HNPM
HNP Mikrosysteme

# »precise pumps – smart solutions«

## micro annular gear pumps

# HNP Mikrosysteme

**Company**

HNP Mikrosysteme was founded in 1998. Today, about 90 employees work at our location in Northern Germany. Here, micro annular gear pumps and dosing systems are created from the idea to design and assembly to final testing and validation. Our products are used worldwide.

We take responsibility for our region, society and the environment and are committed to the further training of young engineers. With our pumps, we make applications more effective and enable our customers' innovations.

**Products**

We manufacture micro annular gear pumps (mzr®-pumps) for dosing and metering small quantities of liquids. With five series and several sizes of mzr®-pumps, dosing volumes starting at 0.25 µl, flow rates ranging from 1 µl/h to 1.1 l/min as well as pressures from 0 to max. 150 bar can be realized. The range of the liquid viscosity extends from 0.3 to 1,000,000 mPas. Operation in an explosion-proof area is also possible.

Furthermore, we offer customized dosing systems, our own filter series as well as the development of OEM pumps. We are, of course, available for any question during the integration, commissioning and the running process. We offer technical service as well as training. Our specialized sales team will advise you comprehensively, individually and with your application in mind.

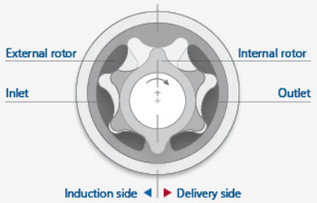
**Advantages**

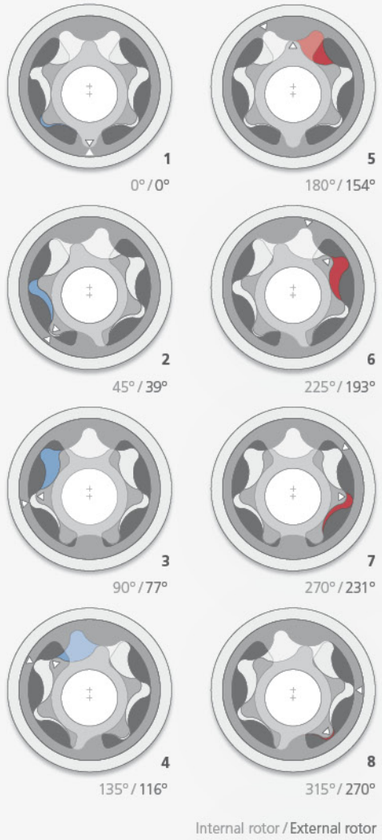
- precise dosing
- long service life due to tungsten carbide and ceramic components
- corrosion-resistant materials
- self-priming
- dosing, metering and rinsing
- low dead volume
- compact structure
- low weight
- low pulsation
- low shear stress
- wide dynamic range
- forward and reverse operation

**Technology**

Micro annular gear pumps are miniaturized rotary positive displacement pumps. They are based on a so-called micro annular gear principle with an externally toothed internal rotor and an internally toothed external rotor. The internal rotor has one tooth less. The resulting chambers have a fixed displacement volume. Tooth ratios of 6/7 and 10/11 are used.

The inner rotor is driven by the shaft. The outer rotor is moved by the inner rotor. The volume of the pumping chambers increases on the induction side and simultaneously decreases on the delivery side of the pump. A kidney-shaped inlet or outlet opening connects several pumping chambers. This results in a homogeneous and low-pulsation flow rate.




Internal rotor / External rotor



# Applications

- Analytical instrumentation
- Diagnostics
- Cell analysis
- Chromatography
- Biochip technology
- Mass spectrometry
- Biotechnology
- In-vitro diagnostics
- Microencapsulation

- Fine chemistry
- Pharmaceutical production
- Vaccine production
- Polymer chemistry
- Basic chemistry
- Agrochemical industry
- Petro chemistry
- Food
- Cosmetics
- Metering of liquid gases

- Packaging and filling
- Automotive industry
- Tobacco industry
- Mechanical engineering for medical products
- Liquid color dosing
- Pharmaceutical plant engineering
- Coating
- Additivation
- Polymer handling electrospinning
- Battery production
- Dosing technology
- LOHC metering

# Pump Series

## High performance pump series

The high performance pump series is well suited for **challenging dosing tasks** requiring high precision, a middle pressure range, high temperatures and viscosities ranging from 0.3 to 1,000,000 mPas. The pump has a double-sided bearing system and is driven by a powerful DC-servo motor with integrated controller. With a large choice of additional modules such as the fluidic seal module, heating module, heat insulation module or gear modules, the high performance pumps are especially recommended for mechanical and plant engineering. Depending on the pump size, standardized connectors 1/4"-28 UNF, 1/8" NPT or 3/8" NPT are offered.

## Hermetic inert pump series

The hermetic and chemically inert series is almost **universally suitable for aggressive liquids** and therefore an innovation in pumping technology. Rotors and functional elements made from nickel-based tungsten carbide or ceramics like zirconia and alumina lend the pumps high chemical resistance and outstanding wear-resistance. With shaft and bearing material of silicon carbide (SSiC) and the housing components of alloy C22 (2.4602), the pumps can be used with demanding oxidizing and reducing liquids, acids, bases and solvents. The pumps are designed hermetically and driven by a torsion-proof NdFeB magnetic coupling.

## Ex-versions

The high performance series pumps as well as the hermetic inert series pumps can be equipped with drives which have Ex-approval for **use in areas with potential explosion risk** or UL/CSA certification. The approval of the pumps is in compliance with ATEX according to the EU Directive 2014/34/EU.

## Low pressure pump series

The pumps of the low pressure pump series are used in analytical instrumentation for precise dosage tasks **at low pressures and for low viscosities**. They are particularly suited for lowest volumes of non-lubricating liquids. Using DC mini motors, the pumps have small dimensions and low power consumption so that they can be easily integrated into OEM applications. The pumps are suitable for metering and dosing de-ionized water, watery solutions, solvents as well as low-viscosity oils and lubricants.

## Modular pump series

The modular micro annular gear pumps are suitable for use with **light corrosive liquids**. When equipped with oxide ceramic bearing components, the pump bodies as well as the rotors can be combined from different materials dependent on the liquid to be conveyed. The rotors are available in a zirconia based ceramic and, alternately in nickel-based tungsten carbide. Alloy C22, stainless steel 316 L, aluminium and PEEK™ form the different options for the wetted pump housing. The pump covers applications from analytical instrumentation to chemistry.

## Magnetic hermetic pump series

The pumps of the magnetic hermetic series are qualified to **handle crystallizing, air or moisture-sensitive liquids** because the pump has no shaft seal. This feature is made possible thanks to a liquid-separating cup surrounding the magnetic drive. The compact dimension of the pump is realized using a completely new product design and optimal coordination with an integrated motion controller. The pump can be used in all areas where leak-free operation and long service life as well as low energy consumption are important requirements.



# Technical Data

## Technical Data

$V_g$ = Displacement volume
* with additional equipment such as high-resolution encoder, gear box, special drive
** depending on liquid and viscosity

Even if single parameters are within the indicated performance range of technical data, certain parameter combinations may not be achievable. Single parameters may exceed their indicated performance range under adequate circum-stances. For detailed evaluation please contact HNP Mikrosysteme. Actual performance may vary. Specifications are subject to change without notice.

# Filter Series F-MI

[F-MI0]
· Internal volume: 0.3 ml
· Filter area: 1.3 cm²
· Fluid connection**: 1/4"-28 UNF

[F-MI1]
· Internal volume*: 7.5 - 11 ml
· Filter area: 9.5 cm²
· Fluid connection**: 1/8" NPT

[F-MI2]
· Internal volume*: 20 - 30 ml
· Filter area*: 61 - 72 cm²
· Fluid connection**: 1/8" NPT

[F-MI3]
· Internal volume*: 65 - 84 ml
· Filter area*: 135 - 150 cm²
· Fluid connection**: 3/8" NPT

[F-MI4]
· Internal volume: 195 ml
· Filter area*: 407 - 450 cm²
· Fluid connection**: G 1/2"

* depending on design, size and configuration
** other connections on request

## Filter series F-MI

**Liquids and gases efficiently filtered**

The **F-MI filter series from HNP Mikrosysteme** is used in a wide range of applications in the life science, mechanical engineering, chemical and pharmaceutical production and food industry.

In microfluidics, the use of filters is a question of purity or particle size limitation in the liquids processed. Processes at the molecular level are often involved that do not tolerate impurities. Filters keep foreign particles, fibers and, in the worst case, chips away from downstream devices and microfluidic structures.

The **F-MI0 to F-MI4 filter series** includes three different designs in five sizes. There is a wide selection of media-resistant and certified materials. Filter finenesses of 3, 10, 25, 40, 50 and 100 µm are available. Our experts will be happy to advise you on the right choice of filter from this wide range of variants, according to the properties and requirements of your process.

### Function

- guarantees purity in the production process
- protects the end product from contamination
- protects sensitive periphery from particles
- ensures the functionality of the system

### Material

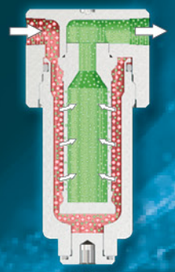
- corrosion-resistant materials 316L stainless steel or alloy C22
- media-resistant and certified sealing materials FPM, FFPM or EPDM

### Advantages at a glance

- high filtration capacity in relation to the internal volume due to large filter area
- high-performance filter elements for low pressure losses even at higher flow rates and viscosities
- variety of designs due to different housing shapes (t-filter, inline or inlet filter) and housing materials, filter finenesses and sealing materials
- purely metallic filter elements
- suitable for food and pharmaceutical industries: FDA-compliant sealing materials, surface roughness ≤ Ra 0.8 and hygienic fittings on request
- user-friendly and economical: filter elements can be cleaned and replaced
- optional filter monitoring and electrical heating elements can be integrated
- professional advice and configuration by our experts

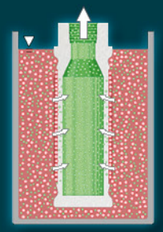
**Filter structure**
**Example F-MI2-T**

**Functional principle of filter designs**



T-Filter

Inline filter (straight)



Inlet filter

## Filter accessories

### Filter monitoring

When using a filter in a pump system, it should be placed as close as possible to the pump. The filter is being monitored by means of a suction pressure sensor. The measured pressure shows the pressure loss of the entire suction line upstream of the pump and allows conclusions to be drawn about the condition of the filter element. Maintenance and cleaning can be carried out as required and unnecessary downtimes can be avoided. A reliable media supply is guaranteed.

In addition to simple pressure sensors with analog output, pressure switches with digital display, LED displays or configurable output signals are available. Pressure switches provide feedback when a defined pressure threshold is reached. They can be configured for specific applications using the IO-Link interface.

### Electrical heating module

An electric heating module is available for the larger filters. Consisting of a heating jacket and a thermocouple, it prevents the media temperature from dropping, thus ensuring a stable production process.

### Filter series F-MI0 - F-MI4

| | |
|---|---|
| Internal volume: | 0.3 … 195 ml |
| Filter fineness: | 3 … 100 µm |
| Max. system pressure: | 140 … 200 bar |
| Max. differential pressure: | 5 … 20 bar |
| Liquid temperature: | -200 … +275 °C |
| Height: | 21.5 … 174 mm |
| Weight: | 2 … 3.100 g |
| Diameter: | 6.5 … 80 mm |

# System Solutions

**Drive Technology**

We supply our pumps with regulated precision motors and pay attention to a compact design. Depending on requirements with regard to discrete or continuous dosing as well as the required performance, other drive options such as stepper motors or three phase AC motors are available.

**Controller**

The range includes controller modules, such as cabinet control units as well as controllers with a graphical user interface. The graphical user interface facilitates handling by direct input of dosing quantity and speed as well as dosing duration and number of repetitions. For continuous feeding, the volume flow and duration are set. Further functions are, for example, the restart procedure and a graphical data analysis.

The mzr-Touch Control is designed for a single pump application. For the control of a larger number of pumps, the Display Control is the right choice.

Two programs provide support to operate the pumps. Our own control program mzr®-pump controller is available for laboratory and test operations. Alternatively, using the software »Motion Manager« which runs under Microsoft Windows®, all drive parameters can be set and saved.

**Supplementary Modules**

Depending on pump series, there are supplementary modules which increase the application range of the pumps. For metering air and moisture-sensitive liquids as well as for vacuum applications, a fluidic seal module is available. With the use of a heat insulation module, cold and hot liquids of -20 up to 200° Celsius may be delivered. Active heating of the pump head to maintain the liquid temperature is made possible using the heating module.

**Dosing Systems**

We designed compact dosing systems for a variety of applications. The Modular Dosing System MoDoS® is a tailor-made pump system for continuous production processes in fine chemistry. The Micro Dispense Module µDispense® is used for a process-safe liquid handling in analytical instrumentation. LiquiDoS® is a very compact and versatile dosing system for analysis, research and development. The flexible smartDoS® dosing and filling system is primarily used in mechanical engineering and the cosmetics sector. colorDoS® was specially developed for dosing liquid colors in plastic injection molding.

The heart of each dosing system is a self-priming micro annular gear pump. Other possible components include flow meters and controllers, pressure sensors, controls, filters, valves, shut-off elements, screw-in fittings, adapters, hoses, pipes, dosing needles, cabinets, reservoirs and more.

All systems are delivered ready-to-use and are configured according to customer specifications. You can rely on our many years of experience in the selection and configuration of components.

Our sales team, consists of chemists, physicists, biochemists, electrical and mechanical engineers, will provide you with comprehensive advice. We offer metering and dosing tests as well as on-site support during commissioning.

You can find all videos on our YouTube channel.



# Modular Dosing System

The **Mo**dular **Do**sing **S**ystem **MoDoS®** is a tailor-made pump system for continuous production processes in fine chemical and pharmaceutical production.

**MoDoS®** is synonym for a design concept, forming the base for the development of a customized pump module. We provide detailed advice on the selection and integration of components. You will receive a tested and ready-to-use dosing system in a stable frame. The selection of sensors for flow, pressure or temperature is based on the process parameters. We use flow sensors from different manufacturers, based on various thermal principles or on the Coriolis principle.

**Applications**

- Flow chemistry
- Fine chemistry
- Pharmaceutical production
- Miniplant technology
- Dosing and filling

**Advantages**

- high process stability
- chemically resistant materials
- media change for flexible use
- stand-alone operation or integration into process control system
- open design with easy access to components
- customized configuration

**Components**

- Micro annular gear pump
- Sensors for flow, pressure, temperature
- Display Control
- Filter
- Valves, shut-off elements
- Screw-in fittings, adapters
- Hoses, pipes
- Frames

**Typical Liquids**

- Acids and bases
- Organometallic compounds, butyl lithium
- Catalysts
- Ammonia, pure or in solution
- Pharmaceutical ingredients and vaccines
- Solutions of radioactive isotopes
- Organic reagents

# Dosing Systems

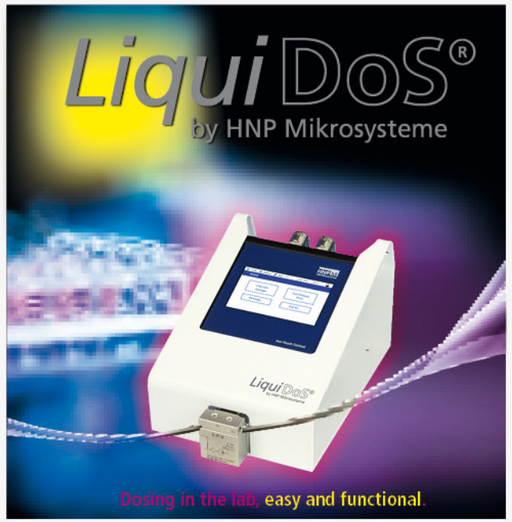
The Micro Dispense Module **µDispense®** is used for process-safe liquid handling in analytical devices. The size corresponds to half the syringe pump format. Due to interface compatibility, existing syringe pumps can be replaced by µDispense®.

**Advantages**
- continuous and reversible flow rate
- high flow rates during rinsing
- modular design
- low noise level
- long service life
- low pulsation

**Typical liquids**
- Organic and inorganic solvents
- Water solutions
- Buffer solutions
- Nutrient media

**Applications**
- Analytical instrumentation
- Biotechnology
- Laboratory automation
- Flow cytometry
- Chromatography
- In-vitro diagnostics

**Components**
- Micro annular gear pump
- Filter and valve
- Mounting block
- Flow sensor
- Cabinet




**LiquiDoS®** is the comfortable and versatile dosing system for analysis, research and development. The graphical user interface allows easy programming, reproducible results and a fast change between manual and automated dosing tasks.

**Advantages**
- gentle and bubble-free delivery
- reproducible dosing results
- fast media change
- effective use of reagents
- operation via touch display

**Typical liquids**
- Organic and inorganic solvents
- Water solutions
- Low viscosity oils
- Buffer solutions
- Nutrient media

**Applications**
- Research and development
- Analytical instrumentation
- Microreaction technology
- Diagnostics
- Laboratory automation

**Components**
- Micro annular gear pump
- Filter and valve
- Mounting block
- Control system mzr-Touch Control
- Component carrier

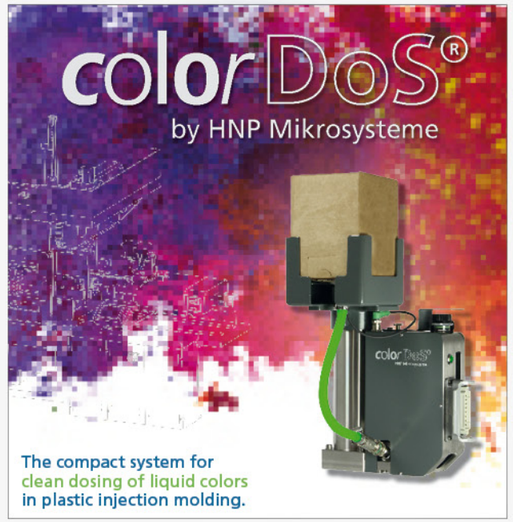
**smartDoS®** is a flexible dosing and filling system for industrial production. It is suitable for the ergonomic design of manual workstations for small batches and pilot series; on the other hand, it can be integrated mechanically and in terms of control technology and is suitable for automated production processes.

**Advantages**
- variable dosing dynamic
- wide viscosity range
- gentle, bubble-free dosing
- cost and time saving
- easy emptying and rinsing
- signal exchange with PLC

**Typical liquids**
- Oils, greases, silicones, waxes
- Adhesives, coatings
- Colorants, flavors
- Gels, pastes, emulsions
- Additives in Food & Pharma

**Applications**
- Dosing in cosmetics
- Filling in the pharmaceutical sector
- Ink and color dosing
- Bubble-free filling of oil dampers
- Microencapsulation

**Components**
- Micro annular gear pump
- Filter
- Reservoir
- mzr-Touch Control
- Hand or foot switch
- Shut-off element
- Dosing needle




**colorDoS®** is a compact dosing system for liquid colors in plastic injection molding. It is mounted above the injection molding machine in the feed area of the conveying screw. Short fluid connections between the container and the pump module as well as dripless quick-release couplings ensure fast and clean color changes.

**Advantages**
- clean handling
- fast color change
- special dosing nozzle design
- no color contamination in the feed area
- high color fidelity with minimum color application
- effective use of raw materials and machine time
- operates synchronously with the injection molding machine
- intuitively operable display control
- signal exchange with the injection molding machine

**Applications**
- Dosing in plastic injection molding

**Typical liquids**
- Liquid colors
- Additives

**Components**
- Micro annular gear pump
- Dosing nozzle
- Adapter unit
- Container holder with load cell
- Dripless quick-release couplings
- Display Control

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