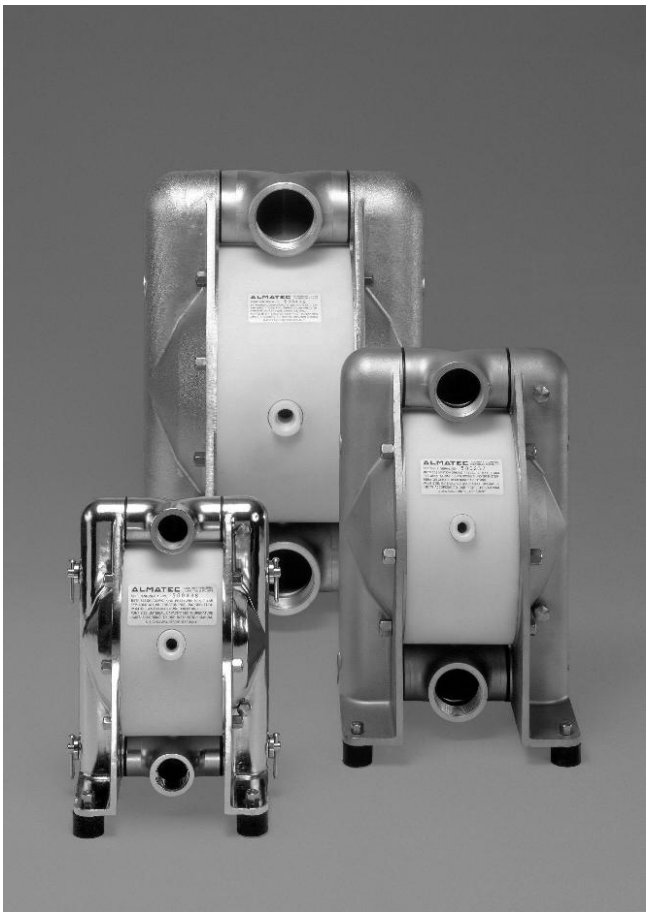
TECHNIQUES DES FLUIDES

ALMATEC® A DOVER COMPANY

Operating and Installation Instructions

AD Chemicor
AD 20 - AD 50



Metal Pneumatic Diaphragm Pumps

ought to be studied before installing the pump

Original Instruction

CE

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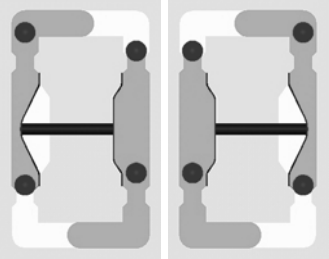
Introduction

ALMATEC air-operated diaphragm pumps are constructed according to the state of the art and they are reliable. Imminent danger by operating error or misuse can lead to damages of properties and/or persons. The pumps are to be applied for the intended use and in a safety-related proper condition only.

Each person working on the ALMATEC air-operated diaphragm pumps concerning installation, start-up, handling or maintenance has to read this manual completely and in an attentive way and has to follow all mentioned procedures and safety notes.

General description of the machine, appropriate use and residual dangers



The ALMATEC Chemicor pumps are oscillating positive displacement pumps and are based on the functional principle of double diaphragm pumps. The basic configuration consists of two external side housings with a center housing between them. Each of the side housings contains a product chamber which is sealed against the center housing by a diaphragm. The two diaphragms are interconnected by a piston rod. Directed by an air control system, the diaphragms are alternately loaded with compressed air so that they move back and forth. In the first figure, the compressed air has forced the left-hand diaphragm towards the product chamber and displaced the liquid from that chamber through the open valve at the top to the discharge port. Liquid is simultaneously drawn in by the right-hand diaphragm, thus refilling the second product chamber. When the end of the stroke is reached, it reverses automatically and the cycle is repeated in the opposite direction. In the second figure, liquid is drawn in by the left-hand diaphragm and displaced by the right-hand diaphragm.

The appropriate use of an Almatec air-operated diaphragm pump of the refers to the liquid transport taking into account the operation parameter mentioned in this manual and in compliance of the given terms for commissioning, operation, assembly, disassembly and maintenance.

Even if all necessary safety measures described in this manual have been met, a residual danger exists by leakages or mechanical damages. At sealing areas or connections liquid can be released uncontrollably then.

Storage

In general the ALMATEC pump is delivered operational and packaged. If the unit is not installed right away, proper storage conditions are important for a trouble free operation later. The pump has to be protected from wetness, coldness, dirtying, UV-radiation and mechanical influences. The following storage conditions are recommended:
- Steady ventilated, dust and vibration free storage room
- Ambient temperature between 15°C and 25°C with a relative humidity below 65%
- Prevention of direct thermal influences (sun, heating)

Code system

The ALMATEC Maschinenbau GmbH is certified as a modern, quality-orientated enterprise according to DIN EN ISO 9001:2008 and 14001:2005. Before release for dispatch, any pump of the Chemicor series 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.

As a general rule in the countries of the EU only such machines are allowed to take into operation, which are determined to meet the regulations of the EU machinery directive, the harmonized standards, European standards and the respective national standards. Hence the operator has to verify whether the ALMATEC pump manufactured and delivered properly according to the customers order meets the mentioned requirements.

Therefore make sure, before putting the pump into operation, that the pump and the used materials of construction are suitable for the provided application and the installation site. 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.

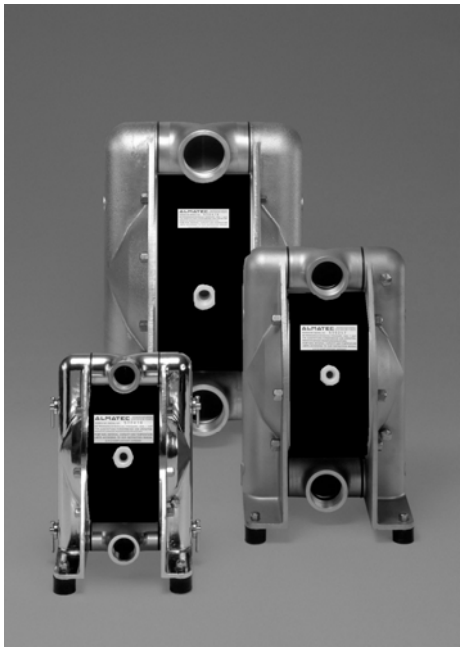
Example to clarify the ALMATEC Chemicor pump code:

AD 20 S E E - CD

Optional equipment:	BS	Barrier chamber system
	C	Stroke counting
	D	Diaphragm monitoring
	E	Center block in PE conductive
	N	Ports with NPT threads
	R	Draining system
	M/N1/N2/T	Special ports
Ball valve material:	E	EPDM
	N	NBR
	T	PTFE
Diaphragm material:	E	EPDM
	N	NBR
	T	PTFE/EPDM compound
Housing material:	S	Stainless steel 1.4408 (SS 316)
	H	Stainless steel 1.4408, polished
Size and port dimension:	20: R 3/4, 32: R 1 1/4, 50: R 2 (BSP)	

ALMATEC Pneumatic diaphragm pump, Series Chemicor

Operation in explosion-proof areas and for inflammable liquids (Reg.-No. PTB: 03 ATEX D004)



For inflammable liquids as well as for applications in explosion-proof areas, Chemicor pumps have to be equipped with a center section in conductive PE instead of the standard Polyamid block. The pump has to be grounded to one of the tapping holes located in the side housings. All other housing parts are connected to the side housing; therefore it is not necessary to ground single parts.

Grounded Chemicor pumps with conductive center section are suitable to be used in explosion areas of the category 2 and 3, atmosphere G/D, which are liable to the 94/9/EG. As well following electrostatic reasons, conductive diaphragms (liquid side) are suitable for transferring liquids of any explosion-group. When using non-conductive diaphragm materials, the following exemplary protection measures have to be respected:

- The pump is always used for the transfer of exclusively fluids which are conductive or soluble in water or
- Dry-running is avoided by action steps within the facility and/or its control or
- The system is inertisated in case of dry running by nitrogen, water, carbon dioxide etc. when the fluid transfer ends.

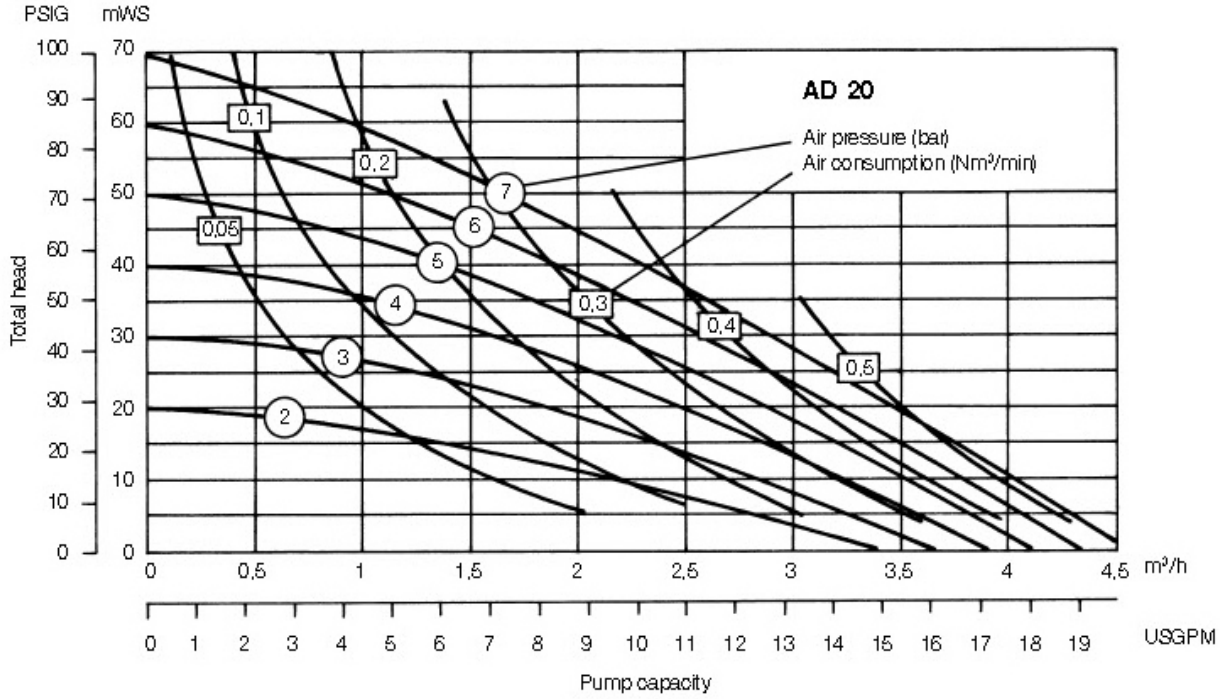
Piping systems and product connections have to be grounded separately. To avoid ignition hazards the formation of dust deposits on the pumps must be prevented. In explosion-proof areas repair working only after careful inspection of the practicability and only with appropriate tools. For the ATEX marking according to 94/9/EG please see the attached conformity declaration and the according pump label.

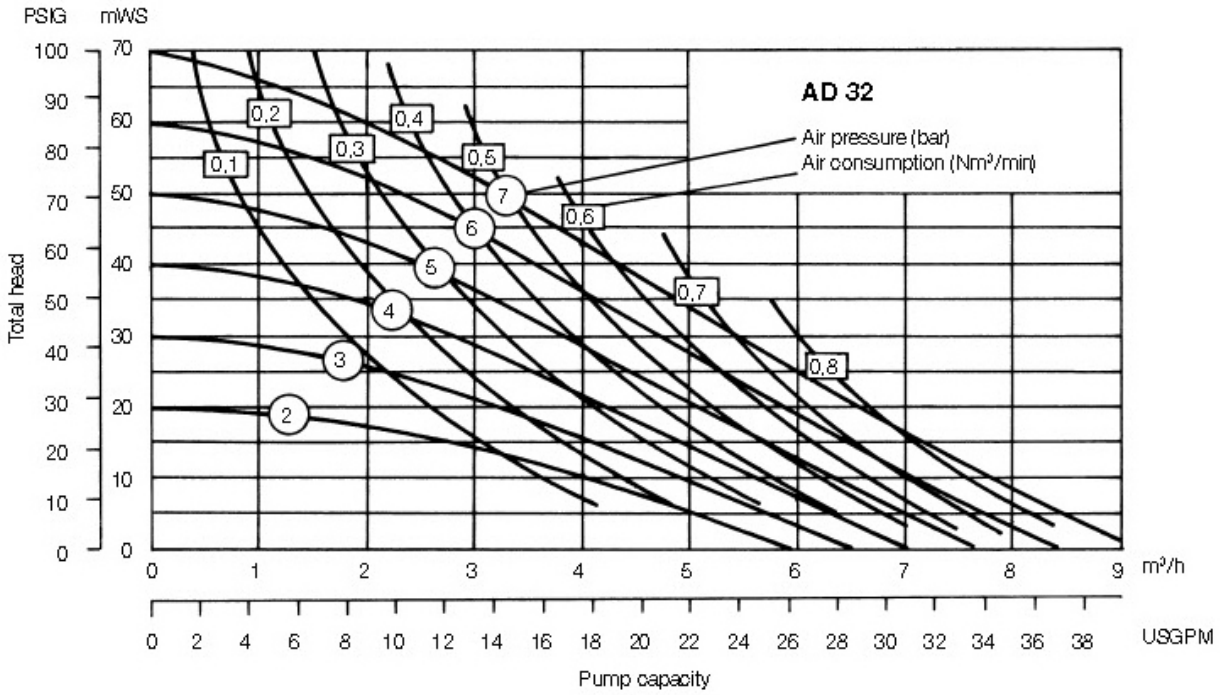
Technical data		AD 20	AD 32	AD 50
Dimensions (mm):	length	154	203	278
	width	150	200	270
	height	241	325	450
Nominal port size (BSP)		3/4”	1 1/4"	2”
Air connection (BSP)		1/4"	1/4"	1/2"
Weight (kg)		6	13	29
Max. particle size of solids (mm)		9	12	14
Suction lift, dry (mWC):				
	EPDM ball valves	2	2	3
	PTFE ball valves	1	1,5	2
Suction lift, wet (mWC)		9	9	9
Max. driving and operating pressure (bar)		7	7	7
Max. operating temperature (°C)		130	130	130
with center block in conductive PE (X)		80	80	80
with NBR equipment		80	80	80
Theoretical displacement volume per single stroke (l)		0,1	0,34	0,98
Sound pressure level acc. to DIN 45635, part 24, depending on the operating data [dB (A)]:	driving pressure 3 bar	68-71	69-71	63-65
	driving pressure 5 bar	73-75	71-75	64-68
	driving pressure 7 bar	74-78	73-76	69-74

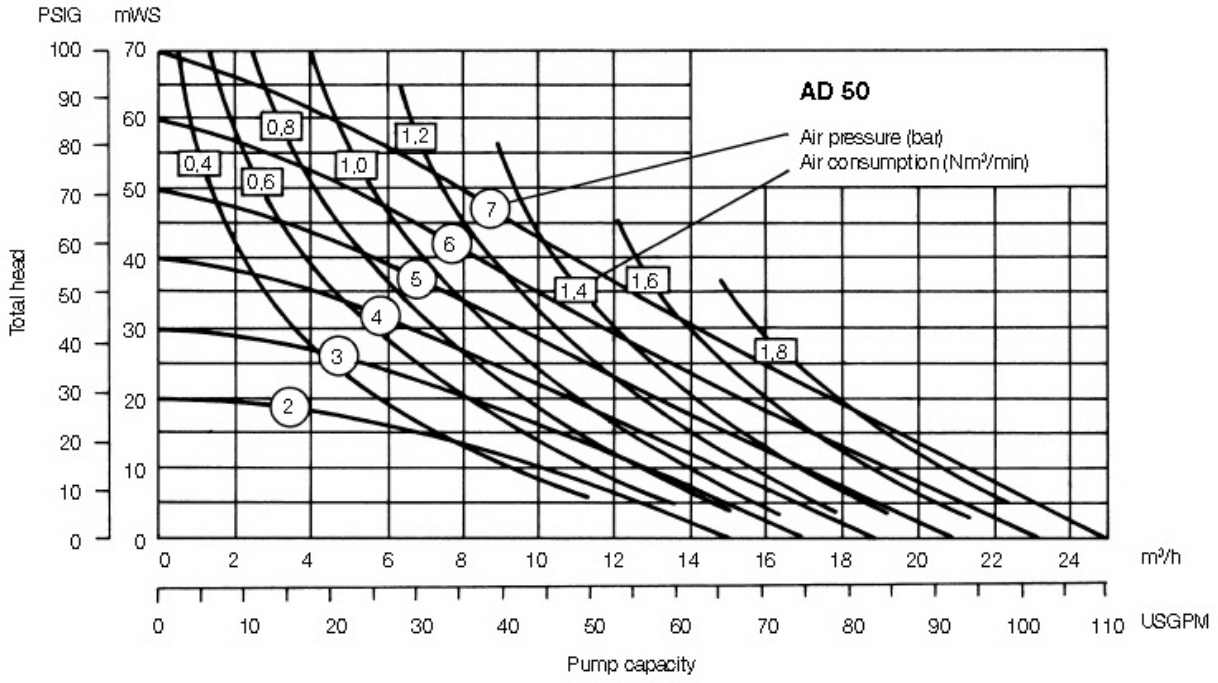
These technical data are for ALMATEC CHEMICOR pumps without optional equipment.

Performance charts

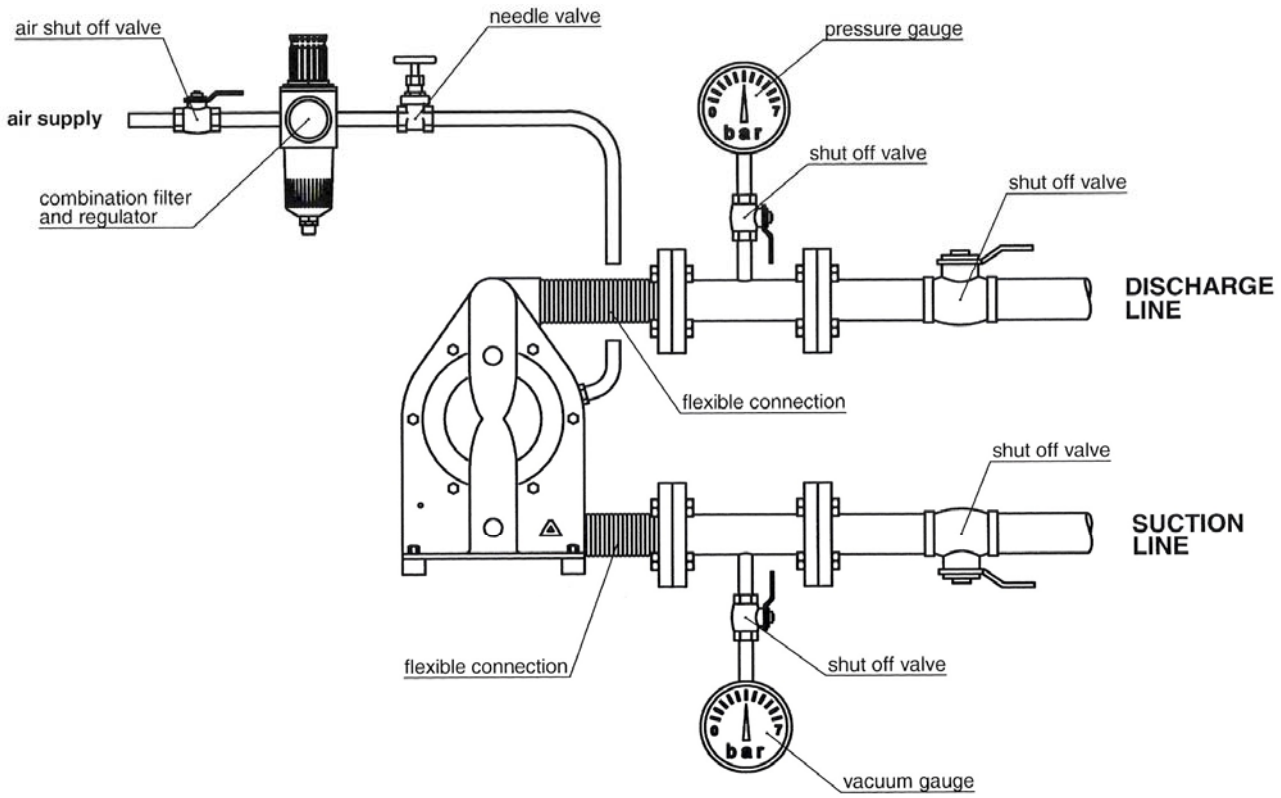
Performance data are in accordance with DIN EN ISO 9906. The data refer to water (20°C), without using of a pulsation damper.




PSIG
mWS
AD 32
Air pressure (bar)
Air consumption (Nm³/min)
0,1
0,2
0,3
0,4
0,5
0,6
0,7
0,8
2
3
4
5
6
7
Total head
m³/h
USGPM
Pump capacity


PSIG
mWS
AD 50
Air pressure (bar)
Air consumption (Nm³/min)
0,4
0,6
0,8
1,0
1,2
1,4
1,6
1,8
2
3
4
5
6
7
Total head
m³/h
USGPM
Pump capacity

Recommended installation



Installation and operation

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.

In general, the pump has to be connected load free. Neglecting this causes leakage and maybe even damages. To avoid vibrations, pulsation dampers and compensators are recommended. Before connecting the pump, take the yellow blind plugs out of the suction and discharge connections as well as the air inlet [18] in the center block [16]. Use threadseal only sparingly, otherwise the connections could be damaged.

The operator is responsible for an adequately stability and an appropriate fixation of the piping according to the state of the art. To facilitate the installation and maintenance shut off valves should be installed right before and after the pump. 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. Connect the suction line to the lower manifold [2] which can be swivelled carefully along its longitudinal axis into the position required. Seal the suction line diligently; hosepipes should be suitably armoured. A suction line continuously rising will prevent the formation of air locks in the line which would affect the suction lift. The discharge line has to be connected to the upper manifold [2] which can be swivelled along its longitudinal axis as well.

The air inlet [18] is located in the middle of the center block [16]. Before installation, make sure that the air supply pipe is free of solids. To supply the pump with driving air sufficiently, the pipe diameter should match the size of the air inlet. 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 integrated PERSWING P air control system is a precision-control that requires oil-free, dry and clean compressed air for optimal function. If humidity is expected, a water separator or air dryer has to be fitted to protect the pump from blocking by ice. The ideal condition is the dewpoint of air at -20°C. In humid surroundings, icing from the outside may occur despite the driving air is dried. If so, a prolonged waste-air-exhaust (ca. 500mm 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. In applications with a tendency to freezing at the waste air exhaust, good experiences in practise have been achieved by pre-heating the

driving air to increase the distance to the dew point of the air. Doing so, it has to be considered that the driving air temperature generally may not exceed 50°C to avoid expansion and sticking effects on the air side. This max. air temperature is a well valid when using a compressor producing warm air which is e.g. often true for truck compressors.

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. For a proper operation at the lower performance range the regulation via a needle valve is recommended. An empty pump has to be driven slowly (e.g. via a needle-valve). The pump starts automatically. Pumps of the Chemicor series 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 pumps can briefly (up to max. one hour) be operated against a closed discharge line. Throttling on the suction side may damage the pump. When the pump operation has been stopped by a closed discharge, the pressure equilibrium of the diaphragms must be ensured. This can be achieved by keeping the pump connected to the air supply pressure; for longer stoppage, the pump must be released from the pressure within the system on both fluid side and air supply side.

Torque values

Before putting the pump into operation as well as after some hours of operation, the housing bolts [8] 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. In case of temperature varying between extremes or high temperature difference between the liquid and the surrounding, the housing bolts should be controlled more frequently (interval proposals are available on request).

Size	AD 20	AD 32	AD 50
Torque values for housing bolts (Nm)	15	23	23

Safety hints

- Installation, operation, and maintenance by qualified staff only.
- Before start-up of the pump anyone should acquaint oneself with the explanations of the chapter troubleshooting (see pages 13/14). Only by this the defect quickly can be realized and eliminated in case of trouble. Problems which cannot be solved or with an unknown reason should be passed on to the manufacturer.
- Before any maintenance and service procedures arising on the pump or on the optional equipments, the complete installation has to be turned off and protected against accidental turn on. This is possible by a lockable emergency stop for the air supply of the pump. Additional a danger sign against restart should be attached.
- 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.
- 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 (in this case muffler has to be replaced). For further safety requirements the optional equipment diaphragm monitoring and barrier chamber system are recommended.
- In case of a diaphragm rupture, it might be possible fort he fluid pumped to intrude into the air side of the pump. In very adverse conditions - e.g. pressure within the fluid system during stopped air supply - the fluid might as well find its way into the air supply lines. To protect other devices like pulsation dampers or even pneumatic valves, it is recommended to protect the air supply line accordingly, e.g. via a non-return valve. This would as well avoid polluting the air supply line.
- 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 the product tends to settle, the pump has to be flushed regularly. For larger solids a filter has to be installed in the suction line.
- In case of delivery of hot liquids the wetted pump must not standstill for a longer time, because it could lead to temporary leaks in the valve area and to a blockade of the air control system.
- The relevant effective security advises have to be respected.
- 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.
- Before starting to disassemble the pump, take care that the pump has been emptied and rinsed. Both ports piping are to be closed and drained if applicable. Further the pump has to be cut off from any energy on the air and product side. If the pump is being deported from the plant, a reference about the delivered liquid has to be attached.
- Please respect the relevant additional security advices, if the pump has been used for aggressive, dangerous or toxic liquids (e.g. suitable protective equipment according to the safety data sheet of the liquid). In case of a diaphragm rupture, it is possible that residues of the liquid remain behind the diaphragms, in the area of the air control system and at the muffler, despite of several flushing processes. Hence, appropriate safety equipment according to the safety data sheet of the liquid is indispensable.
- Before putting the pump back into operation, the tightness of the pump has to be checked.
- Air-operated diaphragm pumps can lead to bruises when lifting, sinking or assembling them. Appropriate accessories and safety equipments are to be used. Big and heavy modules have to fixed and secured to lifting gears when transporting/replacing them.
- 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.
- Possible electrical connections (e.g. when using optional equipment with controllers) may be executed by a qualified person only. The regulations of the respective manufacturers are to be followed.
- At any work arising it has to be made sure that no explosive atmosphere can appear. Appropriate safety equipment is recommended.
- Procedure for pump return: 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.

Using as submersible pump

Consider the following advises when using a CHEMICOR pump as a submersible pump: When immersing an air- operated diaphragm pump, it must generally be ensured that the waste air is deducted above the fluid level with a pipe or similar. The pump must be located vertically upright to guarantee proper function. Minute leakage on the air inlet or outlet can block the air valve. The pump must be disconnected from the pressure within the system during standstill. When choosing the pump type, it must be taken into consideration that all external parts - even those non-wetted during standard operation - like covers, shock absorbers, connections etc. must be resistant to the fluid pumped. Please consider as well that depending on the material, the pump must be weight down resp. fixed.

Additional temperature hints

The temperature and pressure limitations listed on page 5 are solely based on mechanical temperature limits of the housing material used. Depending on the fluid pumped, the maximum safe operating temperature of the housing material can be reduced significantly.

A general aspect of lower temperatures is, that below 0°C cold-brittling of the elastomers used within the pumps can results in accelerated wear. Regarding the housing materials, please note that PE - other than PP - keeps its mechanical strengths at low temperatures and PTFE keeps mechanically stable as well for an extended temperature range. ALMATEC pumps can therefore be operated safely as well within low-temperature installations: However, with liquids below 0°C accelerated wear of internal parts has to be accepted. Moreover, freezing, bogging or crystallisation of the fluid pumped must be avoided, especially within the pump. Emptying the pump via the drainage system (optional equipment code R) may be a useful tool to assist this.

Please consider, that viscosity and specific gravity of most fluids change with temperature (most often increasing at lower temperature). Depending on the application, this fact may not only result in result in a reduced flow rate, the pump may even be unable to prime the thicker and/or “heavier“ fluid any more.

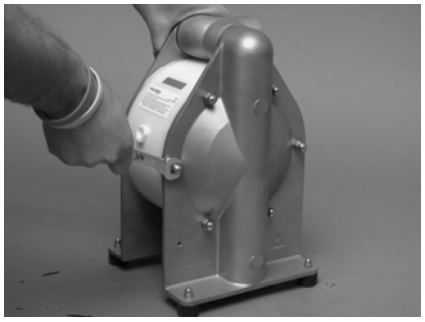
In case of varying application temperatures, the housing bolt tension has to be controlled very thoroughly, as variations like these can change the effective tension of the housing bolts via the different thermal expansion characteristics of single.

Providing spare parts

We recommend having spare part kits S on stock. These include the relevant spare parts for your pump.

Disassembly

When dismantling a pump the mentioned procedures and safety notes on the pages 8-10 have to be considered generally. The general design of the Chemicor pumps is simple. A plastic tool designed for the mounting of the air-valve [22] is delivered along with every pump. Further special tools are not required. Please find the part number for any part in the spare part list.



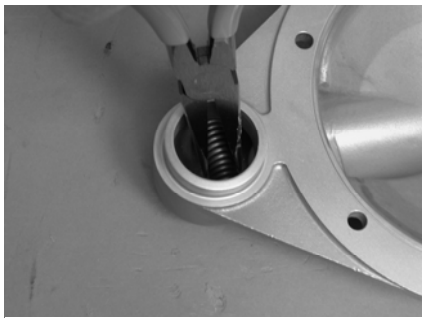
Loosen nuts of the housing bolts on one side of the pump.

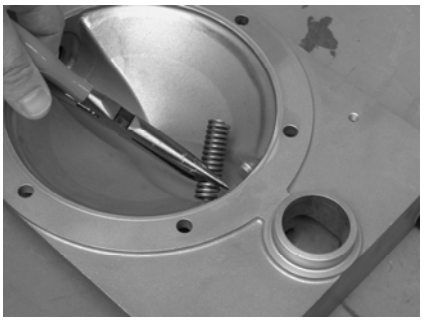


Remove side housing [1] and suction/discharge ports [2].



Draw the O-rings port outside [7] off the side housings [1]. Remove the inner O-rings [6] out of the ports [2].





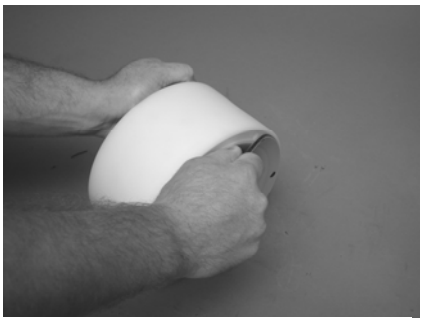


Remove the valve stops [3] and the ball valves [15] out of the side housings [1]. For the AD 32 and AD 50 the use of a screwdriver to remove the valve stops maybe is more convenient.

For pumps with back flushing system (optional equipment code R) only:
Take out the locking handle of the black flushing system [30]; draw off the pressure plate and the outer O-Ring and take out the ball lifter from inside the side housings [1]; withdraw inner O-ring.



Remove the center block [16] by gently pulling apart.



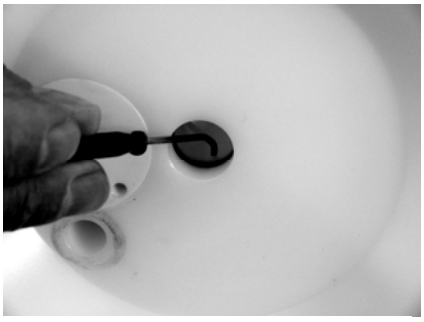
Screw one diaphragm [14] counterclockwise off the shaft [13].



Pull the other diaphragm [14] together with the shaft [13] out of the center block [16].



Screw out the set screws, shaft [13a].



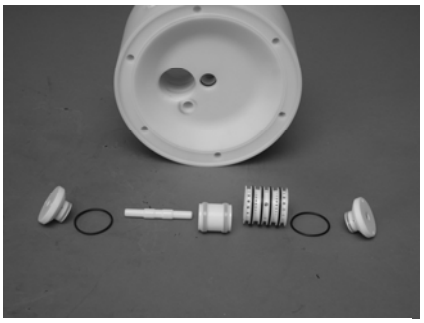
Remove both parts of the shaft piston rings [17] from their grooves carefully (do not damage the edges in the center block; a re-assembly of the same piston rings is impossible; they have to be replaced). Unscrew the muffler [20], the air inlet [18] and the air filter [19] out of the center block [16].



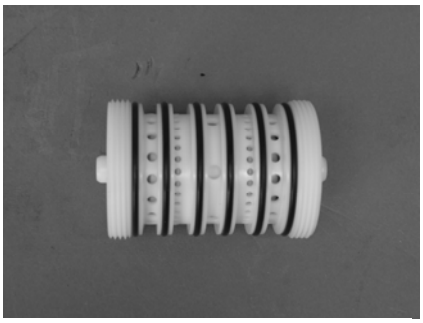
To remove the PERSWING P air control system, screw off both end caps using the plastic mounting tool delivered with the pump. Take out main and pilot piston.



Push out the air-valve housing with the mounting tool turned around.



The disassembled PERSWING P air control system.



Complete air valve assembly.

Hints and tips for reassembly

The re-assembly of the components is principally carried out vice-versa to the dismantling. Here are some additional references.

For the installation of the PERSWING P air control system, 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. Moisture 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.



To install a new piston ring [17], carefully shape it like a kidney (see picture on the left) and with locking ring pliers and insert the ring into the groove in the center block [16]; completely press the rings into the grooves smoothly using some round tool.

Insert the inner O-rings [6] in the manifolds [2] carefully (bending the rings absolutely has to be avoided! Moisturising the rings and twisting them carefully may be helpful). Mount the outer O-rings [7] onto the ledges of the side housings [1].

Screw in set screws, shaft [13a] into the diaphragms [14] and tighten them. Fix one diaphragm [14] with set screw [13a] onto into the shaft [13], shove it into the center block [16], lay on a side housing [1] and fix the position with the housing bolts [8]. Fit the second diaphragm to the other end of the shaft and push the housing bolts [8] carefully (if necessary, rotate the bolt smoothly while pushing) through the bore holes of the diaphragm without damaging the diaphragm and its surfaces. Set the manifolds [2] on the side housings slightly rotating them. Adjust the second side housing [1]. Fix the housing bolts [8] crosswise evenly according to the given torque values until the side housings [1] are situated on the center block [16]. Any further tightening of the bolts does not improve sealing but can deform the housing! Before putting the pump back into operation, the tightness of the pump has to be checked.

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 (if necessary, smoothen the housing surfaces carefully with fine sandpaper). Moisture all O-rings for assembly, push them in carefully, do not bend any ring.

Troubleshooting

Malfunction	Possible Reason	Solutions/Remarks
pump does not operate	air supply line blocked/closed	open air supply
	muffler blocked	clean/replace muffler
	working chambers blocked	remove blockage
	air control system defective	replace air valve system
	discharge line blocked/closed	clean/open line
pump operates unsteadily	piston rings worn	replace piston rings
	air control system worn	replace air control system
	diaphragm rupture	replace diaphragm, clean pump
	air control system soiled	clean/replace air control system
	check valve blocked	cleaning, removal of bulk particles
	icing	improve air processing
air within liquid	suction line leaky	seal suction line
	container with liquid empty	fill/new container
	diaphragm rupture	replace diaphragm
	cavitation	adapt suction lift, possibly install suction pressurised air chamber
insufficient discharge pressure	insufficient pressure/amount of driving air	increase air supply
	air supply line leaky	check/repair air supply
	air control system leaky	replace air control system
	check valve worn	check/replace check valve
	more air consuming components	increase pressure/amount of air
output decreases	air control system soiled	clean/replace air control system
	icing	improve air processing: dryer/filter
	air pressure drop	ensure sufficient supply of air
	suction line/inlet strainer soiled	cleaning
	discharge line/outlet strainer soiled	cleaning
	muffler blocked	replace the muffler
	check valve worn	replace valve
	change in viscosity	change back/adjust pump
	more air consuming components	increase pressure/amount of air
pump stops itself	icing of the air control system	improve air processing: dryer/heater etc.
	air pressure to low	increase air pressure
	air pressure drop	ensure sufficient air supply
	discharge line blocked	clean discharge line
	air filter blocked	clean air filter
	valve closed	open valve
	air control system defective	replace air control system
	wear/leaking of air control system	replace air control system
	diaphragm rupture	replace diaphragm, clean pump
	check valve blocked/worn	clean/replace check valve

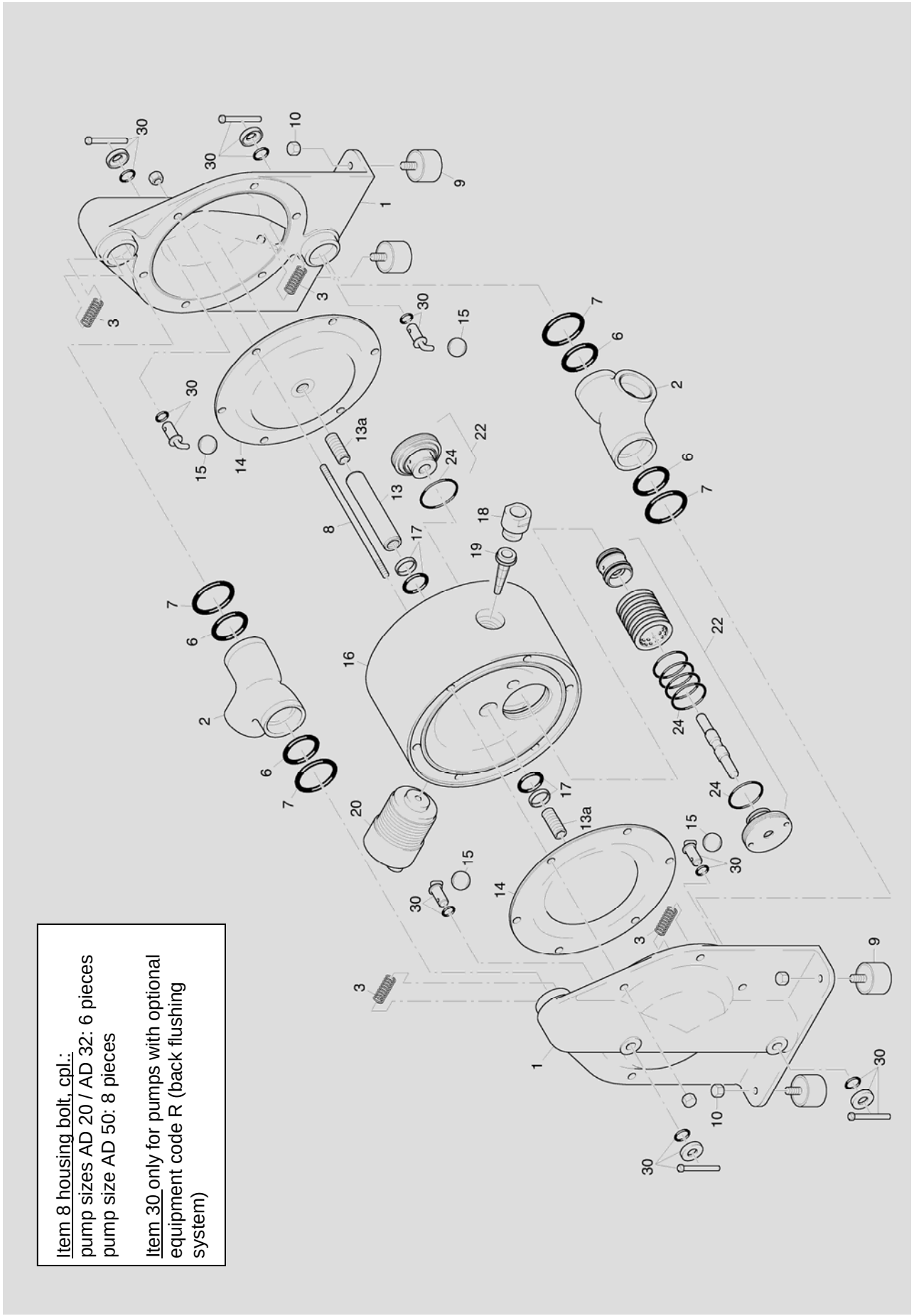
Malfunction	Possible Reason	Solutions/Remarks
pumps operates, however suction capacity insufficient	pump operates too fast	start more slowly
	operation beyond physical limits	adjust installation
	cavitation	check, cool down
	operation beyond pump capacity	adjust installation resp. install bigger pump
	air cushion within suction/discharge line	bleed the line
	dry suction against discharge pressure	wet pump, start without pressure
	valve filter within suction line closed	open valve/clean filter
	valve filter within discharge line closed	open valve/clean filter
	container with liquid empty	fill/new container
	vacuum inside the container	bleed container
	wear of the check valves	replace valves
	suction line leaky	seal suction line
	suction line blocked	clean suction line
	air pressure cushion at discharge	bleed discharge line
	check valve blocked	clean/replace valve
insufficient suction capacity after pump repair	connections tighten incompletely	tighten/seal connections
	check valves inserted falsely	correct positioning of check valves
diaphragm overstrained	pressure within the plant/system	ensure that pressure is only developed by the pump itself, check plant/valves, replace diaphragms
	inadmissible vacuum	check suction line, open valve
	icing	improve air processing
leaking between housing parts	housing bolts loosened	tighten bolts, check pump
	O-rings sleeve damaged	replace O-rings
	diaphragms attacked chemically	replace diaphragms
	diaphragms overstrained	replace diaphragms
	tension installation/pipework	loosen, eliminate tension, use of a compensator
muffler grey	driving air too humid, icing	improve quality of driving air
muffler black	soiled, oily air	improve quality of driving air, install sensitive filter in suction line
pump is connected to air but does not operate	air control system blocked	clean/replace air control system
	bulk particles/dirt	clean pump, replace necessary parts, improve air quality
	chemical influence (O-rings swollen)	check, replace damaged parts
	valve closed in discharge line	open valve
liquid leaves the pump via the muffler	diaphragm rupture	replace diaphragms, clean pump

Spare part list

Pump size				AD 20	AD 32	AD 50
Item	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
1	2	Pump housing (code S..)	1.4408	5 20 210 26	5 32 210 26	5 50 210 26
		Pump housing (code H..)	1.4408 polished	5 20 210 27	5 32 210 27	5 50 210 27
2	2	Suction/discharge port (code S..), BSP	1.4408	5 20 011 26	5 32 011 26	5 50 011 26
		Suction/discharge port (code H..), BSP	1.4408 polished	5 20 011 27	5 32 011 27	5 50 011 27
3	4	Valve stop	1.4571	5 20 216 24	5 32 216 24	5 50 216 24
6	4	O-ring, ports, inside (code .E.)	EPDM	9 24 537 72	9 36 539 72	9 54 542 72
		O-ring, ports, inside (code .N.)	NBR	9 24 537 71	9 36 539 71	9 54 542 71
		O-ring, ports, inside (code .T.)	PTFE	9 24 537 60	9 36 539 60	9 54 542 60
7	4	O-ring, ports, outside	EPDM	9 28 512 72	9 42 540 72	9 62 543 72
8	*	Housing bolt with nuts	1.4301	5 20 020 22	5 32 020 22	5 50 020 22
9	4	Shock absorber	NR	1 15 022 85	1 15 022 85	1 40 022 85
10	4	Nut	1.4305	9 06 106 22	9 06 106 22	9 08 106 22
13	1	Shaft	1.4301	2 15 030 22	2 25 030 22	2 40 030 22
13a	2	Set screw, shaft	1.4305	9 10 220 22	9 12 221 22	9 16 222 22
14	2	Diaphragm (code .E.)	EPDM	1 15 031 72	1 25 031 72	1 40 031 72
		Diaphragm (code .N.)	NBR	1 15 031 70	1 25 031 70	1 40 031 70
		Diaphragm (code .T.)	PTFE/EPDM	1 15 031 67	1 25 031 67	1 40 031 67
15	4	Valve ball (code ..E)	EPDM	1 15 032 72	1 25 032 72	1 40 032 72
		Valve ball (code ..N)	NBR	1 15 032 71	1 25 032 71	1 40 032 71
		Valve ball (code ..T)	PTFE	1 15 032 60	1 25 032 60	1 40 032 60
16	1	Center block	PA	1 15 240 53	1 25 240 53	1 40 240 53
17	2	Shaft piston ring, cpl.	PTFE	1 15 041 64	1 25 041 64	1 40 041 64
18	1	Air inlet	PETP	1 15 047 84	1 15 047 84	1 40 047 84
19	1	Air filter	PE	1 15 043 51	1 15 043 51	1 40 043 51
20	1	Muffler	PE	1 15 244 51	1 15 244 51	1 40 244 51
22	1	*PERSWING P*® air control system, cpl.	PETP	2 15 001 84	2 15 001 84	2 40 001 84
24	6	O-ring, air valve housing (included in item 22)	NBR	9 35 504 71	9 35 504 71	9 46 515 71
* AD 20 and AD 32: 6 pieces; AD 50: 8 pieces per pump						

Please see page 4 for explanation of the pump code.
When ordering spare parts, please state the serial-no. of the pump.

Exploded view



OPTIONAL EQUIPMENT

For special requirements ALMATEC pneumatic double diaphragm pump of the Chemicor series can be furnished with several accessories. The pump code informs which of these are included in the pump. For the barrier chamber system (option code BS) a separate manual is available.

Stroke counting (option code C 2 / C 3 / C 4)

A sensor (Namur) is integrated in the center block [16] of the pump to monitor the movement of a diaphragm [14] without direct contact.
The stroke counting system is available in four variations:

- C 2 Stroke sensor (Namur), also for explosion proof zone
- C 3 Stroke counting system complete with sensor and stroke counter
- C 4 Stroke counting system complete with sensor, stroke counter and controller for explosion proof zone

In case only the sensor is included (code C 2), it has to be connected to an existing controller. For applications an explosion-proof device is required for (code C 4) the intrinsically safe controller has to be installed between the sensor and the counter. The wiring diagram and technical data can be found on the electric units themselves. The controllers have to be installed in a suitable cabinet.
For further details, please refer to the data delivered by the manufacturers of the components.

Pump size					**AD 20**	**AD 32**	**AD 50**
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
C 2	16	1	Center block for sensor	PA	1 15 340 53	1 25 340 53	1 40 340 53
			Center block, conductive for sensor	PE conductive	1 15 340 55	1 25 340 55	1 40 340 56
	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 4			as C 2, but additional:				
	-	1	Controller	diverse	1 00 370 99	1 00 370 99	1 00 370 99
	-	1	Stroke Counter	diverse	1 00 071 99	1 00 071 99	1 00 071 99

Stroke counting pneumatic (option code C 9 / C 10)

Differently from the optional equipment codes C 2 - C 4, 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”
  hose DN 4/6, 2,5 m
- C 10 consist of:
  as C 9 and a stroke counter

For assembly screw the adaptor elbow into the additional air connection of the pump (it is possible that the adaptor is already installed). The air inlet for the pump is located in the middle of the center block. The air inlet for the pneumatic stroke counting system can be found sideways to this. 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 C 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!

Pump size					AD 20	AD 32	AD 50
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
C 9	16	1	Center block with additional air connection R 1/4	PA	1 15 440 53	1 25 440 53	1 40 440 53
			Center block, conductive with add. air connection R 1/4	PE conductive	1 15 440 55	1 25 440 55	1 40 440 56
	-	1	Adaptor elbow	PP	1 00 875 51	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 cpl.	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

Diaphragm monitoring system (option code D)

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. However, it has to be considered, that the diaphragm monitoring possibly cannot prevent that liquid can leave the pump via the muffler. For higher safety requirements the ALMATEC barrier chamber system (optional equipment code BS) is recommended. 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 (code D 1) or to the controller included (code D 3). The wiring diagram and technical data can be found on the controller itself. The controllers have to be installed in a suitable cabinet.
For further details, please refer to the data delivered by the manufacturers of the components.

Pump size					AD 20	AD 32	AD 50
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
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, Namur	diverse	1 00 773 99	1 00 773 99	1 00 773 99
	-	1	Controller	diverse	1 00 370 99	1 00 370 99	1 00 370 99

Center block made of PE conductive (option code E)

For inflammable liquids as well as for applications in explosion proof areas, only pumps of the CHEMICOR series with a center block made of PE conductive instead of the routinely PA one may be used (ATEX conformity). The max. operating temperature for pumps with a center block made of PE is 80°C.

Pump size					AD 20	AD 32	AD 50
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
E	16	1	Center block, conductive	PE conductive	1 15 240 55	1 25 240 55	1 40 240 56
	20	1	Muffler, conductive	Bz	1 15 244 34	1 15 244 34	1 40 244 34

Suction/discharge ports suitable for sanitary thread (option codes M / N1 / N2 / T)

For special applications the sizes AD 20 and AD 32 can be equipped with ports which are suitable for sanitary threads (M=DIN 11851, N1=Naue, N2=Neumo, T=Tri-Clamp)

Pump size					AD 20	AD 32	AD 50
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
M	2	2	Suction/discharge port suitable for sanitary thread DIN 11851 (code S..)	1.4408	5 20 311 26	5 32 311 26	-
			Suction/discharge port suitable for sanitary thread DIN 11851 (code H..)	1.4408 polished	5 20 311 27	5 32 311 27	-
N 1	2	2	Suction/discharge port suitable for sanitary thread Naue (code S..)	1.4408	5 20 511 26	5 32 511 26	-
			Suction/discharge port suitable for sanitary thread Naue (code H..)	1.4408 polished	5 20 511 27	5 32 511 27	-
N 2	2	2	Suction/discharge port suitable for sanitary thread Neumo (code S..)	1.4408	5 20 611 26	5 32 611 26	-
			Suction/discharge port suitable for sanitary thread Neumo (code H..)	1.4408 polished	5 20 611 27	5 32 611 27	-
T	2	2	Suction/discharge port suitable for Tri-Clamp (code S..)	1.4408	5 20 211 26	5 32 211 26	-
			Suction/discharge port suitable for Tri-Clamp (code H..)	1.4408 polished	5 20 211 27	5 32 211 27	-

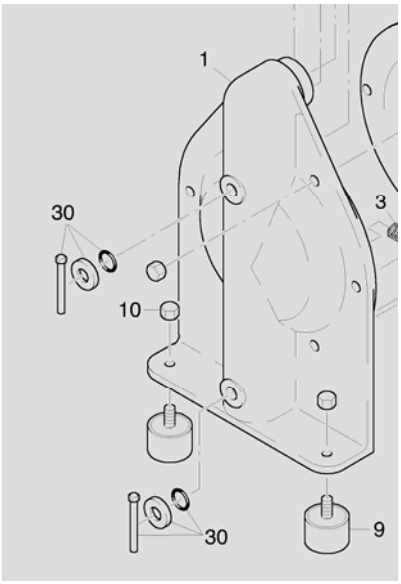
Suction/discharge ports with NPT threads (option code N)

CHEMICOR pumps commonly comes with BSP connection threads. For the sizes AD 20 and AD 32 the pumps can also be equipped with NPT threads.

Pump size					AD 20	AD 32	AD 50
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
N	2	2	Suction/discharge port with NPT thread (code S..)	1.4408	5 20 711 26	5 32 711 26	-
			Suction/discharge port with NPT thread (code H..)	1.4408 polished	5 20 711 27	5 32 711 27	-

Draining system (option code R)

A pump equipped with the unique draining system can be emptied along with an inclining discharge line while being installed within the plant. Ball lifters are fitted to the four product valves. The valve balls are lifted out of their seats by turning the handle upwards by 180°. The pump is drained entirely on the suction side.



Pump size					AD 20	AD 32	AD 50
Code	**Item**	**Pc.**	**Description**	**Material**	**Part number**	**Part number**	**Part number**
R	1	2	Pump housing for draining system (code S..)	1.4408	5 20 310 26	5 32 310 26	5 50 310 26
			Pump housing for draining system (code H..)	1.4408 polished	5 20 310 27	5 32 310 27	5 50 310 27
	30	4	Ball lifter, cpl.	1.4571	5 20 033 24	5 32 033 24	5 50 033 24

Dimensions