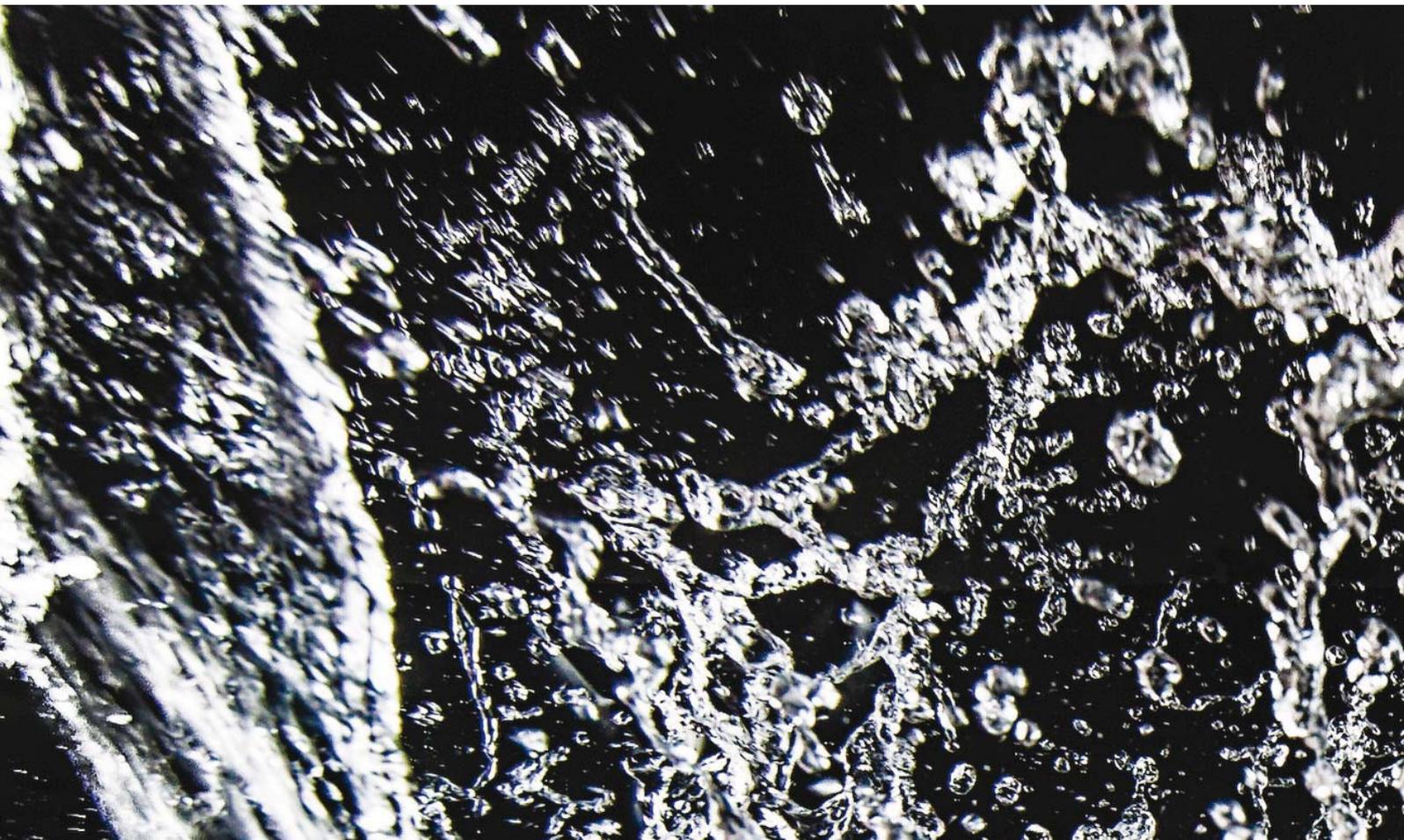


High-pressure dosing pumps

Product Selection Guide



High-pressure dosing pumps

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AZURA P 2.1S

AZURA P 2.1S pump 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.

Key features

- versatile due to wide flow rate range (0.01-50 ml/min)
- powerful and precise drive, with low pulsation
- compact dimensions
- flexible control via Ethernet, RS-232 and analog signals



Spezifikation P2.1S

Pump type	Ultra-compact high pressure pump
Delivery system	Dual piston pump with one working piston, one auxiliary
Pump head	10 / 50 ml/min
Pump head materials	titanium/keramik/SS/Hastelloy C
Maximum delivery pressure	40MPa 10ml & 15MPa 50ml pump head
Maximum flow rate	10 ml PH 0.01-10 ml/min (0,1-4,0 ml/min recommended) 50 ml PH 0.01-50 ml/min (1,0-40 ml/min recommended)
Flow rate increment	0.01 ml/min
Flow rate accuracy	± 1%, measured at 5 - 50% of flow range using ethanol/water 10:90
Flow rate precision	≤ 0.5 % RSD, measured at 5 ml/min using ethanol/water 10:90
System protection	Imin and Imax are programmable
Wetted materials	titanium, graphite fiber reinforced PTFE, FKM, PEEK, sapphire, aluminum oxide (Al ₂ O ₃)
Control	LAN; RS-232; analog and event controlled
Analog inputs	0-10V
Analog control input	flow rate
Max. viscosity	100 mPa · s
Liquid temperature range	-10 - 60° C
Technical parameters	
Ambient conditions	temperature range: 10–40 °C; 50–104 °F air humidity: below 90 % humidity (non condensing)
Power supply	voltage range: 100 - 240V, 50 - 60 Hz
Dimensions	113 x 135 x 225 mm (W x H x D)

Ordering details:

APG90AA	Compact HPLC pump with 10 ml/min pump head, stainless steel
APG90BB	Compact HPLC pump with 10 ml/min pump head, ceramic
APG90AC	Compact HPLC pump with 10 ml/min pump head, titanium
APG90DA	Compact HPLC pump with 50 ml/min pump head, stainless steel
APG90DC	Compact HPLC pump with 50 ml/min pump head, titanium
APG90EC	Compact HPLC pump with 10 ml/min pump head, Hastelloy C
APG90BF	Compact HPLC pump with 10 ml/min pump head, stainless steel, titanium free

AZURA P4.1S

AZURA P 4.1S pump 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.

Key features

- integrated pressure sensor
- versatile due to wide flow rate range (0.01-50 ml/min)
- powerful and precise drive, with low pulsation
- compact dimensions
- flexible control via Ethernet, RS-232 and analog signals



Spezifikation P4.1S

Pump type	Ultra-compact high pressure pump
Delivery system	Dual piston pump with one working piston, one auxiliary
Pump head	10 / 50 ml/min
Pump head materials	titanium/keramik/SS
Maximum delivery pressure	40MPa 10ml & 15MPa 50ml pump head
Maximum flow rate	10 ml PH 0.01-10 ml/min (0,1-4,0 ml/min recommended) 50 ml PH 0.01-50 ml/min (1,0-40 ml/min recommended)
Flow rate increment	0.01 ml/min
Flow rate accuracy	± 1%, measured at 5 - 50% of flow range using ethanol/water 10:90
Flow rate precision	≤ 0.5 % RSD, measured at 5 ml/min using ethanol/water 10:90
System protection	Imin and Imax are programmable
Wetted materials	titanium, graphite fiber reinforced PTFE, FKM, PEEK, sapphire, aluminum oxide (Al ₂ O ₃)
Control	LAN; RS-232; analog and event controlled
Analog inputs	0-10 V
Analog control input	flow rate
Max. viscosity	100 mPa · s
Liquid temperature range	-10 - 60° C
Technical parameters	
Ambient conditions	temperature range: 10–40 °C; 50–104 °F air humidity: below 90 % humidity (non condensing)
Power supply	voltage range: 100 - 240 V, 50 - 60 Hz
Dimensions	113 x 135 x 225 mm (W x H x D)

Ordering details:

APG20AA	Compact HPLC pump with 10 ml/min pump head, stainless steel
APG20BB	Compact HPLC pump with 10 ml/min pump head, ceramic
APG20AC	Compact HPLC pump with 10 ml/min pump head, titanium
APG20DA	Compact HPLC pump with 50 ml/min pump head, stainless steel
APG20DC	Compact HPLC pump with 50 ml/min pump head, titanium

BlueShadow Pump 40P

The pump was designed to provide exceptionally precise and reliable solvent delivery for a wide range of HPLC applications in quality control and testing as well as research and method development.

Two exchangeable pump heads allow a wide range of flow rates with one pump. 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.

The BlueShadow pump 40P is available in two different versions, either the pump only or fully developed with mixing chamber and



Spezifikationen 40P

Pump type	analytical high pressure pump
Delivery system	dual piston pump with one working piston, one auxiliary
Flow properties	0.1–50.00 ml/min
Pulsation compensation	active pulsation compensation
Active piston seal wash	standard
Pump head	10 / 50 ml/min
Pump head materials	titanium
Maximum flow rate	10 ml PH 0.01-10 ml/min (0,1-4,0 ml/min recommended) 50 ml PH 0.01-50 ml/min (1,0-40 ml/min recommended)
Flow rate range	0.01–50.00 ml/min
Maximum delivery pressure	150 bar (15 MPa) bei 50 ml und 650 bar (65MPa) bei 10 ml PH
Flow rate accuracy	< 1 % (0.5–40 ml/min)
Flow rate precision	RSD ≤ 0.4 % (5 ml/min)
Pulsation	< 0.5 % at 1 ml/min
Gradient support	isocratic, upgradeable to a quaternary HPG system with up to three pumps 40P
System protection	Pmin und Pmax programmable
Wetted materials	stainless steel, graphite fiber reinforced PTFE, Hastelloy, FKM, PEEK, ruby, sapphire, aluminum oxide (Al ₂ O ₃)
Max. viscosity	100 mPa s
Liquid temperature range	-10 - 60° C; HT version up to 120° C
Communication	
Analog inputs	flow (0–10V)
Analog control input	flow rate
Control	digital: RS-232, LAN; touchscreen, remote control connections (Stop, Flow, Pressure, Error)
Programming	20 programs + 9 links (to programs) + 1 wake up program
Technical parameters	
Special features	RFID The system pump head is detected automatically using radio frequency identification (RFID)
GLP	RFID pump head recognition, detailed report
Display	Touchscreen
Ambient conditions	temperature range: 4–40° C; 39.2–104 °F air humidity: below 90 % humidity (non condensing)
General	
Power supply	voltage range: 100–240 V, 50–60 Hz
Dimensions	242 x 165 x 399 mm (W x H x D)
Weight	6.1 kg
Optional accessories	mixer

Ordering details:

C56353.0	BlueShadow Pump 40P 10 ml pump head, stainless steel
C56363.0	BlueShadow Pump 40P 50 ml pump head, stainless steel
C56351.0	BlueShadow Pump 40P 10 ml pump head, titanium
C56361.0	BlueShadow Pump 40P 50 ml pump head, titanium
C56353HT.0	BlueShadow Pump 40P 10 ml pump head, stainless steel (for high temperature applications up to 120°C)

BlueShadow Pump 80P

The Preparative Pump 80P delivers stable and precise solvent flow for semi-preparative as well as preparative HPLC applications.

By adding one or more additional pumps, binary, ternary or even quaternary high-pressure 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 systems.

Exchangeable pump heads for flow rates up to 1000 ml/min and pressures up to 40 MPa make it possible to easily optimize 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.



Spezifikationen 80P

Pump type	dual-piston pump with main and auxiliary piston
Flow rate range	0.1 - 1000 ml/min
Maximum delivery pressure	400/200/100/50 bar to 100/250/500/1000 ml/min
Flow rate accuracy	± 2 % at 5-50 % of the flow range with methanol-water mixture (80/20, v/v)
Flow rate precision	RSD < 0.1 % (1 ml/min)
Pulsation	< 0.5 % at 1 ml/min
Gradient support	isocratic HPLC pump pump with binary or ternary LPG valve block (LPG system) up to 4 pumps combined (HPG system)
Max. viscosity	1000 mPa s
Liquid temperature range	-10 - 60° C
System protection	Pmin and Pmax adjustable
Communication	
Control	LAN; RS-232; remote control connections; FRID for automatic pump head detection; touchscreen
Programming	10 programs, 9 program links, WAKE UP program
General	
Power supply	pump: 100 - 240V binary LPG valve lock: 24V ternary LPG valve block: 12V
Dimensions	397 x 242 x 201 mm (length x width x height)
Ambient conditions	Temperature range: 4 - 40 °C; 39.0 - 104 °F Air humidity: Below 90 % humidity (non-condensing)

Ordering details:

C56551.0	BlueShadow Pump 80P with 100 ml pump head, stainless steel
C56561.0	BlueShadow Pump 80P with 250 ml pump head, stainless steel
C56571.0	BlueShadow Pump 80P with 500 ml pump head, stainless steel
C56581.0	BlueShadow Pump 80P with 1000 ml pump head, stainless steel
C56552.0	BlueShadow Pump 80P with 100 ml pump head, titanium
C56562.0	BlueShadow Pump 80P with 250 ml pump head, titanium
C56572.0	BlueShadow Pump 80P with 500 ml pump head, titanium
C56582.0	BlueShadow Pump 80P with 1000 ml pump head, titanium

SmartMix

A5350	SmartMix 100 HPLC mixer up to 100 MPa 100 µl mixing volume
A5351	SmartMix 350 HPLC mixer up to 80 MPa 350 µl mixing volume



Dynamic mixing chamber

A70581	Dynamic mixing chamber, Titanium, preparative, 1/8"
A0581	Dynamic mixing chamber, Stainless steel, preparative, 1/8"
A0275	Dynamic mixing chamber, Titanium, analytic, 1/16" UNF 10-32
A1174	Dynamic mixing chamber, PEEK, analytic, 1/16" UNF 10-32



Pump head cooling and heating devices

A2034-I	Pump head cooling and heating device for 100, 250, 500 and 1000ml pump heads
A2035-I	Pump head cooling and heating device for 10 and 50ml pump heads



A2034-I

Thermostatting unit

A70050	Bioline Labor-Thermostat -40° bis 200°C für 3 MPLC Säulen
A70055	Labor-Thermostat Mini-Chiller -20° bis 40°C max. 0,2 bar Förderdruck

AZURA switching valves

AWA10AA	Valve drive with 6P/3C valve, SS, 1/16" (300 bar)
AWA10AB	Valve drive with 6P/2C valve, SS, 1/16" (300 bar)
AWA10AC	Valve drive with 6P/3C valve, PEEK, 1/16" (300 bar)
AWA10AD	Valve drive with 6P/3C valve, SS, 1/8" (300 bar)
AWA10AE	Valve drive with 6P/3C valve, PEEK, 1/8" (300 bar)
AWA10BA	Valve drive with 6P multiposition valve, SS, 1/16" (300 bar)
AWA10BB	Valve drive with 6P multiposition valve, PEEK, 1/16" (300 bar)
AWA10BC	Valve drive with 6P multiposition valve, SS, 1/8" (300 bar)
AWA10BD	Valve drive with 6P multiposition valve, PEEK, 1/8" (300 bar)
AWA20BG	Valve drive with 12P multiposition valve, SS, 1/8" (25 bar)
AWA30BH	Valve drive with 16P multiposition valve, SS, 1/16" (50 bar)



Switching valves 1/4" (low pressure)

A5850	VICI/VALCO Dead-end Selector, 10 Port-MPos, 1/4" connectors, stainless steel, (7 bar), incl. 10 m tubing (1/4" o.d., PTFE)
A5851	VICI/VALCO Dead-end Selector, 6 Port-MPos, 1/4" connectors, stainless steel, (7 bar), incl. 10 m tubing (1/4" o.d., PTFE)
A9853-2	Azura mounting bracket for Vici valve drives



A5851

Pump head inlet fittings

A58202	Inlet-bushing kit 1/8" capillary, pump heads 10 ml (P 2.1S, P 4.1S, 40P)
A58203	Inlet-bushing kit 1/16" capillary, pump heads 10 ml (P 2.1S, P 4.1S, 40P)
A58204	Inlet-bushing kit 1/8" capillary, pump heads 50 ml (P 2.1S, P 4.1S, 40P)
A58205	Inlet-bushing kit 1/16" capillary, pump heads 50 ml (P 2.1S, P 4.1S, 40P)
A9861	Pump head inlet for Pump AZURA P 2.1L, 80P 3/8" (NPT), stainless steel
A58201	Inlet-bushing kit 1/16" capillary, pump heads 10/50 ml (S100, S1000)
A5820	Inlet-bushing kit 1/8" capillary, pump heads 10/50 ml (S100, S1000)



A9861

Pump head outlet fittings

A5822	Outlet-bushing kit 1/8" pipe socket for pumps S1800, 80P and P 2.1L
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Solvent filters

A3373	Mobile Phase Filter, SS, 2µm 1/8" pipe OD max. 40 ml/min
A3374	Mobile Phase Filter, SS, 20µm 1/8" OD max 100 ml/min



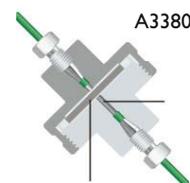
A3373



A3374

Inline filters

A3381	Inline Filter (Präp.) 5-10µm, stainless steel, max. 1000 ml/min
A3381 I	Replacement frit for A3381 (5-10µm), Stainless steel
A3380	Inline Filter (Semi-Präp.) 10µm, stainless steel, 500 bar, max. 100 ml/min
A3380 I	Replacement frit for A3380 10µm, Edelstahl



A3380

Signal transducer

A5835	JUMPFLEX® transducer isolation amplifier Configurable With digital output (0-10V to 4-20 mA)
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Mass flow controllers

A5390	Mini CORI-Flow (M13) Mass flow controller incl. mounting block, capacity: 0.2 - 50 ml/min
A5391	Mini CORI-Flow (M14) Mass flow controller incl. mounting block, capacity: 2 - 800 ml/min
A5393	Mini CORI-Flow (M13) Mass flow controller incl. mounting block, capacity: 0.2 - 50 ml/min, Profibus
A5394	Mini CORI-Flow (M12) Mass flow controller incl. mounting block, capacity: 0,03 - 3,3 ml/min
A5395	Mini CORI-Flow (M13) Mass flow controller incl. mounting block, capacity: 0.2 - 50 ml/min, Hastelloy



Bushings for Capillaries

A1021	1/16", short; 10 piece
A1064	1/16", long; 5 piece
A1067	1/8", short; 4 piece
A0735	1/8", long; 4 piece



Split-Grooved Clamping Rings

A0484	1/16" 4 piece
A1239	1/8" 4 piece



Sealing Rings

A0139	1/16", polymer; 30 piece
A0140	1/16", polymer; 100 piece
A1062	1/16", PEEK; 10 piece
A0232	1/8", polymer; 10 piece
A1063	1/8", PEEK; 10 piece



Double-Cone Sealings

A1022	1/16", polymer; 10 piece
A1070	1/16", PEEK; 10 piece
A0738	1/8", polymer; 10 piece



Bushings for Capillaries 1/16"

A0112	1/16", short, UNF 10/32, SW 1/4", stainless steel; 10 piece
A0113	1/16", short, UNF 10/32, SW 1/4", stainless steel; 25 piece
A0115	1/16", long, UNF 10/32, SW 1/4", stainless steel; 3 piece
A0116	1/16", long, UNF 10/32, SW 1/4", stainless steel; 10 piece



Bushings for Capillaries 1/8"

A0830	1/8", M8 x 1, SW 10, stainless steel; 10 piece
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Ferrules for capillaries

A0110	1/16", stainless steel; 30 piece
A0111	1/16", stainless steel; 100 piece
A0874	1/8", stainless steel; 10 piece



Caps (blind fittings)

A0146	1/16", short, UNF 10/32, polymer; 10 piece
A0147	1/16", short, UNF 10/32, polymer; 30 piece
A0582	1/16", short, UNF 10/32, knurled, polymer; 10 piece
A0734	1/8", M8 x 1, polymer; 10 piece



Bushings for Capillaries 1/16" / 1/8" PEEK/Polymer

A0141	1/16", short, UNF 10/32, knurled, polymer; 10 piece
A0142	1/16", short, UNF 10/32, knurled, polymer; 30 piece
A0143	1/16", short, UNF 10/32, knurled, polymer; 100 piece
A0144	1/16", long, UNF 10/32, knurled, polymer; 10 piece
A0145	1/16", short, UNF 10/32, with sealing ring, knurled, polymer; 10 piece
A0584	1/16", short, UNF 10/32, with sealing ring, knurled, PEEK; 10 piece
A0733	1/8", short, M8 x 1, with sealing ring, knurled, polymer; 10 piece
A2501	1/16", short, UNF 10/32, SW 1/4", PEEK with sealing ring 1 piece
A2502	1/16", long, UNF 10/32, SW 1/4", PEEK with sealing ring 1 piece



A0141



A0733

Low Dead Volume Couplings, polymer

A0148	1/16" – 1/16"; polymer; 1 piece
A0149	1/16" – 1/16"; polymer; 5 piece
A0233	1/16" – 1/16"; PEEK; 1 piece



Low Dead Volume Couplings, stainless steel

A0117V1	1/16" – 1/16"; titanium; 1 piece
A0117	1/16" – 1/16"; stainless steel; 1 piece
A0118	1/16" – 1/16"; stainless steel; 5 piece
A0119	1/16" – 1/16"; stainless steel; 25 piece
A2512	1/8" – 1/8"; stainless steel; 1 piece
A2513	1/16" – 1/8"; stainless steel; 1 piece



T-Connector, stainless steel

A0120	3 capillaries 1/16"; stainless steel; 1 piece
A0120VI	3 capillaries 1/16"; titanium; 1 piece
A2511	3 capillaries 1/8"; stainless steel; 1 piece
A2511VI	3 capillaries 1/8"; titanium; 1 piece



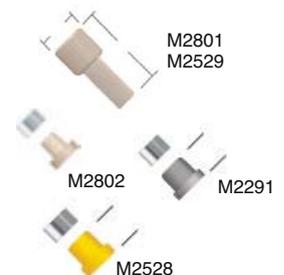
T-Connector, polymer

A0150	3 capillaries 1/16"; polymer; 1 piece
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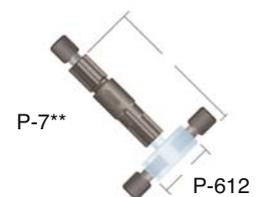
Flat-Bottom Fittings

M2801	Fitting PEEK Fingertight 1/16", 1/4-28 Super Flangeless; 10 piece
M2529	Fitting PEEK Fingertight 1/8", 1/4-28 Super Flangeless; 1 piece
M2802	Ferrule Super Flangeless 1/16" PEEK / natural, with SS lock ring; 10 piece
M2291	Ferrule Super Flangeless 1/8" PEEK / black, with SS lock ring; 10 piece
M2528	Ferrule Super Flangeless 1/8" ETFE / yellow, with SS lock ring; 10 piece



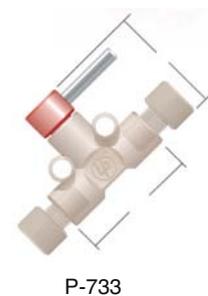
Pressure Relief Valves / Back Pressure Regulators

KNP-612	T-Stück PEEK (1/16"; 14µL) (Fitting inklusive)
KNP-787	7 bar BPR PEEK (1/16"; 131µL) (Fitting inklusive)
KNP-788	17 bar BPR PEEK (1/16"; 102µL) (Fitting inklusive)
KNP-789	34 bar BPR PEEK (1/16"; 96µL) (Fitting inklusive)
KNP-455	69 bar BPR PEEK (1/16"; 89µL) (Fitting inklusive)



Shut-Off Valves

KNP-732	PEEK, Natural, 1/16" 0,5mm Bohrung, 2,5µL (Fitting inklusive)
KNP-733	PEEK, Natural, 1/8" 1,0mm Bohrung, 10µL (Fitting inklusive)



Capillaries, stainless steel

A0130	Stainless steel, 1/16" 0,10 mm ID, 300 cm
A0131	Stainless steel, 1/16" 0,25 mm ID, 300 cm
A0132	Stainless steel, 1/16" 0,50 mm ID, 300 cm
A0133	Stainless steel, 1/16" 0,70 mm ID, 300 cm
A0134	Stainless steel, 1/16" 1,00 mm ID, 300 cm
A0639	Stainless steel, 1/8" 1,60 mm ID, 150 cm
A0640	Stainless steel, 1/8" 2,20 mm ID, 150 cm



Capillaries, Hastelloy C

T0430	Hastelloy C, 1/16" 0,50mm ID, 100 cm
P0307B	Ferrules for capillaries 1/16" Hastelloy C 1 piece

Capillaries, PEEK

A0685	PEEK, 1/16", 0,25 mm ID, 150 cm
A0691	PEEK, 1/16", 0,50 mm ID, 150 cm
A0692	PEEK, 1/16", 0,70 mm ID, 150 cm
A0737	PEEK, 1/8", 1,6 mm ID, 150 cm



Tefzel Tubings

A0182	Tefzel Tubing, 1/16", 0,25 mm ID, 300 cm
A0183	Tefzel Tubing, 1/16", 0,70 mm ID, 300 cm
A0478	Tefzel Tubing, 1/8", 1,60 mm ID, 300 cm

PTFE Tubings

A0152	PTFE-Tubing, 1/16", 0,45 mm ID, 300 cm
A0732	PTFE-Tubing, 1/8", 1,5 mm ID, 300 cm
A0873	PTFE-Tubing, 1/8", 2,0 mm ID, 300 cm
U0435	PTFE-Tubing, 1/4", 4,75 mm ID, 100 cm
A0154	PTFE-Tubing, 4 mm OD, 3 mm ID, 300 cm
A1099	PTFE-Tubing, 9 mm OD 7 mm ID, 300 cm

Replacement pump head Azura 4.1S & 2.1S

A54123-I	Pump head 10 ml, stainless steel
A54121-I	Pump head 10 ml, titanium
A54133	Pump head 50 ml, stainless steel
A54131	Pump head 50 ml, titanium
A5821	Rebuild-Kit for Pump 4.1/2.1S Venting screw, KEL-F, Check valve unit KEL-F, O-ring (FFKM)



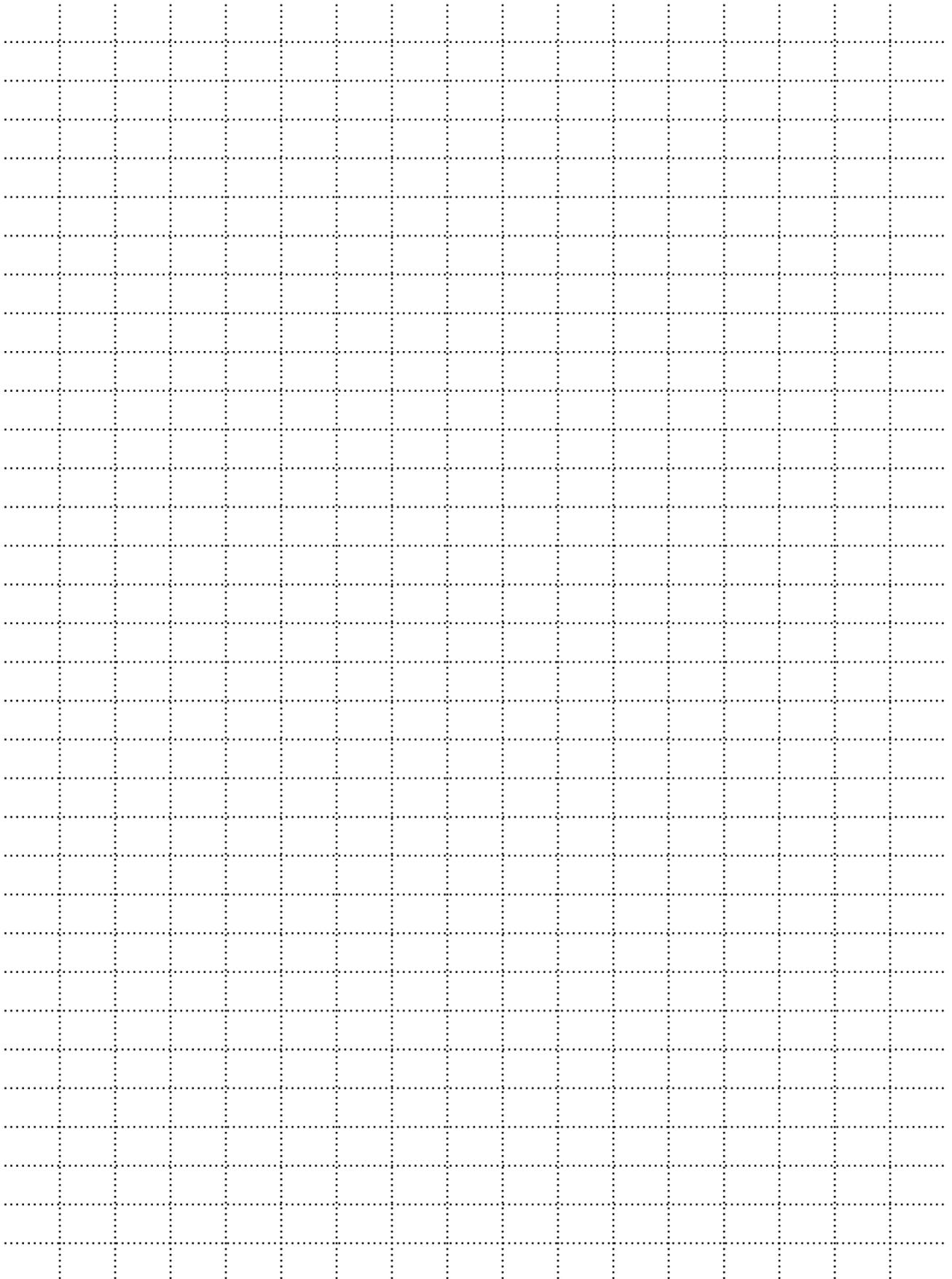
Replacement pump head 40P

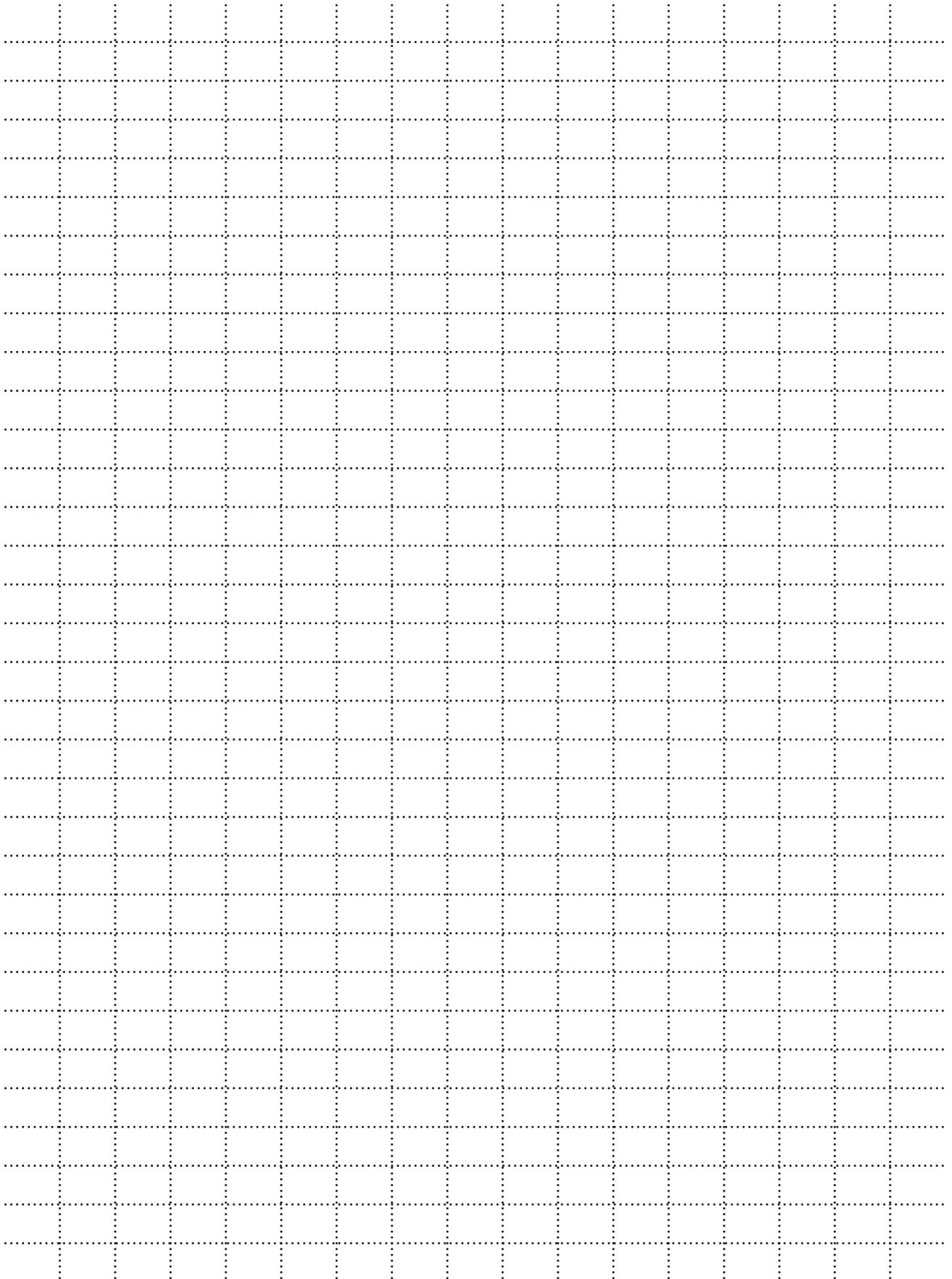
C54123	Pump head 10 ml, stainless steel
A54121-I	Pump head 10 ml, titanium
A54133	Pump head 50 ml, stainless steel
A54131	Pump head 50 ml, titanium
AHB40CA	Pump head 10 ml, stainless steel HT
A5818	Rebuild-Kit for Pump 40P Venting screw, KEL-F, Check valve unit KEL-F, O-ring (FFKM)



Replacement pump head 80P

A4029-I	Pump head 100 ml, stainless steel
A4029VI	Pump head 100 ml, titanium
A4021-I	Pump head 250 ml, stainless steel
A4021VI	Pump head 250 ml, titanium
A4038-I	Pump head 500 ml, stainless steel
A4038VI	Pump head 500 ml, titanium
A4022-I	Pump head 1000 ml, stainless steel
A4022VI	Pump head 1000 ml, titanium





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 Conversion Chart

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

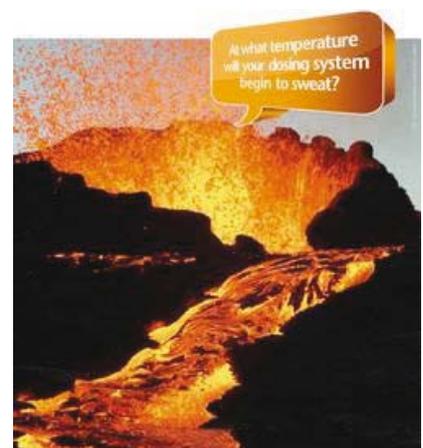
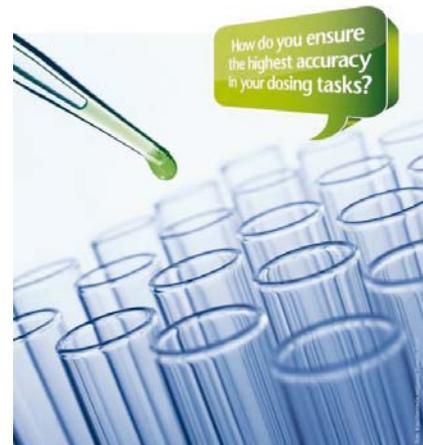
Pressure Conversion Chart

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 Conversion Chart

°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

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