

Science Together



2019/20



KNAUER High-Pressure Dosing Pumps Selection Guide

Pumps, flow meters and accessories
for a wide range of dosing applications



Made in Germany

Get in touch

Service & Support

Do you have questions about the installation or the operation of your instrument or software? Our friendly and competent Service & Support staff will be glad to answer your questions.

Phone: +49 30 809727-111 (workdays 9-17h CET)

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Email: support@knauer.net



Welcome to KNAUER



**Made in Germany
since 1962**

Based in Berlin, KNAUER is a medium-sized, owner-managed company that has been serving the sciences since 1962.

We develop and manufacture scientific instruments of superior quality for liquid chromatography. The range includes systems and components for analytical HPLC / UHPLC, preparative HPLC, fast protein liquid chromatography (FPLC), multi-column chromatography / simulated moving bed (SMB), and osmometry.



**Independent and
family owned**

The founder Dr. Herbert Knauer and his wife Roswitha are still active as advisers in the company to this day. The couple's daughter, Alexandra Knauer, has been managing director and owner of the company since 2000.

Several awards for outstanding products and innovations as well as entrepreneurial excellence make KNAUER a „leading employer“.



**Comprehensive service
from the manufacturer**

Our wide-ranging services complement our excellent instruments: The trainings are performed by experts and cover a variety of topics for beginners to experienced users.

The high-performance customer support and repair service provide fast and spot on solutions.

If you need support for your research project, we help you to develop applications, transfer and optimize methods or develop software.



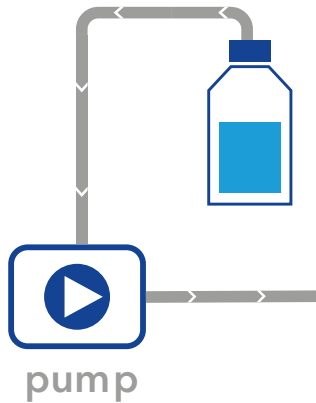
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Dosing pump configurator

CONNECTIONS:

	Inlet port	Outlet port
1/16"	<input type="checkbox"/>	<input type="checkbox"/>
1/8"	<input type="checkbox"/>	<input type="checkbox"/>
1/4"	<input type="checkbox"/>	<input type="checkbox"/>
Other:	<input type="checkbox"/>	<input type="checkbox"/>



PRESSURE:

Inlet pressure ambient
 elevated: bar

Max. outlet pressure bar

PUMP:

Max. flow rate ml/min

Quantity of pumps

LIQUIDS:

Liquids
 (please specify concentration)

Temperature °C

Viscosity mPa·s

OTHER REQUIREMENTS:

Chemical compatibility specifications

Extended material documentation Yes No

GMP compliant Yes No

Pressure sensor Yes No

Mass flow controller Yes No

Communication protocol Yes No

Heater/cooler Yes No

Operation time Continuous (24h/7d) Intermittent (8h/5d)

Service & Installation Inhouse External

Control Manual (standalone) Analog
 Ethernet Mobile Control
 RS-232

ADDITIONAL REQUIREMENTS:

.....

.....

.....



Request a quote online:
www.knauer.net/en/Systems-Solutions/Pumps/Request-a-quote

Overview

High-pressure dosing pumps

Precise dosing in the laboratory and in production

KNAUER dosing pumps are highly accurate two-piston pumps for applications in the chemical and pharmaceutical industries as well as in research and method development. They pump and dose aqueous and organic liquids, aggressive media or liquid gases. The metering pumps impress with their high chemical resistance, excellent flow rate precision and low pulsation of the pumped medium in a wide range of applications:

- Flow rates from 0.01 ml/min to 1,000 ml/min
- High pressure range up to 650 bar
- Wide temperature range from -10 °C to 120 °C
- Viscous liquids up to 1,000 mPa-s



KNAUER dosing pumps are integrated easily in your dosing application due to an independent control via display or touchscreen.

To choose the right pump type, the following aspects must be considered:



**FLOW AND
PRESSURE RANGE**



**CHEMICAL
COMPATIBILITY**



CONNECTIVITY



**MASS FLOW
CONTROL**

Application areas

- Chemical engineering
- Pharma
- Process engineering
- Research & Development

Application examples

- Flow chemistry
- Polymer production
- Microfluidics
- Dosing of aggressive or radioactive substances

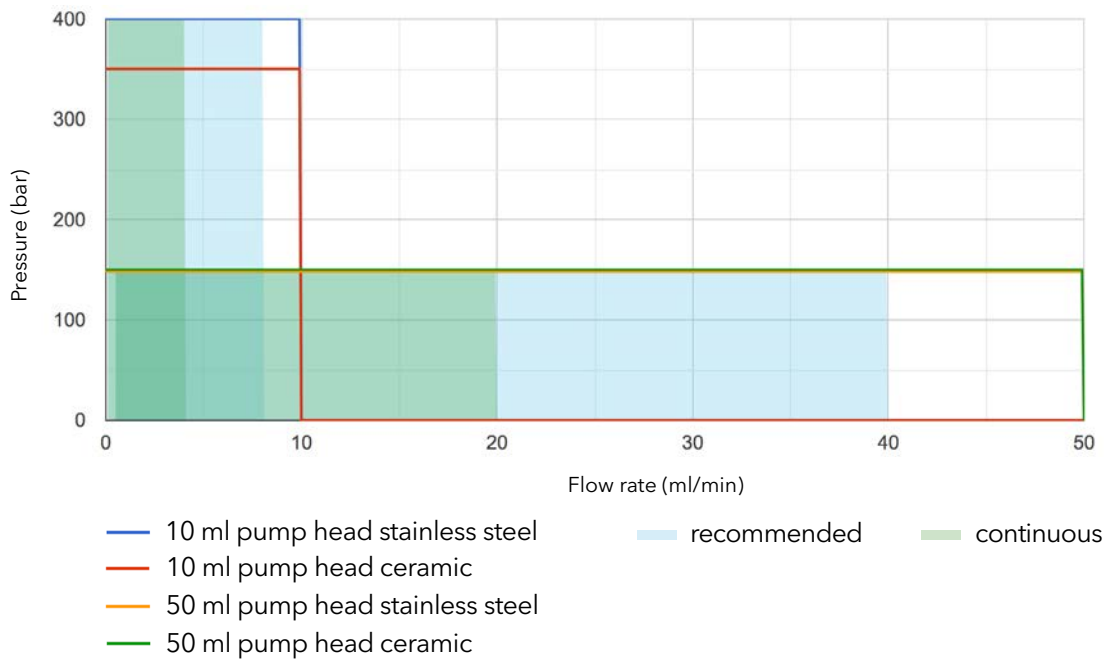


Flow-pressure range

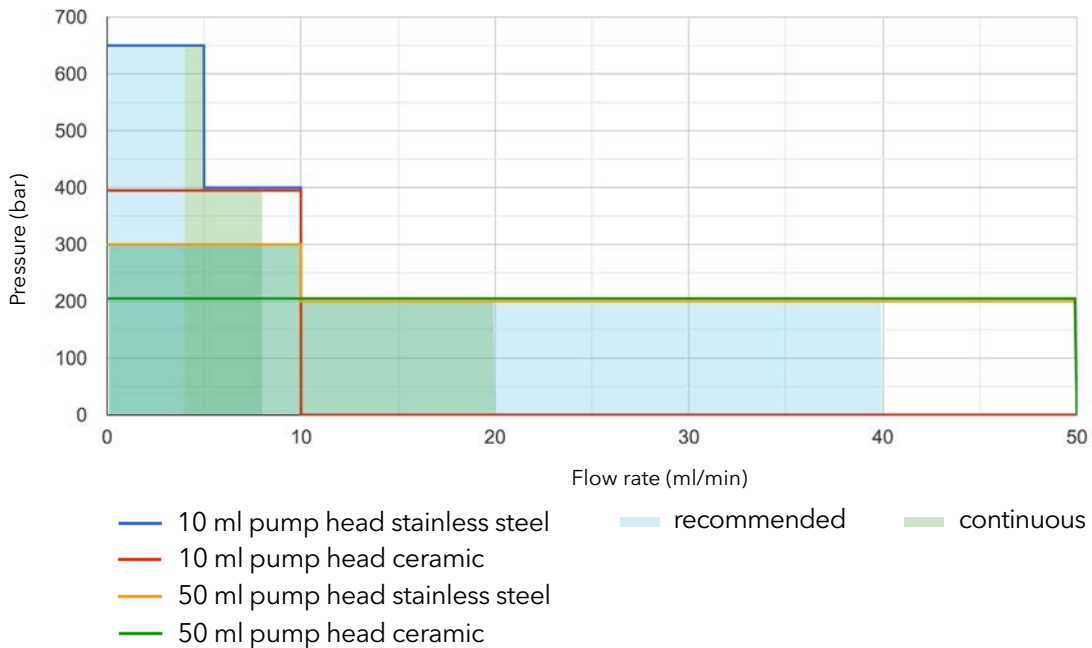
Easily choose the right dosing pump for your application

When choosing a dosing system, flow rate and pressure range are key parameters. KNAUER dosing pumps are designed for HPLC applications and thus feature excellent pressure stability, low pulsation and precise delivery at flow rates from 0.01 - 1000 ml/min.

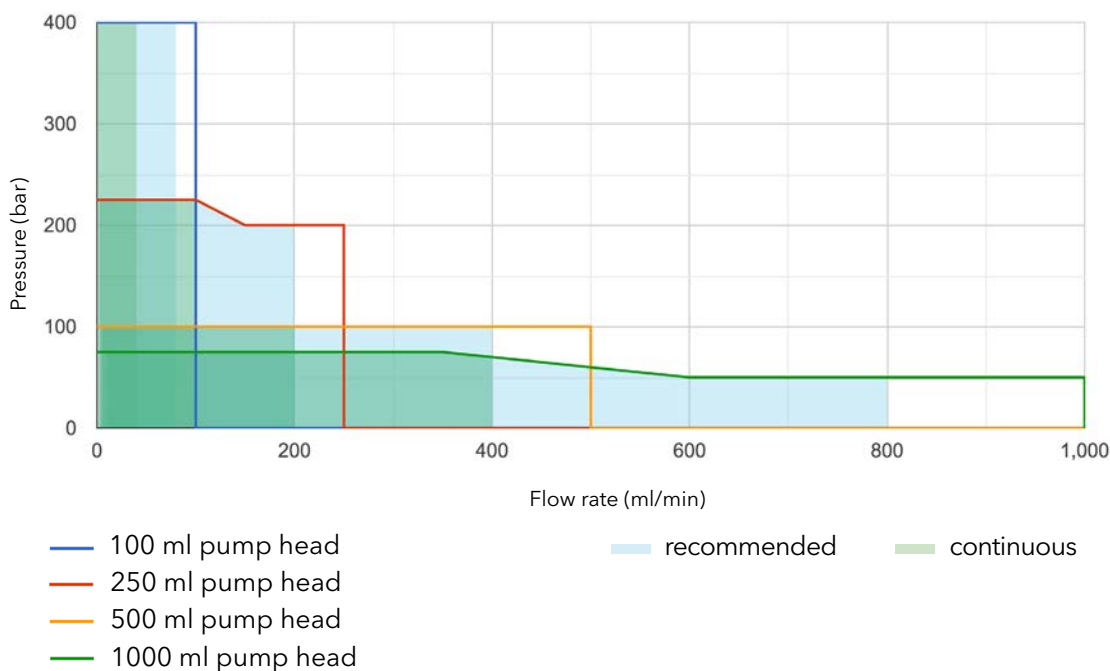
AZURA® Pump P 2.1S / P 4.1S For flow rates of up to 50 ml/min



BlueShadow Pump 40P Compact solution for flow rates of up to 50 ml/min



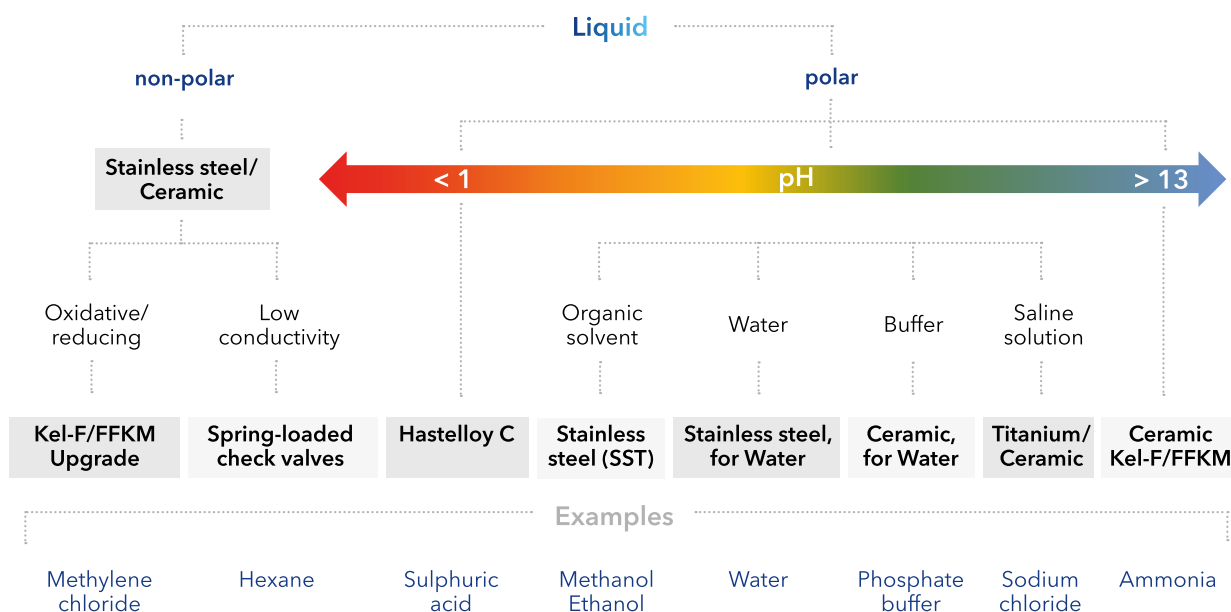
BlueShadow Pump 80P For flow rates of up to 1000 ml/min



Chemical compatibility

In order to optimally adapt the dosing solution to your tasks, the wetted materials must be perfectly matched to the application. KNAUER dosing pumps are resistant to a wide range of chemicals. Depending on the pumped medium, the wetted materials can be stainless steel, titanium, Hastelloy C or ceramic. A choice of check valves, seals and piston rods for various types of eluents is available.

Thanks to the replaceable pump head, which is automatically detected by all BlueShadow pumps, the metering pumps can be adapted to new tasks. The documentation of operating hours is simplified by the automatic recording of the running time and maintenance cycles can be easily planned.



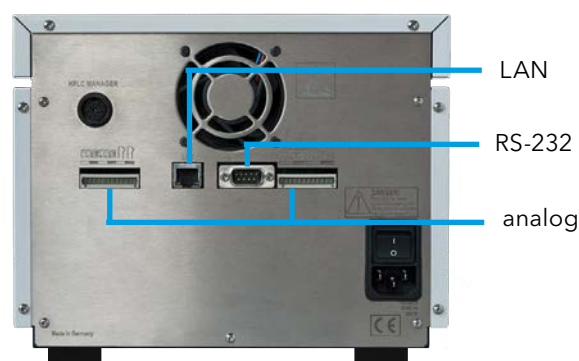
Connectivity

KNAUER dosing pumps offer a wide range of control options. Configuration and adjustment of the flow rate can be made via keyboard and display or touch screen (depending on the device). Smaller test arrangements for setting a constant flow rate can be realized quickly and easily.

In addition, all KNAUER metering pumps can be remote controlled via various interfaces. A flow rate can be set via the local network (LAN) using suitable software. Control via a serial RS-232 interface is also possible. KNAUER dosing pumps also offer a wide range of possibilities for control via an analog signal.

KNAUER pumps can be controlled with a wide range of software solutions. The hand-held Mobile Control allows device monitoring with a touch-optimized user interface. Drivers for chromatography data systems (**ClarityChrom®**, **PurityChrom®**, **OpenLab CDS EZChrom Edition** and **Chromeleon™**) are available.

If you want to integrate KNAUER devices into a specific process control system, we can provide the communication protocol of our pumps free of charge.



Accurate dosing for demanding applications

Gain flexibility, improve precision

Demanding metering applications for liquids with different viscosities or precise batch dosing tasks need a particularly exact control of the flow rate.

Since KNAUER pumps support a wide variety of communication interfaces, the dosing pumps can be combined with mass flow controllers to meet these challenging demands.



Temperature control

Constant fluid temperature is a key factor for many applications. Pump head heating facilitates dosing of viscous liquids, while pump head cooling prevents evaporation of liquid gases.



To avoid temperature gradients, the pump heads of all KNAUER pumps can be equipped with temperature control.

With the BlueShadow Pump 40P high temperature version, fluid temperatures of up to 120°C can be achieved. All other pumps can be heated up to 60°C.

Choose between an electrical heating solution and a heat exchanger in combination with a thermostat.

BlueShadow Pump 40P

The BlueShadow Pump 40P was designed to provide exceptionally precise and reliable solvent delivery for a wide range of dosing applications. Exchangeable pump heads with maximum flow rates of 10 and 50 ml/min cover a wide range of high-pressure dosing tasks. Practically pulse-free flow is achieved by our enhanced smart drive control which actively prevents pressure ripple instead of just dampening it. The improved design also ensures a low dead volume.

Pump heads for high-temperature applications enable solvent delivery at up to 120°C. Minimize temperature gradients by adding a pump head heater and insulation sleeve.



Specifications

Solvent delivery

Pump type	Analytical HPLC pump
Delivery system	Dual piston pump with one working piston, one auxiliary
Pulsation compensation	Active Pulsation Compensation
Piston seal washing	Active Wash
Flow rate accuracy	± 1% (measured at 5 - 80% of flow range using ethanol)
Flow rate precision	< 0.1% RSD
Pulsation	< 2 % amplitude (typically < 1.3 %) or < 0.3 MPa (3 bar), whatever is greater, at 1 mL/min ethanol, at all pressures > 1 MPa (10 bar, 147 psi).
System protection	Pmin und Pmax adjustable
Liquid temperature range	4–120 °C (39.2–248 °F)
Leak management	No
Pump head inlet (standard)	UNF 1/4-28 Thread
Pump head outlet (standard)	UNF 10-32 Thread

Communication

Display	Touchscreen
Inputs	LAN, RS-232, Pin header connectors (Analog IN, Start In, Error IN)
Analog inputs	Flow rate, 0 - 10 V via pin header connectors
Analog control input	Flow Rate
Level/event outputs	8 event outputs (TTL, OC, Relais) and 24 V
Control	Touchscreen, LAN, RS-232, Analog and event control
Programming	10 programs, 9 program links + wake up program, supports gradients

Technical parameters

Leak sensor	No
Special features	Pump Head is detected automatically using radio frequency identification (RFID)
GLP	RFID pump head recognition, detailed report
Conformity	IP20 ingress protection
Display	Touchscreen
Ambient conditions	4 - 40 °C (50-104 °F), Air humidity below 90%, non-condensing

General

Power supply	100 - 240 V; 50 - 60 Hz; Maximum power consumption 320 Watt
Dimensions	361 mm x 208.2 mm x 523 mm (W x H x D)
Weight	6,1 kg
Optional accessories	High temperature pump head, pump head heating and cooling device



For accessories
see page 16.



A variety of software control options is available:
KNAUER offers various options for drivers.
For more information, please visit
www.knauer.net/softwarecontrol

BlueShadow Pump 40P with 10 ml pump head

Specifications

Pump head	10 ml
Flow rate range	0.001 - 10 ml/min
Maximum delivery pressure	9430 psi / 650 bar / 65 MPa up to 5 ml/min; 5800 psi / 400 bar / 40 MPa up to 10 ml/min
Wetted materials	Graphite fiber reinforced PTFE, FKM, PEEK, sapphire, aluminium oxide, ruby, zirconium oxide, titanium and pump head material
Maximum viscosity	100 mPa s
Flow rate increment	0.001 ml/min
Best working conditions	0.1 - 8.0 ml/min
Continuous working conditions	0.1 - 4.0 ml/min
Pumphead material	Stainless steel / ceramic

Ordering details:

APC30EA	BlueShadow Pump 40P with 10 ml pump head, stainless steel
APC30EB	BlueShadow Pump 40P with 10 ml pump head, ceramic
APC30EE	BlueShadow Pump 40P with 10 ml pump head, stainless steel (for high temperature applications up to 120°C)
APC30EI	BlueShadow Pump 40P with 10 ml pump head, stainless steel, with backpiston flushing (for high temperature applications up to 120°C)

BlueShadow Pump 40P with 50 ml pump head

Specifications

Pump head	50 ml
Flow rate range	0.001 - 50 ml/min
Maximum delivery pressure	4350 psi / 300 bar / 30 MPa up to 10 ml/min; 2900 psi / 200 bar / 20 MPa up to 50 ml/min
Wetted materials	Graphite fiber reinforced PTFE, FKM, PEEK, sapphire, aluminium oxide, ruby, zirconium oxide, titanium and pump head material
Maximum viscosity	100 mPa s
Flow rate increment	0.001 ml/min
Best working conditions	0.1 - 40 ml/min
Continuous working conditions	0.1 - 20 ml/min
Pumphead material	Stainless steel / ceramic

Ordering details:

APC30FA	BlueShadow Pump 40P with 50 ml pump head, stainless steel
APC30FB	BlueShadow Pump 40P with 50 ml pump head, ceramic
APC30FE	BlueShadow Pump 40P with 50 ml pump head, stainless steel (for high temperature applications up to 120°C)
APC30FH	BlueShadow Pump 40P with 50 ml pump head, stainless steel, with backpiston flushing (for high temperature applications up to 120°C)

BlueShadow Pump 80P

The BlueShadow Pump 80P delivers stable and precise solvent flow for your dosing application. By adding one or more additional pumps, binary, ternary or even quaternary high-pressure mixing gradient systems can be easily configured. The pump can also be equipped with a binary or ternary gradient valve block to configure cost-effective low-pressure gradient mixing systems. Exchangeable pump heads for flow rates up to 1 000 ml/min and pressures up to 40 MPa make it possible to easily adapt the pump to changing performance requirements and allow simple maintenance.

Available in stainless steel or biocompatible titanium versions, the pump heads enable a wide range of applications. The integrated automatic recognition of the pump head with RFID technology allows fast adaptation of the pump. Change from low-flow organic solvent delivery to high-flow biocompatible buffer metering with minimum downtime.



Specifications

Solvent delivery

Pump type	Preparative HPLC pump
Delivery system	Dual Piston Pump with two working pistons
Pulsation compensation	Active Pulsation Compensation
Piston seal washing	Active Wash
Flow rate accuracy	± 2 %, measured at 5 - 50% of the flow range using ethanol/water 10:90
Flow rate precision	< 0.1% RSD, measured at 5 - 50% of the flow range using ethanol/water 10:90
System protection	Pmin und Pmax adjustable
Gradient range	0 - 100 % (with optional LPG valve block)
Gradient formation	LPG (with optional LPG valve block) or HPG
Liquid temperature range	4–60 °C (39.2–140 °F)
Pump head inlet (standard)	M8 x 1 (flat bottom)
Pump head outlet (standard)	M8 x 1 (coned)

Communication

Display	Touchscreen
Inputs	LAN, RS-232, Pin header connectors (Analog IN, Start In, Error IN)
Analog inputs	Flow rate, 0 - 10 V via pin header connectors
Analog control input	Flow Rate
Level/event outputs	8 event outputs (TTL, OC, Relais) and 24 V
Control	Touchscreen, LAN, RS-232, Analog and event control
Programming	10 programs, 9 program links + wake up program, supports gradients

Technical parameters

Special features	Pump Head is detected automatically using radio frequency identification (RFID)
Conformity	IP20 ingress protection
Ambient conditions	4 - 40 °C (50-104 °F), Air humidity below 90%, non-condensing

General

Power supply	100 - 240 V; 50 - 60 Hz; Maximum power consumption 320 Watt
Dimensions	397 mm x 242 mm x 201 mm (W x H x D)
Weight	10.1 kg
Optional accessories	Ternary low pressure gradient (LPG) valve block (10 - 220 ml/min), binary LPG valve block (10 - 800 ml/min), pump head heating and cooling device, mixer



For accessories
see page 16.



A variety of software control options is available:
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BlueShadow Pump 80P with 100 ml pump head

Specifications

Pump head	100 ml
Flow rate range	0.01 - 100 ml/min
Maximum delivery pressure	5800 psi / 400 bar / 40 MPa
Wetted materials	Aluminium oxide (Al ₂ O ₃), FKM, graphite fiber reinforced PTFE, PEEK, sapphire, stainless steel, titanium
Maximum viscosity	1000 mPa s
Flow rate increment	0.01 ml/min
Best working conditions	1 - 80 ml/min
Continuous working conditions	1 - 40 ml/min
Pumphead material	Stainless steel / titanium

Ordering details:

APD20KA	BlueShadow Pump 80P with 100 ml pump head (stainless steel)
APD20KB	BlueShadow Pump 80P with 100 ml pump head (titanium)

BlueShadow Pump 80P with 250 ml pump head

Specifications

Pump head	250 ml
Flow rate range	0.01 - 250 ml/min
Maximum delivery pressure	3260 psi / 225 bar / 22.5 MPa up to 100 ml/min, 2900 psi / 200 bar / 20 MPa up to 250 ml/min
Wetted materials	Aluminium oxide (Al ₂ O ₃), FKM, graphite fiber reinforced PTFE, PEEK, sapphire, stainless steel, titanium
Maximum viscosity	1000 mPa s
Flow rate increment	0.1 ml/min
Best working conditions	2.5 - 200 ml/min
Continuous working conditions	2.5 - 100 ml/min
Pumphead material	Stainless steel / titanium

Ordering details:

APD20LA	BlueShadow Pump 80P with 250 ml pump head (stainless steel)
APD20LC	BlueShadow Pump 80P with 250 ml pump head (titanium)

BlueShadow Pump 80P with 500 ml pump head

Specifications

Pump head	500 ml
Flow rate range	0.01 - 500 ml/min
Maximum delivery pressure	1450 psi / 100 bar / 10 MPa
Wetted materials	Aluminium oxide (Al ₂ O ₃), FKM, graphite fiber reinforced PTFE, PEEK, sapphire, stainless steel, titanium
Maximum viscosity	1000 mPa s
Flow rate increment	0.1 ml/min
Best working conditions	5 - 400 ml/min
Continuous working conditions	5 - 200 ml/min
Pumphead material	Stainless steel / titanium

Ordering details:

APD20MA	BlueShadow Pump 80P with 500 ml pump head (stainless steel)
APD20MC	BlueShadow Pump 80P with 500 ml pump head (titanium)

BlueShadow Pump 80P with 1000 ml pump head

Specifications

Pump head	1000 ml
Flow rate range	1 - 1000 ml/min
Maximum delivery pressure	1087 psi / 75 bar / 7.5 MPa to 350 ml/min, 725 psi / 50 bar / 5 MPa up to 1000 ml/min
Wetted materials	Aluminium oxide (Al ₂ O ₃), FKM, graphite fiber reinforced PTFE, PEEK, sapphire, stainless steel, titanium
Maximum viscosity	1000 mPa s
Flow rate increment	0.1 ml/min
Best working conditions	10 - 800 ml/min
Continuous working conditions	10 - 400 ml/min
Pumphead material	Stainless steel / titanium

Ordering details:

APD20NA	BlueShadow Pump 80P with 1000 ml pump head (stainless steel)
APD20NB	BlueShadow Pump 80P with 1000 ml pump head (titanium)

AZURA® Pump P 2.1S

AZURA® Pump P 2.1S was developed for eluent delivery up to 400 bar and for flow rates up to 50 ml/min in HPLC and other applications where a compact easy-to-integrate pump is required. This pump is the perfect choice for dosing applications as the exchangeable pump heads are compatible to a wide range of chemicals.



Specifications

Solvent delivery

Pump type	Ultra-compact high pressure pump
Delivery system	Dual piston pump with one working piston, one auxillary
Pulsation compensation	No
Piston seal washing	Passive Wash
Flow rate accuracy	± 5%, measured at 5 - 50% of flow range using ethanol/water 10:90. ±2% at calibration point (one point calibration), measured at 5 - 50% of flow range
Flow rate precision	≤ 0.5% RSD, measured at 1/5 ml/min using ethanol/water 10:90
System protection	Imin und Imax are programmable (I ~ pressure)
Liquid temperature range	4–60 °C (39.2–140 °F)
Pump head inlet (standard)	UNF 1/4-28 Thread
Pump head outlet (standard)	UNF 10-32 Thread

Communication

Display	Yes
Inputs	LAN, Pin header connectors (Analog IN, Start In, Error IN), RS-232
Analog inputs	0 - 10 V
Analog control input	Flow Rate
Control	LAN, RS-232, analog, standalone

Technical parameters

Display	Yes
Ambient conditions	10-40 °C (50-104 °F) Air humidity below 90%, non-condensing

General

Power supply	100 - 240 V; 50 - 60 Hz; Maximum power consumption 100 Watt
Dimensions	121 x 129 x 220 mm (W x H x D)
Weight	2.3 kg



For accessories see page 16.



A variety of software control options is available: KNAUER offers various options for drivers. For more information, please visit www.knauer.net/softwarecontrol

AZURA® Pump P 2.1S with 10 ml pump head

Specifications

Pump head	10 ml
Flow rate range	0.001 - 10 ml/min
Maximum delivery pressure	5800 psi / 400 bar / 40 MPa up to 10 ml/min
Wetted materials	Graphite fiber reinforced PTFE, FKM (FFKM for APG90EC), PEEK (PCTFE for APG90EC), sapphire, ruby, zirconium oxide and pump head material
Maximum viscosity	100 mPa s (at reduced max. flow)
Flow rate increment	0.001 ml/min
Best working conditions	0.1 - 8.0 ml/min
Continuous working conditions	0.1 - 4.0 ml/min
Pumphead material	Stainless steel / ceramic / Hastelloy® C

Ordering details:

APG90EA	AZURA® Pump P 2.1S compact HPLC pump with 10 ml/min stainless steel pump head
APG90EB	AZURA® Pump P 2.1S compact HPLC pump with 10 ml/min ceramic pump head
APG90EC	AZURA® Pump P 2.1S compact HPLC pump with 10 ml/min Hastelloy® C pump head
APG90EG	AZURA® Pump P 2.1S compact HPLC pump with 10 ml/min stainless steel pump head, recommended for aqueous solutions

AZURA® Pump P 2.1S with 50 ml pump head

Specifications

Pump head	50 ml
Flow rate range	0.01 - 50 ml/min
Maximum delivery pressure	2180 psi / 150 bar / 15 MPa up to 50 ml/min
Wetted materials	Graphite fiber reinforced PTFE, FKM (FFKM for APG90FC), PEEK (PCTFE for APG90FC), sapphire, ruby, zirconium oxide and pump head material
Maximum viscosity	100 mPa s (at reduced max. flow)
Flow rate increment	0.01 ml/min
Best working conditions	0.5 - 40.0 ml/min
Continuous working conditions	0.5 - 20 ml/min
Pumphead material	Stainless steel / ceramic / Hastelloy® C

Ordering details:

APG90FA	AZURA® Pump P 2.1S compact HPLC pump with 50 ml/min stainless steel pump head
APG90FB	AZURA® Pump P 2.1S compact HPLC pump with 50 ml/min ceramic pump head
APG90FC	AZURA® Pump P 2.1S compact HPLC pump with 50 ml/min Hastelloy® C pump head
APG90FG	AZURA® Pump P 2.1S compact HPLC pump with 50 ml/min stainless steel pump head, recommended for aqueous solutions

AZURA® Pump P 4.1S

The AZURA® Pump P 4.1S was developed for eluent delivery up to 400 bar and for flow rates up to 50 ml/ min in HPLC and other applications where a compact easy-to-integrate pump is required. Apart from serving as a compact isocratic pump for small HPLC systems, it can also be used as a sample pump for preparative chromatography. This pump is the perfect choice for dosing applications as the exchangeable pump heads are compatible to a wide range of chemicals.



Specifications

Solvent delivery

Pump type	Ultra-compact high pressure pump
Delivery system	Dual piston pump with one working piston, one auxillary
Piston seal washing	Passive Wash
Flow rate accuracy	± 1%, measured at 5 - 50% of flow range using ethanol/water 10:90
Flow rate precision	≤ 0.5% RSD, measured at 1/5 ml/min using ethanol/water 10:90
System protection	Pmin und Pmax are programmable
Liquid temperature range	4–60 °C (39.2–140 °F)
Pump head inlet (standard)	UNF 1/4-28 Thread
Pump head outlet (standard)	UNF 10-32 Thread

Communication

Display	Yes
Inputs	LAN, Pin header connectors (Analog IN, Start In, Error IN), RS-232
Analog inputs	0 - 10 V
Analog control input	Flow Rate
Control	LAN, RS-232, analog, standalone

Technical parameters

Display	Yes
Ambient conditions	10-40 °C (50-104 °F) Air humidity below 90%, non-condensing

General

Power supply	100 - 240 V; 50 - 60 Hz; Maximum power consumption 100 Watt
Dimensions	121 x 129 x 220 mm (W x H x D)
Weight	2.4 kg



For accessories
see page 16.



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AZURA® Pump P 4.1S with 10 ml pump head

Specifications

Pump head	10 ml
Flow rate range	0.001 - 10 ml/min
Maximum delivery pressure	5800 psi / 400 bar / 40 MPa up to 10 ml/min
Wetted materials	Graphite fiber reinforced PTFE, FKM (FFKM for APG20EC), PEEK (PCTFE for APG20EC), sapphire, ruby, zirconium oxide, titanium and pump head material
Maximum viscosity	100 mPa s (at reduced max. flow)
Flow rate increment	0.001 ml/min
Best working conditions	0.1 - 8.0 ml/min
Continuous working conditions	0.1 - 4.0 ml/min
Pumphead material	Stainless steel / ceramic / Hastelloy® C

Ordering details:

APG20EA	AZURA® Pump P 4.1S compact HPLC pump with 10 ml/min stainless steel pump head, stainless steel connections
APG20EB	AZURA® Pump P 4.1S compact HPLC pump with 10 ml/min ceramic pump head, PEEK connections
APG20EC	AZURA® Pump P 4.1S compact HPLC pump with 10 ml/min Hastelloy® C pump head, Titanium pressure sensor, Hastelloy® C connections
APG20EF	AZURA® Pump P 4.1S compact HPLC pump with 10 ml/min ceramic pump head, Ti connections.
APG20EG	AZURA® Pump P 4.1S compact HPLC pump with 10 ml/min stainless steel pump head, stainless steel connections, recommended for aqueous solutions
APG20EH	AZURA® Pump P 4.1S compact HPLC pump with 10 ml/min ceramic pump head, Titanium connections, recommended for aqueous solutions

AZURA® Pump P 4.1S with 50 ml pump head

Specifications

Pump head	50 ml
Flow rate range	0.01 - 50 ml/min
Maximum delivery pressure	2180 psi / 150 bar / 15 MPa up to 50 ml/min
Wetted materials	Graphite fiber reinforced PTFE, FKM (FFKM for APG20FC), PEEK (PCTFE for APG20FC), sapphire, ruby, zirconium oxide, titanium and pump head material
Maximum viscosity	100 mPa s (at reduced max. flow)
Flow rate increment	0.01 ml/min
Best working conditions	0.5 - 40.0 ml/min
Continuous working conditions	0.5 - 20 ml/min
Pumphead material	Stainless steel / ceramic / Hastelloy® C

Ordering details:

APG20FA	AZURA® Pump P 4.1S compact HPLC pump with 50 ml/min stainless steel pump head, stainless steel connections
APG20FB	AZURA® Pump P 4.1S compact HPLC pump with 50 ml/min ceramic pump head, PEEK connections
APG20FC	AZURA® Pump P 4.1S compact HPLC pump with 50 ml/min Hastelloy® C pump head, Hastelloy® C connections
APG20FG	AZURA® Pump P 4.1S compact HPLC pump with 50 ml/min stainless steel pump head, stainless steel connections, recommended for aqueous solutions
APG20FI	AZURA® Pump P 4.1S compact HPLC pump with 50 ml/min ceramic pump head, PEEK connections, recommended for aqueous solutions

Mass flow controllers

Mini CORI-Flow are precise and compact mass flowmeters and controllers, based on the Coriolis measuring principle. Coriolis flowmeters are unmatched in accuracy. When applied for liquids, the mass flow accuracy is better than $\pm 0,2\%$ relative deviance.

Instruments of the mini CORI-Flow series contain a uniquely shaped, single loop sensor tube, forming part of an oscillating system. When a fluid flows through the tube, Coriolis forces cause a variable phase shift, which is detected by sensors and fed into the integrally mounted pc-board. The resulting output signal is strictly proportional to the real mass flow rate. The mini CORI-Flow features density and temperature of the fluid as secondary outputs.



Advantages of mass flow controlled systems:

- Precise metering independent of liquid density and temperature
- No calibration required when changing liquids
- Volume logging incl. signal
- Batch dosing

Specifications

Flowmeter

Flow rate range	3 different ranges available. See ordering details.
Flow rate accuracy	$\pm 0.2\%$ of rate *
Wetted materials	stainless steel AISI 316 or equivalent optional Hastelloy-C22

Communication

Outputs	0 - 5 (10) Vdc or 0 (4) - 20 mA
Control	standard: RS-232 (8-pin DIN male connection) Profibus-DP® bus:(5-pin M12 female; power 8-pin DIN male) DeviceNet™ Modbus-RTU; LonWorks Flow bus (5-pin M12 male)

General

Power supply	+15-24VDC $\pm 10\%$ max. ripple recommended: 50mV tt
Weight	Meter: 1.2 kg Controller: 1.7 kg

Other

Note	* optimal accuracy will be reach after approx. 30 minutes after instrument power up
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Ordering details:

A5390	Mini CORI-Flow (M13) Mass flow controller incl. mounting block, Flow: 1 - 50 ml/min, stainless steel 316
A5391	Mini CORI-Flow (M14) Mass flow controller incl. mounting block, Flow: 2 - 833 ml/min, stainless steel 316
A5393	Mini CORI-Flow (M13) Mass flow controller incl. mounting block, Flow: 1 - 50 ml/min, stainless steel 316, Profibus
A5394	Mini CORI-Flow (M12) Mass flow controller incl. mounting block, Flow: 0,03 - 1,66 ml/min, stainless steel 316
A5395	Mini CORI-Flow (M13) Mass flow controller incl. mounting block, Flow: 1 - 50 ml/min, Hastelloy-C22
A5396	HI-TEC Bright display for Mini CORI-Flow mass flow controller (display, setpoint and counter)



For accessories
see page 16.



A variety of software control options is available: KNAUER offers various options for drivers. For more information, please visit www.knauer.net/softwarecontrol

Pump accessories

Solvent filters & inlet tubing

Mobile Phase Filter, stainless steel, 2 µm, 1/8" pipe OD, suitable for all analytical HPLC systems	A3373
Mobile Phase Filter, stainless steel, 20 µm, for 1/8" OD, compatible with the AZURA® Tubing Kit (A9650), suitable for all analytical and semi preparative HPLC systems, max. flow rate 100 ml/min	A3374
Mobile Phase Filter, stainless steel, 10 µm, for 1/8" OD, compatible with the AZURA® Tubing Kit (A9650), suitable for all analytical HPLC systems, max. flow rate 10 ml/min	A3375
Mobile Phase Filter, Biocompatible PE, 20 µm, 1/8" pipe OD, suitable for all FPLC systems, max. flow rate 500 ml/min	A3364
AZURA® Tubing kit with cap and solvent filter (A3375, stainless steel, 10 µm), suitable for all analytical HPLC systems	A9650
AZURA® Tubing Kit bio with cap and insert, solvent filter inlet and fittings, 1set	A96507
Solvent Filter 1/4"-PTFE Tubing up to 250 ml/min	A58207
Filter Cartridge for pump P 6.1L, Titanium frit, 2 µm pore size. 50 ml/min maximum flow, High capacity filter, 60 µl volume, 3 pcs.	A9661
Filter Cartridge for pump P 6.1L, Stainless steel frit, 2 µm pore size. 10 ml/min maximum flow, Volume optimized filter, 20 µl volume, 3 pcs.	A96601
PTFE tubing, 1/4" OD, 4,75 mm ID, 300 cm length	A08732
PTFE tubing 1/8" OD, 2 mm ID, 300 cm length	A0873
PTFE tubing, 3/8" OD, 8 mm ID, variable length	A01521
FEP tubing, 1/8" OD, 2.1 mm ID, 300 cm length	A9869
FEP tubing, 1/16" OD, 0.81 mm ID, 300 cm length	A9869-1



Mixers



Mixing is an important task when two or more pumps deliver fluids into the same feed line. Choose between **static mixers** for small volumes and **dynamic mixers** for high flow rates.

Dynamic mixers

Dynamic mixing chamber (250 V), stainless steel, analytical, 1/16", up to 420 bar, 1740 µl mixing volume	A0285
Dynamic mixing chamber (115 V), stainless steel, analytical, 1/16", up to 420 bar, 1740 µl mixing volume	A02851
Dynamic mixing chamber (250 V), stainless steel, preparative, 1/8", up to 250 bar, 5.9 ml mixing volume	A0581
Dynamic mixing chamber (115 V), stainless steel, preparative, 1/8", up to 250 bar, 5.9 ml mixing volume	A05811
Dynamic mixing chamber (250 V), titanium, analytical, 1/16", up to 420 bar, 1740 µl mixing volume	A0275
Dynamic mixing chamber (115 V), titanium, analytical, 1/16", up to 420 bar, 1740 µl mixing volume	A02751
Dynamic mixing chamber (250 V), titanium, preparative, 1/8", up to 250 bar, 5.9 ml mixing volume	A70581
Dynamic mixing chamber (115 V), titanium, preparative, 1/8", up to 250 bar, 5.9 ml mixing volume	A705811
Mixing chamber extension unit for A70581/ A705811, 1 intermediate section, titanium, 4.8 ml, 3 screws 6 x 60 mm	A2515



Static mixers

AZURA® HPLC mixer up to 100 MPa, 50 µl mixing volume, stainless steel	AZZ00MB
AZURA® HPLC mixer up to 100 MPa, 100 µl mixing volume, stainless steel	AZZ00MC
AZURA® HPLC mixer up to 100 MPa, 200 µl mixing volume, stainless steel	AZZ00MD
AZURA® HPLC mixer up to 40 MPa, 250 µl mixing volume, PEEK (biocompatible)	AZZ10ME
HyperShear Static Mixer, (1.5mL), high flow series, stainless steel and PEEK	A5830
Mounting bracket AZURA® L for Hypershear mixing chambers	A9853-8



AZZ00MB



AZZ10ME

A5830

Pump head inlet fittings

Pump head inlet for AZURA® Pump P 2.1L, BlueShadow 80P, 1/4" (NPT), stainless steel, max. flow 250 ml/min	A9861
Pump head inlet for AZURA® Pump P 2.1L, Set, 1/2"-20 UNF, PEEK with CTFE (Kel-F) adapter, including tubing 1/4" PTFE	A9868
Inlet bushing for prep pump heads, adapter to 3/8" tube stub	A98611
Inlet bushing for binary LPG prep pump heads, LPG inlet to 3/8" tube stub	A98612
Inlet bushing for LPG prep pump heads, LPG ternary inlet to 3/8" tube stub	A98613
Male connector to connect a 1/4" OD capillary to a 1/4" male NPT adapter (material: stainless steel) for A9861	A58267
Male connector to connect a 4 mm OD capillary to a 1/4" male NPT adapter (material: stainless steel) for A9861	A58268
Male connector to connect a 1/8" OD capillary to a 1/4" male NPT adapter (material: stainless steel) for A9861	A58269
Inlet-bushing kit for P 2.1S, P 4.1S, P6.1L, 40P and S1050 pumps for pump heads 10 ml (1/8" capillaries)	A58202
Inlet-bushing kit for P 2.1S, P 4.1S, P6.1L, 40P and S1050 pumps for pump heads 10 ml (1/16" capillaries)	A58203
Inlet-bushing kit for P 2.1S, P 4.1S, P6.1L, 40P and S1050 pumps for pump heads 50 ml (1/8" capillaries)	A58204
Inlet-bushing kit for P 2.1S, P 4.1S, P6.1L, 40P and S1050 pumps for pump heads 50 ml (1/16" capillaries)	A58205



A9861



A9868



A58267
A58268
A58269

A98611
A98612
A98613

Pump head outlet fittings

Outlet-bushing kit 1/8" tube stub for S1800, 80P and P 2.1L pumps	A5822
Adapter to connect a capillary with 1/16" OD (thread: 10-32 UNF) to AZURA® Pump P2.1L or BlueShadow Pump 80P outlet (1/8", M8x1 thread), material: stainless steel	A7200



A5822

Check valves

Check valve unit for 10 ml (AZURA® Pump P 4.1S/ P 2.1S, BlueShadow 40P)	A06841
Check valve unit for 50 ml (AZURA® Pump P 4.1S/ P 2.1S, BlueShadow 40P)	A06842
Check valve unit (KEL-F) for 10 ml pump head (AZURA® Pump P 2.1S/P4.1S, BlueShadow 40P)	A068412
Check valve unit (spring-loaded) for 10 ml and 50 ml pump head (AZURA® Pump P 4.1S/ P 2.1S, BlueShadow 40P)	A068411
Check valve unit for 100 ml and 250 ml pump head (AZURA® Pump P 2.1L, BlueShadow 80P)	A1122
Check valve unit for 500 ml and 1000 ml pump head (AZURA® Pump P 2.1L, BlueShadow 80P)	A1080

Replacement pump heads for AZURA® Pump P 2.1S/P 4.1S

Pump head 10 ml, stainless steel	AHB40
Pump head 10 ml, ceramic	AHB32
Pump head 10 ml, ceramic with Ti-bushings	AHB32DA
Pump head 10 ml, Hastelloy-C, for corrosive chemicals	AHB43
Pump head 50 ml, stainless steel	AHC20
Pump head 50 ml, ceramic	AHC22
Pump head 50 ml, Hastelloy-C, for corrosive chemicals	AHC23
Pump head, 10 ml, stainless steel, for aqueous solutions	AHB40FA
Pump head 10 ml, ceramic, titanium bushings, for aqueous solutions	AHB32GA
Pump head 50 ml, stainless steel, for aqueous solutions	AHC20FA
Pump head 50 ml, ceramic, for aqueous solutions	AHC22FA



AHB32

Replacement pump head for BlueShadow Pump 40P

Pump head 10 ml, stainless steel	AHB40
Pump head 10 ml, ceramic	AHB32
Pump head 50 ml, stainless steel	AHC20
Pump head 50 ml, ceramic	AHC22
Pump head 10 ml, stainless steel, for high temperature dosing applications	AHB40CA
Pump head 50 ml, stainless steel, for high temperature dosing applications	AHC20CA
Pump head 10 ml, stainless steel, for high-temperature dosing applications	AHB40CB
Pump head 50 ml, stainless steel, for high temperature dosing applications	AHC20CB



AHB40

Replacement pump heads for BlueShadow Pump 80P

Pump head 100 ml, stainless steel	A4029-1
Pump head 100 ml, titanium	A4029V1
Pump head 250 ml, stainless steel	A4021-1
Pump head 250 ml, titanium	A4021V1
Pump head 500 ml, stainless steel	A4038-1
Pump head 1000 ml, stainless steel	A4022-1
Pump head 1000 ml, titanium	A4022V1



A4029-1

LPG modules

LPG module for Pump 80P binary up to 800 ml/min (stainless steel)	AZZ00AA-1
LPG module for Pump 80P ternary up to 220 ml/min (stainless steel)	AZZ00AB-1



AZZ00AB

Pulse dampers

KNAUER Pulse Damper, high volume, stainless steel	AZZ00NB
KNAUER Pulse Damper, low volume, stainless steel	AZZ00NA

Temperature control

Pump head cooling and heating device for 10 and 50 ml/min pump heads	A2035-1
Pump head cooling and heating device for 100/250/500/1000 ml/min pump heads	A2034-1
Heating element for 10 and 50 ml/min pump heads	A57035
Heating solution for 10 and 50 ml/min pump heads, includes heating plate and insulation sleeve	A57036
Temperature controller for pump head heater / column heating sleeve	A57024

Maintenance kits

Maintenance kit for AZURA® Pump P 2.1S/ P 4.1S, AZURA® Pump P 6.1L, BlueShadow 40P, 10 ml pump head, including 1 set of gaskets, 2 piston rods, 2 sapphire backing rings, 2 O-rings	A96423
Maintenance kit for AZURA® Pump P 4.1S & P 2.1S, AZURA® Pump P 6.1L, BlueShadow 40P, 50 ml pump head, including 1 set of gaskets, 2 piston rods, 2 sapphire backing rings, 2 O-rings	A96424
Maintenance kit 100 ml for AZURA® Pump P 2.1L and BlueShadow 80P, including 2 sets of gaskets, 2 piston rods, 2 springs	A96425
Maintenance kit 250 ml for AZURA® Pump P 2.1L and BlueShadow 80P, including 2 sets of gaskets, 2 piston rods, 2 springs	A96426
Maintenance kit 500 ml for AZURA® Pump P 2.1L and BlueShadow 80P, including 2 sets of gaskets, 2 piston rods, 2 springs	A96427
Maintenance kit 1000 ml for AZURA® Pump P 2.1L and BlueShadow 80P, including 2 sets of gaskets, 2 piston rods, 2 springs	A96428
Rebuild-Kit for Pump AZURA® Pump P 2.1L and BlueShadow 80P (100ml/250 ml), Venting screw KEL-F, Check valve unit KEL-F, O-ring	A58211
Rebuild-Kit for AZURA® Pump P 4.1S & P 2.1S, 10 ml/min pump head., Venting screw KEL-F, Check valve unit KEL-F, O-ring (FFKM)	A5821-1
Rebuild-Kit for AZURA® Pump P 4.1S & P 2.1S, 50 ml/min pump head., Venting screw KEL-F, Check valve unit KEL-F, O-ring (FFKM)	A5821-2
Maintenance tool kit for 10 ml pump heads	A9670
Maintenance tool kit for 50 ml pump heads	A9671
Maintenance tool kit for 100 ml pump heads	A9672
Maintenance tool kit for 250 ml pump heads	A9673
Maintenance tool kit for 500 ml pump heads	A9674
Maintenance tool kit 1000 ml pump heads	A9675

Consumables

K-Connect system

K-Connect Fingertight Fitting, PEEK, long, Set of 2, incl. ferrule, UNF 10/32 Thread for 1/16 inch K-Connect and PEEK Capillaries	A9646
K-Connect Fingertight Fitting, PEEK, long, Set of 10, incl. ferrule, UNF 10/32 Thread for 1/16 inch K-Connect and PEEK Capillaries	A9646-1
K-Connect Fingertight Fitting, Stainless Steel, long, Set of 2, incl. ferrules, UNF 10/32 Thread for 1/16 inch K-Connect Capillaries	A9645
K-Connect Fingertight Fitting, Stainless Steel, long, Set of 10, incl. ferrules, UNF 10/32 Thread for 1/16 inch K-Connect Capillaries	A9645-1
K-Connect Standard Fitting, Stainless Steel, Set of 2, incl. ferrule, UNF 10/32 Thread for 1/16 inch K-Connect Capillaries	A9647
K-Connect Standard Fitting, Stainless Steel, Set of 10, incl. ferrule, UNF 10/32 Thread for 1/16 inch K-Connect Capillaries	A9647-1



Split-grooved clamping rings

4 Split-grooved clamping rings for capillaries with 1/16" OD	A0484
4 Split-grooved clamping rings for capillaries with 1/8" OD	A1239
100 Split-grooved clamping rings for capillaries with 1/16" OD	A0482



Sealing rings

30 Sealing rings for capillaries with 1/16" OD, PETP	A0139
100 Sealing rings for capillaries with 1/16" OD, PETP	A0140
10 Sealing rings for capillaries with 1/16" OD, PEEK	A1062
10 Sealing rings for capillaries with 1/8" OD, PETP	A0232
10 Sealing rings for capillaries with 1/8" OD, PEEK	A1063



Biconical sealing rings

10 Biconical sealing rings with 1/16", PEEK	A1070
10 Biconical sealing rings with 1/16", PETP	A1022
10 biconical sealing rings 1/8" PETP	A0738



Bushings for capillaries 1/16" SST

10 Bushings for capillaries with 1/16" OD, stainless steel, wrench caliber 1/4", UNF 10-32, short	A0112
25 Bushings for capillaries with 1/16" OD, stainless steel, wrench caliber 1/4", UNF 10-32, short	A0113
3 Bushings for capillaries with 1/16" OD, stainless steel, wrench caliber 1/4", UNF 10-32, long	A0115
10 Bushings for capillaries with 1/16" OD, stainless steel, wrench caliber 1/4", UNF 10-32, long	A0116



Bushings for capillaries 1/8" SST

10 Bushings for capillaries with 1/8" OD, M8x1, wrench caliber 10, stainless steel A0830



Ferrules for capillaries

30 Ferrules for capillaries with 1/16" OD, stainless steel A0110

100 Ferrules for capillaries with 1/16" OD, stainless steel A0111

10 Ferrules for capillaries with 1/8" OD, stainless steel A0874

10 Ferrules, Hastelloy, for capillaries with 1/16" OD A01101

10 Ferrules, Titanium, for capillaries with 1/16" OD A01102



Bushings for capillaries PEEK & PETP

Bushings for 1/16" capillaries, PETP, knurled, UNF 10-32, short, 10 pcs. A0141

Bushings for 1/16" capillaries, PETP, knurled, UNF 10-32, short, 30 pcs. A0142

Bushings for 1/16" capillaries, PETP, UNF 10-32, long, 10 pcs. A0144

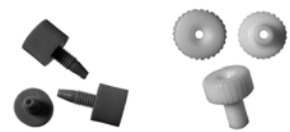
Bushings for 1/16" capillaries, PETP, with integrated sealing cone, knurled, UNF 10-32, short, 10 pcs. A0145

Bushings for 1/16" capillaries, with integrated sealing cone, knurled, PEEK, UNF 10-32, 10 pcs. A0584

Bushings for 1/8" capillaries, PETP, with integrated sealing cone, M8x1, knurled, short, 10 pcs. A0733

Bushing for 1/16" capillaries, PEEK, short Hex, with integrated sealing cone, 5 pcs. A25011

Bushing for 1/16" capillaries, PEEK, long Hex, with integrated sealing cone, 5 pcs A25021



A0584

A0142



A0733

A25021

Flat bottom fittings / adapters

Bushings flat bottom for 1/8" capillaries, PEEK, Super flangeless, 1/4-28, 10 pcs. A5829

Bushings flat bottom for 1/16" capillaries, PEEK, Super flangeless, 1/4-28, 10 pcs. A58291

Ferrules for 1/16" capillaries and flat bottom bushings, PEEK, with lock ring (stainless steel), for Super flangeless bushings, 10 pcs. A58292

Ferrules for 1/8" capillaries and flat bottom bushings, PEEK, with lock ring (stainless steel), for Super flangeless bushings, 10 pcs. A58293

Ferrules for 1/8" capillaries and flat bottom bushings, ETFE, with lock ring (stainless steel), for Super flangeless bushings, 10 pcs. A58294

Adapter PEEK 1/8" flat bottom internal on 1/16" external 10/32 thread A1982

Adapter PEEK 1/8" external thread on 1/16" flat bottom internal thread A05841



A58291
A5829



Blind fittings

Blind fittings, 1/16", PETP, knurled, UNF 10-32, short, 10 pcs. A0146

Blind fittings, 1/16", PETP, knurled, UNF 10-32, short, 30 pcs. A0147

Blind fittings, 1/16", PEEK, knurled, UNF 10-32, short, 10 pcs. A0582

Blind fittings, 1/8", PETP, knurled, M8x1, short, 10 pcs. A0734



A0734

A0146
A0147

Couplings, PETP/PEEK

Coupling to connect 2 capillaries with 1/16" OD (material: PEEK/PETP, thread: UNF10-32), including 2 bushings and sealing rings, 0.5 mm bore, suitable for classical HPLC, 1 pc.	A0148
Coupling to connect 2 capillaries with 1/16" OD (material: PEEK/PETP, thread: UNF10-32), including 2 bushings and sealing rings, 0.5 mm bore, suitable for classical HPLC, 5 pcs.	A0149
Coupling to connect 2 capillaries with 1/16" OD (material: PEEK, thread: 10-32 UNF), including 2 one-piece PEEK fittings, 0.5 mm bore, suitable for classical HPLC	A0233
Coupling to connect 2 capillaries with 1/16" OD (material: PEEK, thread: 10-32 UNF), without fittings, 0.5 mm bore, suitable for classical HPLC	A0233-1
Coupling to connect 2 capillaries with 1/16" and 1/8" OD (material: PEEK, thread: 10-32 UNF, M8x1), including 2 one piece fittings (1x 1/16", 1x 1/8"), 1 mm bore	A1407
Coupling to connect 2 capillaries with 1/8" OD (material: PEEK, thread: M8x1), including 2 one piece fittings 1/8", 2 mm bore, suitable for preparative HPLC	A14071



Couplings, SST/Titanium

Coupling to connect 2 capillaries with 1/16" OD (material: titanium, thread: 10-32 UNF), including 2 bushings and ferrules, 0.5 mm bore, suitable for classical HPLC	A0117V1
Coupling to connect 2 capillaries with 1/16" OD (material: stainless steel, thread: 10-32 UNF), including 2 bushings and ferrules, 0.5 mm bore, suitable for classical HPLC	A0117
Coupling to connect 2 capillaries with 1/16" OD (material: stainless steel, thread: 10-32 UNF), including 2 bushings and ferrules, 0.5 mm bore, suitable for classical HPLC, 5 sets	A0118
Coupling to connect 2 capillaries with 1/16" OD (material: stainless steel, thread: 10-32 UNF), including 2 bushings and ferrules, 0.5 mm bore, suitable for classical HPLC, 25 sets	A0119
Coupling to connect 2 capillaries with 1/8" OD (material: stainless steel, thread: M8x1), including 2 bushings and ferrules, 2 mm bore, suitable for preparative HPLC	A2512
Coupling to connect a capillary with 1/16" OD to a capillary with 1/8" OD (material: stainless steel, thread: M8x1, 10-32 UNF), 1 mm bore	A2513
Coupling Dynaseal to connect a capillary with 1/16" OD to a capillary with 1/8" OD (material: stainless steel, thread: M8x1, 10-32 UNF), including Dynaseal bushings and ferrules (1x 1/16", 1x 1/8"), 1 mm bore	A0485
Coupling Dynaseal to connect 2 capillaries with 1/8" OD (material: stainless steel, thread: M8x1), including 2 Dynaseal bushings and ferrules, 2 mm bore, suitable for preparative HPLC	A0480



Swagelok® unions & reducing unions, SST

Union to connect 2 capillaries with 1/4" OD, material: stainless steel, Swagelok®	A58263
Reducer to connect a capillary with 3/8" OD to a capillary with 1/4" OD, material: stainless steel, Swagelok®	A58264
Reducer to connect a capillary with 8 mm OD to a capillary with 1/4" OD, material: stainless steel, Swagelok®	A58265
Reducer to connect a capillary with 1/8" OD to a capillary with 1/4" OD, material: stainless steel, Swagelok®	A58266
Reducer to connect a capillary with 1/16" OD to a 1/8" OD pipe, material: stainless steel, Swagelok®	A58270
Reducer to connect a capillary with 1/8" OD to a 1/4" pipe union, material: stainless steel, Swagelok®	A58271
Reducer to connect a capillary with 4 mm OD to a 1/8" pipe union, material: stainless steel, Swagelok®	A58282



A58270
A58271



A58263
A58264
A58265
A58266

T-connectors, SST/titanium

T-connector to connect 3 capillaries with 1/8" OD (material: stainless steel, thread: M8x1), including 3 bushings and ferrules	A2511
T-connector to connect 3 capillaries with 1/16" OD (material: stainless steel, thread: 10-32 UNF), including 3 bushings and ferrules	A0120
T-connector to connect 3 capillaries with 1/8" OD (material: stainless steel, Swagelok®)	A58260
T-connector to connect 3 capillaries with 1/4" OD (material: stainless steel, Swagelok®)	A58261
T-connector to connect 3 capillaries with 1/4" OD (material: titanium, Swagelok®)	A58262



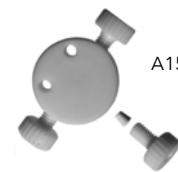
A0120



A58260
A58261
A58262

T-connectors, PEEK

T-connector to connect 3 capillaries with 1/16" OD (material: PEEK, thread: 10-32 UNF), without bushings	A150-1
T-connector to connect 3 capillaries with 1/8" OD (material: PEEK, thread: M8x1), including 2 one piece PEEK fittings 1/8"	A2511-1



A150-1

X-connectors, SST

X-connector to connect 4 capillaries with 1/16" OD (material: stainless steel, thread: 10-32 UNF), including 4 bushings and ferrules	A0121
X-connector to connect 4 capillaries with 1/8" OD (material: stainless steel, thread: M8x1), including 4 bushings and ferrules	A1096
X-connector to connect 4 tubings with 1/4" OD (material: stainless steel, Swagelok®) for 1000 ml/ min Systems	A58272



X-connectors, PEEK

X-connector to connect 4 capillaries with 1/16" OD (material: PEEK, thread: 10-32 UNF), including 4 bushings and sealing rings	A0151
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Pressure release valves

Pressure Release Valve for AZURA® pump P 2.1L and Pump 1800 (up to 50 bar), 1/8", stainless steel	A5800
Pressure Release Valve for AZURA® pump P 2.1L and Pump 1800 (up to 50 bar), 1/8", titanium	A5800V1
Pressure Release Valve for AZURA® pump P 2.1L and Pump 1800 (up to 25 bar), 1/8", stainless steel	A5801
Pressure Release Valve for AZURA® pump P 2.1L and Pump 1800 (without spring), 1/4", stainless steel	A5802
Back-Pressure Regulator/pressure relief valve for 1/16" OD tubing, stainless steel, provides a constant back-pressure of 3 bar, contains pressure relief valve tee and fittings for 1/16"	A5805
Spring for pressure release valve, 25 - 50 bar	M1070
Spring for pressure release valve, 3.4-24 bar	M1080



M1080

Backpressure regulators

Back-Pressure Regulator for 1/16" OD tubing, 10-32 threads, PEEK, Range 1-20 bar (15-300 psi)	A70087
Back-Pressure Regulator for 1/16" OD tubing, 10-32 threads, PEEK, Range 20-103 bar (300-1500 psi)	A70088
Back-Pressure Regulator for 1/16" OD tubing, 10-32 threads, stainless steel, Range 90-300 bar (1300-4200 psi)	A70084
Spare membranes for Back-Pressure Regulators A70084, A70087, A70088	A70082
Back-Pressure Regulator/pressure relief valve for 1/8" and 1/16" OD tubing, 134 µl volume, PEEK, provides a constant back-pressure of 1.4 bar (20 psi), contains pressure relief valve tee and fittings for 1/8" and 1/16"	A5804
Back-Pressure Regulator for 1/16" OD tubing, 134 µl volume, PEEK, provides a constant back-pressure of 0.3 bar (5 psi), contains Y assembly and fittings	A5804-1



A70087

Capillaries 1/16", SST

Stainless steel, 1/16" OD, 0.1 mm ID, 300 cm length, 1 pcs.	A0130
Stainless steel, 1/16" OD, 0.25 mm ID, 300 cm length, 1 pcs.	A0131
Stainless steel, 1/16" OD, 0.5 mm ID, 300 cm length, 1 pcs.	A0132
Stainless steel, 1/16" OD, 0.7 mm ID, 300 cm length, 1 pcs.	A0133
Stainless steel, 1/16" OD, 1 mm ID, 300 cm length, 1 pcs.	A0134
Stainless steel, 1/16" OD, 0.1 mm ID, 10 cm length, 10 pcs.	A0123
Stainless steel, 1/16" OD, 0.1 mm ID, 20 cm length, 10 pcs.	A0124
Stainless steel, 1/16" OD, 0.1 mm ID, 30 cm length, 10 pcs.	A0125
Stainless steel, 1/16" OD, 0.25 mm ID, 10 cm length, 10 pcs.	A0126
Stainless steel, 1/16" OD, 0.25 mm ID, 20 cm length, 10 pcs.	A0127
Stainless steel, 1/16" OD, 0.25 mm ID, 30 cm length, 10 pcs.	A0128



Capillaries 1/16", titanium

Titanium, 1/16" OD, 0.7 mm ID, 50 cm length, 1 pcs.	A0506
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Capillaries 1/8", SST

Stainless steel, 1/8"OD, 1.6 mm ID, 150 cm length, 1 pcs.	A0639
Stainless steel, 1/8" OD, 2.2 mm ID, 150 cm length, 1 pcs.	A0640

Mobile Control (Chrom) for Windows 10

With the hand-held Mobile Control and Mobile Control Chrom software you have your AZURA devices at your fingertips. Remotely control and monitor your devices and enjoy the touch-screen-optimized user interface. Choose Mobile Control as an easy-to-use and cost-effective device control solution!

Mobile Control provides full access to AZURA devices. Change device settings, set operating parameters, automate device control or check the system status... Mobile Control features all functionalities of a device display.

Do you want to record the pressure trace of the pumps? Mobile Control Chrom features data acquisition in addition to full device control.

Why to use Mobile Control (Chrom) software

Mobile Control is an easy user interface to control one or several devices from one tablet, laptop or PC. The software supports all functionalities of the AZURA devices.

Save space: Mobile Control runs on a tablet. Especially in labs with little space avoiding a desktop PC with keyboard and monitor can be a decisive factor. The touch-optimized user interface allows device control using just your fingers.

Save time: Mobile Control convinces due to an intuitive user interface and a clearly structured menu function. The training period is minimal in comparison to a complex CDS.

Free updates: With every release new features are available in Mobile Control. You can download the current version for free.

Free trial: To evaluate if Mobile Control holds up to your expectations, you can download the software and test the free trial option. Perfect for those who'd like to try before they buy.

Customized software design: Mobile Control is made by KNAUER and can be adapted to the requirements of our OEM partners.



Specifications

Software

Software name	Mobile Control - basic display software for AZURA devices without data acquisition Mobile Control Chrom - basic display software for AZURA devices with data acquisition
Operating system	Windows 10
Field of application	Display software, device control,

Expandability

Stand-alone	yes
Multi-user environment	yes
Report functions	yes



This software supports a wide range of instruments. For more information, please visit www.knauer.net/softwarecontrol

Ordering details:

Software

A9607	Mobile Control for AZURA® devices without data acquisition including 10" tablet and mount
A9608	Mobile Control Chrom for AZURA® devices with data acquisition including 10.8" tablet and mount
A9610	Mobile Control for AZURA® devices without data acquisition
A9612	Mobile Control Chrom for AZURA® devices with data acquisition
A9614	Upgrading Mobile Control to Mobile Control Chrom gaining data acquisition

Accessories

A96181	USB-LAN ADAPTER Network adapter USB 2.0 <-> 10/100 Ethernet for tablets
A64809	WLAN Router, 8-port Gigabit RJ-45
A64809INT	WLAN Router with international power supply wo plug, 8-port Gigabit RJ-45
A64811	Single device WLAN router for Mobile Control - 1x RJ45, 10/100 MBit; WLAN
A9615	Tablet lock with stand for all tablets
A9616	Tablet lock for all tablets
A9617	Mobile Control Mount - flexible tablet mount for 7-10" tablets



Get the free demo version:
www.knauer.net/mobilecontrol

Services

Consulting

Do you need help choosing the right pump for your application? Ask our friendly support via sales@knauer.net.

Maintenance

KNAUER maintains your devices to ensure your process is working without any failure. You can order a preventive maintenance service at your place or simply ship your devices to KNAUER.

Do you need more information? Just contact our support team via support@knauer.net.



Note: You can maintain the pump and its pump head individually!

Self service training

Our experienced trainers can show you how to maintain the pump head on your own. After the training you are able to perform routine maintenance and repair your pump head in case of malfunctions.

Get an offer at academy@knauer.net.

Flow rate calibration

Do you observe a decrease of your pump's flow rate precision? Just send your pump unit to KNAUER, we will fix that for you.

Rebuild service

Our pumps can be equipped with several components in order to adapt them to a wide range of dosing tasks (see page 19 and 29). Our service team can install them for you or you can do it yourself after the completion of a KNAUER training.

Technical Support

Do you need help in any kind of way? Just call our friendly support team or write an E-mail:

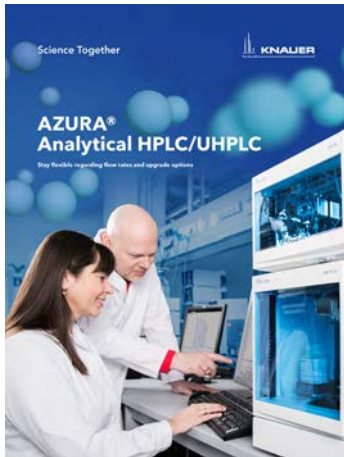
Phone: +49 30 809727-111

Email: support@knauer.net



KNAUER brochures

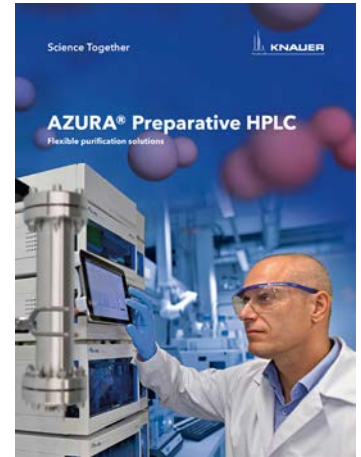
Please visit www.knauer.net/brochures to find more information about KNAUER products and systems.



AZURA® Analytical HPLC/UHPLC
(Document no. V7852US)



AZURA® Bio purification
(Document no. V7855US)



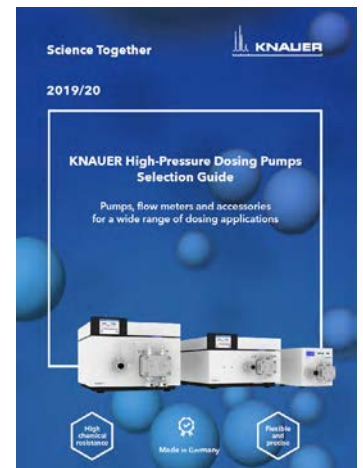
AZURA® Preparative HPLC
(Document no. V7820US)



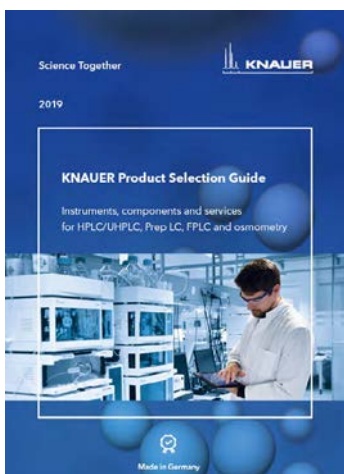
AZURA® SMB systems
(Document no. V7741US)



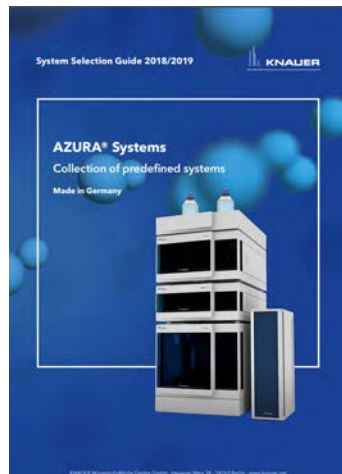
Freezing point osmometry
(Document no. V7716US)



KNAUER Dosing Pump Selection Guide
(Document no. V7803US)



KNAUER Product Selection Guide
(Document no. V7854-2US)



KNAUER System Selection Guide
(Document no. V7857US)



KNAUER Column Selection Guide
(Document no. V7803US)

Conversion tables

Dimensions

mm	inches	inches	mm
0.10	.004"	1/32"	0.8
0.12	.005"	1/16"	1.6
0.15	.006"	1/8"	3.2
0.25	.010"	1/4"	6.4
0.40	.016"	3/8"	9.5
0.50	.020"	1/2"	12.7
0.75	.030"	1"	25.4
1.00	.040"		
1.50	.060"		
2.00	.080"		
4.60	.180"		
6.00	.236"		
6.40	.253"		
7.00	.276"		
10.00	.400"		

Tubing volume/length

Tubing ID	µl/cm	µl/in
.004"	0.08	0.21
.005"	0.13	0.32
.010"	0.51	1.29
.015"	1.14	2.90
.020"	2.03	5.15
.025"	3.17	8.04
.030"	4.56	11.58
.040"	8.11	20.59
.060"	18.24	46.33
.070"	24.83	63.06
.085"	36.61	92.99

Pressure

MPa	bar	psi
5	50	725
10	100	1 450
20	200	2 901
30	300	4 351
40	400	5 802
50	500	7 252
60	600	8 702
70	700	10 153
80	800	11 603
90	900	13 054
100	1 000	14 504
110	1 100	15 954
120	1 200	17 405
130	1 300	18 855
140	1 400	20 306
150	1 500	21 756
160	1 600	23 206
170	1 700	24 657
180	1 800	26 107
190	1 900	27 558
200	2 000	29 008

Temperature

°C	°F	°C	°F	°C	°F
-40	-40	65	149	170	338
-35	-31	70	158	175	347
-30	-22	75	167	180	356
-25	-13	80	176	185	365
-20	-4	85	185	190	374
-15	5	90	194	195	383
-10	14	95	203	200	392
-5	23	100	212	205	401
0	32	105	221	210	410
5	41	110	230	215	419
10	50	115	239	220	428
15	59	120	248	225	437
20	68	125	257	230	446
25	77	130	266	235	455
30	86	135	275	240	464
35	95	140	284	245	473
40	104	145	293	250	482
45	113	150	302	255	491
50	122	155	311	260	500
55	131	160	320	265	509
60	140	165	329	270	518

Chemical compatibility of wetted parts



Note: The user takes the responsibility for using the fluids and chemicals in an appropriate and safe way. If there is any doubt, contact the Technical Support of the manufacturer.

General

The device is very resistant against a variety of commonly used eluents. However, make sure that no eluents or water come in contact with the device or enter into the device. Some organic solvents (such as chlorinated hydrocarbons, ether) may cause coating damage or loosen glued components by improper handling. Even small quantities of other substances, such as additives, modifiers, or salts can influence the durability of the materials. Exposure time and concentration have a high impact on the resistance.

The following list contains information about the chemical compatibility of all wetted materials which are used in devices made by KNAUER. The data bases on a literature research on the manufacturer specifications of the materials.

All resistances mentioned here are for use at temperatures up to 40 °C, unless stated otherwise. Please note that higher temperatures can significantly affect the stability of different materials.

Polymers

Polyetheretherketone (PEEK)

PEEK is a durable and resistant plastic and, next to stainless steel, the standard material in HPLC. It can be used at temperatures up to 100 °C and is highly chemical resistant against almost all commonly used solvents in a pH range of 1-12,5. PEEK is potentially moderate resistant against oxidizing and reducing solvents.

Therefore, following solvents should not be used: Concentrated and oxidizing acids (such as nitric acid solution, sulfuric acid), halogenated acids (such as hydrofluoric acid, hydrobromic acid) and gaseous halogens. Hydrochloric acid is approved for most applications.

In addition, following solvents can have a swelling effect and may have an impact on the functionality of the built-in components: Methylene chloride, THF and DMSO in any concentration such as acetonitrile in higher concentrations.

Polyethylene terephthalate (PET, outdated PETP)

PET is a thermoplastic and semi-crystalline material with high wear resistance. It is resistant against diluted acids, aliphatic and aromatic hydrocarbons, oils, fats and alcohols, but not against halogenated hydrocarbons and ketones. Since PET belongs chemically to esters, it is not compatible with inorganic acids, hot water and alkalis. Maximum operating Temperature: up to 120 °C.

Polyimide (Vespel®)

This material is wear-resistant and permanent resilient thermally (up to 200 °C) as well as mechanically. It is chemically broadly inert (pH range 1-10) and is especially resistant against acidic to neutral and organic solvents, but vulnerable to pH strong chemical or oxidizing environments: It is incompatible with concentrated mineral acids (such as sulfuric acid), glacial acetic acid, DMSO and THF. In addition, it will be disintegrated by nucleophilic substances like ammonia (such as ammonium salts under alkaline conditions) or acetate.

Ethylene-tetrafluorethylene copolymer (ETFC, Tefzel®)

This fluorinated polymer is highly resistant against neutral and alkaline solvents. Some chlorinated chemicals in connection with this material should be handled with care. Maximum operating Temperature is 80 °C.

Perfluorethylenpropylen-Copolymer (FEP), Perfluoralkoxy-Polymer (PFA)

These fluorinated polymers hold similar features as PTFE, but with a lower operation temperature (up to 205 °C). PFA is suitable for ultrapure applications, FEP can be used universally. They are resistant against almost all organic and inorganic chemicals, except elemental fluorine under pressure or at high temperatures and fluorine-halogen compounds.

Polyoxymethylene (POM, POM-H-TF)

POM is a semi-crystalline, high-molecular thermoplastic material which stands out due to its high stiffness, low friction value and thermic stability. It can even substitute metal in many cases. POM-H-TF is a combination of PTFE fibres and acetal resin and is softer and has better slip properties as POM. The material is resistant against diluted acids (pH > 4) as well as diluted lyes, aliphatic, aromatic and halogenated hydrocarbons, oils and alcohols. It is not compatible with concentrated acids, hydrofluoric acid and oxidizing agent. Maximum operating temperature is 100 °C.

Polyphenylene sulfide (PPS)

PPS is a soft polymer which is known for its high break resistance and very high chemical compatibility. It can be used with most organic, pH neutral to pH high, and aqueous solvents at room temperature without concerns. However, it is not recommended for using with chlorinated, oxidizing and reducing solvents, inorganic acids or at higher temperatures. Maximum operating temperature: 50 °C.

Polytetrafluorethylene (PTFE, Teflon®)

PTFE is very soft and anti-adhesive. This material is resistant against almost all acids, lyes and solvents, except against fluid sodium and fluoride compounds. In addition, it is temperature-resistant from -200 °C to +260 °C.

Systeme AF™

This amorphous perfluorinated copolymer is inert against all commonly used solvents. However, it is soluble in perfluorinated solvents like Fluorinert® FC-75 and FC-40, and Fomblin perfluoropolyether solvents from Ausimont. In addition, it is affected by Freon® solvents.

Polychlorotrifluorethylene (PCTFE, Kel-F®)

The semi-crystalline thermoplastic material is plasticizer-free and dimensionally stable, even in a wide temperature range (-240 °C to +205 °C). It is moderately resistant against ether, halogenated solvents and toluene. Halogenated solvents over +60 °C and chlorine gas should not be used.

Fluorinated rubber (FKM)

The elastomer consisting of fluorinated hydrocarbon stands out due to a high resistance against mineral oils, synthetic hydraulic fluids, fuels, aromatics, and many organic solvents and chemicals. However, it is not compatible with strong alkaline solvents (pH value >13) like ammonia, and acidic solvents (pH value <1), pyrrole and THF. Operating temperature: Between -40 °C and +200 °C.

Perfluorinated rubber (FFKM)

This perfluoro elastomer has a higher fluorine content as fluorinated rubber and is therefore chemically more resistant. It can be employed at higher temperatures (up to 275 °C). It is not compatible with pyrrole.

Metals

Stainless steel

Stainless steel is, apart from PEEK, the standard material in HPLC. Steels with WNr. 1.4404 (316L) are used, or with a mixture of higher compatibility.

They are inert against almost all solvents. Exceptions are biological applications which are metal ion sensible, and applications with extreme corrosive conditions. These steels, in comparison to commonly used steels, are increasingly resistant against hydrochloric acid, cyanides and other halogen acids, chlorides and chlorinated solvents.

The use in ion chromatography is not recommended. In case of electrochemical applications, a passivation must be executed first.

Hastelloy®-C

This nickel-chrome-molybdenum alloy is extremely resistant to corrosion, especially against oxidizing, reducing and mixed solvents, even at high temperatures. This alloy may be used in combination with chlor, formic acid, acetic acid and saline solutions.

Titanium, titanium alloy (TiA16V4)

Titanium has a low weight and a high hardness and stability. It stands out due to its very high chemical compatibility and biocompatibility. Titanium is applied when neither stainless steel nor PEEK are usable.

Non-metals

Diamond-like carbon (DLC)

This material is characterized by a high hardness, a low coefficient of friction and thus low wear. In addition, it is highly biocompatible. DLC is inert against all acids, alkalis and solvents commonly used in HPLC.

Ceramic

Ceramic is resistant against corrosion and wear and is fully biocompatible. An incompatibility against acids, alkalis and solvents commonly used in HPLC is not known.

Alumina (Al₂O₃)

Due to their high resistance to wear and corrosion, alumina ceramic is used as a coating for mechanically stressed surfaces. It is a biocompatible material with low thermal conductivity and low thermal expansion.

Zirconium oxide (ZrO₂)

Zirconia ceramics are characterized by their high mechanical resistance, which makes them particularly resistant to wear and corrosion. It is also biocompatible, has low thermal conductivity and is resistant to high pressures.

Sapphire

Synthetic sapphire is virtually pure monocrystalline alumina. It is biocompatible and very resistant to corrosion and wear. The material is characterized by a high hardness and a high thermal conductivity.

Ruby

Synthetic ruby is monocrystalline alumina and gets its red color by the addition of some chromium oxide. It is biocompatible and very resistant to corrosion and wear. The material is characterized by a high hardness and a high thermal conductivity.

Mineral wool

This insulating material consists of glass or stone wool fibres and isolates in high oxidizing conditions and at high temperatures. Mineral wool is valid as commonly inert against organic solvents and acids.

Glass, glass fibre, quartz, quartz glass

These mineral materials are resistant against corrosion and wear and are mostly chemical inert. They are compatible with oils, fats and solvents and show a high resistance against acids and lyes up to pH values of 3-9. Concentrated acids (especially hydrofluoric acid) may embrittle and corrode the minerals. Lyes may ablate the surfaces slowly.

Pump head compatibility

Max. flowrate 10 & 50 ml/min

Details	Stainless steel				Ceramic			Hastelloy-C
		For water	High-temp.	High-temp. piston seal wash		Ti-bushings	For water, Ti-bushings	
Art. no. 10 ml/min	AHB40	AHB40FA	AHB40CA	AHB40CB	AHB32	AHB32DA	AHB32GA	AHB43
Art. no. 50ml/min	AHC20	AHC20FA	AHC20CA	AHC20CB	AHC22	AHC22FA	AHC23	AHB43
AZURA® P 2.1S	X	X			X	X	X	X
AZURA® P 4.1S	X	X			X	X	X	X
BlueShadow 40P	X		X	X	X			

Max. flowrate 100-1 000 ml/min

	Stainless steel	Titanium (biocompatible)
Art. no. 100 ml/min	A4029-1	A4029V1
Art. no. 250 ml/min	A4021-1	A4021V1
Art. no. 500 ml/min	A4038-1	A4038V2
Art. no. 1 000 ml/min	A4022-1	A4022V2
Blueshadow 80P	X	X



Request for more options:
sales@knauer.net

Terms and conditions

1. Definition of terms

The following terms and conditions apply to every order received by KNAUER and every delivery of goods. This holds as well in case of contradictory buying conditions of the purchaser. Exceptions are only valid when confirmed by KNAUER in writing. Purchase orders are only binding if confirmed by KNAUER in writing.

2. Payment

Deliveries are due and payable, net, within 30 days of invoice date or in advance. Deductions are not allowed. Foreign deliveries must be paid by irrevocable letter of credit or in advance. All bank and transfer fees must be paid by the customer. The consequences arising out of delay are due to statutory provisions. Payments are due irrespective of an eventual notice of defect, except such defects are evidently justified.

3. Delivery

Delivery dates are not binding unless expressly stated in the contract as binding dates. Delay in delivery requires a written reminder and an adequate additional grace period set by the customer. KNAUER is only liable for claims for damages under the requirements of no. 6.

4. Claims

Condition for any warranty claim is the immediate inspection of the goods upon delivery, and complaint towards and damage assessment together with the carrier, and an immediate written complaint to KNAUER. The complaint must be made within five workdays in case of visible defects or losses.

5. Risk liability

Delivery is made at the customer's own risk. As soon as the goods leave KNAUER's plant the risk of accidental loss, destruction or deterioration passes to the customer.

6. Warranty and damages

6.1. Warranty claims

The warranty begins with receipt of the goods. If commissioning has been ordered, after commissioning. In the case of delayed commissioning, the warranty begins at the latest four weeks after receipt of the goods unless the supplier is responsible for delayed commissioning.

The warranty for osmometers and liquid chromatography instruments is limited to two years, excluding glass breakage, damages due to stoppage and consumable materials such as membranes, light bulbs, columns, bushings, gaskets and valves. KNAUER's liability shall be restricted to the replacement of defective material or repair only. Transportation costs are borne by the customer. In case of failure of replacement or repair the customer may demand a reduction in price or cancellation of the contract with respect to the defective material. The customer has to inspect the goods delivered immediately and shall immediately give written notification of any defects to KNAUER, in case of non-obvious defects within 10 working days after delivery at the very latest.

6.2. Claims for damages

The liability of KNAUER shall be restricted to intentional acts and acts of gross negligence and compensation shall only be due for direct, foreseeable damages. Liability for breach of a material, essential duty of the contract, liability because of personal injury, liability according to the stipulations of the German Law on Product Liability and liability for the lack of the condition of the contract goods guaranteed by KNAUER remain unaffected.

7. Third party rights on industrial or other intellectual property

KNAUER shall not be liable for the infringement of third party rights founded on industrial or other intellectual property caused by the use of the delivered goods. The customer is fully responsible for the products manufactured with the goods. In particular KNAUER is not obliged to indemnify and hold harmless the customer from all claims raised by third parties based on the infringement of their industrial or intellectual property rights by the use of the goods.

8. Property rights

The ownership of the goods shall remain with KNAUER until payment in full for all our claims resulting from our business relation is received. In case of improper treatment of the goods or in case of default KNAUER may demand the return of the delivered goods. This demand entails resignation of the contract only if KNAUER declares it explicitly.

Resellers are allowed to sell the goods to third parties in due course of the business. The customer herewith assigns his resale claims against third parties to KNAUER.

9. Export

Instruments and products delivered by KNAUER may not be exported to a country other than of the customer's headquarters without KNAUER's prior written permission.

10. Place of settlement and court of jurisdiction

The place of performance is Berlin. Proper venue for all claims is the competent local court at KNAUER's principal place of business - Berlin. KNAUER reserves the right to sue the customer at his principal place of business.

This agreement shall be governed by the laws of the Federal Republic of Germany excluding the UN-Convention on the International Sale of Goods (CISG).

KNAUER Wissenschaftliche Geräte GmbH

Hegauer Weg 38

14163 Berlin, Germany

These terms and conditions apply since June 1, 2016

Analytical
HPLC

Multi-Column
Chromatography,
SMB

Preparative
HPLC

FPLC

Osmometry

Dosing,
Metering,
Pumping

Detection

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