

# Which pumps fit you right?

► Dosing liquids on demand



How adaptable is  
your high pressure  
dosing pump?



### **Pumps are used for a wide range of tasks in the food, chemical, and pharmaceutical industries.**

These can include the conveying and dosing of aqueous and organic liquids, highly viscous liquids, aggressive media, or liquid gases. Dosing at high or low temperatures (below 0°C to over 100°C) and at high pressures over 100 bar is also a common task.

Meeting this range of requests requires very adaptable pumps. KNAUER develops analytical instrumentation since 1962. The German based family business is highly experienced in the field of high-performance

liquid chromatography (HPLC) and pumps have always been a core competence of the company.

Low pulsation and high pressures of up to 400 bar are a must in HPLC and are also ideal for high precision metering and liquid supply applications. KNAUER is highly adept at developing customized solutions, thanks to decades of experience with our OEM business partners.

### **Dosing pump features**

- ▶ Maximum back pressure up to 400 bar
- ▶ Flow rate range: 0.01 – 1000 ml/min
- ▶ Maximum viscosity up to 1000 mPa·s
- ▶ Liquid temperature range: -10 – 120 °C
- ▶ Easily exchangeable pump heads (customizable and service-friendly)
- ▶ Pump head components are available in a range of materials, even for aggressive media
- ▶ Very low pulsation
- ▶ Flexible control (Ethernet, RS-232, analog signals)
- ▶ LabVIEW 2011 driver support

Other pump models or application tasks are available upon request. Please contact: [dosing@knauer.net](mailto:dosing@knauer.net)

Technical data are subject to change without notice.

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How flexible is your  
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dosing solution?



# High pressure dosing

Dosing liquids easily up to 400bar

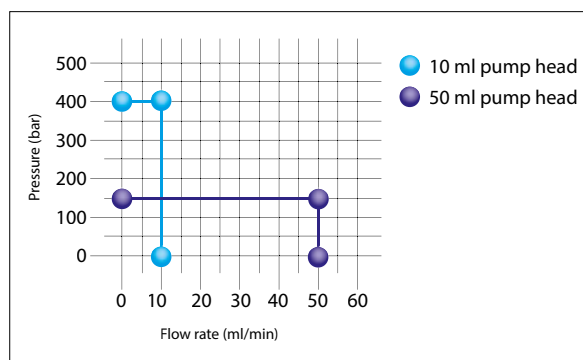
KNAUER pumps are designed for feeding liquids under high pressure. A selection of pump heads is available for customized chemical compatibility with a wide range of liquids. Different flow rate ranges and an optimized pump design enable excellent performance and high flexibility for demanding low, medium, and high pressure dosing tasks. Pump heads can be exchanged quickly to adapt easily to changing applications.

## Pump requirements

- ▶ High flow rate accuracy
- ▶ Low pulsation
- ▶ Compatibility with materials
- ▶ High reproducibility

## Pump features

- ▶ Easy to exchange pump heads available in sizes of 10 ml/min or 50 ml/min
- ▶ High pressure capability up to 400 bar
- ▶ Excellent flow rate accuracy and precision
- ▶ Powerful and precise drive with low pulsation
- ▶ Flexible control – possible through a touch pad, via RS-232, Ethernet and analog interface
- ▶ Compact dimensions – it fits almost anywhere
- ▶ Economical solution for simple dosing applications




Capacity range for simple dosing applications

## Application examples

- ▶ Metering of water
- ▶ Metering of methanol
- ▶ Metering of aromatic hydrocarbons (e.g. benzene or xylene)

## Operating parameters

Max. delivery pressure	40 MPa (400 bar, 5800 psi)
Flow rate range	0.01 – 50 ml/min
Max. viscosity	100 mPa·s
Liquid temperature range	20–60 °C (68–140 °F)

A close-up photograph of a laboratory setting. A glass pipette is shown dispensing a single drop of green liquid into a rack of clear glass test tubes. The test tubes are arranged in rows, and the background is a soft, out-of-focus blue. A green speech bubble is overlaid on the upper right portion of the image.

How do you ensure  
the highest accuracy  
in your dosing tasks?

Photo: ©panthermedia/nellgnacio Gonzalez Prado

# High accuracy dosing

Combining pumps with mass flow controllers

Demanding metering applications for liquids with different viscosities or precise batch dosing tasks can be achieved by combining KNAUER pumps with mass flow controllers. Since KNAUER pumps support a wide variety of communication interfaces, their pumps can be easily integrated into pilot plants or process environments. KNAUER pumps can also be combined with mass flow controllers to enable batch dosing or metering tasks.

The online measurement of the density and the direct feedback of the actual mass flow guarantee feeding of the highest accuracy. Mass flow coupling enable precise dosing of liquids independent of their properties.

## Pump requirements

- ▶ Low pulsation
- ▶ High flow rate accuracy
- ▶ Large dynamic range

## Pump features

- ▶ Compact solution for highly accurate batch dosing applications
- ▶ Dosing accuracy is independent of liquid properties e.g. viscosity
- ▶ Features batch control and alarm function
- ▶ Mass and volume dosage possible

## Application examples

- ▶ Metering of diisocyanates
- ▶ Metering of 1,4-butanediol
- ▶ Metering of hexylene glycol



Mass flow controllers can – easily combined with KNAUER dosing pumps

## Operating parameters

Max. delivery pressure	40 MPa (400 bar, 5800 psi)
Flow rate range	0.01 – 1000 ml/min
Max. viscosity	100 mPa·s
Liquid temperature range	20–60 °C (68–140 °F)

Which liquids are  
challenging for your  
dosing equipment?



# Dosing of aggressive liquids

Tackling dosing challenges with the right pump



Strong acids and bases are often required for different liquid applications. KNAUER offers pumps with a choice of different pump head materials which can be used for demanding dosing tasks. Furthermore the pump design allows an easy replacement of parts which come in contact with aggressive and corrosive chemicals. This makes the KNAUER pumps ideal for metering aggressive liquids.

## Pump requirements

- ▶ Chemical compatibility of wetted parts
- ▶ High delivery pressure
- ▶ Easy maintainability

## Pump features

- ▶ Different pump head materials for extended chemical compatibility, including stainless steel, ceramic, and Hastelloy C
- ▶ Optimized materials for aggressive liquids
- ▶ Suitable for a large variety of aggressive media
- ▶ Easy pump head maintenance to reduce downtime
- ▶ High dosing accuracy even with fluctuating pressure conditions
- ▶ Large variety of accessories allows the easy integration of these pumps into dosing environment

## Application examples

- ▶ Metering of ammonia/amines
- ▶ Metering of inorganic acids ( $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ , and  $\text{HCl}$ )



Pump heads with optimized materials for different application tasks

## Operating parameters

Max. delivery pressure	40 MPa (400 bar, 5800 psi)
Flow rate range	0.01 – 50 ml/min
Max. viscosity	100 mPa·s
Liquid temperature range	20–60 °C (68–140 °F)

A microscopic view of ice crystals, showing a complex, branching, and feathery structure. The crystals are light blue and white, set against a darker blue background. The overall appearance is that of a delicate, crystalline network.

What are your  
requirements for  
dispensing in the cold?

Photo: ©panthermedia.net/Ramona Heim

# Low temperature & liquid gas dosing

Metering liquids below 0°C and liquid gas

KNAUER pumps cover a wide range of different demands. Chemical compatibility and working temperatures are just two possible requirements. Pumping liquids at low temperatures may be required in flow chemistry or in various applications involving liquefied gases. The wetted parts of the KNAUER pumps are capable of working under these conditions. With an optional pump head cooling device these pumps are perfect for dosing or feeding of liquefied gases or cooled liquids.

## Pump requirements

- ▶ Suitability for low liquid temperatures
- ▶ Pump head with cooling option
- ▶ High delivery pressure

## Pump features

- ▶ Capability to meter pre-cooled liquids (down to  $-10^{\circ}\text{C}$ )
- ▶ Pump head can be thermostated with optional pump head cooling device
- ▶ Optimized pump head for low temperature applications
- ▶ Suitable for liquid gases e.g.  $\text{NH}_3$  or  $\text{CO}_2$
- ▶ Flexible fluid connections
- ▶ Easy integration into process control systems via analog and digital signals
- ▶ Optimized high pressure inlet bushings for feeding of liquid gases



AZURA pump P 4.1S

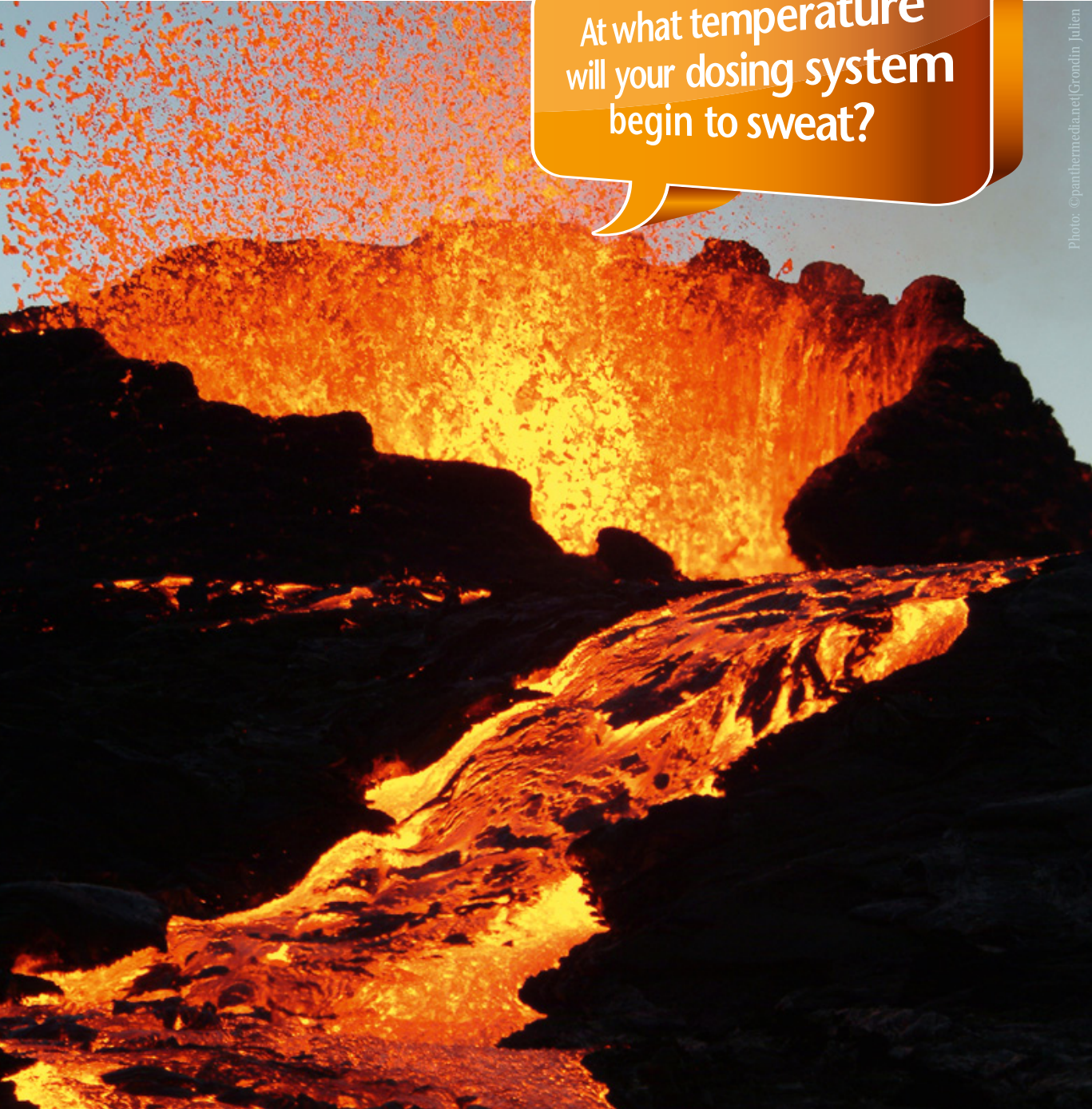
## Application examples

- ▶ Metering of liquid gas
- ▶ Metering of liquid  $\text{CO}_2$
- ▶ Metering of liquid  $\text{NH}_3$

## Operating parameters

Max. delivery pressure	40 MPa (400 bar, 5800 psi)
Flow rate range	0.01 – 1000 ml/min
Max. viscosity	100 mPa·s
Liquid temperature range	$-10$ – $20^{\circ}\text{C}$ ( $14$ – $68^{\circ}\text{F}$ )





At what temperature  
will your dosing system  
begin to sweat?

Photo: ©panthermediant(Gronin Julien

# High temperature dosing

Handling temperatures up to 120°C without running hot



Sometimes the supply of media or starting materials for a chemical reaction needs to be heated to properly meet the conditions of the process. This is where standard high pressure pumps can reach their limits. KNAUER dosing pumps withstand moderate liquid temperatures and can be equipped with thermally decoupled pump heads even for elevated temperatures.

It is also possible to equip the pump with a pump head heating device for temperature sensitive applications.

## Pump requirements

- ▶ Pump head with heating option
- ▶ Suitability for high liquid temperatures
- ▶ High flow rate accuracy

## Pump features

- ▶ Designed for operating temperatures up to 120 °C
- ▶ Optimized pump head for high temperature applications
- ▶ Pump head heating device is an optional upgrade and is fast and easy to install
- ▶ High pressure inlet bushing allows handling of pre-heated liquids

## Application examples

- ▶ Metering of polyethylene glycol
- ▶ Metering of heavy fuel oils



Thermally decoupled pump head for high operating temperatures

## Operating parameters

Max. delivery pressure	40 MPa (400 bar, 5800 psi)
Flow rate range	0.01 – 10 ml/min
Max. viscosity	100 mPa·s
Liquid temperature range	60–120 °C (140–248 °F)



What do you  
need for batching  
honey?

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# Dosing highly viscous liquids

Getting exquisite results with viscous media

One important property of liquids is their viscosity and many pumps will struggle with highly viscous media. When bottling honey, it is typically heated moderately to reduce its viscosity, a principle applicable also to many other highly viscous liquids. If an increase of the liquid temperature is not suitable, pumps with a high engine performance will be required. KNAUER pumps with their powerful motor drives are adequate for these demanding conditions.

## Pump requirements

- ▶ High delivery pressure
- ▶ Reliable and easy to maintain
- ▶ Handling of high viscosity fluids

## Pump features

- ▶ Engineered for durability and built with high quality components and materials
- ▶ High engine performance for highly viscous media
- ▶ Capability to meter liquids with viscosities up to 1000 mPa·s
- ▶ Constant flow and pressure operation mode
- ▶ Wide flow rate range and large dynamic range
- ▶ Additional pump head heating device can be used to reduce the viscosity of the liquid
- ▶ Flexible control due to a range of supported interfaces (RS-232, Ethernet and analog)

## Application examples

- ▶ Metering of polymers
- ▶ Metering of polyols and isocyanates



AZURA pump P 2.1L

## Operating parameters

Max. delivery pressure	40 MPa (400 bar, 5800 psi)
Flow rate range	0.1 – 1000 ml/min
Max. viscosity	1000 mPa·s
Liquid temperature range	20–60 °C (68–140 °F)





[www.knauer.net/dosing](http://www.knauer.net/dosing)

## HPLC · SMB · Osmometry

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