Almatec E Series Air-operated double diaphragm pumps

DESCRIPTION

The Almatec® E-Series is developed based on extensive experience with proven pump models. Its refined design, with optimized wall thicknesses, flange connection capability, a ring-tightening structure, and additional advanced construction, the E Series meet the highest customer requirements for safety, quality, and reliability. Six pump sizes, combined with a wide range of optional equipment, cover the majority of market applications. Pulsation dampeners are available in both screw-on and flanged configurations.

KEY FEATURES

- Air-operated diaphragm pumps in solid design
- Housing made of PE or PTFE, both also available in a conductive version
- Interchangeability to the A-Series
- Seven sizes from DN 8 to DN 80
- Max. capacities of 0.9 to 48 m3/h
- Increased pump security due to innovative ring-tightening structure
- Compared to the A-Series, increased capacity and decreased air consumption thanks to the optimized flow pattern, decreased noise level
- ATEX conformity
- Exterior free of metal
- Optimized diaphragm fixing
- Different possible port configurations
- Ball or cylinder check valves with identical interior design
- Maintenance and lubrication-free air control system PERSWING P® without dead center
- Composite diaphragms with integrated metal core, no diaphragm discs
- Proof against dry running and overloading, self-priming, insensitive to solids
- Gentle displacement
- Can be infinitely controlled via the air volume
- No drives, no rotating parts, no shaft seals
- Unattended operation with long service life
- Easy to start up
- Integrated muffler
- Recessed tie rods
- Vibration dampers with female thread on the underside for simple direct installation
- Low noise levels
- Optional features meeting requirements, such as:
  - Screw-on or flanged pulsation damper
  - Draining system
  - Barrier chamber system
  - Diaphragm monitoring
  - Stroke counter
  - Flange connection
  - Transport cart

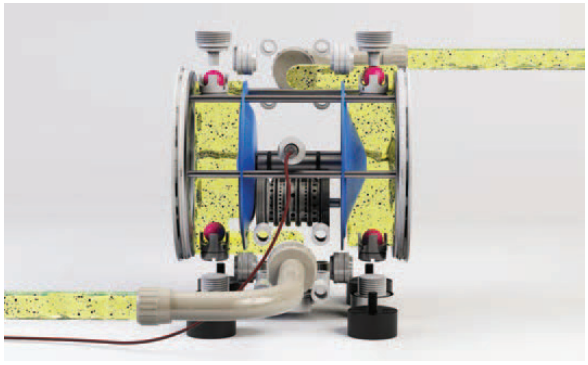
CONSTRUCTION AND MATERIALS

An important construction element is the solid design. Only a solid plastic body can support the necessary weight for an oscillating pump. The individual components can be designed, so that the required wall thicknesses are arranged where they are needed. The mechanical machining of a solid plastic block is economical thanks to modern CNC technology, enabling tight tolerances to be achieved. The high static mass leads to a smooth operation and external metal parts for reinforcement are not necessary. For ALMATEC pumps only virgin PE and PTFE without additives are used.

PE (polyethylene) competes with PP (polypropylene) which is frequently used in the manufacture of pumps. Thermally and chemically speaking, there are virtually no differences between these two. However, the similarity ends where the mechanical properties are concerned. Trials based on the sand-slurry method have shown that the abrasion resistance of the PE (material sample on top) is 7 times higher than that of PP (middle) and even 1.6 times higher than that of steel (bottom). It is certainly also more wear-resistant than, for example, cast iron or aluminum. This high resistance to abrasion plays a vital role in many applications (e.g. silicon carbide slurry in the solar cell production, pickling baths in the electroplating industry, printing inks, lime slurry for wet desulphurization, ceramic mass and glazes in the ceramics industry).

Material availability

Housing	PE, PE conductive, PTFE, PTFE conductive
Diaphragms	EPDM, PTFE/EPDM compound, PTFE modified, NBR, ATEX variations
Ball valves	EPDM, PTFE, NBR, stainless steel
Cylinder valves	PTFE



FUNCTIONAL PRINCIPLE

The Almatec E-Series is based on the functional principle of double diaphragm pumps. The basic configuration consists of two external side housing with a center housing between them. Each of the side housings contains a product chamber which is separated from the center housing by a diaphragm. The two diaphragms are interconnected by a piston rod. Directed by an air control system, they are alternately subjected to 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 liquid is displaced – and thus conveyed – by the compressed air. The diaphragms merely serve as barriers and are not pressurized. This is a fact of decisive importance for the service life of the diaphragms.

Summary of chemical resistance

PTFE	EPDM	PTFE	PE	
+	+	+	+	Water
+	-	+	+	Mineral oil
+	-	+	+	Veget., anim. fats
-	-	+	+	Aliphatic
-	-	+	0	Aromatic
-	-	+	-	Halogenated
-	-	+	0	Chlorinated
0/-	0	+	+	Alcohols
-	+	+	+	Ketones
-	+	+	+	Esters
-	+	+	+	Acids, diluted
-	+	+	0	Acids, concentrated
-	+	+	+	Alkalis, diluted
-	+	+	+	Alkalis, concentrated
0	+	+	+	salts

+ = resistant
- = not resistant
0= fairly resistant
All entries are merely intended for guidance

CONDUCTIVE VERSION

The housings and internals of the conductive versions are made of PE or PTFE filled with conductive pigment which always remains below the limits set by the FDA. The pumps are to be grounded via a connection on the center housing, thus excluding the risk of electrostatic charges. Conductive pumps of the E-Series are ATEX conform. They can consequently be used without difficulty in gas and dust atmospheres and for flammable liquids.

SPECIAL FEATURES

Almatec air-operated diaphragm pumps of the E-Series consist of only three solid housing parts, namely center housing and two side housings, all of which are made from the same material (PE or PTFE). The exterior is completely free of metal so that the pumps can also be used in corrosive atmospheres. The product ports prepared for standard flanges are located in the center housing. Different port configurations can be obtained by turning the center housing resp. by re-location of the center housing plug. The standard configuration at delivery is with the suction inlet horizontally at the bottom and the discharge outlet horizontally at the top.

As common, the housing parts are tightened to each other via housing bolts. However, instead of single bolts pressing punctually against the housing, all housing bolts are now tightened against a diaphragm-sized ring per side. This structure results in more evenly spreading the housing bolt force and in an increased permissible bolt torque – in the end an increased pump safety.

The heavy-duty muffler in the center housing is made of expanded PE (the conductive versions of E 15 – E 50 are equipped with a bronze one). Direct installation of the stationary pumps is facilitated by shock absorbers with female thread on the underside. The positions of the connections are corresponding to those of the predecessor A-Series.

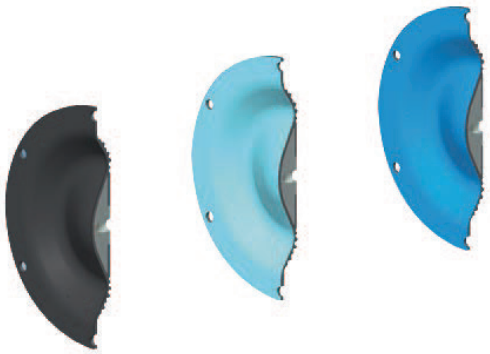
DIAPHRAGMS

The surface of the Almatec diaphragms is smooth and not interrupted by any seals whatsoever. Due to the integrated metal core, they do not require diaphragm discs which frequently give rise to leaks. Almatec diaphragms have always been designed from the “PTFE” point of view. Result: Almatec diaphragms have a large diameter and short stroke with low flexural load. Possible materials for the diaphragms are EPDM, PTFE/EPDM compound, NBR and special ATEX variations. Special diaphragms: For media with increased diffusion tendency (e. g. benzene, solvents) as well as for application with priming out of a vacuum diaphragms made of modified PTFE are available.

AIR CONTROL SYSTEM AND VALVES

The metal-free, pneumatically pilot-operated PERSWING P® air control system ensures accurate reversal of the main piston and is characterized by low noise levels. Only two moving parts ensure that there is absolutely no dead center. It does not require maintenance, operates without any lubrication whatsoever and is made up of no more than four different parts. The complete cartridge can be replaced easily. The patented PERSWING P® is a precision control system and therefore requires clean, oil-free compressed air to ensure its optimal function.

Ball valves are robust and insensitive to media containing solids since they only form a linear seal with the valve seat. They are available in EPDM, PTFE, NBR and stainless steel. The use of stainless steel ball valves is recommended for high-viscosity media. PTFE pumps can be equipped with cylinder valves also. The surface sealing shows very good dry priming values. They close gently and uniformly, condition for an accurate delivery. The interior design of the housings is identical, regardless of the type of valve used. This makes it easier to change over to a different valve type at a later date.



PULSATION DAMPER, ET SERIES

Due to their design, pumps with oscillating action produce a pulsating flow. Although the double-acting design of the E-Series and the direct pneumatic drive have already greatly reduced the pulsation, a pulsation damper must still be installed on the delivery side in order to obtain a virtually uniform flow.

The Almatec pulsation damper series ET represents the latest generation of active pulsation dampers. It is simply screwed onto the pump. Additional connecting elements are not required. Alternatively the dampers are available in a flange version, too (ET-F series). Pulsation dampers of appropriate size are available for every pump. The wetted material is PE or PTFE (both also conductive). The damper heads are made of polyamide or PE conductive. As with the pumps the recessed housing bolts are tightened against a ring. The exterior is completely free of metal.

The dampers are self-regulating. They have their own air connection which must be supplied via the pump connection so that pump and damper always operate with the same air pressure. The pulsation can already be damped effectively with a minimum back pressure of only approx. 1 bar. As in the Almatec pumps, the diaphragm merely serves as a barrier between product and air chamber and is therefore always without load. If the pressure on the product side drops due to changes in the operating conditions, the pressure on the other side of the diaphragm will decline accordingly. If the pressure on the product side rises, the pressure on the other side will also increase. This automatic adjustment optimizes the diaphragm setting and ensures a consistently good damping effect.

OPTIONAL EQUIPMENT

BARRIER CHAMBER SYSTEM (CODE BS)

The ALMATEC barrier chamber system for sizes E 10 to E 50 meets high safety requirements. The individual diaphragm is replaced by two diaphragms arranged in tandem with a barrier chamber of conductive PE between them and filled with non-conductive liquid. The barrier chambers must always be filled entirely to transmit the air pressure to the medium. Therefore it is monitored by level sensors. If the diaphragm on the product side breaks, medium merely enters the barrier chamber and the non-conductive liquid flows into the medium. The change in conductivity of the barrier liquid is detected by sensors and signaled to a controller which triggers an alarm or disconnects the pump.

DIAPHRAGM MONITORING (CODE D)

A capacitive sensor installed in the pump muffler detects all liquids and in case of a diaphragm rupture it outputs a corresponding signal to a controller which then triggers an alarm or disconnects the pump via a connected solenoid valve.

PNEUMATIC EXPANSION COMPENSATION (CODE EC)

Temperature changes can cause thermal expansion to occur in air-operated double-diaphragm (AODD) pump units engineered with plastic housings and metallic connecting elements. Operating in wide temperature ranges – including many PTFE pump standard applications – can lower the tension of the connecting elements. Therefore, Almatec has introduced an "Expansion Compensation" option for its line of E-Series AODD pumps (code EC for E-Series pump sizes 15/25/40/50).

DRAINING SYSTEM (CODE R)

The E-Series pumps of the sizes 15 to 50 are available with the special ALMATEC draining system. This unit consists of a by-pass system in the side housings that can be activated easily either via hand-operated valves or pneumatically. The pump and piping can then be drained without having to be dismounted. The amount of cleaning agent and solvent required when changing products is reduced considerably, greatly reducing environmental pollution.

FLANGE CONNECTION (CODE F)

According to the safety standard all over the industry the pump sizes E 15 to E 80 can be equipped with thread bushings and flange-O-rings for flange connections to DIN or ANSI / PN 10.

STROKE COUNTING (CODE C)

Almatec air-operated double diaphragm pumps can be used continuously or intermittently for hours, minutes or for an exact defined number of strokes. A sensor can be installed in the pump's center housing to accurately count the strokes. This is available in a pneumatic version as well.

EXTERNAL CONTROL (CODE Z)

Such a pump has neither an air control system nor a muffler, but can be controlled externally via a solenoid valve. The center housing has two separate air connections to ventilate and exhaust both working chambers. The solenoid valve is not part of the delivery.

SPECIAL DIAPHRAGMS (CODE LAND P)

For the use of the pumps in the device group IIC (European ATEX regulation) without flanking measures diaphragms made of conductive PTFE/EPDM compound are available (code L). For liquids with increased diffusion tendency (e.g. benzene, solvents) as well as for applications with priming out of a vacuum PTFE/EPDM compound diaphragms made of modified PTFE are obtainable (code P).

FKM HOUSING GASKETS (CODE V)

Pumps with PTFE diaphragms can be equipped with housing gaskets made of FKM (FDA compliant) instead of FEP/FKM. These reasonably priced FKM gaskets cover the major part of applications requiring PTFE diaphragms.

EC1935/2004 CERTIFICATION (CODE H)

Since certifications are an important aspect in the hygienic market, an EC1935/2004 conformity declaration can be issued for Almatec pumps with PTFE internals for the applicability of the pump material for food contact.

USP CLASS VI (CODE USP)

After receiving an increasing number of requests to state "USP Class VI" conformity for the wetted pump materials, Almatec has introduced the "Option Code USP" for defined material types. Whenever ordering such a pump, the customer can be sure to receive a clearly marked pump together with an according certificate. Please contact us for more information about the concerned pump material codes.

Almatec E series

Pump size		E 08	E 10	E 15	E 25	E 40	E 50
Dimensions, mm (in.):	Lenth Width Height	88 (3.5) 128 (5.0) 129 (5.1)	110 (4.3) 147 (5.8) 169 (6.7)	166 (6.5) 189 (7.4) 240 (9.4)	220 (8.7) 255 (10.0) 320 (12.6)	304 (12.0) 353 (13.9) 432 (17.0)	399 (15.7) 430 (16.9) 552 (21.7)
Nominal port size Air connection	NPT BSP	1/4" R 1/8	3/8" R 1/8	1/2" R 1/4	1" R 1/4	1 1/2" R 1/2	2" R 1/2
Weight, kg (lb):	PE PTFE	- 2 (4)	- 5 (11)	7 (15) 12 (26)	15 (33) 29 (64)	34 (75) 69 (152)	66 (146) 131 (289)
Max. particle size of solids for pumps with ball valves	mm (in.)	2 (0.08)	3 (0.12)	4 (0.16)	6 (0.24)	9 (0.35)	11 (0.43)
Suction lift dry, mWC (ft): Suction lift dry, mWC (ft): Suction lift wet, mWC (ft):	cylinder valves ball valves	1 (3.3) 0,5 (1.6) 9 (29.5)	2 (6.6) 1 (3.3) 9 (29.5)	3 (9.8) 2 (6.6) 9,5 (31.2)	4 (13.1) 3 (9.8) 9,5 (31.2)	5 (16.4) 4 (13.1) 9,5 (31.2)	5 (16.4) 4 (13.1) 9,5 (31.2)
Max. driving and operating pressure	bar (psig)	7 (100)	7 (100)	7 (100)	7 (100)	7 (100)	7 (100)
Max. operating temperature, °C (F):	PE PTFE	- 100 (212)	- 100 (212)	70 (158) 120 (248)	70 (158) 120 (248)	70 (158) 120 (248)	70 (158) 120 (248)

These technical data apply to ALMATEC E-Series standard pumps without optional equipment and dampers.

CODE SYSTEM

E 15 T T T - B

- B: Optional equipment (see page 6)
- T: Valve material (E=EPDM, T=PTFE, N=NBR, Z=PTFE-Cylinder)
- T: Diaphragm material (E=EPDM, T=PTFE/EPDM compound, N=NBR)
- T: Housing material (E=PE, F=PE conductive, T=PTFE, U=PTFE conductive)
- 15: Size, port dimension
- E: ALMATEC air-operated diaphragm pump, E-Series

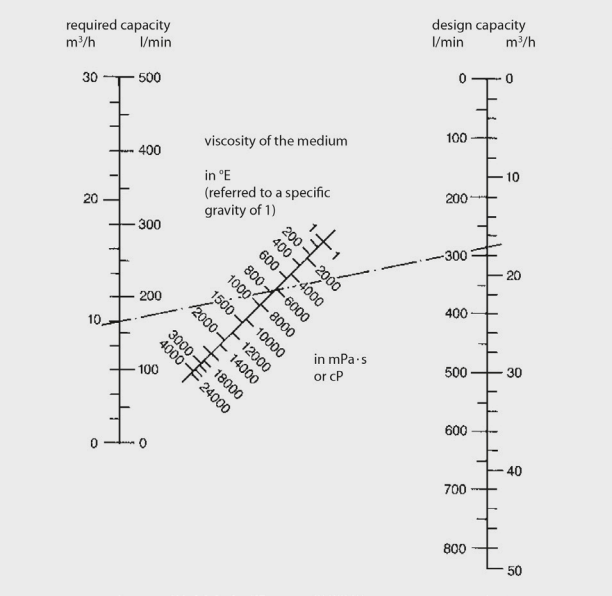
TECHNICAL DATA

VISCOSITY AND PUMP CAPACITY

The capacity specified in the pump performance charts generally refers to water (1 mPa·s). The value must be reduced correspondingly when pumping media with higher viscosity. The design capacity can be read off directly from the graph and the corresponding pump size selected.

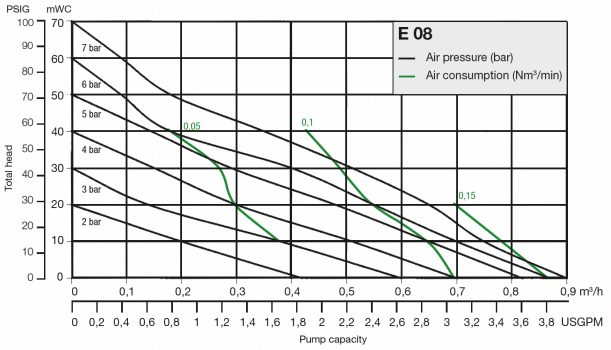
The example shown here is based on a required capacity of 10 m3/h with a product viscosity of 6000 mPa·s. The dash-dotted line intersects the design capacity scale at 17 m3/h.

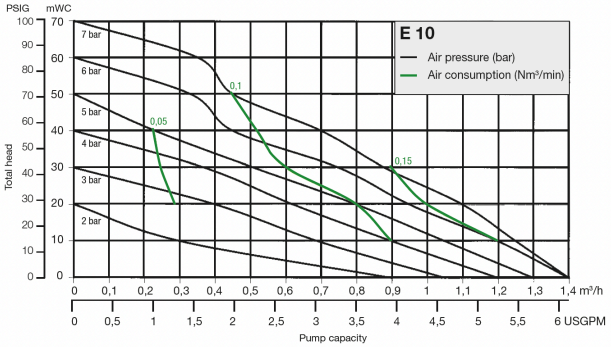
When handling viscous media, the highly increased necessary suction capacity has to be taken into consideration also. A sufficient size of cross-sections in the suction piping helps to avoid gasing as well as capillary effects. For media with high viscosity a mild positive suction pressure is to recommended.



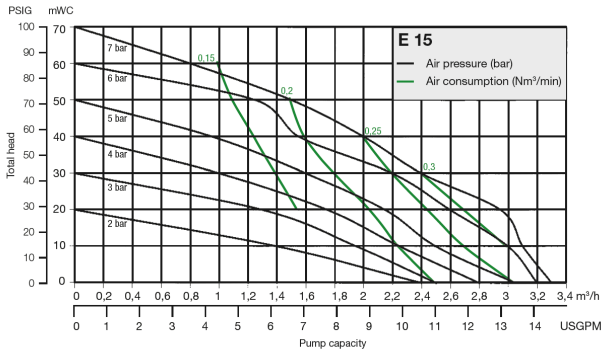
PERFORMANCE RANGE

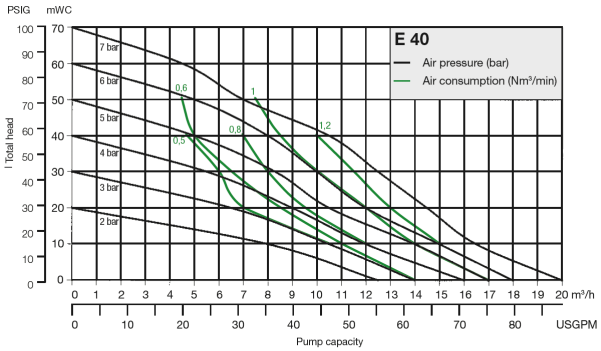
The data refer to water (20 °C), under using of different variations (e. g. ball valve model, damper preparation etc.), a compressor Atlas Copco VSG30 and calibrated measuring equipment. The specified performance data are warranted by Almatec in accordance with DIN EN ISO 9906.

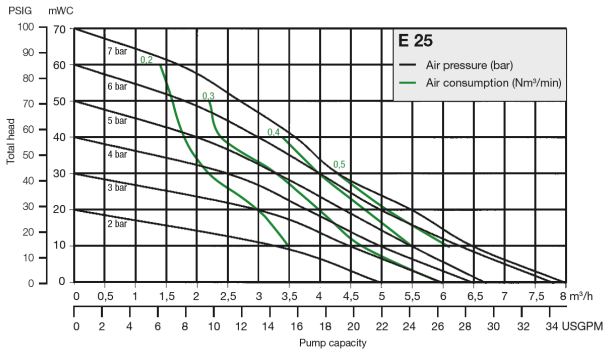


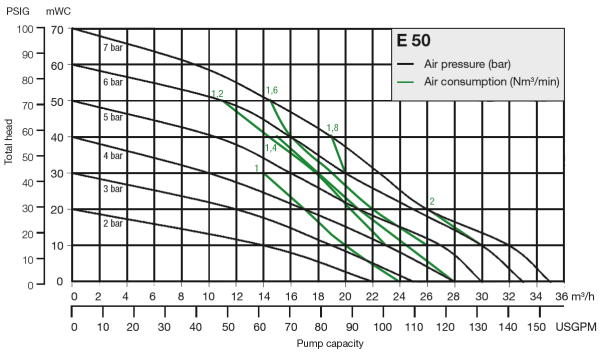


TECHNICAL DATA









- Compatible liquids include sludges, acids, alkalis, solvents, slurries, emulsions, mixtures of liquids and solids, resins, powders, aqueous solutions.
- These liquids may be of high or low viscosity, abrasive, thixotropic, hazardous, toxic, nonlubricating,
- The fields of application include chemical industry, pharmaceuticals, cosmetics, ceramics, surface treatment, emergency services, power plants, refineries, mechanical engineering, textile industry, water processing, waste disposal, paper industry, electronics, solar industry.