



YOUR PARTNER  
IN MEDICAL DEVICE  
TECHNOLOGY  
KNF GAS & LIQUID PUMPS





From diagnosis to treatment, KNF is your partner supplying customized pump solutions for device technology across a broad range of medical disciplines.

## KNF PUMPS IN ACTION: MEDICAL DEVICES

# FROM DIAGNOSIS TO TREATMENT: EXPERTISE FOR LIFE

State-of-the-art medical device technology is a pillar of medical expertise. Therefore it is vitally important that these products work precisely and reliably. As suppliers of gas and liquid pumps for a broad range of medical devices from diagnosis to treatment, we take this responsibility seriously.

For decades, our tailored solutions have been used by leading global manufacturers of devices for a diverse range of medical disciplines. Our pumps perform challenging tasks, transferring gaseous and liquid media and generating vacuum and pressure.

### **Systems expertise for the highest quality standards**

When lives are on the line, exacting standards must be met. Our highly skilled and experienced employees work meticulously to find the best possible solution for your challenge, always supported by our product centers in Germany and Switzerland. You can count on us every step of the way, from providing you with sample pumps to developing prototypes to series production. We also fully support subsequent generations of devices in order to ensure continuous improvement.

## OUR STRENGTHS

### **Collaboration**

Your personal contact will actively address your concerns. We will work closely with you to design a customized pump that can be integrated into your device technology, giving you a competitive edge in your target market. We can also help you find solutions that will make you stand out from the crowd. Our focus on service also includes customized warehouse and logistics concepts, which promote the efficiency of your production process.

### **Flexibility**

The parameters for our gas and liquid pumps are tailored to your specific requirements – as well as to test conditions, documentation and packaging upon request. Our modular system makes it easy to supply a variety of production models whose individual components have already been tried and tested while our flexible production process allows for both small and large production numbers.

### **Reliability**

You can count on KNF for quality, comprehensive advice and tailored solutions, as well as for reliable adherence to the applicable regulations governing medical equipment.



Precision is one of the marks of quality of KNF pumps – and vital for valid diagnostics.

## DIAGNOSIS: ANALYSIS & DIAGNOSTICS

# PRECISION RIGHT FROM THE START

A broad range of methods are used in analysis and diagnostics. But they have one thing in common: Accurate diagnosis sets the course for effective treatment.

We do our part to ensure valid results. Durable, adjustable and precisely working KNF gas and liquid pumps prove themselves in all aspects of analysis and diagnostics – from devices for invasive or non-invasive examinations to processing procedures for liquid samples in the clinical laboratory.

### **Precision**

We are leaders in diaphragm pump technology. We know that analysis and diagnostics place particular demands on equipment technology. This is why our pumps are designed to deliver consistent volumes of gaseous or liquid media. Each application requires specific performance parameters. Our proprietary control device technology is the key for precise and adjustable control, especially with high flow rates.

### **Durability**

Our selection of high quality pump components and materials provides the durability you need. Our gas and liquid pumps are maintenance free.

### **Flexible performance**

Size, performance parameters, various motor designs and mechanical options – all of this can be adapted and constructed to fit your specific requirements. Our modular system offers a flexible and cost-effective selection with a price-performance ratio tailored to any set of requirements.



Fine-tuning the performance parameters of KNF pumps to match the requirements of the application to ensure positive patient experiences.



TREATMENT: PREPARATION, PROCEDURE, MONITORING, FOLLOW-UP CARE

## WHEN RELIABILITY IS KEY

The reliability of KNF gas and liquid pumps is proven across a wide range of applications in devices covering all phases of treatment. We serve all medical specialties with products for the preparation and care of surgical instruments, surgical procedures including patient monitoring, irradiation technology, wound management, machine-aided intensive care, through to device technology for follow-up care.

KNF has been setting technological standards for more than half a century. The patented structured and zone diaphragms in our gas pumps achieve superior power density and gas tightness. The focus is always on safe and reliable performance, even under difficult operating conditions. When used in close proximity to patients, our micro gas pumps impress with their pleasantly quiet, low-vibration performance.

Following the same philosophy, our liquid pumps and diaphragm dosing pumps have been developed further to improve diaphragms and valves in particular. The dosing pumps can reliably meter even the smallest amounts with high repeatability – even in constant operation.

### Reliability

We will implement your precise specification, ensuring that the KNF pump reliably performs the defined task. Medical applications benefit from the fundamental advantages of our diaphragm technology:

- no contamination of media
- outstanding gas tightness
- can be mounted and operated in any position
- self-priming and able to operate dry for liquid applications
- moisture insensitive for applications using gas

### Stability

Our comprehensive expertise in the areas of mechanics, materials, fluidics, pneumatics, electronics and software development ensures continued advancement of technologies and solutions.

### High performance

Whether used in close proximity to the patient, built into a wearable medical device, or used to ensure safe irradiation processes – the functionality of KNF gas and liquid pumps provides the performance you need.



KNF pumps offer reliable performance in a wide range of medical devices used in treatment.

When used in close proximity to patients, KNF pumps impress with their pleasantly quiet, low-vibration performance.

# CONSISTENTLY MARKET-ORIENTED WITH A FOCUS ON YOUR REQUIREMENTS

## Our goal – Your added value

We see ourselves as your partner for custom-fit pump solutions in the field of medical device technology. For us, being a partner means providing competent and confidential support throughout all phases of device development as well as with subsequent generations of devices. It also means that we recognize changes in the market and respond with appropriate, constructive solutions. Our goal is to create advantages that provide you with added value.

## Custom-fit solutions

To develop our custom-fit solutions, we analyze the market requirements that you must meet as a device manufacturer and gain a sense of what users – your customers – expect from the devices. The results serve as the starting point for redefining the technical and economic specifications of the products, as necessary. In pursuit of our goal, we fundamentally reevaluate the status quo and systematically adjust our approach – from the design to the production process to logistics.

Allow us to present our most recent innovations.

### MAINTENANCE FREE

In the version with the brushless DC motor, the FF 12 and FF 20 pumps are capable of up to 20,000 hours of maintenance-free operation.



### SEALED & SECURE

The number of sealing points has been reduced to a minimum and the pump head parts are welded to ensure maximum security. All components that come into contact with the medium are chemically resistant.

### CLEVERLY DESIGNED

The mounting plate is equipped with a click-on mechanism, allowing the pump to be installed in the analytical system and removed again without the need for any tools.

### ADJUSTABLE

In the model featuring a brushless DC motor with IP54 protection, the flow rate can be varied in accordance with the process requirements. This enables a precise level of control especially at the lowest flow rates.

## FF 12 & FF 20 DIAPHRAGM LIQUID PUMP SPECIALIST FOR CHALLENGING MEDIA

The FF 12 and FF 20 have been developed for systems used to supply and prepare liquid samples for analysis. These pumps can be used for a wide range of tasks, including the dosing and supply of chemicals as well as the transfer of cleaning fluid to tip washing stations.

They also deliver high performance in the aspiration of washing fluid. The low-pulsation dosing enables high repeatability for precise and reproducible volumetric flow rates. During the design of these pumps, KNF paid particular attention to their impermeability to ensure that they can handle even substances with a very low viscosity.



*“With the FF 12 and FF 20, we’ve developed small, reliable powerhouses that allow us to cover a broad spectrum of applications.”*

Andreas Wüthrich, development team,  
Liquid Pump Product Center

#### FLEXIBLE

Available with  
1 or 2 heads.

#### A VARIETY OF MOTORS

Depending on the operating conditions,  
a range of different motors from the  
KNF modular system are available, from  
inexpensive to high-end models.



#### HIGH- PERFORMING

Up to 10 l/min  
flow rate and an  
ultimate vacuum of  
up to 50 mbar abs.

#### CHEMICALLY RESISTANT

The components that come into contact  
with the medium are made from PPS and  
EPDM, optionally also from FKM or FFKM.

## MICRO DIAPHRAGM GAS SAMPLING PUMP NMP 830 HP

# THREE TIMES BETTER: FLOW RATE, VACUUM, PRESSURE

Among other uses, the NMP 830 HP is suitable for medical devices for dialysis and ozone therapy – devices that operate reliably and fault-free in close proximity to patients. It can also be used in diagnostics equipment. The new NMP 830 HP is an extension of the NMP series, which has proven its worth over decades of use. This latest innovation offers a

much higher flow rate, vacuum and pressure – while keeping the footprint small. This gives engineers and developers a decisive advantage when designing equipment for particularly challenging applications.

#### COMPACT

The pump's small size facilitates system integration and supports space-saving solutions.

#### DURABLE UND CHEMICALLY RESISTANT

Even over the long term, the N 816 stands up to humidity and condensation without incurring any damage. The pump head components that come into contact with the medium are made from the chemically resistant materials PPS, EPDM, PTFE or FFPM.



#### HIGH-PERFORMING

With impressive flow rates of up to 16 l/min, collecting containers are evacuated quickly and reliably.

#### A VARIETY OF MOTORS

Select from among AC and two brushless DC motors, including a brushless DC motor developed by KNE, which offers all of the advantages of adjustable parameters.

## N 816 DIAPHRAGM VACUUM PUMP HIGH-PERFORMANCE ASPIRATION OF LIQUID SAMPLE WASTE

A variety of reagents, solvents and cleaning agents are used in the analysis of biological samples, resulting in mixed chemical liquid waste, which is collected in special containers. As this waste mixture is associated with risks, the containers must be emptied

regularly, a process which requires a durable and reliable pump. The N 816 was specially developed for precisely this purpose. It is resistant to humidity and condensation as well as aggressive media, and impresses with its durability.



*"The combination of durability and performance makes the N 816 a universal solution for handling liquid sample waste."* Christian Quintus,

development team, Gas Pump Product Center



### TARGETED FORCE

The pump achieves up to 5.5 bar of positive pressure and makes this available either as a pressure pulse or as constant pressure – an ultimate vacuum of less than 250 mbar is attained.



### COMPACT

Given its performance class, the pump is surprisingly small, making system integration easy.

### QUIET

Operating noise is minimal, which makes the pump ideal for mounting in devices that are used close to the patient.

## NPK 03 MICRO PISTON GAS PUMP

# WHEN TARGETED PRESSURE IS REQUIRED

In order to function properly, many medical devices require specific pressure – either in the form of a pressure pulse or constant pressure. These requirements are often associated with compact devices. This is typically the case with inhalation devices, for example.

The NPK 03 fulfills both requirements, achieving up to 5.5 bar of positive pressure despite its extremely compact size.



*“With the NPK 03, we have fulfilled the requirements requested by many customers.”*

Walter Flubacher, development team,  
Micro Gas Pump Product Center

#### LEAK-PROOF

The sophisticated sideport ensures a reliable hydraulic connection to the system.

#### PRECISE AND FLEXIBLE TRANSFER OF LIQUIDS

The frequency of the pump can be linearly adjusted from 0–50 Hz for precise, frequency-controlled transfer. In addition, the priming time can be varied in accordance with the demands of the process.



#### SIMPLE

Non-return valves are not required, as the FL 10's design ensures that liquid cannot flow through the pump heads uncontrolled, even when the pump is switched off.

#### GENTLE

A resonating chamber compensates for turbulence caused by negative pressure peaks, ensuring that volatile liquids are transferred gently.

#### DURABLE AND MAINTENANCE-FREE

The FL 10 maintains its performance through 2,000,000,000 strokes and more than 10,000 hours of operation without maintenance – even when handling aggressive liquids.

## FL 10 DIAPHRAGM LIQUID PUMP

# ABSOLUTE SECURITY FOR CLEANING AND DISINFECTION APPLICATIONS

Successful hygiene management involves the use of low-viscosity, aggressive and often volatile media. Transferring such disinfectants places particular demands on pump technology. The FL 10 was designed with precisely these demands in mind. Its IP65 protection class makes it suitable for harsh operating conditions

involving humidity and dirt. Thanks to its maintenance-free design, the FL 10 boasts low operating costs, which give it an edge over other pump technologies. There is no need to change the hose due to wear and tear.



*“Thanks to its durability and maintenance-free design, the FL 10 boasts very low operating costs, and the integrated sealing mechanism saves the customer from having to install additional valves.”* Ruedi Schnyder, development team, Liquid Pump Product Center

**FEWER VARIANTS –  
REDUCED  
INVENTORY COSTS**

Two motor variants for all voltages used around the globe.

**FASTER STERILIZATION**

The special diaphragm design ensures that input volumes remain stable throughout the entire pressure range. Outstanding suction speed at pressures from < 500 mbar abs to ultimate vacuum accelerates the entire process.

**EASILY  
INTEGRATED  
INTO EXISTING  
DEVICE DESIGNS**

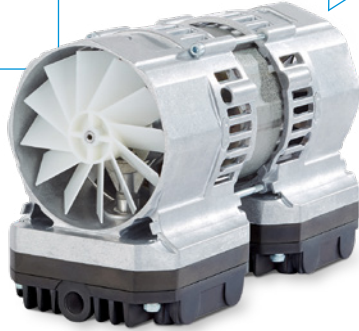
Universal connection scheme, compact external dimensions.

**RAPID EVACUATION OF THE VAPOR  
PRODUCED DURING STERILIZATION**

The aluminum pump heads effectively dissipate heat, reducing the volume of the vapor and allowing the sterilization chamber to be evacuated more quickly.

**ROBUST DIAPHRAGM**

The selected membrane material is resistant to the oil used to maintain the medical instruments, thereby preventing the diaphragm from swelling and causing the autoclave to break down.



## N 936.3 DIAPHRAGM GAS PUMP

# ADDED VALUE FOR AUTOCLAVE MANUFACTURERS AND USERS

Steam sterilization using a fractionated vacuum and vacuum drying requires maximum technical performance from diaphragm gas pumps. The goals of the new development focused on improving the performance and reducing the costs of these pumps. The key insights of KNF's intense market research

pointed toward reducing maintenance needs, the number of variants and the costs of device integration, as well as shortening sterilization times. In order to create advantages that add value, the KNF development team examined and adjusted both the design and the entire manufacturing process.



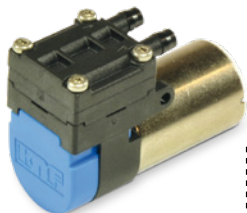
*"The diaphragm design of the N 936.3 accelerates the drying phase, which can help shorten the entire process in autoclaves."* Christian Beutter, development team, Gas Pump Product Center

### IDEAL FOR BATTERY-OPERATED DEVICES

thanks to minimal power consumption.

### QUIET AND NEARLY VIBRATION-FREE

Ideal for applications in sensitive areas in close proximity to patients.



### POWERFUL CONTINUITY

The NMP 03 transfers quantities from just a few milliliters to up to 500 ml/min at a constantly linear rate.

### SETTING NEW STANDARDS

Weighing only 11 grams at a total length of 24 millimeters, the pumps are ideal for use in battery-operated hand-held devices.

## NMP 03 MICRO-DIAPHRAGM GAS SAMPLING PUMP OPTIMALLY STREAMLINED FOR PORTABLE DEVICES

Countless medical applications rely on portable, battery-operated and/or hand-held devices. The requirements in terms of size, weight, noise levels, vibration, adjustable control and power consumption are particularly demanding, as the configuration of these parameters has a direct impact on the quality of the device. The new NMP 03 diaphragm gas sampling

pump is specially designed for maximum performance in these areas. The following benefits also emerged during the development process: Minimal power consumption ensures that battery-operated devices feature a long service life and linear control action. The brushless motor may also be connected to optionally available electronics.

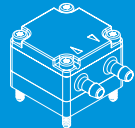
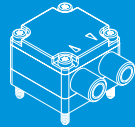
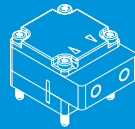


*“The performance parameters of the NMP 03 are ideally configured to satisfy the requirements of portable devices.”* Christian Waser, development team, Micro Gas Pump Product Center

## MATERIAL OPTIONS

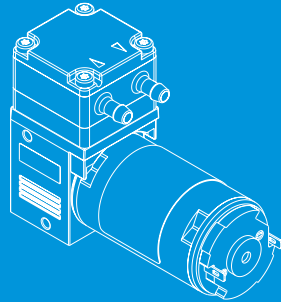
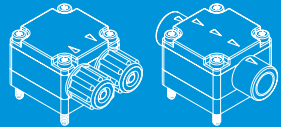
Valve/Diaphragm:  
EPDM, FKM, FFKM,  
HNBR, stainless steel  
and others

Pump head:  
PP, PPS, fluoroplastics,  
stainless steel, aluminum  
and others



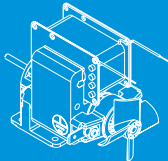
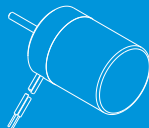
## MECHANICAL OPTIONS

Circuit points and  
connections



## MOTOR OPTIONS

All common voltage  
configurations are available.  
Explosion-proof options  
(motor types: DC, DC-B, AC)



## KNF MODULAR SYSTEM

# FLEXIBLE, CUSTOM-FIT, COST-EFFECTIVE – FROM STANDARD TO HIGH-END

Every application is different and some are one of a kind. Our modular system is designed to give you a high degree of flexibility, speed and reliability. You can be sure that every gas and liquid pump supplied by KNF will exactly meet your requirements, no matter how complex or unusual these might be.

### Project pumps – precisely designed for the application

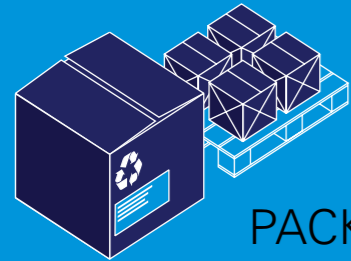
We support your development project by providing you with sample pumps quickly and easily. In consultation with you, our employees from the sales, engineering, and product management divisions determine the modifications to be made.

### The KNF modular system for creating customized pumps

The configurations created by the KNF modular system are based on tried and tested individual components, meaning that developing customized pumps is quick and inexpensive.

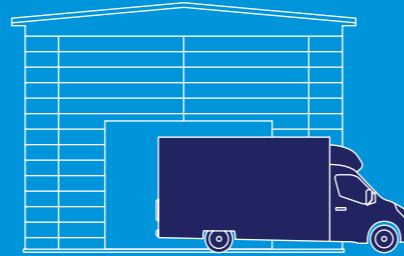
# FLEXIBLE SUPPORT FROM START TO FINISH – YOUR ADDED VALUE IS OUR PRIORITY

WITH KNF, FLEXIBILITY DOESN'T STOP AT THE TECHNICAL SOLUTION. WE FULFILL YOUR INDIVIDUAL REQUESTS EVERY STEP OF THE WAY UNTIL DELIVERY AND SERVICE.



## PACKAGING

We'll be happy to implement any measures that make life easier for your goods inward department, as well as to support your efforts toward recycling and environmental protection.



## LOGISTICS

We support all types of production lot ordering – including Kanban, VMI, CMI, B2B and others.



## DOCUMENTATION

Together, we'll define the type, scope and design of the documentation.

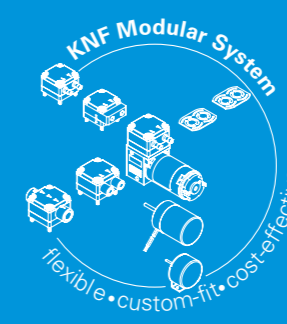


We inspect and test 100% in line with your requests.



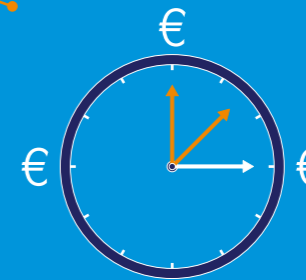
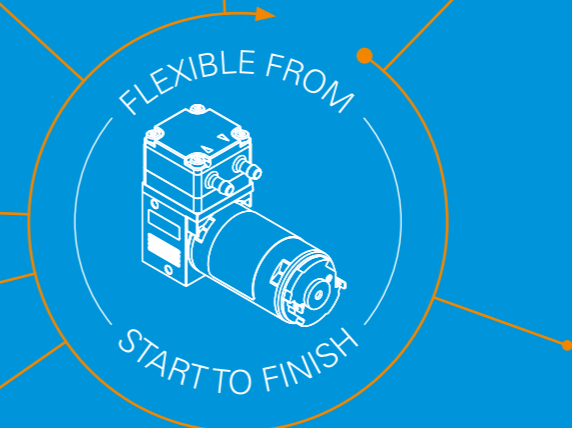
## SERVICE

We implement custom-fit service concepts for you. It is important to us to minimize the overall running costs of our pumps, and we take this into account in the pricing of replacement parts.



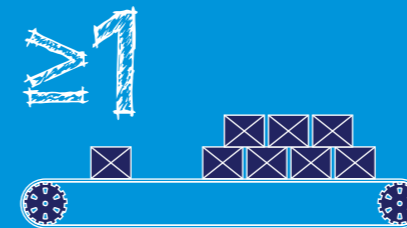
~3,000

customized adaptations are carried out at KNF every year for all our customers worldwide – quickly and inexpensively thanks to our modular system. We also develop exclusive pumps and drive concepts for individual customers.



## "ASSEMBLY AND ENGINEERING IN ONE"

We will provide you with the pump as an assembly. This may include completing steps in the production process or installing components such as a valve block, sensors, tubing etc.



## PRODUCTION

You can rely on the flexibility and quality of our support for every order with KNF, from large lot sizes to a single pump.

## OUR BEST PUMP SERIES MODELS FOR MEDICAL DEVICE TECHNOLOGY

Thanks to the KNF modular system, each of our series models can be quickly and easily adapted to suit the specific needs of an application.

### TRANSFER, EVACUATION & COMPRESSION OF NEUTRAL/AGGRESSIVE GASES

	Type	Flow rate at atm. pressure (l/min)	max. vacuum (mbar abs.)	atmospheric pressure	max. pressure (bar g)
<b>Micro diaphragm pump</b>	NMP to NMS	0.3 – 12	200		3
<b>Mini diaphragm pump</b>	N 85.3 to N 936	5 – 60	10		2.5
<b>Multi-stage diaphragm pump for deep vacuum and high flow rate</b>	N 84.3 to N 950	4.2 – 80	0.5		1



Micro diaphragm pump



Mini diaphragm pump

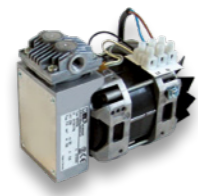


Multi-stage diaphragm pump

	Type	Flow rate at atm. pressure (l/min)	max. vacuum (mbar abs.)	atmospheric pressure	max. pressure (bar g)
<b>Micro swing-piston compressors &amp; vacuum pumps</b>	NPK 03 ... 04	2 – 3.3	250		5.5
<b>Swing-piston compressors &amp; vacuum pumps</b>	NPK 09 ... 0100	12 – 78	80	7	



Micro swing-piston pump



Swing-piston compressor & vacuum pump

### THE DIAPHRAGM – THE CENTERPIECE OF EVERY PUMP



#### Continuous development

The diaphragm is the centerpiece of every pump. This hard-working component is essential for ensuring the pump works efficiently, which is why KNF works diligently to further advance its technology. From flat diaphragms, molded diaphragms and structured diaphragms to zone diaphragms and oval diaphragms, each diaphragm shape boasts its own specific advantages in order to meet the requirements of their various fields of application.

### TRANSFER & METERING OF NEUTRAL/AGGRESSIVE LIQUIDS

	Type	max. flow rate at atm. pressure (ml/min)	max. pressure (mWg)	max. suction height, self-priming (mWg)
<b>Solenoid diaphragm liquid pumps</b>	FMM 20 to FL 10	18 – 100	10	4
<b>Micro diaphragm liquid pumps</b>	NF 5 to NF 1.60	5 – 650	60	3.5
<b>Diaphragm liquid pumps (two pump heads)</b>	NFB 5 to NFB 100	2 x 1.3 (l/min)	10	6
<b>Diaphragm liquid pumps</b>	NF 100 to NF 1.600	1.2 – 6 (l/min)	60	3
<b>Diaphragm pressure pump</b>	NF 2.35	350	16 (bar)	3



Solenoid diaphragm liquid pump



Micro diaphragm liquid pump



Diaphragm liquid pump (two pump heads)



Diaphragm liquid pump



Diaphragm pressure pump

	Type	Dispense volume at atm. pressure (µl)	Dosing rate at atm. pressure (ml/min)	Pressure height (mWg)
<b>Micro diaphragm metering pump (stepper motor-driven)</b>	FEM	5 – 520	0.2 – 90	60



Micro diaphragm metering pump (stepper motor-driven)

# YOUR LOCAL PARTNER AROUND THE WORLD

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