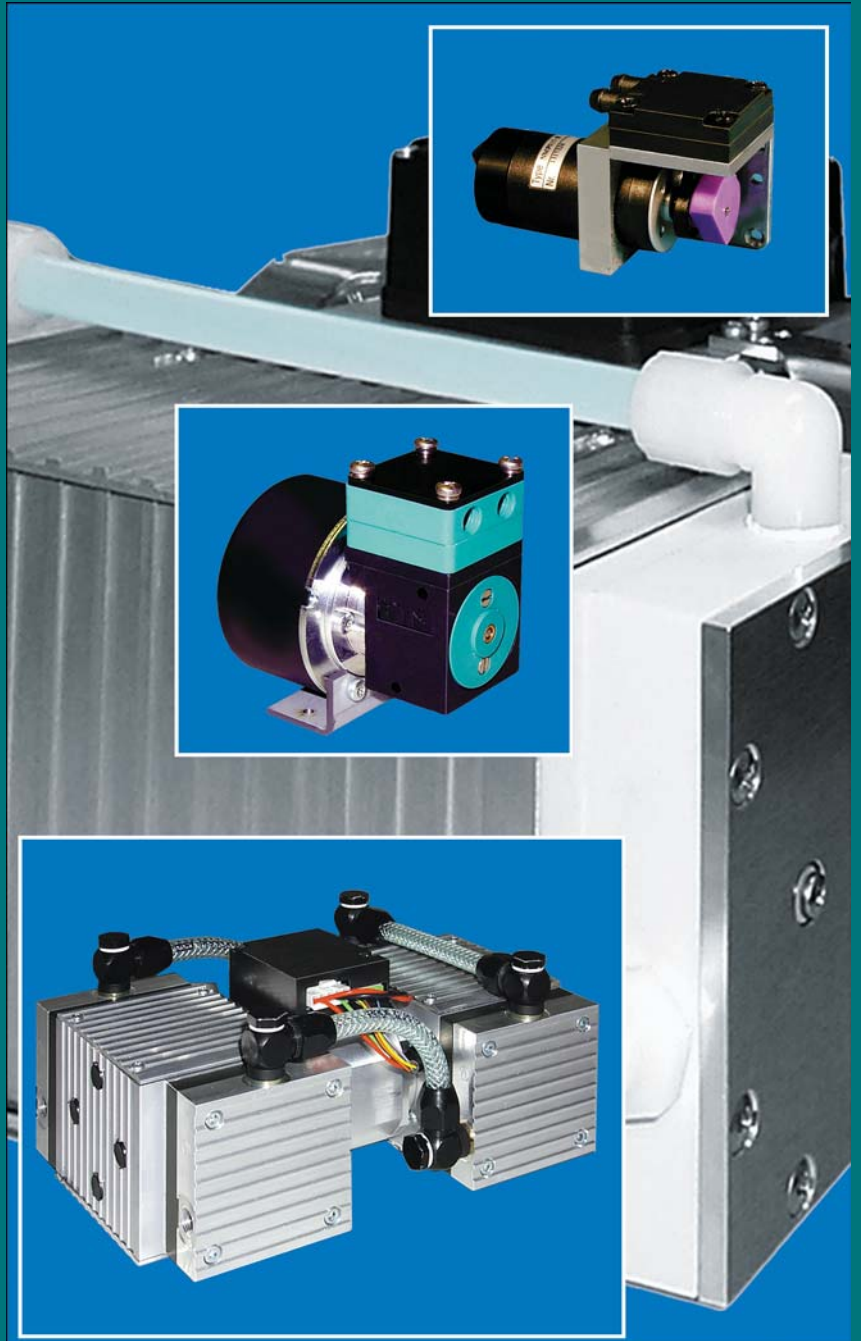


Air, Gas & Liquid Diaphragm Pumps for the OEM

oil-free transfer of air or gases
corrosion-resistant materials
contamination-free operation
self-priming liquid pumps

OEM ENGINEER
PUMP SELECTION GUIDE

REVISED!
new pumps



Over 50 Years of Innovative Technology Worldwide



Why choose KNF?

Because, for over fifty years we've acquired a wealth of know-how, hold over 300 patents, and are a worldwide technology leader in creative diaphragm pump solutions. In fact, KNF manufactures the world's most extensive range of diaphragm pumps. We have design solutions for pumping air, gases and liquids, with models capable of handling neutral to highly corrosive or difficult materials.

Because of our extensive experience with many materials of construction, motor types, and modifications, we can easily build a pump that will fit your specific needs and perhaps save you money. Chances are, we've already built a pump for a similar application.

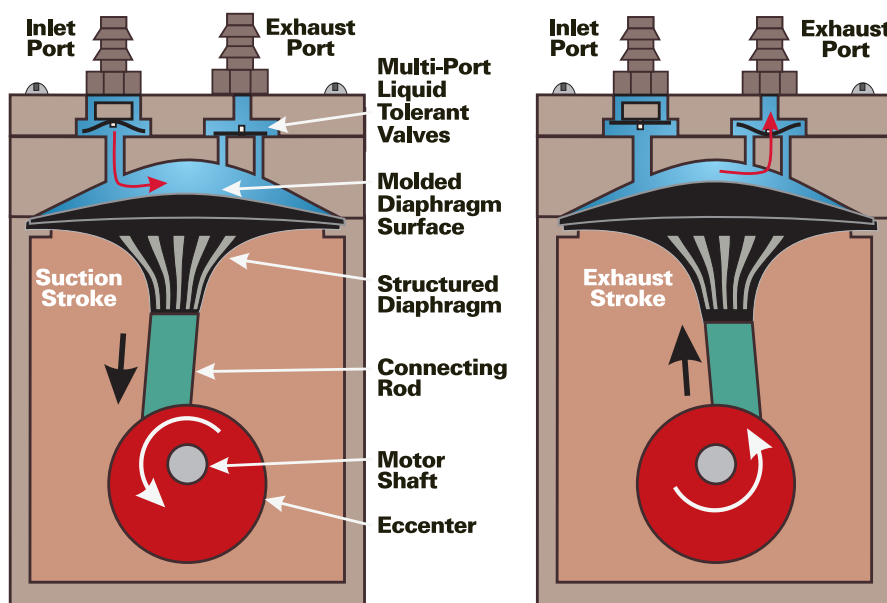
Just as our standard pump designs evolved, so has our ability to optimize their performance, which is why KNF products today offer unrivaled efficiency and performance. Whether your application calls for special materials, surface finishes, mounting plates, media temperature or unusual performance requirements, count on KNF engineering to meet or even exceed your challenge.

Innovative Technology Worldwide

With 12 wholly-owned subsidiaries in Europe, America and Asia, as well as representatives worldwide, KNF demonstrates the commitment of these words to our valued customers.

How a diaphragm pump works

In its simplest form, a KNF diaphragm pump has a motor, eccentric, connecting rod, diaphragm, valve system and pump head. The drive motor turns the eccentric, oscillating the connecting rod and the diaphragm against the sealed pump chamber. KNF's patented FEA-engineered smooth, structured diaphragm requires a minimum of power, resulting in the highest possible efficiency and lifetime. Valves direct the media through the pump in the proper direction. KNF's exclusive, multi-port valve design permits greater flow, and withstands condensate without a loss of performance or lifetime. Heads are easily disassembled on site using simple tools.



- Oil-free, contamination-free operation
- Can be made chemically resistant
- Variety of wetted materials
- Virtually maintenance free
- Liquid tolerant multi-port valve system

- High operating efficiency
- Mounts in any position
- Minimal size and weight
- Modular design components
- Economical to replace or repair

MICROPUMPS

AIR & GAS PUMPS

Model	Motor Type	LPM	CFM	In. Hg	psig
NMP05	DC/BLDC/ICDC	.45	.016	15.2	2.2
NMP09	DC/BLDC/ICDC	.85	.03	15.2	7.3
NMP015	DC/BLDC/ICDC	1.6	.06	18.1	13.1
NMP830	AC/DC/BLDC	3.1	.11	22.8	20.3
NMP50	DC/BLDC	4	.14	18.1	16.5



Compact performance - KNF micropumps set the standard in miniature diaphragm pump technology. New models feature a precision, bolted-on pump head to ensure excellent gas tightness, and a molded, structured diaphragm surface for maximum achievable end vacuum. KNF's engineers combined high performance with precision miniature packaging to produce a smooth running, efficient, compact unit. They are ideal for use in portable equipment where performance, low current draw, minimal weight, size and noise are important. A variety of motor types are available, including ironless core DC (ICDC) and affordable brushless DC (BLDC.)

MINI PUMPS

Model	Motor Type	LPM	CFM	In. Hg	psig
N85 <i>two-stage</i>	AC/DC/BLDC	5.5	.18 - .19	29.2	4.5
N86	AC/DC/BLDC	6.5	.23	27	30
N87	AC	8	.28	26	36
N89	AC/DC/BLDC	9.5	.34	27	7.2
N811	AC/DC/BLDC	11.5	.41	27	7.2
N814	AC/DC/BLDC	12	.42	22.8	29
N815	AC/DC/BLDC	15	.53	27	—
NPK09 <i>piston</i>	AC/DC/BLDC	15	.53	27	101.5
NPK09.0 <i>parallel</i>	AC/DC/BLDC	24	.85	27	101.5



Functional versatility - These designs represent a new generation of diaphragm pumps from KNF. They are fine-tuned for efficiency and durability using the latest CAD/FEA methods. Our experience with designs, materials and motors permits us to "optimize" a standard pump to fit your exact specifications. Our mini pump line also encompasses roughing/backing pumps, heated sampling pumps, and feature available system options such as valves, electrical connectors, shock mounts and gas-tightness.

HIGH CAPACITY

Model	Motor Type	LPM	CFM	In. Hg	psig
N022	AC	19	.7	26.9	58
N726	AC/BLDC	20	.7	28.6	—
N726 <i>two-stage</i>	AC/BLDC	20	.7	29.7	—
N023	AC	23	.8	23.5	30
N026	AC/BLDC	25	.9	26.9	36
N828	AC/DC/BLDC	30	1.1	27	15
N035	AC	33	1.2	27	60
N035 <i>two-stage</i>	AC	33	1.2	29.5	—
N838	AC/DC/BLDC	35	1.2	27	7.2
N726 <i>parallel</i>	AC	38	1.3	28.6	—
N023 <i>parallel</i>	AC	39	1.4	23.7	30
N026 <i>parallel</i>	AC	46	1.6	26.9	28
N860	AC	60	2.1	27.6	15
N860 <i>two-stage</i>	AC	60	2.1	29.86	15
N035 <i>parallel</i>	AC	62	2.2	27	60
N0150	AC	150	5.3	27	29
N0150 <i>two-stage</i>	AC	150	5.3	29.3	—
N0150 <i>parallel</i>	AC	280	9.9	27	29



Tough performers get the job done - KNF has manufactured pumps for the process industry for many years. Sampling the environment, industrial process control, automotive emission systems, and transfer of rare or dangerous gases are applications where KNF is well recognized as the leader. These pumps are designed for efficient, uncontaminated evacuation, transfer and compression of air, gases and vapors. We've even employed unusual materials such as gold and ceramics where needed, to solve problems associated with especially aggressive corrosives.

DEEP VACUUM

Model	Motor Type	LPM	CFM	In. Hg/mbar	psig
N84 <i>four-stage</i>	AC/DC/BLDC	4.8	.17	29.86/2	4.5
N84 <i>two-stage</i>	AC/DC/BLDC	5	.18	29.8/5	4.5
N813 <i>two-stage</i>	AC/BLDC	13	.46	29.8/3	15
N813 <i>four-stage</i>	AC/BLDC	13	.46	29.91/<.5	15
N813 <i>three-stage</i>	AC/BLDC	19	.67	29.9/<1	15
N843 <i>two-stage</i>	AC	43	1.52	29.86/2	15
N880 <i>two-stage</i>	AC	80	2.82	29.86/2	15



The deepest vacuum available in a production diaphragm pump - KNF's newest pumps use a smooth, molded diaphragm to minimize the dead volume in the pumping chamber, improving end vacuum. Less than 0.5 mbar/0.375 Torr is obtainable using four heads. New controllers integrate into your system and offer remote speed, on/off and current limit functions.

HEATED/SAMPLING

Model	Motor Type	LPM	CFM	In. Hg	psig
N010	AC	9	.32	23	22
N012	AC	10.5	.37	23	22
N024	AC	18	.64	24	22
N026	AC	16	.56	23	22
N035	AC	34	1.2	24	20
N035 <i>parallel</i>	AC	64	2.3	24	22



Heated-head/heat-resistant sampling systems - Sampling pumps are used to draw exhaust gases through an instrument for analysis. They are available with aluminum and 316 stainless steel materials. Heating elements are usually added to avoid condensation of the sample within the hot pump head. An optional electronic controller will sense, record and regulate the system temperature. An optional insulated jacket provides added temperature stability and personnel safety.

EXPLOSION PROOF

Model	LPM	CFM	in. Hg	psig	Class 1, Div. 1
UN726	20	0.7	28.55	—	Group C & D
UN726 <i>two-stage</i>	20	0.7	29.74	—	Group C & D
UN026	25	0.9	26.9	36	Group C & D
UN035	29.3	1.0	27	50	Group D
UN035 <i>two-stage</i>	29.2	1.0	29.5	—	Group D
UN726 <i>parallel</i>	30	1.1	27.95	20	Group C & D
UN026 <i>parallel</i>	46	1.6	27	29	Group C & D
UN035 <i>parallel</i>	56.1	2.0	27	60	Group D



Explosion-proof motors for Group C environments - These pumps are supplied with an affordable, explosion-proof motor for use in hazardous locations. Wetted materials include PTFE, forged 316 stainless steel and Kynar®. Featuring deep vacuum performance using only two heads, they are expanding the worldwide presence of KNF sampling pumps in the process industry.

AUTOCLAVE/STERILIZER

Model	Motor Type	LPM	CFM	In. Hg	psig
N816.0 <i>two-stage</i>	AC	16	.6	29.5	7
N816.0 <i>three-head</i>	AC	26	.92	29.5	7
N836	AC	31	1.1	27.5	7
N836.0 <i>two-stage</i>	AC	31	1.1	29.6	7



Pumps for use in autoclaves and steam sterilizers - These pumps are cost effective, and specifically designed to meet the new, stringent requirements for pre-vacuum and post-drying stages. They have optimal flow characteristics for fast drying, and are excellent choices for handling warm and moist media where condensate inside the pump head is expected. Head cooling fans (shown) and a condensate purging system are available options.

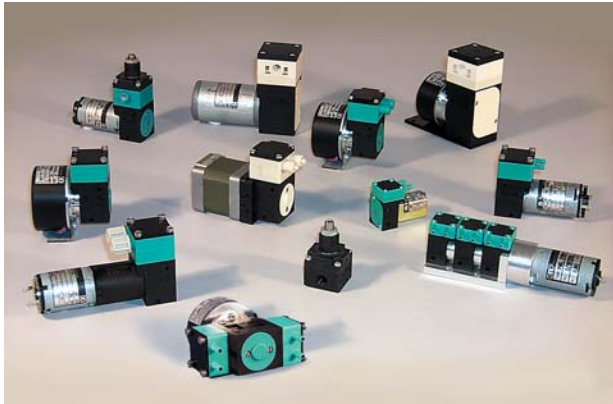
LIQUID PUMPS

KNF's liquid pumps move air, gases and liquids, while simultaneously creating a vacuum. Their unique, one-piece molded diaphragm is usually found in more expensive pumps. There are no exposed metal wetted parts to corrode. A wide choice of wetted parts materials are available including polypropylene and PTFE. KNF liquid pumps are ideal for use in portable, battery-

operated equipment where consistent performance, corrosion-resistance, self-priming capability, and long life are important. In addition to standard product, a variety of custom options are available that will optimize the pump to fit your requirements.

KNF liquid pump features

- Self-priming, can run dry indefinitely
- Contamination-free transfer of liquids
- Few moving parts for reliable operation
- Compact footprint ideal for portable instruments
- Flexible mounting operates in any position
- Modular construction simplifies product choice
- Variety of modifications and options available



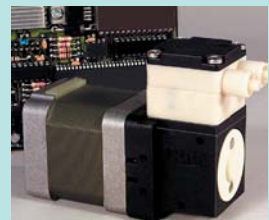
LIQUID MICRO

Model Series	Motor Types	LPM Free-flow	GPH Free-flow	ft. H ₂ O Suction	psig Pressure
NF5	DC/BLDC	.05	.75	13	15
NF10/11	AC/DC/ICDC/BLDC	.1	1.5	10	15
NF1.30	Geared DC	.17	2.7	20	85
NF30/31	AC/DC/ICDC/BLDC	.3	4.8	20	15
NFT30/31	DC/ICDC/BLDC	.6	9.5	20	15
NF60/61	AC/DC/BLDC/ICDC	.6	9.5	16	15
NF100	AC/DC/BLDC	1.2	19	13	15
NF1.100	AC/DC/BLDC	1.3	20.6	13	85
NF300	AC/DC/BLDC	3	47.5	10	15
NF1.300	AC/DC/BLDC	3	47.5	13	85



LIQUID METERING

Model	Motor Type	ml/min	GPH	ft. H ₂ O	psig
Programmable Metering Pumps					
FEM1.03	Stepper	.03 - 30	0.0047 - .475	12	90
FEM1.08	Stepper	.08 - 80	0.0013 - 1.28	13	60



Programmable Metering Pumps

KNF's FEM1.03 and FEM1.08 diaphragm metering pumps open unexplored possibilities to the OEM designer for metering neutral and aggressive liquids. Diaphragm technology plays a decisive role in increased process reliability; delivering precise, long-term dosing capability. The FEM diaphragm technology can be used with any type of liquid, but is particularly suitable for aggressive medium. One clear advantage is an extremely long service life, since there is no tubing or sliding seals that are subject to repeated stress. Stepdos pumps are easy to program and can be directly controlled using an external Windows PC.

New features - The FEM pumps features +/-2% accuracy, continuous metering, variable-volume metering, metering by time, repeat metering to 65,000 times and auto calibration. KNF incorporates all the advantages of diaphragm pump

technology, including self-priming, can run dry indefinitely, virtually maintenance free and highly resistant to chemicals.

Smother flow characteristics - These FEM pumps deliver a smooth, almost continuous flow. This is achieved by executing the suction stroke at the maximum motor speed, then slowing down to the selected speed for the delivery stroke. KNF metering pumps have the extraordinary wide metering range of 1:1000, and can be used for very low delivery rates.

Control interfaces - Pump characteristics are controlled manually on board, or via supplied Windows PC software. Standard protocols include 0-10 V, 4-20 mA, RS-485 & RS-232. In addition, there are input and output connections for monitoring an impulse signal, level-sensing switches, foot switches and an interface to electronic weighing scales, titrators, meters and other system electronically-controlled components.

Liquid Pump Accessories

Pulsation dampeners - The FPD reduces the pressure waves created by the oscillating action of a diaphragm pump. Several sizes are available to be used with the entire NF liquid pump line. Pressure fluctuation limited to 1.5 psi can be achieved with the proper FPD valve. Flow rate, pressure and stroke frequency all influence the amount of dampening possible.

Available sizes: **FPD 06, FPD 1.06, FPD 10, FPD 1.10**

Adjustable-diaphragm pressure control valve - This device regulates system pressure via a spring-loaded diaphragm. The valves are available in several materials, and are supplied with a lock-set screw or a control knob. They can serve as a backflow preventer or provide overpressure relief, preventing tubing damage as a result of excessive pressure in a blocked line.

Available sizes: **FDV 30, FDV 1.30 - 3 to 36 psig** **FDV31, FDV 1.31 - 30 to 95 psig**

Take advantage of KNF's new, advanced motor options

Previous design choices were basically limited to AC and DC motors. That is no longer the case in today's design environment. Users of sophisticated instruments demand products that are smaller, lighter, less expensive, and incorporate electronic control features. KNF has answered that challenge by designing our own advanced brushless DC (BLDC) motor and matching controller. The first to offer features such as speed sensing and control, sets KNF apart from the competition. Users of turbo backing systems can now precisely control system performance. Ironless-core DC (ICDC) motors are also available. Other motor types included explosion-proof Group C, air motors, and even motorless pumps. In addition, we offer the highest quality, KNF-built AC motors.

You have a variety of materials from which to choose

KNF's long experience with a variety of materials comes from decades of customer challenges to safely pump corrosive gases and liquids. Some of the materials available are:

- | | | | | |
|------------|-----------------|----------------|-----------------|-----------------|
| • Aluminum | • Ceramic | • EPDM | • Hastelloy® | • Kalrez® |
| • Kynar® | • Neoprene | • Nickel-plate | • Polycarbonate | • Polypropylene |
| • Ryton® | • 316 Stainless | • Teflon® | • Viton® | • TFM® |

Available head configurations - Depending on your performance requirement, KNF diaphragm pumps can be assembled with up to four heads, connected in series where deep vacuum is desired, or in parallel for the highest available flowrate. In addition, the heads may be connected separately for independent operation to create a multi-functional pump, including a unique air/gas pump in combination with a liquid pump.

KNF'S Unique Project Pump Program

KNF offers the widest range of standard diaphragm pumps in the industry, but we recognize that an "off-the-shelf" model, however flexible, will not always meet your specific needs. This is where KNF's Project Pump program has become our cornerstone of customer service.

Through the years we have mastered a way to "optimize, not compromise" a pump design quickly, efficiently and cost effectively. We bring together our knowledge about pumps, with what you know about your special requirements, to create a high-performance, value-added component you need. And, by combining our "project pump" expertise with your unique product knowledge, we will help you optimize our pump to work with your overall system.

All of our regional representatives are degreed engineers who will work closely with your designers to understand your system design goals. Our engineering department then uses the latest CAD programs and engineering research tools to create your custom design - for one piece or for thousands. Our confidential treatment of your system's features and components, leads to a proprietary pump construction for your company only. This successful "project pump" design strategy has resulted in more than 25,000 custom solutions representing over 75% of our business.

KNF manufactures oil-free vacuum pumps for the laboratory, featuring premium, corrosion-resistant parts of DuPont's Teflon® resin.

KNF provides you with solid design support to help you select system components including relief valves, gauges, motor drives, shock mounts and connectors, freeing you to concentrate more efficiently on your core product's development.



Pump sub-systems

A pump is the heart of any instrument, though equipment designers are sometimes not familiar with construction details affecting performance and life. Frequently, they lack familiarity with the pump's relationship to other components in the total system. KNF adds value by providing a system comprised of fittings, tubing, filters, valves, gauges, mounting connectors and other related items, allowing you to dedicate your resources to your core competencies. We welcome the opportunity to provide you with more than just a pump.

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