cabinet.

10.1.2. Code C 9 / C 10

Differently from the optional equipment codes C 2 - C 3, the strokes of the pump are registered pneumatically on the codes C 9 / C 10. The pressure switch registers the changes in pressure within the air chamber behind one of the diaphragms and it converts the pneumatic impulse into an electrical signal.

The pneumatic stroke counting system is available in two types:

- C 9 consist of:
  pressure switch, cpl. mounted, 1 – 10 bar
  socket with cable 5 m
  adaptor elbow NPT ¼ (or adaptor straight for pump sizes AH 15)
  hose DN 4/6, 2,5 m
- C 10 consist of:
  as C 9 and a stroke counter

For assembly screw the adaptor elbow (or adaptor straight for pump size AH 15) into the additional air connection of the pump (it is possible that the adaptor is already installed). The position of the air inlet of the pneumatic stroke counting is above the air inlet of the pump (do not mistake it). Link up the adaptor and the pressure switch with the hose. Connect the socket to the electrical connection plug of the pressure switch and the cable to existing registering devices (code C 9) resp. to the enclosed stroke counter (code 10). Technical data, connection schemes and further details can be found in the technical documentation delivered by the manufacturers of the pressure switch and the stroke counter.

The pneumatic stroke counting system requires a minimum air pressure of 1.5 bar for optimal function!

10.2. Diaphragm monitoring system (optional equipment code D)

Although ALMATEC diaphragms with integrated metal core are designed for an optimum service life, the diaphragm remains a wear part. If it breaks, liquid can leak into the center housing and possibly emerge through the muffler. This can be prevented simply and effectively with the ALMATEC diaphragm monitoring.

A capacitive diaphragm sensor is mounted in the muffler [20] of the pump, which registers any liquid approaching the sensor, no matter whether the liquid is conductive or not. Hence, a fast reaction to a damage of a diaphragm becomes possible. In case of humid surrounding air a false alert may occur despite operating the pump with dried compressed air.

The diaphragm monitoring system is available in two variations:

- D 1 Diaphragm sensor (Namur), also for explosion proof area
- D 3 Diaphragm monitoring system complete with sensor and controller

The diaphragm sensor can either be connected to an existing controller with Namur inlet (code D 1) or to the controller included (code D 3). The wiring diagram and technical data can be found on the controller itself. For further details, please refer to the data delivered by the manufacturers of the components. The controllers have to be installed in a suitable cabinet.

10.3. Spare part list optional equipments

					AH 15	AH 25	AH 40
Code	Item	Pc.	Description	Material	Part number	Part number	Part number
C 2	16	1	Center block for sensor	PA	3 15 340 53	3 25 340 53	3 40 340 53
	50	1	Stroke sensor, Namur	diverse	1 00 072 99	1 00 072 99	1 00 072 99
C 3			as C 2, but additional:				
	-	1	Clamp amplifier	diverse	1 00 171 99	1 00 171 99	1 00 171 99
	-	1	Stroke counter	diverse	1 00 071 99	1 00 071 99	1 00 071 99
C 9	16	1	Center block with additional air connection R 1/4”	PA	3 15 240 53	3 25 240 53	3 40 240 53
	-	1	Adaptor straight	PP	1 00 877 51	-	-
	-	1	Adaptor elbow	PP	-	1 00 875 51	1 00 875 51
	-	1	Hose	PE	1 00 876 51	1 00 876 51	1 00 876 51
	-	1	Pressure switch	diverse	1 00 972 99	1 00 972 99	1 00 972 99
	-	1	Socket with cable	diverse	1 00 973 99	1 00 973 99	1 00 973 99
C 10			as C 9, but additional:				
	-	1	Stroke counter	diverse	1 00 071 99	1 00 071 99	1 00 071 99
D 1	51	1	Diaphragm sensor, Namur	diverse	1 00 773 99	1 00 773 99	1 00 773 99
D 3	51	1	Diaphragm sensor	diverse	1 00 773 99	1 00 773 99	1 00 773 99
	-	1	Controller	diverse	1 00 470 99	1 00 470 99	1 00 470 99