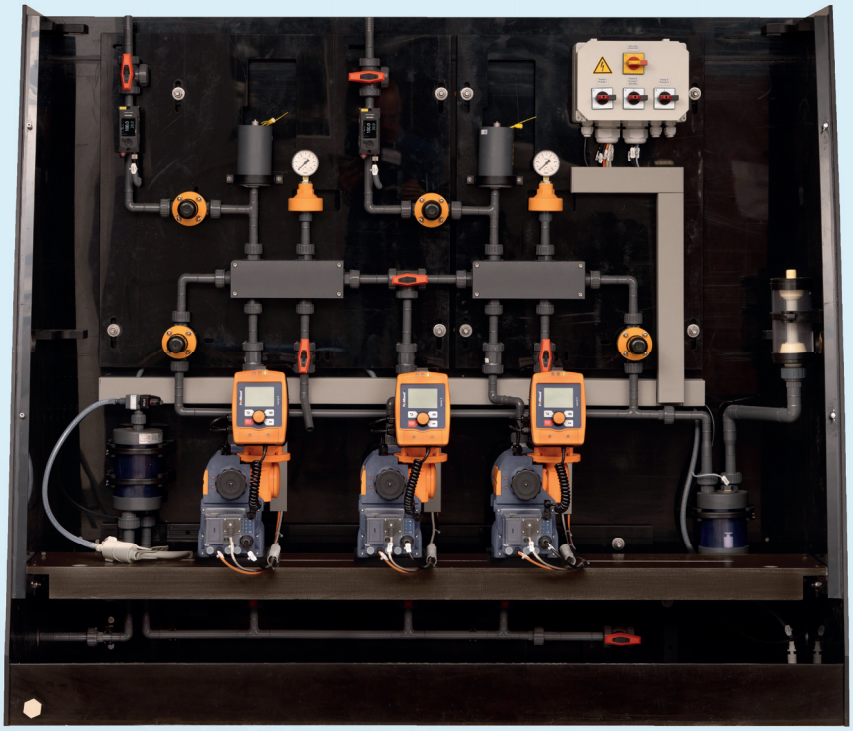
ProMinent®

Metering Technology

Product Catalogue 2026



Product Catalog

Volume 1/3

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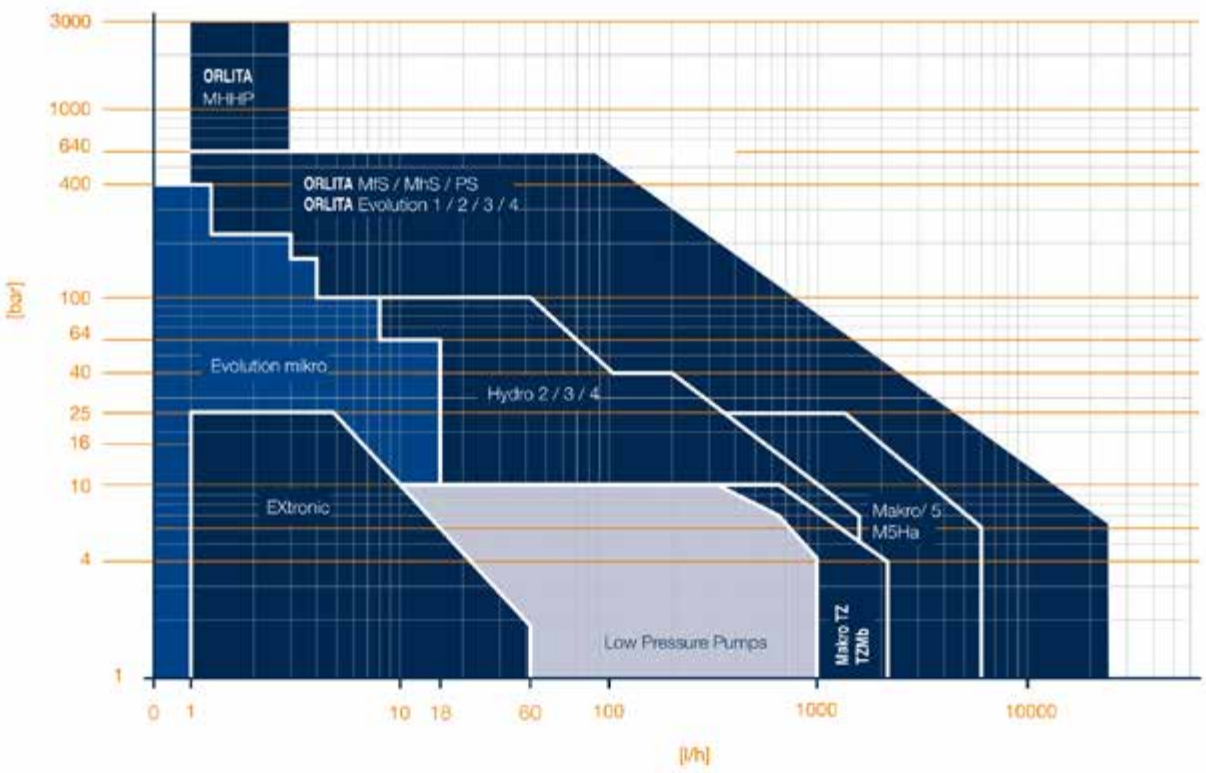
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Heidelberg, January 2026

2.1 Overview of Process Metering Pumps

2.1.1 Selection Guide



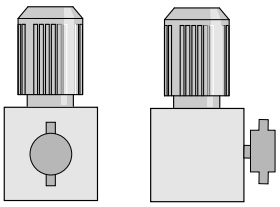
Type	Series	Type	Stroke length mm	Connecting rod force N
Diaphragm Metering Pumps	EXTRONIC	EXBb	0 – 1,25	2,000
	MAKRO	TZMb	0 – 10	8,000
Hydraulic Diaphragm Metering Pumps	HYDRO API	HA1a *	0 – 15	2,000
		HA2a *	0 – 15	2,000
		HA3a *	0 – 15	4,200
		HA4a *	0 – 20	5,800
	HYDRO Classic	HP2a *	0 – 15	2,000
		HP3a *	0 – 15	4,200
		HP4a *	0 – 20	5,800
	Evolution	E1Sa	0 – 16	2,000
		E2Sa	0 – 16	4,500
		EF1a	0 – 16	2,600
		EF2a	0 – 16	6,200
		EF3a	0 – 25	9,000
		EF4a	0 – 40	18,000
		EMFa	0 – 60	500
	MAKRO	M5Ha	0 – 50	10,000
	ORLITA	MhS 18	0 – 15	1,800
		MfS / MhS 35	0 – 20	3,500
		MfS / MhS 600	0 – 40	40,000
		MfS 1400	0 – 60	60,000
Plunger Metering Pumps	sigma	SBKa	0 – 15	1,700
	MAKRO	M5Ka	0 – 50	10,000
		TZKa	0 – 20	8,000
	ORLITA	PS 35	0 – 20	3,500
		PS 80	0 – 20	14,000
		PS 180	0 – 40	18,000
		PS 600	0 – 40	40,000
		Rb 15	0 – 15	1,800
		Rb 150	0 – 32	15,000

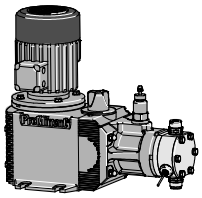
* Stroke volume control

2.1 Overview of Process Metering Pumps

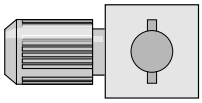
2.1.2 Mounting forms of process metering pumps

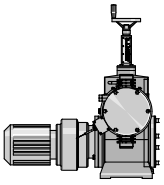
Single-head pump with vertical motor (e.g. HYDRO)



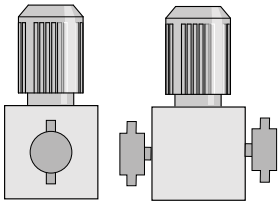


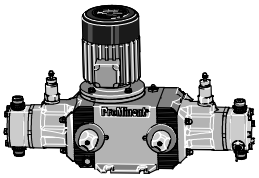
Single-head pump with horizontal motor (e.g. MAKRO)



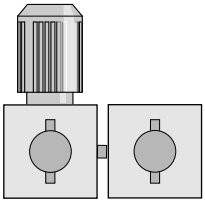


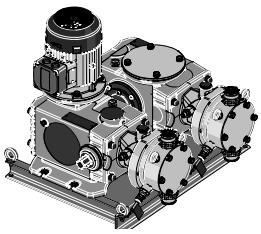
Double-head pump (e.g. HYDRO)
Boxer version



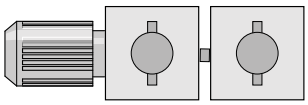


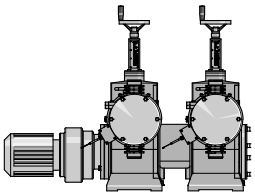
Double pump with vertical motor (e.g. HYDRO)
Duplex version



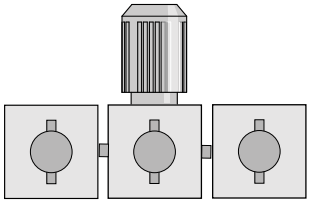


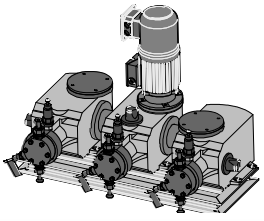
Duplex pump with horizontal motor (e.g. MAKRO)



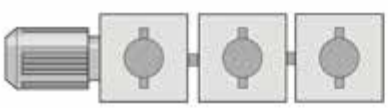


Triple pump with vertical motor (e.g. HYDRO)
Triplex version





Triple pump with horizontal motor (e.g. Evolution)
Triplex version

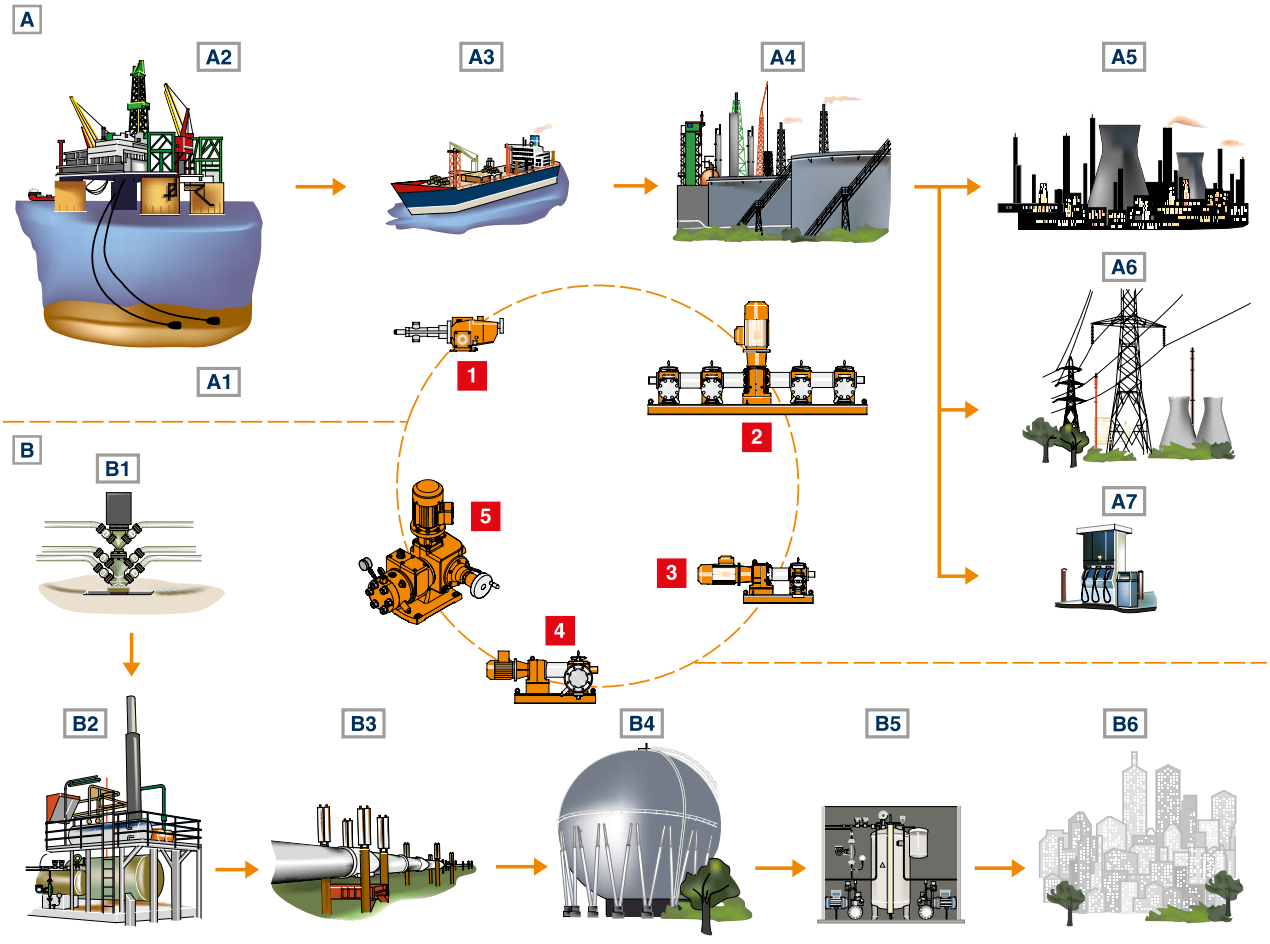




Other variants are available on request.

2.1.3 Installation Options

- A Oil industry
  - A1 Well
  - A2 Platform
  - A3 Transportation (tanker, pipeline)
  - A4 Refinery
  - A5 Petrochemical
  - A6 Industry/power plants
  - A7 Filling stations
- B Gas industry
  - B1 Well
  - B2 Gas treatment/gas drying
  - B3 Transportation (tanker, pipeline)
  - B4 Gas storage tank
  - B5 Local distribution/odorization
  - B6 Industry/power plants



1 Valveless piston-type dosing pump DR

2 Multiplexed dosing pumps

3 Piston-type dosing pump PS

4 Hydraulic diaphragm-driven dosing pump Mh (metal diaphragm)

5 Hydraulic diaphragm-driven dosing pump ORLITA Evolution (PTFE diaphragm)

2.2 Diaphragm Metering Pumps

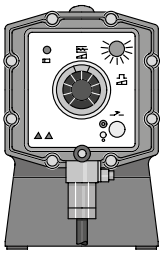
2.2.1 Diaphragm metering pump EXTRONIC

Precise metering with explosion protection

Capacity range of single head pump: 1 – 60 l/h; 25 – 1 bar

The diaphragm metering pump EXTRONIC is perfectly suited to the sensitive application of liquid media in facilities at risk of gas explosions as it is approved in compliance with the EU EX Regulation 2014/34/EU (ATEX).

The ATEX-compliant diaphragm metering pump EXTRONIC (EXBb) is tested and approved in line with EN 60079/-1 for the ignition type 'compression-resistant enclosures' and thus offers the maximum level of protection. The short-stroke solenoid and the complete pump control are integrated in the pump housing so that, together with the explosion-proof drive, there is IP 65 protection against contact and moisture as per EN 60529 even when the front cover is open.

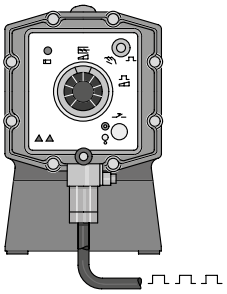


'Internal' control type
stroke length adjustment 1:10, stroke rate adjustment 1:25, total adjustment range 1:250

Your Benefits

Optimum adaptation for use in areas at risk from explosion

- ATEX-compliant in line with EExd IIC T6 and EExd I/IIC T6
- Excellent operating and functional reliability by a microprocessor controller, which compensates for fluctuations in mains voltage and automatically switches from 50 to 60 Hz operation
- Broad range of applications due to operating voltages of 230 V, 115 V, special voltage on request
- Ease of integration into processes, thanks to the range of control types (internal, external contact, analogue)
- Also suitable for use with gaseous media, thanks to the self-bleeding head



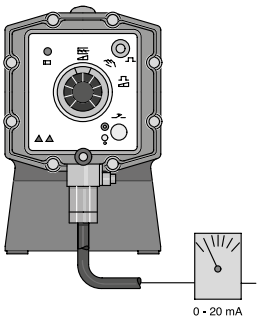
'External contact' control type
stroke length adjustment 1:10, stroke rate control 0 – 100 %, depending on external switching contacts. *)

Technical Details

- Stroke length: 1.25 mm, rod force: 2000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- Stroke length adjustment: manually using scaled rotary dial
- The dosing precision is better than ± 2 % within the 30 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- DEVELOPAN® metering diaphragm with PTFE coating with diaphragm rupture monitoring
- Wetted materials: Polypropylene, PVC, PTFE with carbon, clear acrylic, stainless steel, special designs available on request
- Degree of protection: IP 65 (even with open front cover)
- Short stroke solenoid drive and complete pump control integrated in the pump housing
- "Internal", "External contact" and "Analogue" control inputs are available, the latter two also available as intrinsically safe and approved to EN 60079-11
- EXBb G for use in areas at risk from gases and vapours, degree of protection EEx [i,a] d IIC T6

This means:

- EEx - Equipment complies with European standards
- [i,a] - Control input is intrinsically safe when 2 independent errors occur
- d - Type of ignition protection, compression-resistant enclosure
- IIC - Explosion group II for all areas at risk from explosion with the exception of mining, sub-group IIC (includes IIA and IIB)
- T6 - Temperature class permissible for gases and vapours with ignition temperature > 85 °C



'Analogue' control type
stroke length adjustment 1:10, stroke rate control 0 – 100 % proportional to 0/4 – 20 mA analogue signal. *)

*) The electric connecting cable for mains power cable, contact or analogue control are already routed out of the pump. Note the relevant specifications for connection and control.

Field of Application

- Oil, gas and petrochemicals
- For use in areas with hazardous gases and vapours
- Use in mines at risk from firedamp

2.2 Diaphragm Metering Pumps

Technical data for EXTRONIC EXBb

Type	Capacity at max. back pressure*			Delivery rate at medium back pressure*			Stroke rate	oØ x iØ	Suction lift	Shipping weight PP, NP, TT-SS
	l/h	bar	ml/stroke	l/h	bar	ml/stroke	Strokes/min	mm	m WC	kg
EXTRONIC - metering pumps										
1000	0.19	10	0.03	0.27	5	0.04	120	6 x 4	1.5	12
1601	1.00	16	0.15	1.30	8	0.18	120	6 x 4	5.0	12
2501	1.14	25	0.15	1.10	20	0.17	120	6 x 4	5.0	-
1201	1.70	12	0.23	2.00	6	0.28	120	6 x 4	5.0	12
2502	2.00	25	0.28	2.20	20	0.31	120	8 x 5	5.0	13
1002	2.30	10	0.31	2.70	5	0.38	120	8 x 5	5.0	12
0803	3.70	8	0.51	3.90	4	0.54	120	6 x 4	3.0	12
2505	4.20	25	0.64	4.80	20	0.73	110	8 x 5	5.0	16
1006	6.00	10	0.83	7.20	5	1.00	120	8 x 5	5.0	13
0308	8.60	3	1.20	10.30	1	1.43	120	8 x 5	5.0	12
1310	10.50	13	1.59	11.90	6	1.80	110	8 x 5	5.0	16
0613	13.10	6	1.82	14.90	3	2.07	120	8 x 5	5.5	13
0814	14.00	8	2.12	15.40	4	2.33	110	12 x 9	5.0	16
0417	17.40	3	2.42	17.90	2	2.49	120	12 x 9	4.5	13
0430	27.00	3	4.09	29.50	2	4.47	110	DN 10	5.0	16
0260	60.00	1	9.09	-	-	-	110	DN 15	1.5	16
EXTRONIC - metering pumps for media of higher viscosity										
1002	2.30	10	0.31	2.70	5	0.38	120	DN 10	1.8	-
1006	6.00	10	0.83	7.20	5	1.00	120	DN 10	2.0	-
1310	10.50	10	1.59	11.90	5	1.80	110	DN 15	2.8	-
0814	14.00	8	2.12	15.40	4	2.33	110	DN 15	2.0	-
EXTRONIC - metering pumps with self-bleeding dosing head										
1601	0.66	16	0.09	-	-	-	120	6 x 4	1.8	-
1201	1.00	12	0.14	-	-	-	120	6 x 4	2.0	-
1002	1.80	10	0.25	-	-	-	120	6 x 4	2.0	-
0803	2.40	8	0.33	-	-	-	120	6 x 4	2.8	-

* The performance data stated represents guaranteed minimum values, calculated using water as the medium at room temperature.

Wetted materials for EXTRONIC EXBb

Identity code of material	Dosing head	Connection on suction/discharge side	Seals	Balls (6 – 12 mm connection)	Balls (DN 10 and DN 15 connection)
PP1	Polypropylene	Polypropylene	EPDM	Ceramic	Borosilicate glass
PP4 *	Polypropylene	Polypropylene	EPDM	-	Ceramic
NP1	Clear acrylic	PVC	FKM A	Ceramic	Borosilicate glass
PP4 *	Clear acrylic	PVC	FKM B	Ceramic	Ceramic
PP4 *	PVC	PVC	FKM B	Ceramic	Ceramic
TT1	Carbon-filled PTFE	Carbon-filled PTFE	PTFE	Ceramic	Ceramic
SS ..	Stainless steel 1.4404	Stainless steel 1.4404	PTFE	Ceramic	Stainless steel 1.4404

* PP4 with valve springs made of Hastelloy C

FKM = fluorine rubber

2.2 Diaphragm Metering Pumps

Identity code ordering system for EXTRONIC EXBb

EXBb	Enclosure rating								
	G	Gas-EX-proof							
		Type	Capacity						
		1000	10 bar	0.19 l/h					
		2501	25 bar	1.14 l/h	(only available in SSM and SBM)				
		1601	16 bar	1.00 l/h					
		1201	12 bar	1.70 l/h					
		0803	8 bar	3.70 l/h					
		1002	10 bar	2.30 l/h					
		0308	3 bar	8.60 l/h					
		2502	25 bar	2.00 l/h	(available in SS and SB only)				
		1006	10 bar	6.00 l/h					
		0613	6 bar	13.10 l/h					
		0417	4 bar	17.40 l/h					
		2505	25 bar	4.20 l/h	(available in SS and SB only)				
		1310	13 bar	10.50 l/h	(only available in NP, PP4, SS and SB)				
		0814	8 bar	14.00 l/h					
		0430	4 bar	27.00 l/h					
		0260	2 bar	60.00 l/h					
			Liquid end material						
			PP1	Polypropylene with EPDM O-ring					
			PP4	Polypropylene HV for high-viscosity media with EPDM O-ring and valve springs in Hastelloy C, Only for types 1002, 1006, 1310 and 0814					
			NP1 *	Clear acrylic with FKM A O-ring					
			NP3 *	Clear acrylic with FKM B O-ring					
			TT1	PTFE with carbon, PTFE seal					
			SS1	Stainless steel, no. 1.4404, with PTFE seal					
			SS2	Stainless steel with 1/4" NPT internal thread, PTFE seal					
			SB1	Stainless steel with ISO 7 Rp 1/4 internal thread, ISO 7 Rp 1/2 on type 0260, PTFE seal (recommended for flammable materials)					
			SSM	As SS1, with diaphragm rupture indicator , Type 2501 only					
			SBM	Stainless steel with 1/4" NPT internal thread, with diaphragm rupture indicator, Type 2501 only					
				Valve springs					
				0	No valve spring				
				1	With 2 valve springs, 1.4571, 0.1 bar				
					Electrical Connection				
					A	230 V, 50/60 Hz			
					B	115 V, 50/60 Hz			
						Control type			
						0	Manual stroke rate adjustment via potentiometer		
						1	External contact		
						2	Analogue 0-20 mA		
						3	Analogue 4-20 mA		
						4	External contact, intrinsically safe [i,a]		
						5	Analogue 0-20 mA, intrinsically safe [i,a]		
						6	Analogue 4-20 mA, intrinsically safe [i,a]		
						7	Manual with zero volts ON/OFF		
						8	Manual with zero volts ON/OFF, intrinsically safe [i,a]		
							Control Variants		
							0	With potentiometer, Only for control types 0, 7 and 8	
							1	With manual auxiliary key for maximum stroke rate, Only for control types 1 – 6	
							2	With manual auxiliary frequency changer key for maximum stroke rate, Only for control types 1 – 6	
								Approved/Language	
								0	BVS - Europe, German, 100 V - 500 V
								1	BVS - Europe, English, 100 V - 500 V
								2	FM - USA, English, 115 V
								3	CSA - Canada, English, 115 V, 230 V

* FKM = Fluorine Rubber

Design of connectors

With PP, NP, NS, PS and TT	6, 8 and 12 mm	Hose sleeve with clamp connection
With stainless steel SS1/SSM	6, 8 and 12 mm	Swagelok system threaded connector
With stainless steel SS2/SBM	6, 8 and 12 mm	Internal thread 1/4" NPT
With stainless steel SB1	6, 8 and 12 mm	Internal thread ISO 7-1 Rp 1/4

Repeatability of metering ±2 % when performed in line with the information in the operating instructions.

For type 1601 with self-bleeding dosing head ±5 %.

Permissible ambient temperature –20 °C to +45 °C.

Electrical connection:	230 V ±10 %, 50/60 Hz
	115 V ±10 %, 50/60 Hz
	Special voltage on request
Degree of protection:	IP 65, insulation class F

Average power consumption at max. stroke rate (W)/peak current during metering stroke (A) at 230 V, 50/60 Hz

EXBb	Type 1000, 2501, 1601, 1201, 0803, 1002, 0308	13 W/0.8 A	at 120 strokes/min.
EXBb	Type 2502, 1006, 0613, 0417	35 W/1.8 A	at 120 strokes/min.
EXBb	Type 2505, 1310, 1014, 0430, 0260	45 W/2.2 A	at 110 strokes/min.

Scope of delivery: Metering pump with mains cable (5 m) and connector parts for hose/pipe connection as per table.

Spare Parts Kits for Diaphragm Metering Pump EXTRONIC

Scope of delivery for PP and NP mat. versions:
1 metering diaphragm
1 suction valve assembly
1 discharge valve assembly
2 valve balls
1 sealing set, complete
1 connector kit

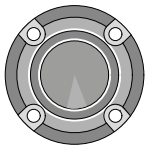
Scope of delivery for TT-PTFE material version:
1 metering diaphragm
1 suction valve assembly
1 discharge valve assembly
2 valve balls
2 ball seat discs
1 sealing set, complete
1 connector kit

Scope of delivery for NS3 and PS3 mat. versions:
1 metering diaphragm
1 suction valve assembly
1 connector component assembly
1 discharge valve assembly
1 bleed valve assembly
1 connector kit

Scope of delivery for SS stainless steel mat. vers.:
1 metering diaphragm
4 valve balls
4 ball seat discs
1 sealing set, complete
1 connector kit

Pump type			Order no.
EXBb 1000	PP1		740357
	NP3		740354
	TT		910776
	SS/SK		910777
EXBb 2501	SBM		1020281
	SSM		1020282
EXBb 1601	PP1		740361
	NP3		740358
	NS3/PS3		792033
	TT		910778
	SS/SK		910779
EXBb 1201	PP1		740380
	NP3		740362
	NS3/PS3		792034
	TT		910780
	SS/SK		910781
EXBb 0803	PP1		740384
	NP3		740381
	NS3/PS3		792035
	TT		910782
	SS		910783
EXBb 1002/2502	PP1		740388
	NP3		740385
	NS3/PS3		792036
	TT		910784
	SS		910785
	HV/PP 4	Type 1002	910743
EXBb 0308/1006/2505	PP1		740497
	NP1		740498
	TT		910957
	SS		910959
	HV/PP4	Type 1006	910939
EXBb 0613/1310	PP1		740504
	NP1		740505
	TT		910969
	SS		910971
	HV/PP4	Type 1310	910941
EXBb 0417/0814	PP1		740501
	NP1		740502
	TT		910977
	SS		910979
	HV/PP4	Type 0814	910943
EXBb 0430-DN 10	PP1		740507
	NP1		740508
	TT		910993
	SS		910995

Spare parts kit as of DN 10 with single ball valves.



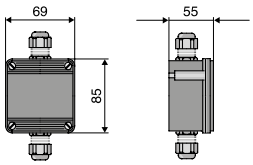
Spare Diaphragms for Diaphragm Metering Pump ProMinent EXTRONIC

DEVELOPAN® metering diaphragms from ProMinent made of EPDM with woven inner layer, large-area vulcanised steel core and PTFE Teflon layer on the wetted side.

For pump type	Description	Order no.
1000	31.0 x 6.0	811452
1601	48.0 x 9.5	811453
1201	48.0 x 12.5	811454
0803	48.0 x 18.5	811455
1002, 2502	60.0 x 17.0	811456
0308, 2505, 1006	60.0 x 28.0	811457
0430, 0230	127.5 x 63.0	811460
0260	127.5 x 91.0	811461
1310, 0613	76.0 x 37.0	811458
0814, 0417	76.0 x 45.0	811459
2501	35.0 x 11.5	1000246

Ex-Proof Ancillary Equipment

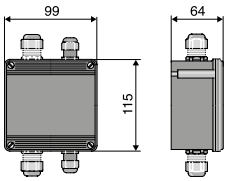
Plastic terminal box: Type I



IP 66, EEx e II T 6, max. 380 V to mains connection of e.g. ProMinent EXTRONIC in area at risk from explosion.

	Order no.
1 input, 1 output for power supply cable. 2 terminals + PE and 2 M 20-12 screw glands	1000071

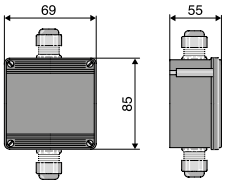
Plastic terminal box: Type II



IP 6, EEx e II T 6, max. 380 V. As type I, but with additional connector for control cable (e.g. for contact water meter or DULCOMETER controller).

	Order no.
2 inputs (mains and controller cable), 2 outputs 2 terminals + PE, 1 partition, 2 terminals and 2 M 20-12 screw glands and 2 M 16-0.8 screw glands	1000072

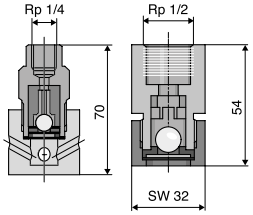
Plastic terminal box: EExi Type I



IP 66, EEx ia II T 6 for intrinsically safe control cable

	Order no.
1 input, 1 output for control cable, 2 terminals and 2 M 16-0.8, blue screw glands	1000073

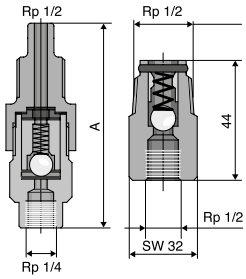
Stainless steel foot valve 1.4404 „SB“



With filter and ball check valve, designed for use with flammable materials. Materials: 1.4404/1.4401/PTFE/ceramic

	Order no.
Connector ISO 7 Rp 1/4 SB version for ProMinent EXTRONIC	809301
Connector ISO 7 Rp 1/2 SB version for ProMinent EXTRONIC	924561

2.2 Diaphragm Metering Pumps



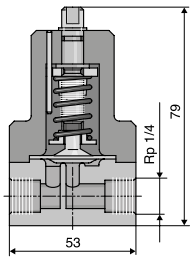
Stainless steel 1.4404 „SB“ dosing valve

Spring-loaded ball check valve designed for use with flammable materials. Materials: 1.4404/1.4401/Hastelloy C/PTFE/ceramic

	Order no.
Connector ISO 7 Rp 1/4 - R 1/2, priming pressure approx. 0.5 bar	809302
Connector ISO 7 Rp 1/2 - R 1/2, priming pressure approx. 0.5 bar	924560

Adjustable ‘SB’ back pressure valve

For the generation of a defined back pressure for precise metering, only for use with a free outlet. Also suitable for use as a relief valve.



	Order no.
Operating range approx. 1-10 bar, closed version, designed for use with flammable materials.	924555

PTFE dosing pipe

Carbon-filled, surface resistance < 10^7 Ω

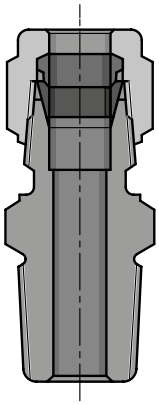
Material	Length	Connector size Ø x i Ø	permitted operating pressure*	Order no.
	m	mm	bar	
Carbon-filled PTFE	Sold in metres	6 x 4	12	1024831
Carbon-filled PTFE	Sold in metres	8 x 5	16	1024830
Carbon-filled PTFE	Sold in metres	12 x 9	9	1024832

* Permissible operating pressure at 20 °C as per DIN EN ISO 7751 subject to chemical resistance and correct connection

Further accessories, such as foot valves, injection valves and back pressure valves in the usual material versions, are identical to gamma accessories and/or those for connecting DN 15 VARIO accessories.

(Hydraulic/mechanical accessories, see page → 156)

Straight Male Adapter Stainless Steel



Swagelock system, stainless steel SS 316 (1.4401) for fitting tubing to dosing heads and valves with inner threads and for SB versions.

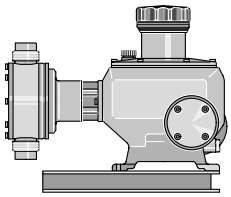
	Order no.
6 mm - ISO 7 R 1/4	359526
8 mm - ISO 7 R 1/4	359527
12 mm - ISO 7 R 1/4	359528
16 mm - ISO 7 R 1/2	359529

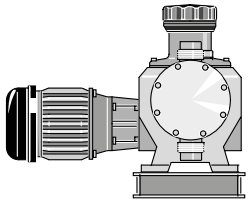
2.2.2 Diaphragm Metering Pump Makro TZ

Greater safety in continuous operation through mechanically deflected multi-layer safety diaphragm.

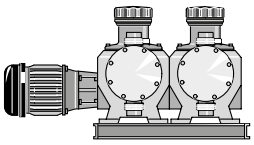
Capacity range of single head pump: 260 – 2,100 l/h, 12 – 4 bar

The modular construction of the diaphragm metering pump MAKRO TZMb with adjustable eccentric drive mechanism and mechanically deflected multi-layer safety diaphragm enables it to be outstandingly adapted to the performance requirements of the respective application.

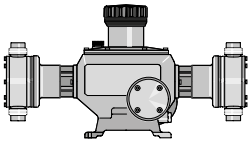




Makro TZ TZMb



Makro TZ externally mounted pump



Makro TZ double-head pump

The diaphragm metering pump MAKRO TZMb has an adjustable eccentric drive mechanism and, together with the Makro TZ plunger metering pump, forms a range of drive mechanisms with stroke lengths of 10 or 20 mm. A wide range of drive versions is available for use in areas at risk from explosion with ATEX certification.

Your benefits

Excellent process reliability:

- Patented multi-layer safety diaphragm with integral diaphragm rupture warning / signalling system
- The dosing precision is better than ± 2 % within the 30-100 % stroke length range under defined conditions and with correct installation

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs (boxer principle) being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

Technical Details

- Stroke length: 0-10 mm, rod force: 8000 N
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by means of scaled rotary dial in 0.5% increments (optionally with electric actuator or control drive)
- The dosing precision is better than ± 2 % within the 30 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with electrical diaphragm rupture signalling system / warning via a contact)
- Wetted materials: polypropylene, PVC, PTFE+25% carbon, stainless steel 1.4571. Special materials are available on request
- A wide range of power end/drive versions is available: Three-phase or 1-phase AC motor, motors for use in areas at risk from explosion, different flange designs for use of customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- For reasons of safety, provide suitable overflow equipment during the installation of all mechanically actuated diaphragm metering pumps

Field of Application

- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering

2.2 Diaphragm Metering Pumps

Technical data for MAKRO TZMb

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure with 1800 rpm motor at 60 Hz				Suction lift	Connector Suction/ Discharge Side	Shipping weight	
	l/h	bar	ml/ stroke	Max. stroke rate Strokes/ min	l/h	psi	gph (US)	Max. stroke rate Strokes/ min	m WC	G-DN	PP, NP, TT kg	SS kg
120260	260	12	60	72	312	174	82	86	4.0	1 1/2–25	46	54
120340	340	12	60	96	408	174	108	115	4.0	1 1/2–25	46	54
120430	430	12	60	120	516	174	136	144	4.0	1 1/2–25	46	54
120510	510	12	60	144	622	174	164	173	4.0	1 1/2–25	46	54
120650	640	12	60	180	-	174	-	-	4.0	1 1/2–25	46	54
070430	430	7	99	72	516	100	136	86	3.5	2–32	50	64
070570	570	7	99	96	684	100	181	115	3.5	2–32	50	64
070720	720	7	99	120	864	100	228	144	3.5	2–32	50	64
070860	860	7	99	144	1,032	100	273	173	3.5	2–32	50	64
071070	1,070	7	99	180	-	100	-	-	3.5	2–32	50	64
040840	840	4	194	72	1,008	58	266	86	3.0	2 1/4–40	56	80
041100	1,100	4	194	96	1,320	58	349	115	3.0	2 1/4–40	56	80
041400	1,400	4	194	120	1,680	58	444	144	3.0	2 1/4–40	56	80
041670	1,670	4	194	144	2,004	58	529	173	3.0	2 1/4–40	56	80
042100	2,100	4	194	180	-	58	-	-	3.0	2 1/4–40	56	80

Plastic material design: max. 10 bar back pressure

The permissible priming pressure on the suction side is approximately 50% of the max. permitted back pressure

Wetted materials for MAKRO TZMb

			DN 25 ball valves			DN 32 / DN 40 plate valves		
Identity code of material	Dosing head	Connection on suction/ discharge side	Seals DN 25	Valve balls	Valve seats	Seals DN 32/DN 40	Valve plates/valve springs	Valve seats
PCT	PVC	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/Hastelloy C + CTFE *	PTFE
PPT	Polypropylene	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/Hastelloy C + CTFE *	PTFE
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4401	PTFE	PTFE	Stainless steel 1.4404/Hastelloy C	PTFE
TTT	Carbon-filled PTFE	PVDF	PTFE	Ceramic	PTFE	PTFE	Ceramic/Hastelloy C + CTFE *	PTFE

* The valve spring is coated with CTFE (resistance similar to PTFE)

Multi-layer safety diaphragm with PTFE coating. Special designs available on request.

Identity Code Ordering System for Makro TZMb Mechanically Deflected Diaphragm Metering Pump

TZMb	Drive type													
	H	Main drive												
	A	Add-on drive												
	D	Main drive for double-head pump												
	B	Add-on drive for double-head pump												
		Type												
		120260												
		120340												
		120430												
		120510												
		120650												
		070430												
		070570												
		070720												
		070860												
		071070												
		040840												
		041100												
		041400												
		041670												
		042100												
			Liquid end material											
			PC	PVC (max. 10 bar)										
			PP	Polypropylene (max. 10 bar)										
			SS	Stainless steel										
			TT	PTFE + 25% carbon (max. 10 bar)										
				Material of seals/diaphragm										
				T	PTFE									
					Displacement body									
					1	Multi-layer safety diaphragm with rupture indicator								
						Liquid end version								
						0	No valve spring							
						1	With valve springs							
							Hydraulic connections							
							0	Standard connection						
							1	PVC union nut and insert						
							2	Union nut and insert PP						
							3	PVDF union nut and insert						
							4	SS union nut and insert						
								Version						
								0	With ProMinent logo					
								2	Without ProMinent logo					
								A	With ProMinent® logo, with frame, simplex					
								B	With ProMinent® logo, with frame, duplex					
								C	With ProMinent® logo, with frame, triplex					
								M	Modified					
									Electrical power supply					
									S	3-phase 230/400 V 50 Hz, 0.75 kW				
									R	4-pin variable speed stroke control motor 230/400 V, 1.5 kW				
									V-0	Variable speed stroke control motor with integrated frequency converter, 3-phase, 400 V, 50/60 Hz, 1.5 kW				
									L	3-phase 230/400 V 50 Hz, 0.75 kW (Exe, Exd)				
									P	3-phase 230/400 V 60 Hz, 0.75 kW (Exe, Exd)				
									4	No motor, with motor flange 56 C				
									7	No motor, with motor flange 120/80				
									8	No motor, with motor flange 160/90				
									0	Without motor, externally mounted drive				
										Enclosure rating				
										0	IP 55 (standard)			
										2	Exd motor version ATEX-T4			
										A	ATEX drive			
											Stroke sensor			
											0	No stroke sensor		
											1	With stroke sensor (Namur)		
												Stroke length adjustment		
												0	Stroke length adjustment, manual	
												1	230 V stroke actuator	
												2	115 V stroke actuator	
												3	230 V 0-20 mA stroke controller	
												4	230 V 4-20 mA stroke controller	
												5	115 V 0-20 mA stroke controller	
												6	115 V 4-20 mA stroke controller	
													Application	

2.2 Diaphragm Metering Pumps



Motor data for MAKRO TZMb

Identity code specification	Power supply				Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	0.75 kW	
R	3-phase, IP 55*	230 V/400 V	50/60 Hz	1.5 kW	With PTC, speed control range 1:20, with external fan (1-phase 230 V; 50/60 Hz; 20 W)
V0	3-phase, IP 55*	400 V	50 Hz	1.5 kW	Variable speed stroke control motor with integrated frequency converter
L2	3-phase, II 2G Ex db IIC T4 Gb	230 V/400 V	50 Hz	0.75 kW	With PTC, speed control range 1:5
P2	3-phase, II 2G Ex db IIC T4 Gb	265 V/400 V	60 Hz	0.75 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Maintenance kits for MAKRO TZMb with valve wear parts

The maintenance kit generally includes the wear parts for the liquid ends.

Scope of delivery:

1 spare diaphragm, complete, 2 valve balls (DN32 / DN40 with plate and spring), 1 sealing set

Liquid end	Materials in contact with the medium	Suitable for identity code	Order no.
FM 650 - DN 25	PCT, PPT, TTT	120260, 120340, 120430, 120510, 120650	1025164
FM 650 - DN 25	SST	120260, 120340, 120430, 120510, 120650	1022896
FM 1100 - DN 32	PCT, PPT, TTT	070430, 070570, 070720, 070860, 071070	1025167
FM 1100 - DN 32	SST	070430, 070570, 070720, 070860, 071070	1022917
FM 2100 - DN 40	PCT, PPT, TTT	040840, 041100, 041400, 041670, 042100	1025169
FM 2100 - DN 40	SST	040840, 041100, 041400, 041670, 042100	1022930

Maintenance kits for MAKRO TZMb with valve, complete

The maintenance kit generally includes the wear parts for the liquid ends.

Scope of delivery:

1 spare diaphragm, complete, 2 valves, complete, 2 valve balls (DN32 / DN40 with plate and spring), 1 sealing set

Liquid end	Materials in contact with the medium	Suitable for identity code	Order no.
FM 650 - DN 25	SST	120260, 120340, 120430, 120510, 120650	1022895
FM 1100 - DN 32	SST	070430, 070570, 070720, 070860, 071070	1022916
FM 2100 - DN 40	SST	040840, 041100, 041400, 041670, 042100	1022929

Multi-layer safety diaphragm for MAKRO TZMb

ProMinent multi-layer safety diaphragm with diaphragm rupture warning system and PTFE Teflon coating on the wetted side.

Pump type	Order no.
Identity code: 120260, 120340, 120430, 120510, 120650; Makro TZ FM 650	1022887
Identity code: 070430, 070570, 070720, 070860, 071070; Makro TZ FM 1100	1022900
Identity code: 040840, 041100, 041400, 041670, 042100; Makro TZ FM 2100	1022921

Standard oil for maintaining hydraulics and gearbox MAKRO TZMb

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilgear 600 XP 460 gear oil, 1 litre	3.2 l	1004542

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

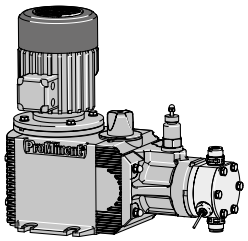
2.3 Hydraulic Diaphragm Metering Pumps

2.3.1 Hydraulic Diaphragm Metering Pump HYDRO Classic

For flexible metering with excellent process reliability in the medium pressure range.

Capacity range of single-head pump: 3 – 1450 l/h, 100 – 7 bar

As an extremely robust hydraulic diaphragm metering pump, the HYDRO range meets the most exacting safety requirements. Its modular construction, with either one or two dosing heads, 4 gear ratios, 2 dosing head sizes and 3 dosing head materials, offers a very high degree of flexibility in terms of areas of application.



HYDRO

The hydraulic diaphragm metering pump HYDRO with its HP2a, HP3a and HP4a product ranges forms an integrated product range with stroke lengths of 15 or 20 mm. This covers the capacity range from 3 to 1450 l/h at 100 – 7 bar. A wide range of power end versions is available, including some for use in areas at risk from explosion with ATEX certification.

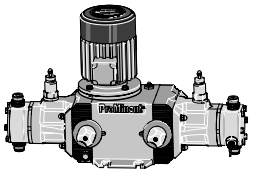
Your Benefits

Excellent process reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning / signalling system
- Integral hydraulic relief valve
- The dosing precision is better than ± 1 % within the 20-100 % stroke volume range under defined conditions and with correct installation

Excellent flexibility:

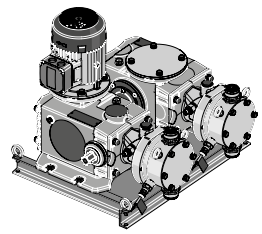
- The modular construction with single and double head versions permits a wide range of applications, with the double head designs (boxer principle) being operated in push-pull mode
- It is possible to combine up to 5 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available



HYDRO double-head pump

Technical Details

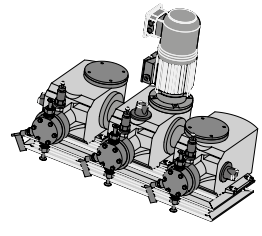
- Stroke length: 15 mm (HP2a, HP3a), 20 mm (HP4a)
- Rod force: 2000 N (HP2a), 4200 N (HP3a), 5800 N (HP4a)
- Stroke volume adjustment range: 0 – 100%
- Stroke volume adjustment: manually using scaled rotary dial (optionally with electric actuator or control drive)
- The dosing precision is better than ± 1 % within the 20 to 100% stroke volume range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning / signalling system via a contact
- Integrated hydraulic relief and vent valve
- Wetted materials: PVDF, PTFE+25% carbon, stainless steel 1.4571, Hastelloy C.
- A wide range of power end/drive versions is available: Three-phase or 1-phase AC motor, motors for use in areas at risk from explosion, different flange designs for use of customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 see page →289



HYDRO add-on pump

Field of Application

- Oil and gas industry
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



HYDRO triplex pump

2.3 Hydraulic Diaphragm Metering Pumps

2.3.1.1 Hydraulic Diaphragm Metering Pump HYDRO HP2a

Technical data for HYDRO HP2a

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure at 60 Hz			Suction lift	Perm. pre-pressure suction side	Suction/ discharge side connector	Shipping weight	Plunger Ø
	l/h	bar	ml/ stroke	Max. stroke rate Strokes/ min	psi	l/h / gph (US)	Max. stroke rate Strokes/ min	m WC	bar	G-DN	kg	mm
100003 *	3	100	3.0	60	1,450	3.6/1.0	72	3.0	5	Rp 1/4	31	16
100006 *	6	100	3.0	125	1,450	7.0/1.8	150	3.0	5	Rp 1/4	31	16
100007 *	7	100	3.0	150	1,450	8.0/2.1	180	3.0	5	Rp 1/4	31	16
100009 *	9	100	3.0	187	1,450	11.0/2.9	224	3.0	5	Rp 1/4	31	16
100010 *	10	100	3.0	212	-	-	-	3.0	5	Rp 1/4	31	16
064007	7	64	3.8	60	928	8.4/2.2	72	3.0	5	G 3/4-10	31	18
064015	15	64	3.8	125	928	18.0/4.8	150	3.0	5	G 3/4-10	31	18
064018	18	64	3.8	150	928	21.0/5.5	180	3.0	5	G 3/4-10	31	18
064022	22	64	3.8	187	928	26.0/6.9	224	3.0	5	G 3/4-10	31	18
064025	25	64	3.8	212	-	-	-	3.0	5	G 3/4-10	31	18
040014	14	40	5.7	60	580	16.8/4.4	72	3.0	5	G 3/4-10	31	22
040029	29	40	5.7	125	580	34.8/9.2	150	3.0	5	G 3/4-10	31	22
040035	35	40	5.7	150	580	42.0/11.1	180	3.0	5	G 3/4-10	31	22
040044	44	40	5.7	187	580	52.8/13.9	224	3.0	5	G 3/4-10	31	22
040050	50	40	5.7	212	580	-	-	3.0	5	G 3/4-10	31	22
025019 **	19	25	7.9	60	362	23.0/6.1	72	3.0	5	G 3/4-10	31	26
025040 **	40	25	7.9	125	362	48.0/12.7	150	3.0	5	G 3/4-10	31	26
025048 **	48	25	7.9	150	362	58.0/15.3	180	3.0	5	G 3/4-10	31	26
025060 **	60	25	7.9	187	362	72.0/19.0	224	3.0	5	G 3/4-10	31	26
025068 **	68	25	7.9	212	-	-	-	3.0	5	G 3/4-10	31	26

* SST version with double ball valve, valve connector on the suction-discharge side with female thread Rp 1/4 and male thread G 3/4 - DN 10

** HV design with G1 - DN 15 connector

PVDF version max. 25 bar, PTFE + 25 % carbon; PTFE max.16 bar

Wetted materials for HYDRO HP2a

Identity code of material	Dosing head	Connection on suction/discharge side	Seals/ball seat	Balls
PVT *	PVDF	PVDF	PTFE/PTFE + 25 % carbon	Ceramic
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/stainless steel 1.4404	Ceramic
TTT	PTFE + 25% carbon	PVDF (polyvinylidene fluoride)	PTFE/PTFE + 25 % carbon	Ceramic
SCT	Stainless steel 316L	Stainless steel 1.4581	PTFE/stainless steel 1.4404	Ceramic

* Not for areas at risk from explosion

Motor data for HYDRO HP2a

Identity code Feature		Power supply			Remarks
S	3 ph, IP 55 *	230 V/400 V	50 Hz	0.37 kW	
T	3 ph, IP 55 *	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.37 kW	with PTC, speed control range 1:5
R	3 ph, IP 55 *	230 V/400 V	50 Hz	0.45 kW	with PTC, speed control range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55 *	230 V	50 Hz	0.37 kW	Variable speed motor with integrated frequency converter, speed control range 1:20
L2	3 ph, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	0.37 kW	with PTC, speed control range 1:5
P2	3 ph, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.37 kW	with PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

2.3 Hydraulic Diaphragm Metering Pumps

Identity code ordering system for HYDRO HP2a

HP2a	Drive type													
	H	Main drive												
	D	Main drive, double-head version												
	E	Main drive for add-on pump												
	F	Main drive, double-head version for add-on pump												
	A	Add-on drive												
	B	Add-on drive, double-head version												
	T	Triplex pump comprising 3 drives and 3 identical heads												
		Type	Capacity											
		100003	100 bar	3 l/h										
		100006	100 bar	6 l/h										
		100007	100 bar	7 l/h										
		100009	100 bar	9 l/h										
		100010	100 bar	10 l/h										
		064007	64 bar	7 l/h										
		064015	64 bar	15 l/h										
		064018	64 bar	18 l/h										
		064022	64 bar	22 l/h										
		064025	64 bar	25 l/h										
		040014	40 bar	14 l/h										
		040029	40 bar	29 l/h										
		040035	40 bar	35 l/h										
		040044	40 bar	44 l/h										
		040050	40 bar	50 l/h										
		025019	25 bar	19 l/h										
		025040	25 bar	40 l/h										
		025048	25 bar	48 l/h										
		025060	25 bar	60 l/h										
		025068	25 bar	68 l/h										
			Liquid end material											
			SS	Stainless steel										
			PV	PVDF, Not for types 100..., max. 25 bar										
			TT	PTFE + 25 % carbon, max. 16 bar										
			SC	Stainless steel 316L										
				Sealing material										
				T	PTFE									
					Diaphragm									
					0	Standard multilayer diaphragm with rupture signalling facility								
						Liquid end version								
						1	With valve springs							
						D	Double ball valve , Only for SST and HCT							
							Hydraulic connections							
							0	Standard threaded connector						
							E	With DIN ISO flange						
							F	With ANSI flange						
								Version						
								0	With ProMinent logo					
								1	Without ProMinent logo					
								M	Modified					
									Electrical power supply					
									S	3-phase, 230/400 V, 50 Hz, 0.37 kW				
									T	3-phase, 230/400 V, 50/60 Hz, 0.37 kW, with PTC				
									R	3-phase variable speed stroke control motor, 230/400 V, 0.45 kW				
									V-0	Variable speed stroke control motor with integrated frequency converter, 1-phase, 230/400 V, 50/60 Hz, 0.37 kW				
									L	3 ph, 230/400 V, 50 Hz (Exe, Exd), 0.37 kW				
									P	3 ph, 265/400 V, 60 Hz (Exe, Exd), 0.37 kW				
									1	No motor, with motor flange B 14, size 200				
									3	No motor, with motor flange B5, size 160				
									4	No motor, with motor flange NEMA 56 C				
									0	Add-on drive				
										Enclosure rating				
										0	IP 55 (standard)			
										2	Exde design ATEX-T4 (L2, P2)			
										A	ATEX drive			
											Stroke sensor			
											0	No stroke sensor (standard)		
											1	Stroke sensor (for explosion-proof applications)		
												Stroke length adjustment		
												0	Manual (Standard)	
												1	With stroke positioning motor, 230 V/50/60 Hz	
												2	With stroke positioning motor, 115 V/60 Hz	
												A	With stroke control motor 0-20 mA 230 V/50/60 Hz	
												B	With stroke control motor 4-20 mA 230 V/50/60 Hz	
												C	With stroke control motor 0-20 mA 115 V/60 Hz	

														D	With stroke control motor 4-20 mA 115 V/60 Hz
															Hydraulic oil
															0 Standard
															1 Food grade
															2 Low temperature to -25 °C
															3 Low temperature Zone 2

Maintenance kits for HYDRO HP2a with valve wear parts

The maintenance kit generally includes the wear parts for the liquid ends.

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls (4 valve seats, 4 valve balls for double ball valve)

Plunger Ø mm	Material	Suitable for identity code	Order no.
16 *	S1	HP2a.100..SST	1029260
16, 18	H1	HP2a.100..HCT, HP2a.064..HCT	1009571
18	S1	HP2a.064..SST	1005549
22, 26	S1	HP2a.040..SST, HP2a.025..SST	1005553
22, 26	H1	HP2a.040..HCT, HP2a.025..HCT	1009573

* Piston Ø 16 mm, material S1, version for double ball valves

Maintenance kits for HYDRO HP2a with valves, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
16, 18	P1	HP2a.100..PVT, HP2a.064..PVT	1005548
18	S1	HP2a.064..SST	1005550
22, 26	S1	HP2a.040..SST, HP2a.025..SST	1005554
22, 26	P1	HP2a.040..PVT, HP2a.025..PVT	1005552

Diaphragms PTFE/1.4404 for HYDRO HP2a

Plunger Ø mm	Material	Suitable for identity code	Order no.
16, 18	S1	HP2a.100..SST, HP2a.064..SST	1005545
16, 18	P1	HP2a.100..PVT, HP2a.064..PVT	1122578
22, 26	S1	HP2a.040..SST, HP2a.025..SST	1005546
22, 26	P1	HP2a.040..PVT, HP2a.025..PVT	1122579

Diaphragms PTFE/Hastelloy C Coated for HYDRO HP2a

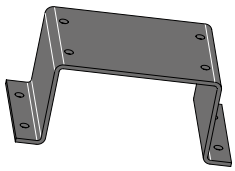
Plunger Ø mm	Material	Suitable for identity code	Order no.
16, 18	H1	HP2a.100..HCT, HP2a.064..HCT	1006481
22, 26	H1	HP2a.040..HCT, HP2a.025..HCT	1006482

Standard oil for maintaining hydraulics and gearbox HYDRO HP2a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 2.5 l Double head (D) - 2.9 l Duplex (U) - 2 x 2.5 l Triplex (T) - 3 x 2.5 l	1006010

Base for HYDRO Hydraulic Diaphragm Metering Pumps



	Order no.
Base for HYDRO HP2a, dimensions: 300 x 160 x 128 mm (LxWxH)	1005660

2.3.1.2 Hydraulic Diaphragm Metering Pump HYDRO HP3a

Technical data for HYDRO HP3a

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure at 60 Hz			Suction lift	Perm. pre-pressure suction side	Suction/ discharge side connector	Shipping weight	Plunger Ø
	l/h	bar	ml/ stroke	Max. stroke rate Strokes/ min	psi	l/h / gph (US)	Max. stroke rate Strokes/ min	m WC	bar	G-DN	kg	mm
100010	10	100	5.7	60	1,450	12/3.2	72	3.0	5	Rp 3/8-10	41	22
100021 *	21	100	5.7	125	1,450	25/6.6	150	3.0	5	Rp 3/8-10	41	22
100025 *	25	100	5.7	150	1,450	30/7.9	180	3.0	5	Rp 3/8-10	41	22
100031 *	31	100	5.7	187	1,450	37/9.8	224	3.0	5	Rp 3/8-10	41	22
100035 *	35	100	5.7	212	1,450	-	-	3.0	5	Rp 3/8-10	41	22
064019 **	19	64	7.9	60	928	23/6.1	72	3.0	5	G 3/4-10	41	26
064040 **	40	64	7.9	125	928	48/12.7	150	3.0	5	G 3/4-10	41	26
064048 **	48	64	7.9	150	928	58/15.3	180	3.0	5	G 3/4-10	41	26
064060 **	60	64	7.9	187	928	72/19.0	224	3.0	5	G 3/4-10	41	26
064068 **	68	64	7.9	212	928	-	-	3.0	5	G 3/4-10	41	26
040029 ***	29	40	12.0	60	580	35/9.2	72	3.0	5	G 1-15	41	32
040062 ***	62	40	12.0	125	580	74/19.7	150	3.0	5	G 1-15	41	32
040074 ***	74	40	12.0	150	580	89/23.5	180	3.0	5	G 1-15	41	32
040092 ***	92	40	12.0	187	580	110/29.2	224	3.0	5	G 1-15	41	32
040105 ***	105	40	12.0	212	580	-	-	3.0	5	G 1-15	41	32
025048 ***	48	25	17.0	60	362	58/15.3	72	3.0	5	G 1-15	41	38
025100 ***	100	25	17.0	125	362	120/31.7	150	3.0	5	G 1-15	41	38
025120 ***	120	25	17.0	150	362	144/38.0	180	3.0	5	G 1-15	41	38
025150 ***	150	25	17.0	187	362	180/47.6	224	3.0	5	G 1-15	41	38
025170 ***	170	25	17.0	212	362	-	-	3.0	5	G 1-15	41	38

* SST version with double ball valve, valve connector on the suction/discharge side with female thread Rp 3/8, male thread G 3/4-DN 10

** HV design (SST only) with G 1 - DN 15 connector

*** HV design (SST only) with 1 1/4" - DN 20 connector

PVDF version max. 25 bar, PTFE + 25 % carbon; PTFE max.16 bar

SST version with double ball valve, valve connector on the suction/discharge side with female thread Rp 3/8, male thread G 3/4-DN 10

Wetted materials for HYDRO HP3a

Identity code of material	Dosing head	Connection on suction/discharge side	Seals/ball seat	Balls
PVT *	PVDF	PVDF	PTFE/PTFE + 25 % carbon	Ceramic
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/ZrO_2 (DN 15/DN20 stainless steel 1.4404)	Ceramic
TTT	PTFE + 25% carbon	PVDF (polyvinylidene fluoride)	PTFE/PTFE + 25 % carbon	Ceramic
SCT	Stainless steel 316L	Stainless steel 1.4581	PTFE/stainless steel 1.4404	Ceramic

* Not for areas at risk from explosion

2.3 Hydraulic Diaphragm Metering Pumps

Motor data for HYDRO HP3a

Identity code Feature		Power supply			Remarks
S	3 ph, IP 55 *	230 V/400 V	50 Hz	0.75 kW	
T	3 ph, IP 55 *	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.75 kW	with PTC, speed control range 1:5
R	3 ph, IP 55 *	230 V/400 V	50 Hz	0.75 kW	with PTC, speed control range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55 *	230 V	50 Hz	0.75 kW	Variable speed motor with integrated frequency converter, speed control range 1:20
L2	3 ph, II 2G Ex de IIC T4	230 V/400 V	50 Hz	0.75 kW	with PTC, speed control range 1:5
P2	3 ph, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.75 kW	with PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Identity code ordering system for HYDRO HP3a

HP3a	Drive type													
	H	Main drive												
	D	Main drive, double-head version												
	E	Main drive for add-on drive												
	F	Main drive, double-head version for add-on drive												
	A	Add-on drive												
	B	Double-head version add-on drive												
	T	Triplex comprising 3 power ends and 3 identical heads												
		Type	Capacity											
		100010	100 bar	10 l/h										
		100021	100 bar	21 l/h										
		100025	100 bar	25 l/h										
		100031	100 bar	31 l/h										
		100035	100 bar	35 l/h										
		064019	64 bar	19 l/h										
		064040	64 bar	40 l/h										
		064048	64 bar	48 l/h										
		064060	64 bar	60 l/h										
		064068	64 bar	68 l/h										
		040029	40 bar	29 l/h										
		040062	40 bar	62 l/h										
		040074	40 bar	74 l/h										
		040092	40 bar	92 l/h										
		040105	40 bar	105 l/h										
		025048	25 bar	48 l/h										
		025100	25 bar	100 l/h										
		025120	25 bar	120 l/h										
		025150	25 bar	150 l/h										
		025170	25 bar	170 l/h										
			Liquid end material											
			SS	Stainless steel										
			PV	PVDF, max. 25 bar, only for 025048 – 025170, 064019 – 064068										
			TT	PTFE + 25 % carbon, max. 16 bar										
			SC	Stainless steel 316L										
				Sealing material										
				T	PTFE									
					Diaphragm									
					0	Standard multilayer diaphragm with rupture signalling facility								
						Liquid end version								
						0	No valve springs (standard)							
						1	With valve springs							
						D	Double ball valve , for 100010 – 100035, 064019 – 064060, only for SST and HCT							
							Hydraulic connections							
							0	Standard threaded connector						
							E	With DIN ISO flange						
							F	With ANSI flange						
								Version						
								0	With ProMinent logo					
								1	Without ProMinent logo					
								M	Modified					
									Electrical power supply					
									S	3-phase, 230/400 V, 50 Hz, 0.75 kW				
									T	3-phase, 230/400 V, 50/60 Hz, 0.75 kW, with PTC				
									R	3 ph, variable speed motor, 230 V/400 V, 0.75 kW				
									V-0	Variable speed stroke control motor with integrated frequency converter, 1-phase, 230 V, 50 Hz, 0.75 kW				
									L	3 ph, 230/400 V 50 Hz (Exe, Exd), 0.75 kW				
									P	3 ph, 265/440 V 60 Hz (Exe, Exd), 0.75 kW				
									1	No motor, with motor flange B 14, size 200				
									3	No motor, with motor flange B5, size 160				
									4	No motor, with motor flange NEMA 56 C				
									0	Add-on drive				
										Enclosure rating				
										0	IP 55 (standard)			
										2	Exd design ATEX-T4 (L2, P2)			
										A	ATEX drive			
											Stroke sensor			
											0	No stroke sensor (standard)		
											1	Stroke sensor (for explosion-proof applications)		
												Stroke length adjustment		
												0	Manual (Standard)	
												1	With stroke positioning motor, 230 V/50/60 Hz	
												2	With stroke positioning motor, 115 V/60 Hz	

2.3 Hydraulic Diaphragm Metering Pumps

| | | |

Spare parts for HYDRO HP3a

Maintenance kits for HYDRO HP3a with valve wear parts

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls (4 valve seats, 4 valve balls for double ball valve)

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	S1	HP3a.100...SST, HP3a.064...SST	1005553
22 *	S1	HP3a.100..SST	1005555
22, 26	H1	HP3a.100...HCT, HP3a.064...HCT	1009573
32, 38	S1	HP3a.040...SST, HP3a.025...SST	1005557
32, 38	H1	HP3a.040...HCT, HP3a.025...HCT	1009575

* Piston Ø 22 mm, material S1, version for double ball valves (optional)

Maintenance kits for HYDRO HP3a with valves, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	S1	HP3a.100...SST, HP3a.064...SST	1005554
22, 26	P1	HP3a.100...PVT, HP3a.064...PVT	1005552
32, 38	S1	HP3a.040...SST, HP3a.025...SST	1005558
32, 38	P1	HP3a.040...PVT, HP3a.025...PVT	1005556

Diaphragms PTFE/1.4404 for HYDRO HP3a

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	S1	HP3a.100...SST, HP3a.064...SST	1005546
22, 26	P1	HP3a.100...PVT, HP3a.064...PVT	1122579
32, 38	S1	HP3a.040...SST, HP3a.025...SST	1005547
32, 38	P1	HP3a.040...PVT, HP3a.025...PVT	1122580

Diaphragms PTFE/Hastelloy C Coated for HYDRO HP3a

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	H1	HP3a.100...HCT, HP3a.064...HCT	1006482
32, 38	H1	HP3a.040...HCT, HP3a.025...HCT	1006483

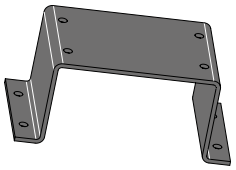
Standard oil for maintaining hydraulics and gearbox HYDRO HP3a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 3.5 l Double head (D) - 4.0 l Duplex (U) - 2 x 3.5 l Triplex (T) - 3 x 3.5 l	1006010

Base for HYDRO Hydraulic Diaphragm Metering Pumps

	Order no.
Base for HYDRO HP3a, dimensions: 324 x 180 x 128 mm (LxWxH)	1005661



2.3.1.3 Hydraulic Diaphragm Metering Pump HYDRO HP4a

Technical data for HYDRO HP4a

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure at 60 Hz			Suction lift	Perm. pre-pressure suction side	Suction/ discharge side connector	Shipping weight	Plunger Ø
	l/h	bar	ml/ stroke	Max. stroke rate Strokes/ min	psi	l/h / gph (US)	Max. stroke rate Strokes/ min	m WC	bar	G-DN	kg	mm
400071	71	40	25.1	71	580	85/22	86	3	5	G 1 1/2-25	69	40
400105	105	40	25.1	103	580	126/33	124	3	5	G 1 1/2-25	69	40
400140	140	40	25.1	136	580	168/44	164	3	5	G 1 1/2-25	69	40
400190	190	40	25.1	188	580	188/49	225	3	5	G 1 1/2-25	69	40
400220	220	40	25.1	214	580	-	-	3	5	G 1 1/2-25	69	40
250130	130	25	42.4	71	363	155/41	86	3	5	G 1 1/2-25	69	52
250190	190	25	42.4	103	363	230/61	124	3	5	G 1 1/2-25	69	52
250250	250	25	42.4	136	363	300/79	164	3	5	G 1 1/2-25	69	52
250350	350	25	42.4	188	363	420/111	225	3	5	G 1 1/2-25	69	52
250400	400	25	42.4	214	-	-	-	3	5	G 1 1/2-25	69	52
160210	210	16	62.3	71	232	250/66	86	3	5	G 1 1/2-25	76	63
160300	300	16	62.3	103	232	360/95	124	3	5	G 1 1/2-25	76	63
160400	400	16	62.3	136	232	480/127	164	3	5	G 1 1/2-25	76	63
160550	550	16	62.3	188	232	660/174	225	3	5	G 1 1/2-25	76	63
160625	625	16	62.3	214	-	-	-	3	5	G 1 1/2-25	76	63
100330	330	10	100.4	71	145	400/106	86	3	5	G 2-32	87	80
100480	480	10	100.4	103	145	580/153	124	3	5	G 2-32	87	80
100635	635	10	100.4	136	145	760/201	164	3	5	G 2-32	87	80
100880	880	10	100.4	188	145	1,050/277	225	3	5	G 2-32	87	80
101000	1,000	10	100.4	214	-	-	-	3	5	G 2-32	87	80
070465	465	7	138.7	71	102	560/148	86	3	5	G 2 1/4-40	96	94
070670	670	7	138.7	103	102	805/213	124	3	5	G 2 1/4-40	96	94
070890	890	7	138.7	136	102	1,070/283	164	3	5	G 2 1/4-40	96	94
071230	1,230	7	138.7	188	102	1,450/383	225	3	5	G 2 1/4-40	96	94
071400	1,400	7	138.7	214	-	-	-	3	5	G 2 1/4-40	96	94

PVDF version max. 25 bar, PTFE + 25 % carbon; PTFE max.10 bar

Wetted materials for HYDRO HP4a

Identity code of material	Dosing head	Connection on suction/discharge side	Seals	Valve seats	Valve balls up to DN 25	Valve plates/ valve springs
SCT	Stainless steel 316L	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	Ceramic	Stainless steel 1.4404/ Hastelloy C
PVT *	PVDF	PVDF	PTFE	PTFE + 25% carbon	Glass	Ceramic/E-CTFE
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE	PTFE	Stainless steel 1.4401	Stainless steel 1.4404/ Hastelloy C
TTT	PTFE + 25% carbon	PVDF (polyvinylidene fluoride)	PTFE	PTFE + 25% carbon	Glass	Ceramic/E-CTFE

* Not for areas at risk from explosion

2.3 Hydraulic Diaphragm Metering Pumps

Motor data for HYDRO HP4a

Identity code specification	Power supply				Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	1.1 kW	
T	3-phase, IP 55*	230 V/400 V 265 V/460 V	50 Hz 60 Hz	1.1 kW	With PTC, speed control range 1:5
R	3-phase, IP 55*	230 V/400 V	50 Hz	1.5 kW	With PTC, speed control range 1:20, with external fan 1-phase 230 V; 50/60 Hz
V0	3-phase, IP 55*	400 V	50 Hz	1.5 kW	Variable speed stroke control motor with integrated frequency converter
L2	3-phase, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	1.1 kW	With PTC, speed control range 1:5
P2	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz	1.1 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Identity code ordering system for HYDRO HP4a

HP4a	Drive type												
	H	Main drive											
	D	Main drive, double-head version											
	E	Main drive for add-on drive											
	F	Main drive, double-head version for add-on drive											
	A	Add-on drive											
	B	Double-head version add-on drive											
	T	Triplex comprising 3 power ends and 3 identical heads											
		Type	Capacity										
		400071	40 bar	71 l/h									
		400105	40 bar	105 l/h									
		400140	40 bar	140 l/h									
		400190	40 bar	190 l/h									
		400220	40 bar	220 l/h									
		250130	25 bar	130 l/h									
		250190	25 bar	190 l/h									
		250250	25 bar	250 l/h									
		250350	25 bar	350 l/h									
		250400	25 bar	400 l/h									
		160210	16 bar	210 l/h									
		160300	16 bar	300 l/h									
		160400	16 bar	400 l/h									
		160550	16 bar	550 l/h									
		160625	16 bar	625 l/h									
		100330	10 bar	330 l/h									
		100480	10 bar	480 l/h									
		100635	10 bar	635 l/h									
		100880	10 bar	880 l/h									
		101000	10 bar	1,000 l/h									
		070465	7 bar	465 l/h									
		070670	7 bar	670 l/h									
		070890	7 bar	890 l/h									
		071230	7 bar	1,230 l/h									
		071400	7 bar	1,400 l/h									
			Liquid end material										
			SS	Stainless steel									
			PV	PVDF, max. 25 bar									
			TT	PTFE + 25 % carbon, max. 10 bar									
			SC	Stainless steel 316L									
				Sealing material									
				T	PTFE								
					Diaphragm								
					0	Standard multilayer diaphragm with rupture signalling facility							
						Liquid end version							
						0	No valve springs (standard)						
						1	With valve springs						
							Hydraulic connections						
							0	Standard threaded connection					
							E	With DIN ISO flange					
							F	With ANSI flange					
								Version					
								0	With ProMinent logo				
								1	Without ProMinent logo				
								3	With ProMinent® logo, with electrical overpressure display				
								M	Modified				
									Electrical power supply				
									S	3-phase, 230/400 V, 50 Hz, 1.1 kW			
									T	3-phase, 230/400 V, 50/60 Hz, with PTC, 1.1 kW			
									R	3 ph, variable speed motor, 230/400 V, 1.5 kW			
									V-0	Variable speed stroke control motor with integrated frequency converter, 1-phase, 230/400 V, 50 Hz, 1.5 kW			
									L	3 ph, 230/400 V 50 Hz (Exe, Exd), 1.1 kW			
									P	3 ph, 265/440 V 60 Hz (Exe, Exd), 1.1 kW			
									1	No motor, with motor flange 250			
									3	No motor, with motor flange B5, size 200			
									4	No motor, with motor flange NEMA 143/145 TC			
									0	Add-on drive			
										Enclosure rating			
										0	IP 55 (standard)		
										2	Exd design ATEX-T4 (L2, P2)		
										A	ATEX drive		
											Stroke sensor		
											0	No stroke sensor (standard)	
											1	Stroke sensor (for explosion-proof applications)	

2.3 Hydraulic Diaphragm Metering Pumps

| | | |

Spare parts for HYDRO HP4a

Maintenance kits for HYDRO HP4a with valve wear parts

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	S1	HP4a.025...SST	1040812
40, 52	H1	HP4a.025...HCT	1040860
40, 52	P1	HP4a.025...PVT	1043763
63	S1	HP4a.016...SST	1040824
63	H1	HP4a.016...HCT	1040861
63	P1	HP4a.016...PVT	1043775
80	S1	HP4a.010...SST	1040826
80	H1	HP4a.010...HCT	1040864
80	P1	HP4a.010...PVT	1043776
94	S1	HP4a.007...SST	1040828
94	H1	HP4a.007...HCT	1040867
94	P1	HP4a.007...PVT	1043777

Spare parts kit for HYDRO HP4a with valves, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	S1	HP4a.025...SST	1040813
40, 52	P1	HP4a.025...PVT	1023057
63	S1	HP4a.016...SST	1040825
63	P1	HP4a.016...PVT	1040863
80	S1	HP4a.010...SST	1040827
80	P1	HP4a.010...PVT	1040866
94	S1	HP4a.007...SST	1040829
94	P1	HP4a.007...PVT	1040869

Diaphragms PTFE/1.4404 for HYDRO HP4a

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	S1	HP4a.040...SST, HP4a.052...SST	1040808
40, 52	P1	HP4a.040...PVT, HP4a.052...PVT	1122581
63	S1	HP4a.016..SST	1040809
63	P1	HP4a.016...PVT	1122582
80	S1	HP4a.010..SST	1040810
80	P1	HP4a.010...PVT	1122583
94	S1	HP4a.007..SST	1040811
94	P1	HP4a.007...PVT	1122594

Diaphragms PTFE/Hastelloy C Coated for HYDRO HP4a

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	H1	HP4a.040...HCT, HP4a.025...HCT	1040874
63	H1	HP4a.016...HCT	1040875
80	H1	HP4a.010...HCT	1040876
94	H1	HP4a.007...HCT	1040877

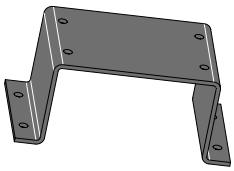
Standard oil for maintaining hydraulics and gearbox HYDRO HP4a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 5.8 l Double head (D) - 6.8 l Duplex (U) - 2 x 5.8 l Triplex (T) - 3 x 5.8 l	1006010

Base for HYDRO Hydraulic Diaphragm Metering Pumps

	Order no.
Base for HYDRO HP4a, dimensions: 344 x 250 x 120 mm (LxWxH)	1051421

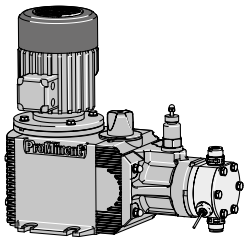


2.3.2 Hydraulic Diaphragm Metering Pump HYDRO API

For flexible metering with excellent process reliability in the medium pressure range.

Capacity range of single-head pump: 7 – 1,506 l/h, 100 – 7 bar

The HYDRO API 675 is an extremely robust hydraulic diaphragm metering pump, which meets the most exacting safety requirements and is designed in accordance with API 675. This is ensured by the PTFE multi-layer diaphragm with diaphragm monitoring, the full-motion drive and automatic bleeding, for example. Its modular construction makes it extremely versatile.



HYDRO Simplex (vertical)

The HYDRO API 675 hydraulic diaphragm metering pumps form an integrated product range with stroke lengths of 15 or 20 mm. Equipped with full-motion drive and automatic bleeding, they therefore cover the capacity range of 7 to 1506 l/h at 100 – 7 bar. They also meet the requirements of API 675.

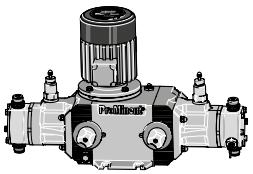
Your Benefits

Excellent process reliability:

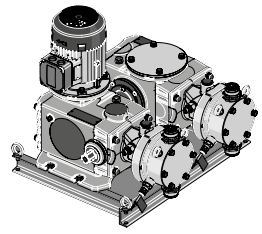
- PTFE multi-layer diaphragm with integrated diaphragm monitoring with condition signals sent via contact
- Integrated hydraulic relief valve with ventilation function
- The dosing precision is better than ± 1 % within the 10-100 % stroke volume range under defined conditions and with correct installation.

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs (boxer principle) being operated in push-pull mode
- It is possible to combine up to 5 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request



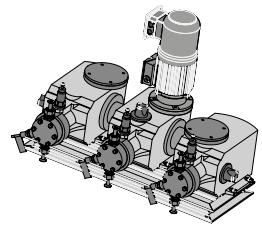
HYDRO double-head pump



HYDRO add-on pump

Technical Details

- Stroke length: 15 mm (HA1a, HA2a, HA3a), 20 mm (HA4a)
- Rod force: 2000 N (HA1a, HA2a), 4200 N (HA3a), 5800 N (HA4a)
- Stroke volume adjustment range: 0 – 100%
- Stroke volume adjustment: manually using scaled rotary dial (with electric actuator or control drive as an option).
- The dosing precision is better than ± 1 % within the 10 – 100 % stroke volume range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm monitoring with condition signals sent via contact
- Integrated hydraulic relief and vent valve
- Full-motion drive
- Wetted materials: PVDF, PTFE+25% carbon, stainless steel 1.4571, Hastelloy C.
- A wide range of power end/drive versions is available: Three-phase or standard three-phase motors or motors for use in areas at risk from explosion, different flange designs for use of customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675



HYDRO triplex pump

Field of Application

- Oil and gas industry
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

2.3 Hydraulic Diaphragm Metering Pumps

2.3.2.1 Hydraulic Diaphragm Metering Pump HYDRO HA1a

Technical data for HYDRO HA1a (50 Hz)

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		60	125	150	187	214				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
9	100	[0.8]	[1.5]	[1.9]	[2.5]	[3.0]	0.9	3.0	NPT 1/4 – DN 3 *	31
9	64	(1.3) – 1.3	(2.9) – 2.9	(3.1) – 3.1	(4.0) – 4.8	(4.8) – 5.3	0.9	3.0	NPT 1/4 – DN 3 *	31
9	40	(1.7) – 1.8	(2.7) – 3.9	(3.6) – 4.7	(4.0) – 6.0	(5.5) – 6.8	0.9	3.0	NPT 1/4 – DN 3 *	31
9	25	(1.7) – 2.1	(2.8) – 4.5	(3.8) – 5.6	(4.6) – 7.0	(5.5) – 8.0	0.9	3.0	NPT 1/4 – DN 3 *	31
9	10	(1.7) – 2.5	(2.8) – 5.2	(3.8) – 6.3	(4.6) – 7.8	(5.5) – 9.1	0.9	3.0	NPT 1/4 – DN 3 *	31
12	100	(2.9) – 2.9	(5.5) – 6.0	(7.4) – 7.4	(8.0) – 9.3	(9.0) – 10.1	1.7	3.0	NPT 1/4 – DN 6 *	31
12	64	(2.8) – 3.6	(4.5) – 7.7	(7.0) – 9.1	(8.0) – 11.4	(9.0) – 13.0	1.7	3.0	NPT 1/4 – DN 6 *	31
12	40	(2.5) – 4.1	(4.5) – 8.7	(6.0) – 10.4	(7.0) – 13.0	(9.0) – 14.7	1.7	3.0	NPT 1/4 – DN 6 *	31
12	25	(2.3) – 4.5	(4.8) – 9.4	(6.0) – 11.1	(7.0) – 13.8	(9.0) – 15.9	1.7	3.0	NPT 1/4 – DN 6 *	31
12	10	(2.5) – 4.8	(4.8) – 10.1	(6.0) – 12.1	(7.0) – 15.1	(9.0) – 17.1	1.7	3.0	NPT 1/4 – DN 6 *	31

* Double ball valve with female thread

The permitted rated flow configuration is possible in the stated range when pumps are selected in accordance with API 675 (control range 1:10).

The litre capacity indicated using [...] is the maximum litre capacity with an applicable control range of 1:5 and does not therefore satisfy API 675.

Example: a 12 mm piston, 40 bar pressure and stroke rate of 125 strokes/min results in (4.5) - 8.7, i.e. the control range of 1:10 is met for a rated flow of between 4.5 l/h and 8.7 l/h.

Technical data for HYDRO HA1a (60 Hz)

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		59	72	149	180	224				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
9	100	[0.5]	[0.8]	[1.8]	[2.0]	[3.0]	0.9	3.0	NPT 1/4 – DN 3 *	31
9	64	[1.2]	(1.6) – 1.6	(3.3) – 3.3	(3.7) – 3.7	(4.8) – 5.7	0.9	3.0	NPT 1/4 – DN 3 *	31
9	40	(1.7) – 1.7	(2.0) – 2.1	(3.2) – 4.6	(4.3) – 5.6	(4.8) – 7.2	0.9	3.0	NPT 1/4 – DN 3 *	31
9	25	(2.0) – 2.1	(2.0) – 2.5	(3.4) – 5.4	(4.5) – 6.7	(5.5) – 8.4	0.9	3.0	NPT 1/4 – DN 3 *	31
9	10	(2.0) – 2.5	(2.0) – 3.0	(3.4) – 6.2	(4.5) – 7.5	(5.5) – 9.3	0.9	3.0	NPT 1/4 – DN 3 *	31
12	100	(2.8) – 2.8	(3.5) – 3.5	(6.6) – 7.2	(8.8) – 8.8	(9.6) – 11.1	1.7	3.0	NPT 1/4 – DN 6 *	31
12	64	(2.4) – 3.6	(3.4) – 4.3	(5.4) – 9.2	(8.4) – 10.9	(9.6) – 13.6	1.7	3.0	NPT 1/4 – DN 6 *	31
12	40	(2.6) – 4.0	(3.0) – 4.9	(5.4) – 10.4	(7.2) – 12.4	(8.4) – 15.6	1.7	3.0	NPT 1/4 – DN 6 *	31
12	25	(2.6) – 4.4	(3.0) – 5.4	(5.7) – 11.2	(7.2) – 13.3	(8.4) – 16.5	1.7	3.0	NPT 1/4 – DN 6 *	31
12	10	(2.6) – 4.4	(3.0) – 5.7	(5.7) – 12.1	(7.2) – 14.5	(8.4) – 18.1	1.7	3.0	NPT 1/4 – DN 6 *	31

* Double ball valve with female thread

Piston Ø 9 and 12, version with double ball valves.

Wetted materials for HYDRO HA1a

Identity code of material	Dosing head	Suction/discharge connection	Seals/ball seat	Balls
S1	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/stainless steel 1.4404	Ceramic

Motor data for HYDRO HA1a

Identity code specification		Power supply			Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	0.37 kW	
T	3-phase, IP 55*	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.37 kW	With PTC, speed control range 1:5
R	3-phase, IP 55*	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:20, with external fan 1-phase 230 V; 50/60 Hz
V	1-phase, IP 55*	230 V	50 Hz	0.37 kW	Variable speed stroke control motor with integrated frequency converter
L	3-phase, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
Q	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.37 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

2.3 Hydraulic Diaphragm Metering Pumps

Identity code ordering system for HYDRO HA1a

HA1a	Drive type														
	V	Simplex (vertical)													
	D	Simplex double head													
	U	Duplex													
	T	Triplex													
		Plungers													
		009	Plunger 9 mm												
		012	Plunger 12 mm												
			stroke rate												
			060	60 strokes/min.; 50 Hz											
			125	125 strokes/min.; 50 Hz											
			150	150 strokes/min.; 50 Hz											
			187	187 strokes/min.; 50 Hz											
			214	214 strokes/min.; 50 Hz											
			059	59 strokes/min.; 60 Hz											
			072	72 strokes/min.; 60 Hz											
			149	149 strokes/min.; 60 Hz											
			180	180 strokes/min.; 60 Hz											
			224	224 strokes/min.; 60 Hz											
				Pressure rating											
				A	10 bar										
				D	25 bar										
				E	40 bar										
				H	64 bar										
				J	100 bar										
					Liquid end material										
					S1	Standard stainless steel; PTFE									
						Valve design									
						0	Standard								
							Diaphragm monitor								
							0	Standard							
							1	None							
							2	Visual indication							
								Hydraulic connector							
								0	Standard						
								F	Flange ANSI						
								N	NPT connection						
									Electrical Connection						
									S	3-phase 230/400 V, 50 Hz, 0.37 kW					
									T	3-phase, 230/400 V, 50/60 Hz, 0.37 kW, with PTC					
									L	3-phase, 230/400 V, 50 Hz, 0.37 kW, (Exde) T4					
									Q	3-phase, 265/460 V, 60 Hz, 0.37 kW, (Exde) T4					
									R	3-phase variable speed stroke control motor, 230/ 400 V, 50 Hz, 0.37 kW					
									V	Controllable motor with integrated frequency converter, 1-phase, 230 V, 50 Hz, 0.37 kW					
									1	Without motor, with flange 200/80					
									2	Without motor, with flange 160/71					
									3	Without motor, with 56C flange					
									4	Without motor, with 200/80 ATEX flange					
									5	Without motor, with 160/71 ATEX flange					
									6	Without motor, with NEMA ATEX flange					
										Stroke length adjustment					
										0	Stroke length adjustment standard				
										A	Stroke control motor 0-20 mA, 230 V, 50/60 Hz				
										B	Stroke control motor 4-20 mA, 230 V, 50/60 Hz				
										C	Stroke control motor 0-20 mA, 115 V, 60 Hz				
										D	Stroke control motor 4-20 mA, 115 V, 60 Hz				
											Temperature (ambient / fluid)				
											0	-20 °C … +40 °C / -20 °C … +90 °C (SS; HC) or +50 °C (PTFE) or +65 °C (PVDF)			
												Paint			
												0P	C3 Standard textured paint - RAL 2003		
												1P	C3 Standard gloss paint - RAL 2003		
												2P	C4 Outdoor - RAL 2003		
												3P	C5 Offshore - RAL 2003		
													Tests		
													S1	Standard performance test	
													S2	Standard performance test including 3.1 certificate	
													S3	As S1 + 3.1 certificate wetted material	
													S4	As S2 + 3.1 certificate wetted material	
													A1	API complete test including 3.1 certificate	
													A2	As A1 + NPSH	
													A3	As A1 + NPIP	
													A4	As A1 + 3.1 material certificate	

																Approvals			
																0	CE		
																1	CE + ATEX		
																2	CE + EAC		
																3	CE + EAC + ATEX		
																4	CE + UKCA		
																5	CE + UKCA + ATEX		
																	Documentation		
																	DE	German	
																	EN	English	
																	FR	French	
																	ES	Spanish	
																	RU	Russian	
																	M0	Modified	
																		Measuring unit	
																		0	bar, l/h
																		1	psi, gph
																		2	kPa, l/h

Spare parts for HYDRO HA1a

Maintenance kits for HYDRO HA1a with valves, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 4 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
9	S1	HA1a.009....S1	1119517
12	S1	HA1a.012....S1	1128389

Diaphragms PTFE/1.4404 for HYDRO HA1a

Plunger Ø mm	Material	Suitable for identity code	Order no.
9, 12	S1	HA1a.009....S1, HA1a.012....S1	1005545

Standard oil for maintaining hydraulics and gearbox HYDRO HA1a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 2.5 l Double head (D) - 2.9 l Duplex (U) - 2 x 2.5 l Triplex (T) - 3 x 2.5 l	1006010

2.3.2.2 Hydraulic Diaphragm Metering Pump HYDRO HA2a

Technical data for HYDRO HA2a 50 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		60	125	150	187	214				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
16	100	[3.0]	[6.5]	(8.5) – 8.5	(10) – 11	(12) – 13	3.0	3.0	Rp 1/4 – DN 6 *	31
16	64	[4.0]	(10) – 10	(10) – 13	(12) – 16.5	(14) – 18.5	3.0	3.0	Rp 1/4 – DN 6 *	31
16	40	[5.5]	(10) – 13	(12) – 15.5	(14) – 19.5	(16) – 23.5	3.0	3.0	Rp 1/4 – DN 6 *	31
16	25	[6.5]	(12) – 14.5	(14) – 17.5	(17) – 22.5	(20) – 26.5	3.0	3.0	Rp 1/4 – DN 6 *	31
16	10	(7) – 7.5	(13) – 16.5	(15) – 19.5	(18) – 24.5	(22) – 29.5	3.0	3.0	Rp 1/4 – DN 6 *	31
18	64	[6.5]	(12) – 15.5	(18.5) – 18.5	(24.5) – 24.5	(26) – 26.5	3.8	3.0	G 3/4 – DN 10	31
18	40	(7) – 8	(13) – 18.5	(22) – 22	(26) – 28.5	(26) – 32.5	3.8	3.0	G 3/4 – DN 10	31
18	25	(8) – 9	(16) – 19.5	(23) – 24.5	(26) – 30.5	(28) – 35.5	3.8	3.0	G 3/4 – DN 10	31
18	10	(8) – 10	(16) – 21.5	(23) – 26.5	(29) – 33.5	(28) – 37.5	3.8	3.0	G 3/4 – DN 10	31
22	40	(7) – 7.5	(20) – 25.5	(27) – 28.5	(37) – 42.5	(44) – 48	5.7	3.0	G 3/4 – DN 10	31
22	25	(7) – 8.5	(20) – 25.5	(25) – 33.5	(35) – 43.5	(40) – 51	5.7	3.0	G 3/4 – DN 10	31
22	10	(8) – 10	(17) – 28.5	(25) – 36.5	(30) – 47	(40) – 54	5.7	3.0	G 3/4 – DN 10	31
26	25	(20) – 22	(35) – 49	(40) – 59	(65) – 72	(50) – 83	7.9	3.0	G 3/4 – DN 10	31
26	10	(20) – 23.5	(30) – 51	(35) – 61	(40) – 76	(45) – 86	7.9	3.0	G 3/4 – DN 10	31

* Double ball valve with female thread

The permitted rated flow configuration is possible in the stated range when pumps are selected in accordance with API 675 (control range 1:10).

The litre capacity indicated using [...] is the maximum litre capacity with an applicable control range of 1:5 and does not therefore satisfy API 675.

Example: with 16 mm piston, pressure 25 bar and stroke rate of 150 strokes/min gives (14) - 17.5, i.e. the control range of 1:10 is met for a rated flow of between 14 l/h and 17.5 l/h.

PVDF version max. 25 bar, PTFE + 25 % carbon; PTFE up to 16 bar

Technical data for HYDRO HA2a 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min				Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		72	149	180	224				
mm	bar	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
16	100	[3.5]	[7.5]	(10) – 10	(12) – 13	3.0	3.0	Rp 1/4 – DN 6 *	31
16	64	[4.5]	(10) – 11.5	(12) – 15.5	(14.5) – 19.5	3.0	3.0	Rp 1/4 – DN 6 *	31
16	40	[6.5]	(12) – 15.5	(14.5) – 18.5	(16.5) – 23	3.0	3.0	Rp 1/4 – DN 6 *	31
16	25	[7.5]	(14.5) – 17	(16.5) – 21	(20.5) – 27	3.0	3.0	Rp 1/4 – DN 6 *	31
16	10	(8.5) – 9	(15.5) – 19.5	(18) – 23	(21.5) – 29	3.0	3.0	Rp 1/4 – DN 6 *	31
18	64	[7.5]	(14.5) – 18.5	(22) – 22	(29) – 29	3.8	3.0	G 3/4 – DN 10	31
18	40	(8.5) – 9.5	(15.5) – 22	(26) – 26	(31) – 34	3.8	3.0	G 3/4 – DN 10	31
18	25	(9.5) – 10.5	(19.5) – 23	(27.5) – 29	(31) – 36.5	3.8	3.0	G 3/4 – DN 10	31
18	10	(9.5) – 12	(19.5) – 25.5	(27.5) – 31.5	(34.5) – 40	3.8	3.0	G 3/4 – DN 10	31
22	40	(8.5) – 9	(24) – 30	(32.5) – 34	(44) – 50.5	5.7	3.0	G 3/4 – DN 10	31
22	25	(8.5) – 10	(24) – 30	(30) – 40	(42) – 52	5.7	3.0	G 3/4 – DN 10	31
22	10	(9.5) – 12	(20) – 34	(36) – 43	(44) – 50.5	5.7	3.0	G 3/4 – DN 10	31
26	25	(24) – 26	(42) – 58	(48) – 70.5	(78) – 86	7.9	3.0	G 3/4 – DN 10	31
26	10	(24) – 28	(36) – 60.5	(42) – 73	(48) – 91	7.9	3.0	G 3/4 – DN 10	31

* Double ball valve with female thread

Wetted materials for HYDRO HA2a

Identity code of material	Dosing head	Connection on suction/discharge side	Seals/ball seat	Balls
P1	PVDF	PVDF	PTFE/PTFE + 25 % carbon	Ceramic
S1	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/stainless steel 1.4404	Ceramic
T1	PTFE + 25% carbon	PVDF	PTFE/PTFE + 25 % carbon	Ceramic

Motor data for HYDRO HA2a

Identity code specification	Power supply				Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	0.37 kW	
T	3-phase, IP 55*	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.37 kW	With PTC, speed control range 1:5
R	3-phase, IP 55*	230 V/400 V	50 Hz	0.45 kW	With PTC, speed control range 1:20, with external fan 1-phase 230 V; 50/60 Hz
V	1-phase, IP 55*	230 V	50 Hz	0.37 kW	Variable speed stroke control motor with integrated frequency converter
L	3-phase, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
Q	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.37 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Identity code ordering system for HYDRO HA2a

HA2a	Drive type																
	V	Simplex (vertical)															
	D	Simplex double head															
	U	Duplex															
	T	Triplex															
		Plungers															
		016	Plunger 16 mm														
		018	Plunger 18 mm														
		022	Plunger 22 mm														
		026	Plunger 26 mm														
			stroke rate														
			060	60 strokes/min.; 50 Hz													
			125	125 strokes/min.; 50 Hz													
			150	150 strokes/min.; 50 Hz													
			187	187 strokes/min.; 50 Hz													
			214	214 strokes/min.; 50 Hz													
			072	60 strokes/min.; 50 Hz													
			149	125 strokes/min.; 50 Hz													
			180	187 strokes/min.; 50 Hz													
			224	214 strokes/min.; 50 Hz													
				Pressure rating													
				A	10 bar												
				D	25 bar												
				E	40 bar												
				H	64 bar												
				J	100 bar												
					Material												
					S1	Standard stainless steel; PTFE											
					P1	PVDF with PTFE diaphragm, up to 25 bar											
					T1	PTFE + 25 % carbon; PTFE up to 16 bar											
						Valve design											
						0	Standard										
						1	With valve springs										
							Diaphragm rupture display										
							0	Standard (electrical)									
							1	Standard (electrical)									
							2	Visual indication									
								Hydraulic connector									
								0	Standard								
								E	DIN flange								
								F	Flange ANSI								
									Electrical Connection								
									S	3-phase 230/400 V, 50 Hz, 0.37 kW							
									T	3-phase, 230/400 V, 50/60 Hz, 0.37 kW, with PTC							
									L	3-phase, 230/400 V, 50 Hz, 0.37 kW, (Exde) T4							
									Q	3-phase, 265/460 V, 60 Hz, 0.37 kW, (Exde) T4							
									R	Variable speed stroke control motor, 1-phase, 230/400 V, 50 Hz, 0.45 kW							
									V	Variable speed stroke control motor with integrated frequency converter, 1-phase, 230 V, 50 Hz, 0.37 kW							
									1	No motor, with motor flange 200/80							
									2	No motor, with motor flange 160/71							
									3	Without motor, with motor flange 56C							
									4	Without motor, with motor flange 200/80 ATEX							
									5	Without motor, with motor flange 160/71 ATEX							
									6	Without motor, with motor flange 56C							
										Stroke length adjustment							
										0	Stroke length adjustment standard						
										A	Stroke control motor 0-20 mA, 230 V, 50/60 Hz						
										B	Stroke control motor 4-20 mA, 230 V, 50/60 Hz						
										C	Stroke control motor 0-20 mA, 115 V, 60 Hz						
										D	Stroke control motor 4-20 mA, 115 V, 60 Hz						
											Temperature (ambient / fluid)						
											0	-20 °C … +40 °C / -20 °C … +90 °C (SS; HC) / +50 °C (PTFE) / +65 °C (PVDF)					
											1	-10 °C … +50 °C / -20 °C … +90 °C (SS; HC) / +50 °C (PTFE) / +65 °C (PVDF)					
											2	-25 °C … +40 °C / -25 °C … +90 °C (SS; HC) / +50 °C (PTFE) / +65 °C (PVDF)					
												Paint					
												0P	C3 Standard textured paint - RAL 2003				
												1P	C3 Standard gloss paint - RAL 2003				
												2P	C4 Outdoor - RAL 2003				
												3P	C5 - Offshore - RAL 2003				
													Tests				
													S1	Standard performance test			

2.3 Hydraulic Diaphragm Metering Pumps

| | | |

Spare parts for HYDRO HA2a

Maintenance kits for HYDRO HA2a with valve wear parts

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls (4 valve seats, 4 valve balls for double ball valve)

Plunger Ø mm	Material	Suitable for identity code	Order no.
16 *	S1	HA2a.016....S1	1029260
16, 18	H1	HA2a.016....H1, HA2a.018....H1	1009571
18	S1	HA2a.018....S1	1005549
22, 26	S1	HA2a.022....S1, HA2a.026....S1	1005553
22, 26	H1	HA2a.022....H1, HA2a.026....H1	1009573

* Piston Ø 16 mm, material S1, version for double ball valves

Maintenance kits for HYDRO HA2a with valves, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
16, 18	P1	HA2a.016....P1, HA2a.018....P1	1005548
18	S1	HA2a.018....S1	1005550
22, 26	S1	HA2a.022....S1, HA2a.026....S1	1005554
22, 26	P1	HA2a.022....P1, HA2a.026....P1	1005552

Diaphragms PTFE/1.4404 for HYDRO HA2a

Plunger Ø mm	Material	Suitable for identity code	Order no.
16, 18	S1	HA2a.016....S1, HA2a.018....S1	1005545
16, 18	P1	HA2a.016....P1, HA2a.018....P1	1122578
22, 26	S1	HA2a.022....S1, HA2a.026....S1	1005546
22, 26	P1	HA2a.022....P1, HA2a.026....P1	1122579

Diaphragms PTFE/Hastelloy C coated for HYDRO HA2a

Plunger Ø mm	Material	Suitable for identity code	Order no.
16, 18	H1	HA2a.016....H1, HA2a.018....H1	1006481
22, 26	H1	HA2a.022....H1, HA2a.026....H1	1006482

Standard oil for maintaining hydraulics and gearbox HYDRO HA2a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 2.5 l Double head (D) - 2.9 l Duplex (U) - 2 x 2.5 l Triplex (T) - 3 x 2.5 l	1006010

2.3 Hydraulic Diaphragm Metering Pumps

2.3.2.3 Hydraulic Diaphragm Metering Pump HYDRO HA3a

Technical data for HYDRO HA3a 50 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		60	125	150	187	214				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
22	100	[9.0]	[19.0]	[25.0]	[30.5]	[32.0]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	64	[11.0]	[26.0]	[31.5]	[40.0]	[46.0]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	40	[12.0]	[28.5]	[35.5]	[45.0]	[51.5]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	25	[12.5]	[30.5]	[37.0]	[47.0]	[55.0]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	10	[13.5]	[31.5]	[39.0]	[50.0]	[57.5]	5.7	3.0	Rp 3/8 – DN 8 *	41
26	64	(18) – 19	(35) – 43.5	(40) – 51.5	(55) – 63	(65) – 73	7.9	3.0	G 3/4 – DN 10	41
26	40	(18) – 21	(37) – 45.5	(40) – 55	(50) – 71	(70) – 81	7.9	3.0	G 3/4 – DN 10	41
26	25	(15) – 21	(30) – 49.5	(40) – 59	(55) – 74	(70) – 84	7.9	3.0	G 3/4 – DN 10	41
26	10	(15) – 22	(30) – 49.5	(35) – 61	(50) – 77	(80) – 87	7.9	3.0	G 3/4 – DN 10	41
32	40	(25) – 25.5	(50) – 66	(70) – 80	(65) – 101.5	(70) – 116.5	12.0	3.0	G 1 – DN 15	41
32	25	(25) – 26.5	(50) – 69	(65) – 83	(65) – 105.5	(70) – 122.5	12.0	3.0	G 1 – DN 15	41
32	10	(22) – 31.5	(50) – 74	(70) – 90	(60) – 112.5	(65) – 129	12.0	3.0	G 1 – DN 15	41
38	25	(25) – 50.5	(70) – 110.5	(80) – 126	(150) – 166	(180) – 187	17.0	3.0	G 1 – DN 15	41
38	10	(30) – 51.5	(80) – 111.5	(90) – 135	(150) – 168	(180) – 191	17.0	3.0	G 1 – DN 15	41

* Double ball valve with female thread

The permitted rated flow configuration is possible in the stated range when pumps are selected in accordance with API 675 (control range 1:10).

The litre capacity indicated using [...] is the maximum litre capacity with an applicable control range of 1:5 and does not therefore satisfy API 675.

Example: a 26 mm piston, 25 bar pressure and stroke rate of 150 strokes/min results in (40) - 59, i.e. the control range of 1:10 is met for a rated flow of between 40 l/h and 59 l/h.

PVDF version max. 25 bar, PTFE + 25 % carbon; PTFE up to 16 bar

Technical data for HYDRO HA3a 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min				Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		72	149	180	224				
mm	bar	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
22	64	[13.0]	[30.5]	[38.0]	[47.5]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	40	[14.5]	[34.0]	[42.5]	[53.5]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	25	[15.0]	[36.5]	[44.5]	[56.0]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	10	[16.0]	[37.5]	[47.0]	[59.5]	5.7	3.0	Rp 3/8 – DN 8 *	41
22	100	[10.0]	[22.0]	[29.5]	[36.5]	5.7	3.0	Rp 3/8 – DN 8 *	41
26	64	(21.5) – 22.5	(42) – 51.5	(48) – 61.5	(66) – 75	7.9	3.0	G 3/4 – DN 10	41
26	40	(21.5) – 25	(44) – 54	(48) – 66	(60) – 85	7.9	3.0	G 3/4 – DN 10	41
26	25	(18) – 25	(36) – 59	(48) – 70.5	(66) – 88.5	7.9	3.0	G 3/4 – DN 10	41
26	10	(18) – 26	(36) – 59	(42) – 73	(60) – 92	7.9	3.0	G 3/4 – DN 10	41
32	40	(30) – 30.5	(60) – 78.5	(84) – 96	(78) – 121	12.0	3.0	G 1 – DN 15	41
32	25	(30) – 31.5	(60) – 82	(78) – 99.5	(78) – 126	12.0	3.0	G 1 – DN 15	41
32	10	(26.5) – 37.5	(60) – 88	(84) – 108	(72) – 134.5	12.0	3.0	G 1 – DN 15	41
38	25	(30) – 60.5	(84) – 131	(96) – 151	(180) – 198	17.0	3.0	G 1 – DN 15	41
38	10	(36) – 61.5	(96) – 132	(108) – 162	(180) – 201	17.0	3.0	G 1 – DN 15	41

* Double ball valve with female thread

Wetted materials for HYDRO HA3a

Identity code of material	Dosing head	Connection on suction/discharge side	Seals/ball seat	Balls
P1	PVDF	PVDF	PTFE/PTFE + 25 % carbon	Ceramic
S1	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/ZrO_2 (DN 15/DN20 stainless steel 1.4404)	Ceramic
T1	PTFE + 25% carbon	PVDF	PTFE/PTFE + 25 % carbon	Ceramic

Motor data for HYDRO HA3a

Identity code specification		Power supply			Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	0.75 kW	
T	3-phase, IP 55*	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.75 kW	With PTC, speed control range 1:5
R	3-phase, IP 55*	230 V/400 V	50 Hz	0.75 kW	With PTC, speed control range 1:20, with external fan 1-phase 230 V; 50/60 Hz
V	1-phase, IP 55*	230 V	50 Hz	0.75 kW	Variable speed stroke control motor with integrated frequency converter
L	3-phase, II 2G Ex de IIC T4	230 V/400 V	50 Hz	0.75 kW	With PTC, speed control range 1:5
Q	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.75 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

2.3 Hydraulic Diaphragm Metering Pumps

Identity code ordering system for HYDRO HA3a

HA3a	Drive type													
	V	Simplex (vertical)												
	D	Simplex double head												
	U	Duplex												
	T	Triplex												
		Plungers												
		022	Plunger 22 mm											
		026	Plunger 26 mm											
		032	Plunger 32 mm											
		038	Plunger 38 mm											
			stroke rate											
			060	60 strokes/min.; 50 Hz										
			125	125 strokes/min.; 50 Hz										
			150	150 strokes/min.; 50 Hz										
			187	187 strokes/min.; 50 Hz										
			214	214 strokes/min.; 50 Hz										
			072	60 strokes/min.; 50 Hz										
			149	125 strokes/min.; 50 Hz										
			180	187 strokes/min.; 50 Hz										
			224	214 strokes/min.; 50 Hz										
				Pressure rating										
				A	10 bar									
				D	25 bar									
				E	40 bar									
				H	64 bar									
				J	100 bar									
					Material									
					S1	Standard stainless steel; PTFE								
					P1	PVDF with PTFE diaphragm, up to 25 bar								
					T1	PTFE + 25 % carbon; PTFE up to 16 bar								
						Valve design								
						0	Standard							
						1	With valve springs							
						D	With valve springs							
							Diaphragm rupture display							
							0	Standard (electrical)						
							1	Standard (electrical)						
							2	Visual indication						
								Hydraulic connector						
								0	Standard					
								E	DIN flange					
								F	Flange ANSI					
									Electrical Connection					
									S	3-phase, 230/400 V, 50 Hz, 0.75 kW				
									T	3-phase, 230/400 V, 50/60 Hz, 0.75 kW, with PTC				
									L	3-phase, 230/400 V, 50 Hz, 0.75 kW, (Exde) T4				
									Q	3-phase, 265/460 V, 60 Hz, 0.75 kW, (Exde) T4				
									R	Variable speed stroke control motor, 3-phase, 230/400 V, 50 Hz, 0.75 kW				
									V	Variable speed stroke control motor with integrated frequency converter, 1-phase, 230 V, 50 Hz, 0.75kW				
									1	No motor, with motor flange 200/80				
									2	No motor, with motor flange 160/71				
									3	Without motor, with motor flange 56C				
									4	Without motor, with motor flange 200/80 ATEX				
									5	Without motor, with motor flange 160/71 ATEX				
									6	Without motor, with motor flange 56C				
										Stroke length adjustment				
										0	Stroke length adjustment standard			
										A	Stroke control motor , 0-20 mA, 230 V, 50/60 Hz			
										B	Stroke control motor , 4-20 mA, 230 V, 50/60 Hz			
										C	Stroke control motor , 0-20 mA, 115 V, 60 Hz			
										D	Stroke control motor , 4-20 mA, 115 V, 60 Hz			
											Temperature (ambient / fluid)			
											0	-20 °C … +40 °C / -20 °C … +90 °C (SS; HC) / +50 °C (PTFE) / +65 °C (PVDF)		
											1	-10 °C … +50 °C / -20 °C … +90 °C (SS; HC) / +50 °C (PTFE) / +65 °C (PVDF)		
											2	-25 °C … +40 °C / -25 °C … +90 °C (SS; HC) / +50 °C (PTFE) / +65 °C (PVDF)		
												Paint		
												0P	C3 Standard textured paint - RAL 2003	
												1P	C3 Standard gloss paint - RAL 2003	
												2P	C4 Outdoor - RAL 2003	
												3P	C5 Offshore - RAL 2003	
													Tests	
													S1	Standard performance test

														S2	Standard performance test including 3.1 certificate				
														S3	As S1 + 3.1 certificate wetted material				
														S4	As S2 + 3.1 certificate wetted material				
														A1	API test complete including 3.1 certificate				
														A2	As A1 + NPSH				
														A3	As A1 + NPIP				
														A4	As A1 + 3.1 material certificate				
															Approvals				
															0	CE			
															1	CE + ATEX			
															2	CE + EAC			
															3	CE + EAC + ATEX			
															4	CE			
															5	CE			
																Documentation			
																DE	German		
																EN	English		
																FR	French		
																ES	Spanish		
																RU	Russian		
																M0	Modified		
																	Measuring unit		
																	0	bar, l/h	
																	1	psi, gph	
																	2	kPa, l/h	

Spare parts for HYDRO HA3a

Maintenance kits for HYDRO HA3a with valve wear parts

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls (4 valve seats, 4 valve balls for double ball valve)

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	S1	HA3a.022....S1, HA3a.026....S1	1005553
22	S1	HA3a.022....S1	1005555
22, 26	H1	HA3a.022....H1, HA3a.026....H1	1009573
32, 38	S1	HA3a.032....S1, HA3a.038....S1	1005557
32, 38	H1	HA3a.032....H1, HA3a.038....H1	1009575

Maintenance kits for HYDRO HA3a with valve, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	S1	HA3a.022....S1, HA3a.026....S1	1005554
22, 26	P1	HA3a.022....P1, HA3a.026....P1	1005552
32, 38	S1	HA3a.032....S1, HA3a.038....S1	1005558
32, 38	P1	HA3a.032....P1, HA3a.038....P1	1005556

Diaphragms PTFE/1.4404 for HYDRO HA3a

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	S1	HA3a.022....S1, HA3a.026....S1	1005546
22, 26	P1	HA3a.022....P1, HA3a.026....P1	1122579
32, 38	S1	HA3a.032....S1, HA3a.038....S1	1005547
32, 38	P1	HA3a.032....P1, HA3a.038....P1	1122580

Diaphragms PTFE/Hastelloy C Coated for HYDRO HA3a

Plunger Ø mm	Material	Suitable for identity code	Order no.
22, 26	H1	HA3a.022....H1, HA3a.026....H1	1006482
32, 38	H1	HA3a.032....H1, HA3a.038....H1	1006483

Standard oil for maintaining hydraulics and gearbox HYDRO HA3a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 3.5 l Double head (D) - 4.0 l Duplex (U) - 2 x 3.5 l Triplex (T) - 3 x 3.5 l	1006010

2.3.2.4 Hydraulic Diaphragm Metering Pump HYDRO HA4a

Technical data for HYDRO HA4a 50 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		71	103	136	188	214				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
40	40	[79]	[118]	(150) – 154	(200) – 211	(220) – 242	25.1	3	G 1 1/2 – DN 25	69
40	25	[80]	[121]	(150) – 160	(200) – 219	(220) – 250	25.1	3	G 1 1/2 – DN 25	69
40	16	[82]	[125]	[162]	(200) – 225	(220) – 254	25.1	3	G 1 1/2 – DN 25	69
40	10	[83]	(100) – 125	(150) – 166	(200) – 228	(220) – 256	25.1	3	G 1 1/2 – DN 25	69
40	7	[84]	(100) – 127	(150) – 167	(200) – 230	(220) – 261	25.1	3	G 1 1/2 – DN 25	69
52	25	[142]	(200) – 204	(200) – 271	(370) – 372	[425]	42.4	3	G 1 1/2 – DN 25	69
52	16	[143]	(190) – 205	(200) – 274	(370) – 376	[425]	42.4	3	G 1 1/2 – DN 25	69
52	10	[144]	(180) – 207	(200) – 276	(370) – 379	[426]	42.4	3	G 1 1/2 – DN 25	69
52	7	[145]	(180) – 209	(200) – 277	[380]	[426]	42.4	3	G 1 1/2 – DN 25	69
63	16	(200) – 212	(280) – 306	(390) – 401	[562]	[635]	62.3	3	G 1 1/2 – DN 25	76
63	10	(210) – 215	(280) – 311	(380) – 407	[562]	[638]	62.3	3	G 1 1/2 – DN 25	76
63	7	(210) – 216	(280) – 312	(370) – 408	[564]	[648]	62.3	3	G 1 1/2 – DN 25	76
80	10	(280) – 350	(420) – 509	(580) – 657	(890) – 914	(1,050) – 1,056	100.4	3	G 2 – DN 32	87
80	7	(270) – 352	(420) – 513	(590) – 683	(890) – 947	(1,050) – 1,080	100.4	3	G 2 – DN 32	87
94	7	(350) – 493	(500) – 710	(820) – 936	(1,000) – 1,258	(1,400) – 1,440	138.7	3	G 2 1/4 – DN 40	96

The permitted rated flow configuration is possible in the stated range when pumps are selected in accordance with API 675 (control range 1:10).

The litre capacity indicated using [...] is the maximum litre capacity with an applicable control range of 1:5 and does not therefore satisfy API 675.

Example: with 52 mm piston, 10 bar pressure and stroke rate of 136 strokes/min results in (200) - 276, i.e. the control range of 1:10 is met for a rated flow of between 200 l/h and 276 l/h.

PVDF version max. 25 bar, PTFE + 25 % carbon; PTFE up to 10 bar

Technical data for HYDRO HA4a 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min				Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		86	124	164	225				
mm	bar	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
40	40	[95]	[142]	(180) – 185	(240) – 252	25.1	3	G 1 1/2 – DN 25	69
40	25	[96]	[145]	(180) - 192	(240) – 262	25.1	3	G 1 1/2 – DN 25	69
40	16	[99]	[150]	[195]	(240) – 269	25.1	3	G 1 1/2 – DN 25	69
40	10	[100]	(120) – 150	(180) – 200	(240) – 272	25.1	3	G 1 1/2 – DN 25	69
40	7	[101]	(120) – 152	(180) – 201	(240) – 275	25.1	3	G 1 1/2 – DN 25	69
52	25	[171]	(240) – 245	(240) – 327	(440) – 445	42.4	3	G 1 1/2 – DN 25	69
52	16	[172]	(230) – 246	(240) – 330	(450) – 450	42.4	3	G 1 1/2 – DN 25	69
52	10	[174]	(220) – 249	(240) – 333	(450) – 455	42.4	3	G 1 1/2 – DN 25	69
52	7	[176]	(220) – 251	(240) – 334	[454]	42.4	3	G 1 1/2 – DN 25	69
63	16	(245) – 256	(340) – 368	(470) – 483	[672]	62.3	3	G 1 1/2 – DN 25	76
63	10	(255) – 260	(340) – 374	(460) – 490	[672]	62.3	3	G 1 1/2 – DN 25	76
63	7	(260) – 262	(340) – 375	(445) – 491	[674]	62.3	3	G 1 1/2 – DN 25	76
80	10	(340) – 424	(505) – 613	(700) – 792	(1,065) – 1,094	100.4	3	G 2 – DN 32	87
80	7	(330) – 426	(505) – 618	(711) – 823	(1,065) – 1,133	100.4	3	G 2 – DN 32	87
94	7	(430) – 597	(600) – 854	(990) – 1,128	(1,200) – 1,506	138.7	3	G 2 1/4 – DN 40	96

2.3 Hydraulic Diaphragm Metering Pumps

Wetted materials for HYDRO HA4a

Identity code of material	Dosing head	Connection on suction/discharge side	Seals	Valve seats	Valve balls up to DN 25	Valve plates/ valve springs
P1	PVDF	PVDF	PTFE	PTFE + 25% carbon	Glass	Ceramic/E-CTFE
S1	Stainless steel 1.4404	Stainless steel 1.4404	PTFE	PTFE	Stainless steel 1.4401	Stainless steel 1.4404/ Hastelloy C
T1	PTFE + 25% carbon	PVDF	PTFE	PTFE + 25% carbon	Glass	Ceramic/E-CTFE
V1	PVC	PVDF	PTFE	PTFE	Glass	Ceramic/E-CTFE
Y1	PPT	PVDF	PTFE	PTFE	Glass	Ceramic/E-CTFE

Motor data for HYDRO HA4a

Identity code specification	Power supply			Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz 1.1 kW	
T	3-phase, IP 55*	230 V/400 V 265 V/460 V	50 Hz 60 Hz 1.1 kW	With PTC, speed control range 1:5
R	3-phase, IP 55*	230 V/400 V	50 Hz 1.5 kW	With PTC, speed control range 1:20, with external fan 1-phase 230 V; 50/60 Hz
V	3-phase, IP 55*	400 V	50 Hz 1.5 kW	Variable speed stroke control motor with integrated frequency converter
L	3-phase, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz 1.1 kW	With PTC, speed control range 1:5
Q	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz 1.1 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Identity code ordering system for HYDRO HA4a

HA4a	Drive type											
	V	Simplex (vertical)										
	D	Simplex double head										
	U	Duplex										
	T	Triplex										
		Plungers										
		040	Plunger d 40									
		052	Plunger d 52									
		063	Plunger d 63									
		080	Plunger d 80									
		094	Plunger d 94									
			stroke rate									
			071	71 strokes/min; 50 Hz								
			103	103 strokes/min; 50 Hz								
			136	136 strokes/min; 50 Hz								
			188	188 strokes/min; 50 Hz								
			214	214 strokes/min; 50 Hz								
			086	86 strokes/min; 60 Hz								
			124	124 strokes/min; 60 Hz								
			164	164 strokes/min; 60 Hz								
			225	225 strokes/min; 60 Hz								
				Pressure rating								
				Z	7 bar							
				A	10 bar							
				B	16 bar							
				D	25 bar							
				E	40 bar							
					Material							
					S1	Standard stainless steel; PTFE						
					P1	PVDF with PTFE diaphragm, up to 25 bar						
					T1	PTFE + carbon; PTFE up to 10 bar						
					V1	PVC with PTFE diaphragm, up to 10 bar						
					Y1	PP with PTFE diaphragm, up to 10 bar						
						Valve design						
						0	Without valve spring					
						1	With valve spring					
							Diaphragm monitoring					
							0	Standard				
							1	None				
							2	Visual indication				
							A	Standard with electrical overload indication				
							B	Without diaphragm monitoring, with electrical overpressure display				
							C	Visual indication with electric overload indication				
								Hydraulic connector				
								0	Standard			
								E	DIN flange			
								F	Flange ANSI			
									Electrical Connection			
									S	3-phase 230/400 V, 50 Hz, 1.1 kW		
									T	3-phase, 230/400 V, 50/60 Hz, 1,1 kW mit PTC		
									L	3-phase, 230/400 V, 50 Hz, 1,1 kW (Exde) T4		
									Q	3-phase, 265/460 V; 60 Hz, 1,1 kW (Exde) T4		
									R	Variable speed stroke control motor, 3-phase 1.5 kW, 230/400 V		
									V	Controllable motor with integrated frequency converter, 3-phase, 400 V, 50 Hz, 1.5 kW		
									1	Without motor, with motor flange 200/90		
									2	Without motor, with motor flange 250/100		
									3	Without motor, with motor flange NEMA		
									4	Without motor, with motor flange 200/90 ATEX		
									5	Without motor, with motor flange 250/100 ATEX		
									6	Without motor, with motor flange NEMA ATEX		
										Stroke length adjustment		
										0	Stroke length adjustment standard	
										K	Stroke length adjustment standard	
										A	Stroke control motor 0-20 mA; 230 V; 50/60 Hz	
										B	Stroke control motor 4-20 mA; 230 V; 50/60 Hz	
										C	Stroke control motor 0-20 mA; 115 V; 60 Hz	
										D	Stroke control motor 4-20 mA; 115 V; 60 Hz	
											Temperature (ambient / fluid)	
											0	-20 °C…+40 °C / -20 °C…+90 °C (SS; HC) +50 °C (PTFE) +65 °C (PVDF)
											1	-10 °C…+50 °C / -20 °C…+90 °C (SS; HC) +50 °C(PTFE) +65 °C (PVDF)
											2	-25 °C…+40 °C / -25 °C…+90 °C (SS; HC) +50 °C (PTFE) +65 °C (PVDF)
												Paint

2.3 Hydraulic Diaphragm Metering Pumps

| | | |

Maintenance kits for HYDRO HA4a with valve wear parts

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	S1	HA4a.040....S1, HA4a.052....S1	1040812
40, 52	H1	HA4a.040....H1, HA4a.052....H1	1040860
40, 52	P1	HA4a.040....P1, HA4a.052....P1, HA4a.040....V1, HA4a.052....V1, HA4a.040....Y1, HA4a.052....Y1	1043763
63	S1	HA4a.063....S1	1040824
63	H1	HA4a.063....H1	1040861
63	P1	HA4a.063....P1, HA4a.063....V1, HA4a.063....Y1	1043775
80	S1	HA4a.080....S1	1040826
80	H1	HA4a.080....H1	1040864
80	P1	HA4a.080....P1, HA4a.080....V1, HA4a.080....Y1	1043776
94	S1	HA4a.094....S1	1040828
94	H1	HA4a.094....H1	1040867
94	P1	HA4a.094....P1, HA4a.094....V1, HA4a.094....Y1	1043777

Maintenance kits for HYDRO HA4a with valves, complete

Scope of delivery:
1 spare diaphragm complete, 1 suction valve, 1 injection valve, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	S1	HA4a.040....S1, HA4a.052....S1	1040813
40, 52	P1	HA4a.040....P1, HA4a.052....P1, HA4a.040....V1, HA4a.052....V1, HA4a.040....Y1, HA4a.052....Y1	1023057
63	S1	HA4a.063....S1	1040825
63	P1	HA4a.063....P1, HA4a.063....V1, HA4a.063....Y1	1040863
80	S1	HA4a.080....S1	1040827
80	P1	HA4a.080....P1, HA4a.080....V1, HA4a.080....Y1	1040866
94	S1	HA4a.026....S1	1040829
94	P1	HA4a.094....P1, HA4a.094....V1, HA4a.094....Y1	1040869

Diaphragms PTFE/1.4404 for HYDRO HA4a

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	S1	HA4a.040....S1, HA4a.052....S1	1040808
40, 52	P1	HA4a.040....P1, HA4a.052....P1, HA4a.040....V1, HA4a.052....V1, HA4a.040....Y1, HA4a.052....Y1	1122581
63	S1	HA4a.063....S1	1040809
63	P1	HA4a.063....P1, HA4a.063....V1, HA4a.063....Y1	1122582
80	S1	HA4a.080....S1	1040810
80	P1	HA4a.080....P1, HA4a.080....V1, HA4a.080....Y1	1122583
94	S1	HA4a.094....S1	1040811
94	P1	HA4a.094....P1, HA4a.094....V1, HA4a.094....Y1	1122594

Diaphragms PTFE/Hastelloy C Coated for HYDRO HA4a

Plunger Ø mm	Material	Suitable for identity code	Order no.
40, 52	H1	HA4a.040....H1, HA4a.052....H1	1040874
63	H1	HA4a.063....H1	1040875
80	H1	HA4a.080....H1	1040876
94	H1	HA4a.094....H1	1040877

Standard oil for maintaining hydraulics and gearbox HYDRO HA4a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

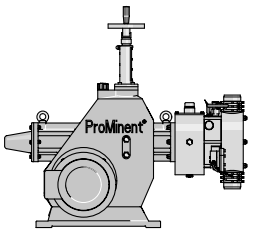
	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	Simplex (V, H) - 5.8 l Double head (D) - 6.8 l Duplex (U) - 2 x 5.8 l Triplex (T) - 3 x 5.8 l	1006010

2.3.3 Hydraulic Diaphragm Metering Pump Makro/ 5

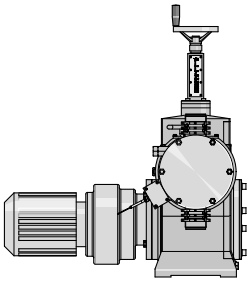
Excellent feed rates in the low-pressure range

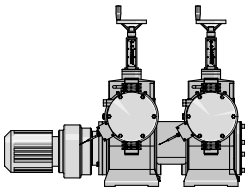
Capacity range of single pump: 450 – 6,108 l/h, 25 – 6 bar

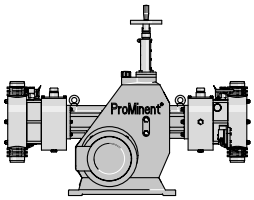
The robust hydraulic diaphragm metering pump Makro/ 5 guarantees outstanding process reliability. Its modular construction offers extremely good flexibility and a large range of drive versions are available.



MAKRO M5Ha


MAKRO M5Ha


MAKRO add-on pump



MAKRO double-head pump

The MAKRO hydraulic diaphragm metering pump (M5Ha) together with the MAKRO diaphragm and plunger metering pumps form an integrated product range with stroke lengths of 20 or 50 mm. This covers the capacity range from 38 to 6108 l/h at 320 – 4 bar. A wide range of drive versions is available for use in areas at risk from explosion with ATEX certification. The MAKRO product range is designed to comply with API 675 among others.

Your Benefits

Excellent process reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning / signalling system
- Integral hydraulic relief valve
- The dosing precision is better than ± 1 % within the 10-100 % stroke length range under defined conditions and with correct installation.

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs (boxer principle) being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

Technical Details

- Stroke length: 0 – 50 mm, Rod force: 10000 N
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually using manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- The dosing precision is better than ± 1 % within the 10 – 100% stroke length range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning / signalling system via a contact
- Integrated hydraulic relief and vent valve
- Wetted materials: PVDF, PTFE+25% carbon, stainless steel 1.4571, special materials are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 among others

Field of Application

- Oil and gas industry.
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

Control of MAKRO Hydraulic Diaphragm Metering Pumps

Stroke length controller MAKRO M5Ha

Stroke length adjustment via a standard signal. Actuating period approx. 100 sec for 100% stroke length, equipped with 2 limit switches for min./max. position, degree of protection: IP 54. Electrical connection 230 V (±10%), 50/60 Hz, approx. 40 W mechanical Stroke length display fitted on the Makro/ 5 drive.

Special voltage/higher degrees of protection/explosion protection on request.

Design with:

Standard current input 0/4 – 20 mA, corresponds to stroke length 0 – 100 %; internal switch-over for manual/ automatic operation, key switch for stroke adjustment in manual mode. Actual value output 0/4 – 20 mA for remote display.

Speed controllers with frequency converter (identity code specification Z)

The complete speed controller comprises a frequency converter and variable speed motor (see also identity code specification R). The frequency converter is accommodated in an IP 55-rated protective housing with integral control unit and main switch, suitable for max. motor power 0.37/0.75/1.1 kW.

Externally controllable with 0/4 – 20 mA or 0 – 10 V corresponding to 0 – 50 (60) Hz output frequency.

Frequency converter for controlling speed, see page → PL

Stroke sensor with Namur signal

Mounting on crank drive mechanism of MAKRO gearbox. For precise measurement of each metering stroke, comprising electronic cams and inductive proximity switches, switching signal according to Namur. In combination with electronic pre-selection meters suitable for batch metering or proportional metering in conjunction with proportional control.

Retrospective fitting only possible in the factory.

Approved for explosion protection operation with degree of protection EEx ia II C T6.

Technical data for MAKRO M5Ha

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure with 1800 rpm motor at 60 Hz				Suction lift	Suction/ discharge side con- nector	Ship- ping weight	Plunger Ø
	l/h	bar	ml/stro- ke	Max. stroke rate Strokes/ min	l/h	psi	gph (US)	Max. stroke rate Strokes/ min	m WC	G-DN	kg	mm
250450	450	25	125.0	60	537	362	142	72	3.0	G 2-32	320	60
250562	562	25	125.0	75	671	362	177	89	3.0	G 2-32	320	60
250772	772	25	125.0	103	922	362	244	123	3.0	G 2-32	320	60
250997	997	25	125.0	133	1,191	362	315	159	3.0	G 2-32	320	60
251170	1,170	25	125.0	156	-	-	-	-	-	G 2-32	320	60
160616	616	16	171.2	60	736	232	194	72	3.0	G 2 1/4-40	320	70
160770	770	16	171.2	75	920	232	243	89	3.0	G 2 1/4-40	320	70
161058	1,058	16	171.2	103	1,264	232	334	123	3.0	G 2 1/4-40	320	70
161366	1,366	16	171.2	133	1,633	232	431	159	3.0	G 2 1/4-40	320	70
161602	1,602	16	171.2	156	-	-	-	-	3.0	G 2 1/4-40	320	70
120716	716	12	199.0	60	855	174	226	72	3.0	G 2 1/4-40	320	75
120895	895	12	199.0	75	1,069	174	282	89	3.0	G 2 1/4-40	320	75
121229	1,229	12	199.0	103	1,469	174	388	123	3.0	G 2 1/4-40	320	75
121588	1,588	12	199.0	133	1,898	174	501	159	3.0	G 2 1/4-40	320	75
121862	1,862	12	199.0	156	-	-	-	-	3.0	G 2 1/4-40	320	75
120919	919	12	255.3	60	1,098	174	290	72	3.0	G 2 1/4-40	320	85
121148	1,148	12	255.3	75	1,372	174	362	89	3.0	G 2 1/4-40	320	85
121577	1,577	12	255.3	103	1,885	174	498	123	3.0	G 2 1/4-40	320	85
122037	2,037	12	255.3	133	2,435	174	643	159	3.0	G 2 1/4-40	320	85
122389	2,389	12	255.3	156	2,856	-	754	-	3.0	G 2 1/4-40	320	85
101345	1,345	10	374.0	60	1,607	145	425	72	3.0	G 2 3/4-50	330	100
101680	1,680	10	374.0	75	2,008	145	530	89	3.0	G 2 3/4-50	330	100
102310	2,310	10	374.0	103	2,761	145	729	123	3.0	G 2 3/4-50	330	100
102980	2,980	10	374.0	133	3,562	145	941	159	3.0	G 2 3/4-50	330	100
103500	3,500	10	374.0	156	-	-	-	-	3.0	G 2 3/4-50	330	100
062305 *	2,305	6	641.0	60	2,755	87	728	72	3.0	Flange–65	330	130
062880 *	2,880	6	641.0	75	3,443	87	910	89	3.0	Flange–65	330	130
063960 *	3,960	6	641.0	103	4,734	87	1,251	123	3.0	Flange–65	330	130
065110 *	5,110	6	641.0	133	6,108	87	1,614	159	3.0	Flange–65	330	130
066000 *	6,000	6	641.0	156	-	-	-	-	3.0	Flange–65	330	130

* SST design with G 2 1/2"

PPT/PCT/TTT material version max. 10 bar

Wetted materials for MAKRO M5Ha

Identity code of material	Dosing head	Connection on suction/ discharge side	DN 32 - DN 65 seals	Valve plates/valve springs	Valve seats
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4571/1.4404	PTFE	Hastelloy C	PTFE
PCT	PVC	PVC	PTFE	Hastelloy C	PTFE
PPT	Polypropylene	Polypropylene	PTFE	Hastelloy C	PTFE
TTT	Carbon-filled PTFE	Carbon-filled PTFE	PTFE	Hastelloy C	PTFE

Patented multi-layer diaphragm, vacuum-packed

Special designs available on request

Viton® is a registered trademark of DuPont Dow Elastomers

Identity code ordering system for MAKRO M5Ha

M5Ha	Drive type											
	H	Main drive										
	A	Add-on drive										
	D	Double main drive										
	B	Double add-on drive										
		Type										
		250450										
		250562										
		250772										
		250997										
		251170										
		160616										
		160770										
		161058										
		161366										
		161602										
		120716										
		120895										
		121229										
		121588										
		121862										
		120919										
		121148										
		121577										
		122037										
		122389										
		101345										
		101680										
		102310										
		102980										
		103500										
		062305										
		062880										
		063960										
		065110										
		066000										
			Liquid end material									
			PC	PVC (max. 10 bar)								
			PP	Polypropylene (max. 10 bar)								
			SS	Stainless steel								
			TT	PTFE + 25% carbon (max. 10 bar)								
				Material of seals/diaphragm								
				T	PTFE							
					Displacement body							
					T	Composite diaphragm, PTFE coating, with rupture indicator						
						Liquid end version						
						1	With valve springs					
							Hydraulic connections					
							0	Standard connection				
							1	PVC union nut and insert				
							2	Union nut and insert PP				
							3	PVDF union nut and insert				
							4	SS union nut and insert				
								Version				
								0	With ProMinent® logo, no frame			
								2	Without ProMinent® logo, no frame			
								A	With ProMinent® logo, with frame, simplex			
								B	With ProMinent® logo, with frame, duplex			
								C	With ProMinent® logo, with frame, triplex			
								D	With ProMinent® logo, with frame, quadruplex			
								M	Modified			
									Electrical power supply			
									S	3-phase 230/400 V, 50 Hz, 3.0 kW		
									R	3-phase variable speed stroke control motor, 230/ 400V, 50 Hz, 3.0 KW		
									V0	Motor with integrated frequency converter, 3-phase, 360 V, 50 Hz, 3.0 kW		
									L	3-phase 230/400 V 50 Hz, 4.0 kW (Exe, Exd)		
									P	3-phase 230/400 V 60 Hz, 4.8 kW (Exe, Exd)		
									5	No motor, with gearbox IEC 100		
									6	No motor, with gearbox IEC 112		
									0	No motor, no gearbox		
										Enclosure rating		
										0	IP 55 (standard)	
										2	Exd motor version ATEX-T4	

											A	ATEX drive			
												Stroke sensor			
												0	No stroke sensor		
												1	With stroke sensor (Namur)		
													Stroke length adjustment		
													0	Stroke length adjustment, manual	
													3	230 V 0-20 mA stroke controller	
													4	230 V 4-20 mA stroke controller	
													5	115 V 0-20 mA stroke controller	
													6	115 V 4-20 mA stroke controller	
														Application	
														0	Standard
														3	Low temperature -20 °C



2.3 Hydraulic Diaphragm Metering Pumps

Motor data for MAKRO M5Ha

Identity code specification	Power supply				Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	3 kW	
R	3-phase, IP 55*	230 V/400 V	50 Hz	3 kW	With PTC, speed control range 1:5
V0	3-phase, IP 55*	360 V	50 Hz	3 kW	Variable speed stroke control motor with integrated frequency converter
L2	3-phase, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	4 kW	With PTC, speed control range 1:5
P2	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz	4.8 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Maintenance kits for MAKRO M5Ha with valve wear parts

The maintenance kit generally includes the wear parts for the liquid ends.

Scope of delivery:

1 spare diaphragm, complete, 2 fastening bodies and sockets, 2 springs, 1 sealing set

Liquid end	Materials in contact with the medium	Suitable for identity code	Order no.
FMH 60–50	SST	250450, 250562, 250772, 250997, 251170	1008169
FMH 70/75/85–50	SST	160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037 122389	911909
FMH 100–50	SST	101345, 101680, 102310, 102980, 103500	1008249
FMH 130–50	SST	062305, 068380, 063960, 065110, 066000	1008264

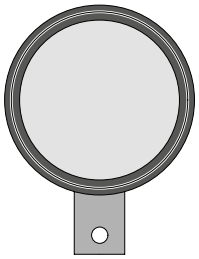
Maintenance kits for MAKRO M5Ha with valve, complete

The maintenance kit generally includes the wear parts for the liquid ends.

Scope of delivery:

1 spare diaphragm, complete, 2 valves, complete, 2 fastening bodies and sockets, 2 springs, 1 sealing set

Liquid end	Materials in contact with the medium	Suitable for identity code	Order no.
FMH 60–50	SST	250450, 250562, 250772, 250997, 251170	1008170
FMH 70/75/85–50	TTT	160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037 122389	911906
FMH 70/75/85–50	SST	160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037 122389	911910
FMH 70/75/85–50	PPT	160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037 122389	911904
FMH 70/75/85–50	PCT	160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037 122389	911902
FMH 100–50	TTT	101345, 101680, 102310, 102980, 103500	1008248
FMH 100–50	SST	101345, 101680, 102310, 102980, 103500	1008250
FMH 100–50	PPT	101345, 101680, 102310, 102980, 103500	1008246
FMH 100–50	PCT	101345, 101680, 102310, 102980, 103500	1008247
FMH 130–50	TTT	062305, 068380, 063960, 065110, 066000	1008253
FMH 130–50	SST	062305, 068380, 063960, 065110, 066000	1008265
FMH 130–50	PPT	062305, 068380, 063960, 065110, 066000	1008251
FMH 130–50	PCT	062305, 068380, 063960, 065110, 066000	1008252



Diaphragms for MAKRO M5Ha

Liquid end	Order no.
FMH 60/70/75/85–50	1007298
FMH 100/130–50	1007852

Standard oil for maintaining hydraulics and gearbox MAKRO M5Ha

	Required quantity	Order no.
Mobil DTE 10 Excel hydraulic oil, 15.1 litres	5 l	1044365
Mobilgear 634 VG 460 gear oil, 20 litres	16.5 l	1006284

2.3 Hydraulic Diaphragm Metering Pumps

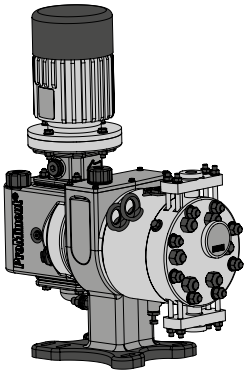
2.3.4 Hydraulic Diaphragm Metering Pump ORLITA Evolution

Maximum process reliability and flexibility.

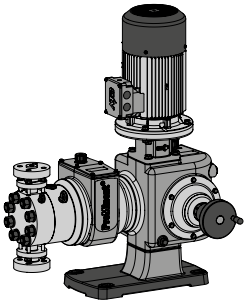
Capacity range of single-head pump: 3 – 7400 l/h, 400 – 10 bar

The ORLITA Evolution meets the most exacting safety requirements as an extremely robust hydraulic diaphragm metering pump. It is characterised by its PTFE multi-layer diaphragm with integral diaphragm rupture warning/signalling and unique diaphragm position control.

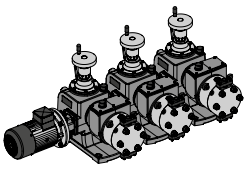
The ORLITA Evolution hydraulic diaphragm metering pump range of EF1a, EF2a, EF3a and EF4a form an integrated product range with stroke lengths of 15 to 40 mm. This covers the capacity range of 3 to 7,400 l/h at 400 – 10 bar. A wide range of drive versions is available, including some with ATEX certification for use in Zone 1 or Zone 2 areas at risk from explosion. The ORLITA Evolution product range is designed to comply with API 675.



ORLITA Evolution EF1a



ORLITA Evolution EF4a



ORLITA Evolution triplex pump

Your Benefits

Maximum process reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning / signalling system
- Integral hydraulic relief valve
- The new diaphragm position control protects against impermissible operating statuses (e.g. no damage in the event of a blockage on the suction or discharge side)
- The dosing precision is better than ± 1 % within the 10-100 % stroke length adjustment range under defined conditions and with correct installation
- Continuous bleeding of the oil chamber ensures reliable operation

Excellent flexibility:

- The modular and compact construction with single and multiple pump versions permits a wide range of applications. In multiple pump systems up to 5 metering units can be combined, including units with different pump capacities
- 7 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Plunger metering pumps are also available in addition to the hydraulic diaphragm version.
- Customised designs are available on request

Technical Details

- Stroke length: 0 - 16 mm (Evo 1, Evo 2), 0 - 25 mm (Evo 3), 0 - 40 mm (Evo 4)
- Rod force: 2600 N (Evo 1), 5400 N (Evo 2), 8000 N (Evo 3), 15,700 N (Evo 4)
- Stroke length adjustment range: 0 – 100%. Stroke length adjustment: manually using manual adjustment wheel and scaled display (optionally with electric actuator or control drive). A fixed stroke variant in accordance with API 674 is also available as an alternative
- The dosing precision is better than ± 1 % within the 10 – 100 % stroke length range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning / signalling system via a contact
- Integrated hydraulic relief and vent valve
- Wetted materials: Stainless steel 1.4404, special designs available on request Plastics PVC, PVDF, special designs available on request
- A wide range of power end/drive versions is available: Three-phase AC standard motors also for use in areas at risk from explosion, different flange designs for use of customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 / API 674 among others

Field of Application

- Oil and gas industry
- Metering of reactants and catalysts in the chemical industry
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

2.3.4.1 ORLITA Evolution EF1a

Technical data for Evolution EF1a single head pump 50 Hz SST

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min							Theor. stroke volume	Suction lift	Connection on suction/ discharge side	Shipping weight
		71	97	116	145	165	181	201				
mm	bar	l/h	l/h	l/h	l/h	l/h	l/h	l/h	ml/ stroke	m WC	G-DN	kg
8	400	1.5	2.0	2.4	3.0	3.4	3.8	4.2	0.80	3.0	DN 3	80
10	337	3.3	4.5	5.3	6.7	7.6	8.3	9.2	1.26	3.0	DN 3	80
11	278	4.6	6.3	7.5	9.4	10.7	11.7	13.0	1.52	3.0	DN 6	80
12	234	5.9	8.1	9.7	12.1	13.8	15.1	16.8	1.81	3.0	DN 6	80
13	200	7.5	10.3	12.3	15.3	17.5	19.1	21.3	2.12	3.0	DN 6	80
14	172	6.5	8.9	10.6	13.3	15.1	16.6	18.4	2.46	3.0	DN 6	80
15	150	8.1	11.0	13.2	16.5	18.8	20.6	22.9	2.83	3.0	DN 6	80
16	132	9.9	13.5	16.1	20.2	22.9	25.2	27.9	3.22	3.0	DN 6	80
17	117	11.9	16.3	19.5	24.3	27.7	30.4	33.7	3.63	3.0	DN 6	80
18	104	14.2	19.4	23.2	29.1	33.1	36.3	40.3	4.07	3.0	DN 6	80
19	93	16.8	23.0	27.5	34.3	39.1	42.9	47.6	4.54	3.0	DN 6	80
20	84	17.8	24.3	29.0	36.3	41.3	45.3	50.3	5.03	3.0	DN 10	80
21	76	20.1	27.4	32.8	41.0	46.6	51.2	56.8	5.54	3.0	DN 10	80
22	70	22.3	30.4	36.4	45.5	51.8	56.8	63.1	6.08	3.0	DN 10	80
23	64	24.6	33.6	40.3	50.3	57.3	62.8	69.8	6.65	3.0	DN 10	80
25	54	30.1	41.1	49.2	61.5	70.0	76.8	85.3	7.85	3.0	DN 10	80
29	40	42.8	58.4	69.9	87.4	99.4	109.0	121.1	10.57	3.0	DN 10	80
32	34	48.8	66.7	79.7	99.6	113.4	124.4	138.1	12.87	3.0	DN 10	80
38	25	71.9	98.2	117.5	146.8	167.1	183.3	203.5	18.15	3.0	DN 10	80
44	17	97.4	133.1	159.2	199.0	226.4	248.4	275.8	24.33	3.0	DN 16	80
47	14	111.2	151.9	181.6	227.0	258.3	283.4	314.7	27.76	3.0	DN 16	80
50	14	127.1	173.7	207.7	259.7	295.5	324.1	359.9	31.42	3.0	DN 16	80
54	12	148.3	202.6	242.3	302.9	344.6	378.1	419.8	36.64	3.0	DN 16	80
58	10	171.1	233.7	279.5	349.4	397.6	436.1	484.3	42.27	3.0	DN 16	80
60	10	183.1	250.1	299.1	373.9	425.5	466.7	518.3	45.24	3.0	DN 16	80

Valve type: Double ball valve up to DN 10, plate valve as of DN 16

Version PVC, PVDF max. 16 bar (slight deviation in pump capacity possible)

2.3 Hydraulic Diaphragm Metering Pumps

Technical data for Evolution EF1a single-head pump 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		88	117	140	175	199				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
8	400	1.8	2.4	2.9	3.6	4.1	0.80	3.0	DN 3	80
10	337	4.1	5.4	6.4	8.1	9.2	1.26	3.0	DN 3	80
11	278	5.7	7.6	9.1	11.3	12.9	1.52	3.0	DN 6	80
12	234	7.4	9.8	11.7	14.6	16.6	1.81	3.0	DN 6	80
13	200	9.3	12.4	14.8	18.5	21.1	2.12	3.0	DN 6	80
14	172	8.1	10.7	12.8	16.0	18.2	2.46	3.0	DN 6	80
15	150	10.0	13.3	15.9	19.9	22.6	2.83	3.0	DN 6	80
16	132	12.2	16.3	19.5	24.3	27.7	3.22	3.0	DN 6	80
17	117	14.8	19.6	23.5	29.4	33.4	3.63	3.0	DN 6	80
18	104	17.6	23.4	28.0	35.1	39.9	4.07	3.0	DN 6	80
19	93	20.8	27.7	33.2	41.4	47.1	4.54	3.0	DN 6	80
20	84	22.0	29.3	35.1	43.8	49.8	5.03	3.0	DN 10	80
21	76	24.9	33.1	39.6	49.5	56.2	5.54	3.0	DN 10	80
22	70	27.6	36.7	43.9	54.9	62.5	6.08	3.0	DN 10	80
23	64	30.5	40.6	48.6	60.7	69.1	6.65	3.0	DN 10	80
25	54	37.3	49.6	59.4	74.2	84.4	7.85	3.0	DN 10	80
29	40	53.0	70.5	84.3	105.4	119.9	10.57	3.0	DN 10	80
32	34	60.5	80.4	96.2	120.3	136.7	12.87	3.0	DN 10	80
38	25	89.1	118.5	141.8	177.2	201.5	18.15	3.0	DN 10	80
44	17	120.8	160.5	192.1	240.1	273.1	24.33	3.0	DN 16	80
47	14	137.8	183.2	219.1	274.0	311.6	27.76	3.0	DN 16	80
50	14	157.6	209.5	250.7	313.4	356.4	31.42	3.0	DN 16	80
54	12	183.8	244.4	292.4	365.5	415.7	36.64	3.0	DN 16	80
58	10	212.0	281.9	337.3	421.7	479.5	42.27	3.0	DN 16	80
60	10	226.9	301.7	361.0	451.3	513.2	45.24	3.0	DN 16	80

Valve type: Double ball valve up to DN 10, plate valve as of DN 16

Important note:

Abridged presentation of our complete product range. Other types on request

Wetted materials for Evolution EF1a

Identity code of material	Dosing head	Diaphragm/diaphragm mounting screw	Connection on suction/discharge side	Seals	Valve seats	Valve balls up to DN 10	Valve plates/ valve springs as of DN 16
S2	Stainless steel 1.4571/1.4404	PTFE / stainless steel 1.4462	Stainless steel 1.4404	stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic	Stainless steel 1.4462
P1	PVDF	PTFE / Hastelloy C	PVDF	PTFE	PTFE	Glass	Ceramic / E-CTFE
V1	PVC	PTFE / Hastelloy C	PVDF	PTFE	PTFE	Glass	Ceramic / E-CTFE

Motor data for EVOLUTION EF1a single-head pump

Identity code specification		Power supply			Remarks
S	3-phase, IP 55	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
T	3-phase, IP 55	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.37 kW	
L	3-phase, IP 55, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
Q	3-phase, IP 55, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.45 kW	With PTC, speed control range 1:5
V	1-phase, IP 55	230 V	50 Hz	0.75 kW	Variable speed stroke control motor with integrated frequency converter

Identity code ordering system for Evolution EF1a

| EF1a | Drive type | | |

4	Ball valve
5	Ball valve with spring
6	Double ball valve
7	Plate valve with spring
8	Cone valve
9	Cone valve with spring

Diaphragm monitor

1	Without diaphragm monitoring
2	Visual indication
3	Contact pressure gauge
4	Electric pressure switch

Hydraulic connector

0	Standard
E	DIN flange
F	Flange ANSI
N	NPT connection

Electrical Connection

S	3-phase 230/400 V, 50 Hz, 0.37 kW
T	3-phase, 230/400 V, 50/60 Hz, 0.37 kW, with PTC
L	3-phase, 230/400 V, 50 Hz, 0.37 kW, (Exde) T4
Q	3-phase, 265/460 V, 60 Hz, 0.45 kW, (Exde) T4
V	Controllable motor with integrated frequency converter, 1-phase, 230 V, 50 Hz, 0.75 kW
1	Without motor, with flange 160/71
2	Without motor, with flange 200/90
3	Without motor, with NEMA 56/143 flange
4	Without motor, with 160/71 ATEX flange
5	Without motor, with 200/90 ATEX flange
6	Without motor, with NEMA 56/143 ATEX flange

Stroke length adjustment

0	Stroke length adjustment standard
1	Stroke length adjustment Aluminium
2	Stroke length adjustment stainless steel
A	Stroke control motor 0-20 mA, 230 V, 50/60 Hz
B	Stroke control motor 4-20 mA, 230 V, 50/60 Hz
C	Stroke control motor 0-20 mA, 115 V, 60 Hz
D	Stroke control motor 4-20 mA, 115 V, 60 Hz
E	EXd stroke control motor 0-20 mA, 230 V, 50/60 Hz
F	EXd stroke control motor 4-20 mA, 230 V, 50/60 Hz
G	EXe stroke control motor 4-20 mA, 230 V, 50/60 Hz
H	EXe stroke control motor 4-20 mA, 115 V, 50/60 Hz
Z	Fixed stroke

Temperature (ambient)

0	-20 °C … +40 °C
1	-10 °C … +50 °C
2	-25 °C … +40 °C
5	-10 °C … +60 °C

Paint

0P	C3 Standard textured paint - RAL 2003
1P	C3 Standard gloss paint - RAL 2003
2P	C4 Outdoor - RAL 2003
3P	C5 Offshore - RAL 2003

Tests

S1	Standard performance test
S2	Standard performance test including 3.1 certificate
S3	As S1 + 3.1 certificate wetted material
S4	As S2 + 3.1 certificate wetted material
A1	API test complete includiung S4
A2	As A1 + NPSH
A3	As A1 + NPIP
A4	As A1 + 3.1 material certificate

Approvals

0	CE
1	CE + ATEX
2	CE + EAC
3	CE + EAC + ATEX
4	CE + UKCA
5	CE + UKCA + ATEX

Documentation

DE	German
X	EN=English, FR=French, ES=Spanish, RU=Russian
M0	Modified

Measuring unit

0	bar, l/h
1	psi, gph
2	kPa, l/h

Spare parts kits for ORLITA Evolution EF1a

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
8-10	S1	EF1a.008....S1, EF1a.009....S1, EF1a.010....S1	1125626
11-13	S1	EF1a.011....S1, EF1a.012....S1, EF1a.013....S1	1125627
14-19	S1	EF1a.014....S1, EF1a.015....S1, EF1a.016....S1, EF1a.017....S1, EF1a.018....S1, EF1a.019....S1	1125628
20-30	S1	EF1a.020....S1, EF1a.021....S1, EF1a.022....S1, EF1a.023....S1, EF1a.024....S1, EF1a.025....S1, EF1a.026....S1, EF1a.027....S1, EF1a.028....S1, EF1a.029....S1, EF1a.030....S1	1125630
31-40	S1	EF1a.031....S1, EF1a.032....S1, EF1a.033....S1, EF1a.034....S1, EF1a.035....S1, EF1a.036....S1, EF1a.037....S1, EF1a.038....S1, EF1a.039....S1, EF1a.040....S1	1125631
41-60	S1	EF1a.041....S1, EF1a.042....S1, EF1a.043.... S1, EF1a.044....S1, EF1a.045....S1, EF1a.046.... S1, EF1a.047....S1, EF1a.048....S1, EF1a.049.... S1, EF1a.050....S1, EF1a.051....S1, EF1a.052.... S1, EF1a.053....S1, EF1a.054....S1, EF1a.035.... S1, EF1a.055....S1, EF1a.056....S1, EF1a.057....S1, EF1a.058....S1, EF1a.059....S1, EF1a.059....S1	1125632

Metering diaphragm PTFE/1.4404 for Evolution EF1a

Plunger Ø mm	Material	Suitable for identity code	Order no.
8-10	S1	EF1a.008....S1, EF1a.009....S1, EF1a.010....S1	1051826
11-13	S1	EF1a.011....S1, EF1a.012....S1, EF1a.013....S1	1051756
14-19	S1	EF1a.014....S1, EF1a.015....S1, EF1a.016....S1, EF1a.017....S1, EF1a.018....S1, EF1a.019....S1	1051827
20-30	S1	EF1a.020....S1, EF1a.021....S1, EF1a.022....S1, EF1a.023....S1, EF1a.024....S1, EF1a.025....S1, EF1a.026....S1, EF1a.027....S1, EF1a.028....S1, EF1a.029....S1, EF1a.030....S1	1051776
31-40	S1	EF1a.031....S1, EF1a.032....S1, EF1a.033....S1, EF1a.034....S1, EF1a.035....S1, EF1a.036....S1, EF1a.037....S1, EF1a.038....S1, EF1a.039....S1, EF1a.040....S1	1051828
41-60	S1	EF1a.041....S1, EF1a.042....S1, EF1a.043.... S1, EF1a.044....S1, EF1a.045....S1, EF1a.046.... S1, EF1a.047....S1, EF1a.048....S1, EF1a.049.... S1, EF1a.050....S1, EF1a.051....S1, EF1a.052.... S1, EF1a.053....S1, EF1a.054....S1, EF1a.035.... S1, EF1a.055....S1, EF1a.056....S1, EF1a.057....S1, EF1a.058....S1, EF1a.059....S1, EF1a.059....S1	1060332

Standard oil for maintaining hydraulics and gearbox Evolution EF1a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Shell Tellus S2V32 hydraulic oil, 1 litre	1.3 – 2.0 l	1050416
Renolin PG 220 gear oil, 1 litre	2.2 l	1101750

2.3.4.2 ORLITA Evolution EF2a

Technical data for Evolution EF2a single-head pump 50 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min							Theor. stroke volume	Suction lift	Connection on suction/ discharge side	Shipping weight
		71	97	116	145	165	181	201				
mm	bar	l/h	l/h	l/h	l/h	l/h	l/h	l/h	ml/ stroke	m WC	G-DN	kg
11	400	3.9	5.2	6.2	7.8	8.9	10.1	10.8	1.52	3.0	DN 6	95
12	400	5.5	7.3	8.7	10.9	12.4	14.0	15.1	1.81	3.0	DN 6	95
13	400	7.3	9.8	11.7	14.6	16.6	18.8	20.2	2.12	3.0	DN 6	95
14	400	3.8	5.1	6.0	7.6	8.5	9.7	10.4	2.46	3.0	DN 6	95
15	351	5.4	7.1	8.5	10.7	12.1	13.7	14.8	2.83	3.0	DN 6	95
16	309	7.3	9.7	11.6	14.5	16.5	18.7	20.1	3.22	3.0	DN 6	95
17	274	9.5	12.4	15.3	18.9	21.6	24.4	26.3	3.63	3.0	DN 6	95
18	244	12.2	16.2	19.4	24.2	27.6	31.2	33.6	4.07	3.0	DN 6	95
19	219	15.2	20.3	24.2	30.3	34.4	39.0	42.0	4.54	3.0	DN 6	95
20	198	16.1	21.4	26.5	31.9	36.3	41.2	44.3	5.03	3.0	DN 10	95
21	179	18.2	24.2	28.9	36.1	41.1	46.6	50.1	5.54	3.0	DN 10	95
22	163	20.5	27.2	32.5	40.6	46.2	52.4	56.3	6.08	3.0	DN 10	95
23	149	22.9	30.4	36.4	45.5	51.8	58.7	63.1	6.65	3.0	DN 10	95
25	127	28.4	37.7	45.1	56.3	64.1	72.7	78.1	7.85	3.0	DN 10	95
29	94	41.7	55.4	66.3	82.8	94.3	106.8	114.8	10.57	3.0	DN 10	95
32	77	42.9	57.0	68.1	85.2	96.9	109.9	118.1	12.87	3.0	DN 10	95
38	55	69.1	91.9	109.9	137.3	156.3	177.1	190.4	18.15	3.0	DN 10	95
44	41	95.6	127.0	151.9	189.9	216.1	244.9	263.2	24.33	3.0	DN 16	95
47	36	110.0	146.2	174.8	218.5	248.7	281.8	302.9	27.76	3.0	DN 16	95
50	32	125.4	166.6	199.3	249.1	283.5	321.3	345.3	31.42	3.0	DN 16	95
54	27	148.0	196.7	235.2	294.0	334.5	379.1	407.5	36.64	3.0	DN 16	95
58	24	172.4	229.0	273.9	342.4	389.6	441.6	474.6	42.27	3.0	DN 16	95
60	22	185.7	246.7	295.0	368.8	419.6	475.6	511.2	45.24	3.0	DN 16	95
65	19	217.7	289.3	346.0	432.5	492.1	557.8	599.5	53.09	3.0	DN 20	95
70	16	254.7	338.5	404.8	506.0	575.8	652.6	701.4	61.58	3.0	DN 20	95
76	14	303.2	402.9	481.8	602.2	685.3	776.7	834.8	72.58	3.0	DN 20	95
78	13	320.4	425.8	509.2	636.4	724.2	820.8	882.2	76.45	3.0	DN 20	95
80	12	338.2	449.3	537.4	671.7	764.4	866.3	931.1	80.42	3.0	DN 20	95

Valve type: Double ball valve up to DN 10, plate valve as of DN 16

Version PVC, PVDF max. 16 bar (slight deviation in pump capacity possible)

2.3 Hydraulic Diaphragm Metering Pumps

Technical data for Evolution EF2a single-head pump 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		88	117	140	175	199				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/stroke	m WC	G-DN	kg
11	400	4.7	6.3	7.5	9.4	10.7	1.52	3.0	DN 6	95
12	400	6.6	8.8	10.5	13.1	14.9	1.81	3.0	DN 6	95
13	400	8.8	11.8	14.1	17.6	20.0	2.12	3.0	DN 6	95
14	400	4.6	6.1	7.4	9.2	10.5	2.46	3.0	DN 6	95
15	351	6.5	8.6	10.3	12.9	14.6	2.83	3.0	DN 6	95
16	309	8.8	11.7	14.0	17.4	19.8	3.22	3.0	DN 6	95
17	274	11.4	15.3	18.3	22.9	26.0	3.63	3.0	DN 6	95
18	244	14.6	19.5	23.4	29.2	33.2	4.07	3.0	DN 6	95
19	219	18.2	24.4	29.2	36.5	41.5	4.54	3.0	DN 6	95
20	198	19.3	25.8	30.8	38.5	43.8	5.03	3.0	DN 10	95
21	179	21.8	29.2	34.9	43.6	49.6	5.54	3.0	DN 10	95
22	163	24.6	32.8	39.2	49.0	55.8	6.08	3.0	DN 10	95
23	149	27.5	36.7	43.9	54.9	62.5	6.65	3.0	DN 10	95
25	127	34.1	45.5	54.4	68.0	77.3	7.85	3.0	DN 10	95
29	94	50.0	66.8	80.0	100.0	113.7	10.57	3.0	DN 10	95
32	77	51.5	68.7	82.2	102.8	116.9	12.87	3.0	DN 10	95
38	55	82.9	110.8	132.6	165.7	188.5	18.15	3.0	DN 10	95
44	41	114.7	153.2	183.3	229.2	260.6	24.33	3.0	DN 16	95
47	36	132.0	176.3	211.0	263.7	299.9	27.76	3.0	DN 16	95
50	32	150.5	201.0	240.5	300.6	341.9	31.42	3.0	DN 16	95
54	27	177.6	237.2	251.1	413.8	403.5	36.64	3.0	DN 16	95
58	24	206.9	276.3	330.6	413.2	469.9	42.27	3.0	DN 16	95
60	22	222.8	297.6	356.1	445.1	506.1	45.24	3.0	DN 16	95
65	19	261.2	349.0	417.6	522.0	593.6	53.09	3.0	DN 20	95
70	16	305.6	408.3	488.6	610.7	694.4	61.58	3.0	DN 20	95
76	14	363.8	485.9	581.5	726.8	826.5	72.58	3.0	DN 20	95
78	13	384.5	513.5	614.5	768.1	873.5	76.45	3.0	DN 20	95
80	12	405.8	542.0	648.5	810.7	921.9	80.42	3.0	DN 20	95

Valve type: Double ball valve up to DN 10, plate valve as of DN 16

Important note:

Abridged presentation of our complete product range. Other types on request

Wetted materials for Evolution EF2a

Identity code of material	Dosing head	Diaphragm/diaphragm mounting screw	Connection on suction/discharge side	Seals	Valve seats	Valve balls up to DN 10	Valve plates/ valve springs as of DN 16
S2	Stainless steel 1.4404	PTFE / stainless steel 1.4462	Stainless steel 1.4404	stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic	Stainless steel 1.4462
P1	PVDF	PTFE / Hastelloy C	PVDF	PTFE	PTFE	Glass	Ceramic / E-CTFE
V1	PVC	PTFE / Hastelloy C	PVDF	PTFE	PTFE	Glass	Ceramic / E-CTFE

Motor data for EVOLUTION EF2a single-head pump

Identity code specification		Power supply			Remarks
S	3-phase, IP 55	230 V/400 V	50 Hz	1.1 kW	With PTC, speed control range 1:5
T	3-phase, IP 55	230 V/400 V 265 V/460 V	50 Hz 60 Hz	1.1 kW	
L	3-phase, IP 55, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	1.1 kW	With PTC, speed control range 1:5
Q	3-phase, IP 55, II 2G Ex de IIC T4	265 V/460 V	60 Hz	1.1 kW	With PTC, speed control range 1:5
V	3-phase, IP 55	230 V	50 Hz	1.5 kW	Variable speed stroke control motor with integrated frequency converter

Identity code ordering system for Evolution EF2a

EF2a	Drive type					
	V	Simplex (vertical)				
	H	Simplex (horizontal)				
	U	Duplex - 2 drives / 2 heads				
	T	Triplex - 3 drives / 3 heads				
		Plungers				
		011	Plunger 11 mm			
		012	Plunger 12 mm			
		013	Plunger 13 mm			
		014	Plunger 14 mm			
		015	Plunger 15 mm			
		016	Plunger 16 mm			
		017	Plunger 17 mm			
		018	Plunger 18 mm			
		019	Plunger 19 mm			
		020	Plunger 20 mm			
		021	Plunger 21 mm			
		022	Plunger 22 mm			
		023	Plunger 23 mm			
		025	Plunger 25 mm			
		029	Plunger 29 mm			
		032	Plunger 32 mm			
		038	Plunger 38 mm			
		044	Plunger 44 mm			
		047	Plunger 47 mm			
		050	Plunger 50 mm			
		054	Plunger 54 mm			
		058	Plunger 58 mm			
		060	Plunger 60 mm			
		065	Plunger 65 mm			
		070	Plunger 70 mm			
		076	Plunger 76 mm			
		078	Plunger 78 mm			
		080	Plunger 80 mm			
			stroke rate			
			071	71 strokes/min.; 50 Hz		
			097	97 strokes/min.; 50 Hz		
			116	116 strokes/min.; 50 Hz		
			145	145 strokes/min.; 50 Hz		
			165	165 strokes/min.; 50 Hz		
			181	181 strokes/min.; 50 Hz		
			201	201 strokes/min.; 50 Hz		
			088	88 strokes/min.; 60 Hz		
			117	117 strokes/min.; 60 Hz		
			140	140 strokes/min.; 60 Hz		
			175	175 strokes/min.; 60 Hz		
			199	199 strokes/min.; 60 Hz		
				Pressure rating		
				A	400 bar	
				B	337 bar	
				C	278 bar	
				D	234 bar	
				E	200 bar	
				F	172 bar	
				G	150 bar	
				H	132 bar	
				I	117 bar	
				J	104 bar	
				K	93 bar	
				L	84 bar	
				M	76 bar	
				N	70 bar	
				O	64 bar	
				P	54 bar	
				Q	40 bar	
				R	34 bar	
				S	25 bar	
				T	17 bar	
				U	14 bar	
				V	12 bar	
				W	10 bar	
					Material	
					S2	Standard stainless steel; stainless steel
					P1	PVDF with PTFE diaphragm
					V1	PVC with PTFE diaphragm

Valve design	
0	Standard
4	Ball valve
5	Ball valve with spring
6	Double ball valve
7	Plate valve with spring
8	Cone valve
9	Cone valve with spring

Diaphragm monitor	
2	Visual indication
1	Without diaphragm monitoring
3	Contact pressure gauge
4	Electric pressure switch

Hydraulic connector	
0	Standard
E	DIN flange
F	Flange ANSI
N	NPT connection

Electrical Connection	
S	3-phase 230/400 V, 50 Hz, 1.1 kW
T	3-phase, 230/400 V, 50 Hz, 1.1 kW, with PTC
L	3-phase, 230/400 V, 50 Hz, 1.1 kW, (Exde) T4
Q	3-phase, 265/460 V, 60 Hz, 1.1 kW, (Exde) T4
V	Controllable motor with integrated frequency converter, 3-phase, 230 V, 50 Hz, 1.5 kW
1	Without motor, with flange 160/71
2	Without motor, with flange 200/90
3	Without motor, with NEMA 56/143 flange
4	Without motor, with 160/71 ATEX flange
5	Without motor, with 200/90 ATEX flange
6	Without motor, with NEMA 56/143 ATEX flange

Stroke length adjustment	
0	Stroke length adjustment standard
1	Aluminium stroke length adjustment
2	Stainless steel stroke length adjustment
A	Stroke control motor 0-20 mA, 230 V, 50/60 Hz
B	Stroke control motor 4-20 mA, 230 V, 50/60 Hz
C	Stroke control motor 0-20 mA, 115 V, 60 Hz
D	Stroke control motor 4-20 mA, 115 V, 60 Hz
E	EXd stroke control motor 0-20 mA, 230 V, 50/60 Hz
F	EXd stroke control motor 4-20 mA, 230 V, 50/60 Hz
G	EXe stroke control motor 4-20 mA, 230 V, 50/60 Hz
H	EXe stroke control motor 4-20 mA, 115 V, 50/60 Hz
Z	Fixed stroke

Temperature (ambient)	
0	-20 °C … +40 °C
1	-10 °C … +50 °C
2	-25 °C … +40 °C
5	-10 °C … +60 °C

Paint	
0P	C3 Standard textured paint - RAL 2003
1P	C3 Standard gloss paint - RAL 2003
2P	C4 Outdoor - RAL 2003
3P	C5 Offshore - RAL 2003

Tests	
S1	Standard performance test
S2	Standard performance test including 3.1 certificate
S3	As S1 + 3.1 certificate wetted material
S4	As S2 + 3.1 certificate wetted material
A1	API test complete + S4
A2	As A1 + NPSH
A3	As A1 + NPIP
A4	As A1 + 3.1 material certificate

Approvals	
0	CE
1	CE + ATEX
2	CE + EAC
3	CE + EAC + ATEX
4	CE + UKCA
5	CE + UKCA + ATEX

Documentation	
DE	German
EN	English
FR	French
ES	Spanish
RU	Russian
M0	Modified

2.3 Hydraulic Diaphragm Metering Pumps

																					Measuring unit	
																					0	bar, l/h
																					1	psi, gph
																					2	kPa, l/h

Spare parts kits for ORLITA Evolution EF2a

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
11-13	S1	EF2a.011....S1, EF2a.012....S1, EF2a.013....S1	1125627
14-19	S1	EF2a.014....S1, EF2a.015....S1, EF2a.016....S1, EF2a.017....S1, EF2a.018....S1, EF2a.019....S1	1125628
20-30	S1	EF2a.020....S1, EF2a.021....S1, EF2a.022....S1, EF2a.023....S1, EF2a.024....S1, EF2a.025....S1, EF2a.026....S1, EF2a.027....S1, EF2a.028....S1, EF2a.029....S1, EF2a.030....S1	1125630
31-40	S1	EF2a.031....S1, EF2a.032....S1, EF2a.033....S1, EF2a.034....S1, EF2a.035....S1, EF2a.036....S1, EF2a.037....S1, EF2a.038....S1, EF2a.039....S1, EF2a.040....S1	1125631
41-60	S1	EF2a.041....S1, EF2a.042....S1, EF2a.043.... S1, EF2a.044....S1, EF2a.045....S1, EF2a.046.... S1, EF2a.047....S1, EF2a.048....S1, EF2a.049.... S1, EF2a.050....S1, EF2a.051....S1, EF2a.052.... S1, EF2a.053....S1, EF2a.054....S1, EF2a.055.... S1, EF2a.056....S1, EF2a.057....S1, EF2a.058....S1, EF2a.059....S1, EF2a.060....S1	1125632
61-80	S1	EF2a.061....S1, EF2a.062....S1, EF2a.063.... S1, EF2a.064....S1, EF2a.065....S1, EF2a.066.... S1, EF2a.067....S1, EF2a.068....S1, EF2a.069.... S1, EF2a.070....S1, EF2a.071....S1, EF2a.072.... S1, EF2a.073....S1, EF2a.074....S1, EF2a.075.... S1, EF2a.076....S1, EF2a.077....S1, EF2a.078....S1, EF2a.079....S1, EF2a.080....S1	1125633

Metering diaphragms PTFE/1.4404 for Evolution EF2a

Plunger Ø mm	Material	Suitable for identity code	Order no.
11-13	S1	EF2a.011....S1, EF2a.012....S1, EF2a.013....S1	1051756
14-19	S1	EF2a.014....S1, EF2a.015....S1, EF2a.016....S1, EF2a.017....S1, EF2a.018....S1, EF2a.019....S1	1051827
20-30	S1	EF2a.020....S1, EF2a.021....S1, EF2a.022....S1, EF2a.023....S1, EF2a.024....S1, EF2a.025....S1, EF2a.026....S1, EF2a.027....S1, EF2a.028....S1, EF2a.029....S1, EF2a.030....S1	1051776
31-40	S1	EF2a.031....S1, EF2a.032....S1, EF2a.033....S1, EF2a.034....S1, EF2a.035....S1, EF2a.036....S1, EF2a.037....S1, EF2a.038....S1, EF2a.039....S1, EF2a.040....S1	1051828
41-60	S1	EF2a.041....S1, EF2a.042....S1, EF2a.043.... S1, EF2a.044....S1, EF2a.045....S1, EF2a.046.... S1, EF2a.047....S1, EF2a.048....S1, EF2a.049.... S1, EF2a.050....S1, EF2a.051....S1, EF2a.052.... S1, EF2a.053....S1, EF2a.054....S1, EF2a.055.... S1, EF2a.056....S1, EF2a.057....S1, EF2a.058....S1, EF2a.059....S1, EF2a.060....S1	1060332
61-80	S1	EF2a.061....S1, EF2a.062....S1, EF2a.063.... S1, EF2a.064....S1, EF2a.065....S1, EF2a.066.... S1, EF2a.067....S1, EF2a.068....S1, EF2a.069.... S1, EF2a.070....S1, EF2a.071....S1, EF2a.072.... S1, EF2a.073....S1, EF2a.074....S1, EF2a.075.... S1, EF2a.076....S1, EF2a.077....S1, EF2a.078....S1, EF2a.079....S1, EF2a.080....S1	1051815

Standard oil for maintaining hydraulics and gearbox Evolution EF2a

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Shell Tellus S2V32 hydraulic oil, 1 litre	1.3 – 2.0 l	1050416
Renolin PG 220 gear oil, 1 litre	2.9 l	1101750

2.3.4.3 ORLITA Evolution EF3a

Technical data for Evolution EF3a single head pump 50 Hz SST

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min							Max. pressure	Efficiency		Nominal diameter
		73 [2]	97 [3]	116 [4]	145 [5]	165 [6]	181 [7]	201 [8]				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
17	5.67	24	33	39	49	56	61	68	397	0.72	0.80	DN 6
22	9.50	41	55	66	82	94	103	114	237	0.87	0.93	DN 6
25	12.27	53	71	85	106	121	133	148	183	0.83	0.85	DN 10
30	17.67	77	102	123	153	174	191	213	127	0.92	0.95	DN 10
34	22.70	99	132	158	197	224	246	273	99	0.90	0.94	DN 16
38	28.35	124	165	197	246	280	307	341	79	0.93	0.95	DN 16
44	38.01	166	221	264	330	376	412	458	59	0.95	0.97	DN 20
50	49.09	215	285	341	427	486	533	592	46	0.97	0.98	DN 20
58	66.05	289	384	459	574	653	717	796	34	0.98	0.99	DN 20
63	77.93	341	453	542	678	771	846	939	29	0.97	0.98	DN 25
70	96.21	421	559	669	837	952	1,044	1,160	23	0.97	0.98	DN 25
75	110.45	483	642	768	960	1,093	1,199	1,332	20	0.98	0.98	DN 25
100	196.35	860	1,142	1,366	1,708	1,943	2,132	2,368	11	0.99	0.98	DN 40

Version PVC, PVDF max. 16 bar

Technical data for Evolution EF3a single head pump 60 Hz SST

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min					Max. pressure	Efficiency		Nominal diameter
		88 [2]	117 [3]	140 [4]	175 [5]	199 [6]				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
17	5.67	30	39	47	59	67	397	0.72	0.77	DN 6
22	9.50	50	66	79	99	113	237	0.83	0.85	DN 6
25	12.27	64	86	103	128	146	183	0.83	0.85	DN 10
30	17.67	93	124	148	185	211	127	0.87	0.89	DN 10
34	22.70	119	159	190	238	271	99	0.88	0.89	DN 16
38	28.35	149	199	238	297	338	79	0.89	0.90	DN 16
44	38.01	200	266	319	399	453	59	9.00	0.91	DN 20
50	49.09	259	344	412	515	586	46	0.91	0.91	DN 20
58	66.05	348	463	554	693	788	34	0.92	0.92	DN 20
63	77.93	411	547	654	818	930	29	0.92	0.93	DN 25
70	96.21	508	675	808	1,010	1,148	23	0.93	0.94	DN 25
75	110.45	583	775	927	1,159	1,318	20	0.94	0.95	DN 25
100	196.35	1,036	1,378	1,649	2,061	2,344	11	0.96	0.96	DN 40

Note:

Abridged presentation of our complete product range. Additional plunger diameters (14-100 mm) on request.

Wetted materials for Evolution EF3a

Dosing head assembly

Dosing head	Diaphragm retaining screw	Diaphragm
Stainless steel 1.4404	Stainless steel 1.4462	PTFE multi-layer diaphragm

Ball valve DN 6 - DN 10

Nominal diameter	Connection on suction/discharge side	Valve/head seal	Valve balls	Valve seats	Valve housing	Clamp ring
DN 6	Stainless steel 1.4404	Stainless steel 1.4404	SiN ceramic	Stainless steel 1.4404	Stainless steel 1.4404	Hastelloy C
DN 10	Stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic	Stainless steel 1.4404	Stainless steel 1.4404	Hastelloy C

Plate valve DN 16 - DN 40

Nominal diameter	Connection on suction/discharge side	Valve/head seal	Valve plate	Valve seats	Valve housing	Clamp ring
DN 16	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404	Hastelloy C
DN 20	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404	Hastelloy C
DN 25	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404	Hastelloy C

Further material versions and details available on request.

2.3.4.4 ORLITA Evolution EF4a

Technical data for Evolution EF4a single head pump 50 Hz SST

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min							Max. pressure	Efficiency		Nominal diameter
		73 [2]	97 [3]	116 [4]	145 [5]	165 [6]	181 [7]	201 [8]				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
22	15.21	66	88	105	132	150	165	183	400	0.64	0.67	DN 16
25	19.63	86	114	136	170	194	213	236	368	0.67	0.74	DN 16
30	28.27	123	164	196	246	279	307	341	255	0.70	0.76	DN 16
34	36.32	159	211	252	316	359	394	438	199	0.81	0.84	DN 16
38	45.36	198	264	315	394	449	492	547	159	0.82	0.84	DN 20
44	60.82	266	354	423	529	602	660	733	119	0.87	0.88	DN 20
50	78.54	344	457	546	683	777	852	947	92	0.90	0.92	DN 25
60	113.10	495	658	787	983	1,119	1,228	1,364	64	0.91	0.93	DN 32
70	153.94	674	895	1,071	1,339	1,524	1,671	1,856	47	0.91	0.93	DN 40
75	176.71	774	1,028	1,229	1,537	1,749	1,919	2,131	41	0.91	0.93	DN 40
86	232.35	1,017	1,352	1,617	2,021	2,300	2,523	2,802	31	0.93	0.94	DN 50
90	254.47	1,114	1,481	1,771	2,213	2,519	2,763	3,068	28	0.93	0.94	DN 50
100	314.16	1,376	1,828	2,186	2,733	3,110	3,411	3,788	23	0.94	0.94	DN 50
110	380.13	1,665	2,212	2,645	3,307	3,763	4,128	4,584	19	0.95	0.95	DN 50
115	415.48	1,819	2,418	2,891	3,614	4,113	4,512	5,010	17	0.93	0.95	DN 65
130	530.93	2,325	3,090	3,695	4,619	5,256	5,765	6,403	14	0.94	0.95	DN 65
140	615.75	2,697	3,583	4,285	5,357	6,095	6,687	7,426	12	0.95	0.96	DN 65

Version PVC, PVDF max. 16 bar

Technical data for Evolution EF4a single head pump 60 Hz SST

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min					Max. pressure	Efficiency		Nominal diameter
		88 [2]	117 [3]	140 [4]	175 [5]	199 [6]				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
22	15.21	80	106	127	159	181	400	0.67	0.81	DN 16
25	19.63	103	137	164	206	234	368	0.74	0.85	DN 16
30	28.27	149	198	237	269	337	255	0.76	0.85	DN 16
34	36.32	191	254	305	381	433	199	0.84	0.87	DN 16
38	45.36	239	318	381	476	541	159	0.84	0.90	DN 20
44	60.82	321	427	510	638	726	119	0.88	0.87	DN 20
50	78.54	414	551	659	824	937	92	0.92	0.90	DN 25
60	113.10	597	793	950	1,187	1,350	64	0.93	0.91	DN 32
70	153.94	812	1,080	1,293	1,616	1,838	47	0.93	0.91	DN 40
75	176.71	933	1,240	1,484	1,855	2,110	41	0.93	0.91	DN 40
86	232.35	1,226	1,631	1,951	2,439	2,774	31	0.94	0.93	DN 50
90	254.47	1,343	1,786	2,137	2,671	3,038	28	0.94	0.93	DN 50
100	314.16	1,658	2,205	2,638	3,298	3,751	23	0.94	0.94	DN 50
110	380.13	2,007	2,668	3,193	3,991	4,538	19	0.95	0.95	DN 50
115	415.48	2,193	2,916	3,490	4,362	4,960	17	0.95	0.93	DN 65
130	530.93	2,803	3,727	4,459	5,574	6,339	14	0.95	0.94	DN 65
140	615.75	3,251	4,322	5,172	6,465	7,352	12	0.96	0.96	DN 65

Wetted materials for Evolution EF4a

Dosing head assembly

Dosing head	Diaphragm retaining screw	Diaphragm
Stainless steel 1.4404	Stainless steel 1.4462	PTFE multi-layer diaphragm

Plate valve

Nominal diameter	Connection on suction/ discharge side	Valve/head seal	Valve plate	Valve seats	Valve housing
DN 16	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404
DN 20	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404
DN 25	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404
DN 32	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404
DN 40	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404
DN 50	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404
DN 65	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404

Note:

Abridged presentation of our complete product range. Other piston diameters (22–140 mm) on request.

2.3.5 Hydraulic Diaphragm Metering Pump ORLITA Evolution E1Sa/E2Sa

Safety processes as standard.

Capacity range of single-head pump: 0.9 – 134 l/h, 260 – 30 bar

As an extremely robust hydraulic diaphragm metering pump, the ORLITA Evolution E1Sa/E2Sa meets the most exacting safety requirements. It is characterised by its PTFE multi-layer diaphragm with integral diaphragm rupture warning / signalling system and unique diaphragm position control.

The ORLITA Evolution E1Sa/E2Sa product ranges together with the ORLITA Evolution hydraulic diaphragm metering pumps product ranges EF1a, EF2a, EF3a and EF4a form an integrated product range with stroke lengths of 15 to 40 mm. This covers the capacity range from 3 to 7,400 l/h at 400- 10 bar. A wide range of power end versions is available, including some for use in the Zone 1 or Zone 2 areas at risk from explosion with ATEX certification. The entire ORLITA Evolution product range is designed to comply with API 675.



Your Benefits

Maximum process reliability:

- Capacity range of 0.9 – 134 l/h, 260 – 30 bar
- PTFE multi-layer diaphragm with integral diaphragm rupture warning / signalling system
- Integral hydraulic relief valve
- The new diaphragm position control protects against impermissible operating statuses (e.g. no damage in the event of a blockage on the suction or discharge side)
- The dosing precision is better than ±1 % in a stroke length adjustment range of 10 - 100 % under defined conditions and with correct installation
- Continuous venting of the oil chamber ensures reliable operation

Technical Details

- Capacity range of pump with a dosing head: E1Sa/E2Sa 0.9 – 134 l/h, 260 – 30 bar
- Stroke length: 0 - 16 mm
- Rod force: 2000 N (E1Sa) / 4500 N (E2Sa)
- Adjustment range of stroke length: 0 - 100 %. Stroke length adjustment: manually by means of manual adjustment wheel and scaled display (optionally with electric power end or control drive). A fixed stroke variant in accordance with API 674 is also available as an alternative
- Dosing precision is better than ± 1 % with a 10 - 100% stroke length range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with optical and/or electrical diaphragm rupture warning / signalling system via a contact
- Integrated hydraulic vent and vent valve
- Materials in contact with fluids: Stainless steel 1.4404, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors, also for use with speed control and/or in areas at risk from explosion, different flange designs for the use of customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 / API 674, ATEX among others

Field of Application

- Oil and gas industry
- Metering of reactants and catalysts in the chemical industry
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

2.3 Hydraulic Diaphragm Metering Pumps

2.3.5.1 ORLITA Evolution E1Sa

Technical data for Evolution E1Sa single-head pump 50 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min						Theor. stroke volume	Suction lift	Connection on suction/ discharge side	Shipping weight
		93 l/h	112 l/h	140 l/h	159 l/h	175 l/h	194 l/h				
mm	bar							ml/ stroke	m WC	G-DN	kg
6	260	(0.8) – 0.9	(0.9) – 1.0	(1.2) – 1.3	(1.3) – 1.5	(1.4) – 1.6	(1.6) – 1.8	0.49	3.0	G 1/4 - DN 3 *	31
6	240	(0.9) – 1.0	(1.0) – 1.1	(1.3) – 1.4	(1.5) – 1.6	(1.6) – 1.8	(1.8) – 2.0	0.49	3.0	G 1/4 - DN 3 *	31
6	190	(1.1) – 1.2	(1.3) – 1.4	(1.6) – 1.8	(1.9) – 2.1	(2.0) – 2.3	(2.3) – 2.5	0.49	3.0	G 1/4 - DN 3 *	31
6	160	(1.2) – 1.3	(1.5) – 1.6	(1.8) – 2.0	(2.1) – 2.3	(2.3) – 2.6	(2.6) – 2.8	0.49	3.0	G 1/4 - DN 3 *	31
6	120	(1.4) – 1.5	(1.7) – 1.9	(2.1) – 2.3	(2.4) – 2.7	(2.6) – 2.9	(2.9) – 3.3	0.49	3.0	G 1/4 - DN 3 *	31
8	260	(1.9) – 2.1	(2.3) – 2.5	(2.9) – 3.2	(3.3) – 3.6	(3.6) – 4.0	(4.0) – 4.5	0.80	3.0	G 1/4 - DN 3 *	31
8	240	(2.0) – 2.3	(2.4) – 2.7	(3.1) – 3.4	(3.5) – 3.9	(3.9) – 4.3	(4.3) – 4.8	0.80	3.0	G 1/4 - DN 3 *	31
8	190	(2.4) – 2.6	(2.8) – 3.2	(3.6) – 4.0	(4.1) – 4.5	(4.5) – 5.0	(5.0) – 5.5	0.80	3.0	G 1/4 - DN 3 *	31
8	160	(2.6) – 2.8	(3.1) – 3.4	(3.9) – 4.3	(4.4) – 4.9	(4.8) – 5.4	(5.4) – 6.0	0.80	3.0	G 1/4 - DN 3 *	31
8	120	(2.8) – 3.1	(3.4) – 3.8	(4.3) – 4.7	(4.8) – 5.4	(5.3) – 5.9	(5.9) – 6.6	0.80	3.0	G 1/4 - DN 3 *	31
8	90	(3.0) – 3.4	(3.6) – 4.0	(4.6) – 5.1	(5.2) – 5.8	(5.7) – 6.3	(6.3) – 7.1	0.80	3.0	G 1/4 - DN 3 *	31
10	260	(2.9) – 3.2	(3.4) – 3.8	(4.3) – 4.8	(4.9) – 5.5	(5.4) – 6.0	(6.0) – 6.7	1.25	3.0	G 1/4 – DN 6 *	35
10	240	(3.0) – 3.4	(3.6) – 4.0	(4.5) – 5.1	(5.2) – 5.7	(5.7) – 6.3	(6.3) – 7.0	1.25	3.0	G 1/4 – DN 6 *	35
10	190	(3.4) – 3.8	(4.1) – 4.5	(5.1) – 5.7	(5.8) – 6.5	(6.4) – 7.1	(7.1) – 7.9	1.25	3.0	G 1/4 – DN 6 *	35
10	160	(3.6) – 4.0	(4.4) – 4.8	(5.5) – 6.1	(6.2) – 6.9	(6.8) – 7.6	(7.6) – 8.4	1.25	3.0	G 1/4 – DN 6 *	35
10	120	(3.9) – 4.4	(4.7) – 5.2	(5.9) – 6.6	(6.7) – 7.5	(7.4) – 8.2	(8.2) – 9.1	1.25	3.0	G 1/4 – DN 6 *	35
10	90	(4.2) – 4.6	(5.0) – 5.6	(6.2) – 6.9	(7.1) – 7.9	(7.8) – 8.7	(8.7) – 9.7	1.25	3.0	G 1/4 – DN 6 *	35
13	160	(6.7) – 7.5	(8.1) – 9.0	(10.1) – 11.2	(11.5) – 12.8	(12.6) – 14.0	(14.0) – 15.6	1.96	3.0	G 1/4 – DN 6 *	35
13	120	(7.3) – 8.1	(8.7) – 9.7	(10.9) – 12.1	(12.4) – 13.8	(13.6) – 15.2	(15.2) – 16.9	1.96	3.0	G 1/4 – DN 6 *	35
13	90	(7.7) – 8.5	(9.2) – 10.2	(11.5) – 12.8	(13.1) – 14.5	(14.4) – 16.0	(16.0) – 17.8	1.96	3.0	G 1/4 – DN 6 *	35
15	120	(8.0) – 8.9	(9.6) – 10.6	(12.0) – 13.3	(13.6) – 15.1	(15.0) – 16.7	(16.7) – 18.5	2.83	3.0	G 1/4 – DN 6 *	39
15	90	(9.0) – 10.1	(10.9) – 12.1	(13.6) – 15.1	(15.5) – 17.2	(17.0) – 18.9	(18.9) – 21.0	2.83	3.0	G 1/4 – DN 6 *	39
15	64	(10.0) – 11.1	(12.0) – 13.3	(15.0) – 16.7	(17.0) – 18.9	(18.8) – 20.8	(20.8) – 23.2	2.83	3.0	G 1/4 – DN 6 *	39
17	90	(13.1) – 14.5	(15.7) – 17.4	(19.6) – 21.8	(22.3) – 24.8	(24.6) – 27.3	(27.3) – 30.3	3.78	3.0	G 1/4 – DN 6 *	39
17	64	(14.2) – 15.7	(17.0) – 18.9	(21.3) – 23.6	(24.2) – 26.9	(26.6) – 29.6	(29.6) – 32.9	3.78	3.0	G 1/4 – DN 6 *	39
19	64	(18.6) – 20.7	(22.3) – 24.8	(27.9) – 31.1	(31.8) – 35.3	(34.9) – 38.8	(38.8) – 43.2	4.64	3.0	G 1/4 – DN 6 *	39
19	51	(19.3) – 21.5	(23.2) – 25.8	(29.0) – 32.2	(32.9) – 36.6	(36.2) – 40.3	(40.3) – 44.7	4.64	3.0	G 1/4 – DN 6 *	39
22	51	(24.7) – 27.4	(29.6) – 32.9	(37.0) – 41.1	(42.1) – 46.7	(46.3) – 51.4	(51.4) – 57.1	6.28	3.0	G 1/4 – DN 10	46
22	30	(27.0) – 30.0	(32.4) – 36.0	(40.5) – 45.0	(46.0) – 51.1	(50.6) – 56.2	(56.2) – 62.5	6.28	3.0	G 1/4 – DN 10	46
30	30	(53.0) – 58.9	(63.6) – 70.6	(79.5) – 88.3	(90) – 100	(99) – 110	(110) – 122	11.31	3.0	G 1/4 – DN 10	46

* Double ball valve with female thread

Other performance variants and materials on request.

Technical data for Evolution E1Sa single-head pump 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		113 l/h	136 l/h	170 l/h	193 l/h	213 l/h				
mm	bar						ml/stroke	m WC	G-DN	kg
6	260	(0.9) – 1.0	(1.1) – 1.3	(1.4) – 1.6	(1.6) – 1.8	(1.8) – 2.0	0.49	3.0	G 1/4 - DN 3 *	31
6	240	(1.1) – 1.2	(1.3) – 1.4	(1.6) – 1.7	(1.8) – 2.0	(2.0) – 2.2	0.49	3.0	G 1/4 - DN 3 *	31
6	190	(1.3) – 1.5	(1.6) – 1.8	(2.0) – 2.2	(2.3) – 2.5	(2.5) – 2.8	0.49	3.0	G 1/4 - DN 3 *	31
6	160	(1.5) – 1.6	(1.8) – 2.0	(2.2) – 2.5	(2.5) – 2.8	(2.8) – 3.1	0.49	3.0	G 1/4 - DN 3 *	31
6	120	(1.7) – 1.9	(2.0) – 2.3	(2.6) – 2.9	(2.9) – 3.3	(3.2) – 3.6	0.49	3.0	G 1/4 - DN 3 *	31
8	260	(2.3) – 2.6	(2.8) – 3.1	(3.5) – 3.9	(4.0) – 4.4	(4.4) – 4.9	0.80	3.0	G 1/4 - DN 3 *	31
8	240	(2.5) – 2.8	(3.0) – 3.3	(3.7) – 4.2	(4.3) – 4.7	(4.7) – 5.2	0.80	3.0	G 1/4 - DN 3 *	31
8	190	(2.9) – 3.2	(3.5) – 3.9	(4.3) – 4.8	(4.9) – 5.5	(5.4) – 6.0	0.80	3.0	G 1/4 - DN 3 *	31
8	160	(3.1) – 3.5	(3.8) – 4.2	(4.7) – 5.2	(5.3) – 5.9	(5.9) – 6.5	0.80	3.0	G 1/4 - DN 3 *	31
8	120	(3.4) – 3.8	(4.1) – 4.6	(5.2) – 5.8	(5.9) – 6.6	(6.5) – 7.2	0.80	3.0	G 1/4 - DN 3 *	31
8	90	(3.7) – 4.1	(4.4) – 4.9	(5.5) – 6.2	(6.3) – 7.0	(6.9) – 7.7	0.80	3.0	G 1/4 - DN 3 *	31
10	260	(3.5) – 3.9	(4.2) – 4.7	(5.2) – 5.8	(6.0) – 6.6	(6.6) – 7.3	1.25	3.0	G 1/4 – DN 6 *	35
10	240	(3.7) – 4.1	(4.4) – 4.9	(5.5) – 6.1	(6.3) – 7.0	(6.9) – 7.7	1.25	3.0	G 1/4 – DN 6 *	35
10	190	(4.1) – 4.6	(5.0) – 5.5	(6.2) – 6.9	(7.1) – 7.9	(7.8) – 8.7	1.25	3.0	G 1/4 – DN 6 *	35
10	160	(4.4) – 4.9	(5.3) – 5.9	(6.6) – 7.4	(7.5) – 8.4	(8.3) – 9.2	1.25	3.0	G 1/4 – DN 6 *	35
10	120	(4.8) – 5.3	(5.7) – 6.4	(7.2) – 8.0	(8.2) – 9.1	(9.0) – 10.0	1.25	3.0	G 1/4 – DN 6 *	35
10	90	(5.1) – 5.6	(6.1) – 6.7	(7.6) – 8.4	(8.6) – 9.6	(9.5) – 10.6	1.25	3.0	G 1/4 – DN 6 *	35
13	160	(8.2) – 9.2	(9.8) – 10.9	(12.3) – 13.6	(13.9) – 15.5	(15.3) – 17.1	1.96	3.0	G 1/4 – DN 6 *	35
13	120	(8.8) – 9.8	(10.6) – 11.8	(13.2) – 14.7	(15.1) – 16.7	(16.6) – 18.4	1.96	3.0	G 1/4 – DN 6 *	35
13	90	(9.3) – 10.3	(11.2) – 12.4	(14.0) – 15.5	(15.9) – 17.7	(17.5) – 19.4	1.96	3.0	G 1/4 – DN 6 *	35
15	120	(9.7) – 10.8	(11.6) – 12.9	(14.6) – 16.2	(16.6) – 18.4	(18.2) – 20.2	2.83	3.0	G 1/4 – DN 6 *	39
15	90	(11.0) – 12.2	(13.2) – 14.7	(16.5) – 18.4	(18.8) – 20.9	(20.7) – 23.0	2.83	3.0	G 1/4 – DN 6 *	39
15	64	(12.1) – 13.5	(14.6) – 16.2	(18.2) – 20.3	(20.7) – 23.0	(22.8) – 25.3	2.83	3.0	G 1/4 – DN 6 *	39
17	90	(15.9) – 17.7	(19.1) – 21.2	(23.9) – 26.5	(27.1) – 30.1	(29.8) – 33.1	3.78	3.0	G 1/4 – DN 6 *	39
17	64	(17.2) – 19.1	(20.7) – 23.0	(25.8) – 28.7	(29.4) – 32.6	(32.3) – 35.9	3.78	3.0	G 1/4 – DN 6 *	39
19	64	(22.6) – 25.1	(27.1) – 30.2	(33.9) – 37.7	(38.6) – 42.9	(42.4) – 47.2	4.64	3.0	G 1/4 – DN 6 *	39
19	51	(23.3) – 25.8	(27.9) – 31.0	(34.9) – 38.8	(39.7) – 44.1	(43.6) – 48.5	4.64	3.0	G 1/4 – DN 6 *	39
22	51	(29.9) – 33.3	(35.9) – 39.9	(44.9) – 49.9	(51.1) – 56.8	(56.2) – 62.4	6.28	3.0	G 1/4 – DN 10	46
22	30	(32.7) – 36.4	(39.3) – 43.7	(49.1) – 54.6	(55.9) – 62.1	(61.4) – 68.3	6.28	3.0	G 1/4 – DN 10	46
30	30	(64.3) – 71.5	(77.2) – 85.8	(96.5) – 107.2	(109.7) – 121.9	(120.6) – 134.1	11.31	3.0	G 1/4 – DN 10	46

* Double ball valve with female thread

Other performance variants and materials on request.

Wetted materials for Evolution E1Sa

Identity code of material	Dosing head	Diaphragm/diaphragm mounting screw	Connection on suction/discharge side	Seals	Valve seats	Valve balls up to DN 10
S2	Stainless steel 1.4404	PTFE / stainless steel 1.4462	Stainless steel 1.4404	stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic
S3	Stainless steel 1.4404	PTFE / stainless steel 1.4462	Stainless steel 1.4404	stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic

Motor data for EVOLUTION E1Sa single-head pump

Identity code specification	Power supply				Remarks
S	3-phase, IP 55	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
T	3-phase, IP 55	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.37 kW	
L	3-phase, IP 55, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
V	3-phase, IP 55	230 V	50 Hz	0.75 kW	Variable speed motor with integrated frequency converter

2.3 Hydraulic Diaphragm Metering Pumps

Identity code ordering system for Evolution E1Sa

| E1Sa | Drive type | | |

C	Stroke control motor 0-20 mA; 115 V
D	Stroke control motor 4-20 mA; 115 V
E	EXd stroke control motor 0-20 mA; 230 V
F	EXd stroke control motor 4-20 mA; 230 V
G	EXd stroke control motor 0-20 mA; 115 V
H	EXd stroke control motor 4-20 mA; 115 V

Temperature (ambient)	
0	-20 °C … +40 °C
1	-10 °C … +50 °C

Paint	
0P	C3 Standard textured paint - RAL 2003
1P	C3 Standard gloss paint - RAL 2003
2P	C4 Outdoor - RAL 2003
3P	C5 Offshore - RAL 2003
XX	Drive, unpainted with rust protection

Tests	
S1	Standard performance test
S2	Performance test including 3.1 certificate
S3	As S1 + 3.1 certificate wetted material
S4	As S2 + 3.1 certificate wetted material
A1	API complete test including certificate
A2	As A1 + NPSH
A3	As A1 + NPIP
A4	As A1 + 3.1 material certificate
XX	Drive (without liquid end)

Approvals	
0	CE
1	CE + ATEX
2	CE + EAC
3	CE + EAC + ATEX
4	CE + UKCA
5	CE + UKCA + ATEX
N	without approval
X	Drive (without liquid end)

Documentation	
DE	German
EN	English
FR	French
ES	Spanish
RU	Russian
ZH	Chinese
XX	Power end (without liquid end)
M0	Modified

Measuring unit	
0	bar, l/h
1	psi, gph
2	kPa, l/h
X	Drive (without liquid end)

Spare parts kits for ORLITA Evolution E1Sa

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
6, 8	S1	E1Sa.006....S1, E1Sa.008....S1	1125625
10, 13	S1	E1Sa.010....S1, E1Sa.013....S1	1125627
15, 17, 19	S1	E1Sa.015...S1, E1Sa.017...S1, E1Sa.019...S1	1125628
22, 30	S1	E1Sa.022....S1, E1Sa.030....S1	1125629

Metering diaphragms PTFE/1.4404 for Evolution E1Sa

Plunger Ø mm	Material	Suitable for identity code	Order no.
6, 8	S1	E1Sa.006....S1, E1Sa.008....S1	1129176
10, 13	S1	E1Sa.010....S1, E1Sa.013....S1	1129268
15, 17, 19	S1	E1Sa.015...S1, E1Sa.017...S1, E1Sa.019...S1	1129197
22, 30	S1	E1Sa.022....S1, E1Sa.030....S1	1129201

Standard oil for maintaining hydraulics and gearbox Evolution E1Sa

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	2 l	1006010

2.3.5.2 ORLITA Evolution E2Sa

Technical data for Evolution E2Sa single-head pump 50 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/ discharge side	Shipping weight
		112	140	159	175	194				
mm	bar	l/h	l/h	l/h	l/h	l/h	ml/ stroke	m WC	G-DN	kg
10	260	(3.4) – 3.8	(4.3) – 4.8	(4.9) – 5.5	(5.4) – 6.0	(6.0) – 6.7	1.25	3.0	G 1/4 – DN 6 *	42
10	240	(3.6) – 4.0	(4.5) – 5.1	(5.2) – 5.7	(5.7) – 6.3	(6.3) – 7.0	1.25	3.0	G 1/4 – DN 6 *	42
10	190	(4.1) – 4.5	(5.1) – 5.7	(5.8) – 6.5	(6.5) – 7.1	(7.1) – 7.9	1.25	3.0	G 1/4 – DN 6 *	42
10	160	(4.4) – 4.8	(5.5) – 6.1	(6.2) – 6.9	(6.8) – 7.6	(7.6) – 8.4	1.25	3.0	G 1/4 – DN 6 *	42
10	120	(4.7) – 5.2	(5.9) – 6.6	(6.7) – 7.5	(7.4) – 8.2	(8.2) – 9.1	1.25	3.0	G 1/4 – DN 6 *	42
10	90	(5.0) – 5.6	(6.2) – 6.9	(7.1) – 7.9	(7.8) – 8.7	(8.7) – 9.7	1.25	3.0	G 1/4 – DN 6 *	42
13	260	(7.7) – 8.5	(9.6) – 10.7	(10.9) – 12.1	(12.0) – 13.3	(13.3) – 14.8	1.96	3.0	G 1/4 – DN 6 *	42
13	240	(7.9) – 8.8	(9.9) – 11.2	(11.2) – 12.5	(12.4) – 13.7	(13.7) – 15.3	1.96	3.0	G 1/4 – DN 6 *	42
13	190	(8.5) – 9.4	(10.6) – 11.8	(12.0) – 13.4	(13.3) – 14.7	(14.7) – 16.4	1.96	3.0	G 1/4 – DN 6 *	42
13	160	(8.8) – 9.8	(11.0) – 12.3	(12.5) – 13.9	(13.8) – 15.3	(15.3) – 17.0	1.96	3.0	G 1/4 – DN 6 *	42
13	120	(9.3) – 10.3	(11.6) – 12.9	(13.2) – 14.7	(14.5) – 16.1	(16.1) – 17.9	1.96	3.0	G 1/4 – DN 6 *	42
13	90	(9.9) – 10.7	(12.0) – 13.4	(13.7) – 15.2	(15.0) – 16.7	(16.7) – 18.6	1.96	3.0	G 1/4 – DN 6 *	42
15	260	(9.9) – 11.0	(12.4) – 13.7	(14.0) – 15.6	(15.5) – 17.2	(17.2) – 19.1	2.83	3.0	G 1/4 – DN 6 *	46
15	240	(10.2) – 11.4	(12.8) – 14.2	(14.6) – 16.2	(16.0) – 17.8	(17.8) – 19.8	2.83	3.0	G 1/4 – DN 6 *	46
15	190	(11.2) – 12.4	(14.0) – 15.5	(15.9) – 17.7	(17.5) – 19.4	(19.4) – 21.6	2.83	3.0	G 1/4 – DN 6 *	46
15	160	(11.7) – 13.0	(14.7) – 16.3	(16.7) – 18.5	(18.4) – 20.4	(20.4) – 22.7	2.83	3.0	G 1/4 – DN 6 *	46
15	120	(12.5) – 13.9	(15.6) – 17.3	(17.7) – 19.7	(19.5) – 21.7	(21.7) – 24.1	2.83	3.0	G 1/4 – DN 6 *	46
15	90	(13.0) – 14.5	(16.3) – 18.1	(18.5) – 20.6	(20.4) – 22.7	(22.7) – 25.2	2.83	3.0	G 1/4 – DN 6 *	46
17	190	(16.0) – 17.7	(20.2) – 22.2	(22.7) – 25.2	(25.0) – 27.8	(27.8) – 30.8	3.78	3.0	G 1/4 – DN 6 *	46
17	160	(16.6) – 18.5	(20.8) – 23.1	(23.6) – 26.3	(26.0) – 28.9	(28.9) – 32.1	3.78	3.0	G 1/4 – DN 6 *	46
17	120	(17.5) – 19.5	(21.9) – 24.3	(24.9) – 27.6	(27.4) – 30.4	(30.4) – 33.8	3.78	3.0	G 1/4 – DN 6 *	46
17	90	(18.2) – 20.2	(22.7) – 25.2	(25.8) – 28.7	(28.4) – 31.6	(31.6) – 35.1	3.78	3.0	G 1/4 – DN 6 *	46
19	160	(22.4) – 24.9	(28.0) – 31.1	(31.8) – 35.4	(35.0) – 38.9	(38.9) – 43.2	4.64	3.0	G 1/4 – DN 6 *	46
19	120	(23.1) – 25.7	(28.9) – 32.1	(32.8) – 36.5	(36.1) – 40.1	(40.1) – 44.6	4.64	3.0	G 1/4 – DN 6 *	46
19	90	(23.6) – 26.3	(29.6) – 32.8	(33.6) – 37.3	(37.0) – 41.1	(41.1) – 45.6	4.64	3.0	G 1/4 – DN 6 *	46
22	120	(30.7) – 34.2	(38.4) – 42.7	(43.7) – 48.5	(48.0) – 53.4	(53.4) – 59.3	6.28	3.0	G 1/4 – DN 10	52
22	90	(32.1) – 35.7	(40.1) – 44.6	(45.6) – 50.7	(50.2) – 55.7	(55.7) – 61.9	6.28	3.0	G 1/4 – DN 10	52
22	64	(33.3) – 37.0	(41.6) – 46.2	(47.3) – 52.5	(52.0) – 57.8	(57.8) – 64.2	6.28	3.0	G 1/4 – DN 10	52
30	64	(60.1) – 66.8	(75.2) – 83.6	(85.5) – 95.0	(94.0) – 104.5	(104.5) – 116.1	11.31	3.0	G 1/4 – DN 10	52
30	51	(61.4) – 68.3	(76.8) – 85.3	(87.3) – 97.0	(96.0) – 106.7	(106.7) – 118.6	11.31	3.0	G 1/4 – DN 10	52

* Double ball valve with female thread

Other performance variants and materials on request.

2.3 Hydraulic Diaphragm Metering Pumps

Technical data for Evolution E2Sa single-head pump 60 Hz

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min					Theor. stroke volume	Suction lift	Connection on suction/discharge side	Shipping weight
		113 l/h	136 l/h	170 l/h	193 l/h	213 l/h				
mm	bar						ml/stroke	m WC	G-DN	kg
10	260	(3.5) – 3.9	(4.2) – 4.7	(5.2) – 5.8	(6.0) – 6.6	(6.6) – 7.3	1.25	3.0	G 1/4 – DN 6 *	42
10	240	(3.7) – 4.1	(4.4) – 4.9	(5.5) – 6.1	(6.3) – 7.0	(6.9) – 7.7	1.25	3.0	G 1/4 – DN 6 *	42
10	190	(4.1) – 4.6	(5.0) – 5.5	(6.2) – 6.9	(7.1) – 7.9	(7.8) – 8.7	1.25	3.0	G 1/4 – DN 6 *	42
10	160	(4.4) – 4.9	(5.3) – 5.9	(6.6) – 7.4	(7.5) – 8.4	(8.3) – 9.2	1.25	3.0	G 1/4 – DN 6 *	42
10	120	(4.8) – 5.3	(5.7) – 6.4	(7.2) – 8.0	(8.2) – 9.1	(9.0) – 10.0	1.25	3.0	G 1/4 – DN 6 *	42
10	90	(5.1) – 5.6	(6.1) – 6.7	(7.6) – 8.4	(8.6) – 9.6	(9.5) – 10.6	1.25	3.0	G 1/4 – DN 6 *	42
13	260	(7.8) – 8.6	(9.3) – 10.4	(11.7) – 13.0	(13.2) – 14.7	(14.6) – 16.2	1.96	3.0	G 1/4 – DN 6 *	42
13	240	(8.0) – 8.9	(9.6) – 10.7	(12.0) – 13.3	(13.6) – 15.2	(15.0) – 16.7	1.96	3.0	G 1/4 – DN 6 *	42
13	190	(8.6) – 9.5	(10.3) – 11.4	(12.9) – 14.3	(14.6) – 16.3	(16.1) – 17.9	1.96	3.0	G 1/4 – DN 6 *	42
13	160	(8.9) – 9.9	(10.7) – 11.9	(13.4) – 14.9	(15.2) – 16.9	(16.8) – 18.6	1.96	3.0	G 1/4 – DN 6 *	42
13	120	(9.4) – 10.4	(11.3) – 12.5	(14.4) – 15.7	(16.0) – 17.8	(17.6) – 19.6	1.96	3.0	G 1/4 – DN 6 *	42
13	90	(9.7) – 10.8	(11.7) – 13.0	(14.6) – 16.2	(16.6) – 18.5	(18.3) – 20.3	1.96	3.0	G 1/4 – DN 6 *	42
15	260	(10.0) – 11.1	(12.0) – 13.3	(15.0) – 16.7	(17.1) – 19.0	(18.8) – 20.9	2.83	3.0	G 1/4 – DN 6 *	46
15	240	(10.4) – 11.5	(12.4) – 13.8	(15.6) – 17.3	(17.7) – 19.7	(19.5) – 21.6	2.83	3.0	G 1/4 – DN 6 *	46
15	190	(11.3) – 12.6	(13.6) – 15.1	(17.0) – 18.9	(19.3) – 21.5	(21.2) – 23.6	2.83	3.0	G 1/4 – DN 6 *	46
15	160	(11.9) – 13.2	(14.3) – 15.8	(17.8) – 19.8	(20.3) – 22.5	(22.3) – 24.8	2.83	3.0	G 1/4 – DN 6 *	46
15	120	(12.6) – 14.0	(15.2) – 16.8	(19.0) – 21.1	(21.5) – 23.9	(23.7) – 26.3	2.83	3.0	G 1/4 – DN 6 *	46
15	90	(13.2) – 14.7	(15.8) – 17.6	(19.8) – 22.0	(22.5) – 25.0	(24.8) – 27.5	2.83	3.0	G 1/4 – DN 6 *	46
17	190	(16.2) – 18.0	(19.4) – 21.6	(24.3) – 27.0	(27.6) – 30.6	(30.3) – 33.7	3.78	3.0	G 1/4 – DN 6 *	46
17	160	(16.8) – 18.7	(20.4) – 22.4	(25.3) – 28.1	(28.7) – 31.9	(31.6) – 35.1	3.78	3.0	G 1/4 – DN 6 *	46
17	120	(17.7) – 19.7	(21.3) – 23.6	(26.6) – 29.5	(30.2) – 33.6	(33.2) – 36.9	3.78	3.0	G 1/4 – DN 6 *	46
17	90	(18.4) – 20.4	(22.1) – 24.5	(27.6) – 30.7	(31.4) – 34.8	(34.5) – 38.3	3.78	3.0	G 1/4 – DN 6 *	46
19	160	(22.7) – 25.2	(27.2) – 30.2	(34.0) – 37.8	(38.7) – 43.0	(42.5) – 47.3	4.64	3.0	G 1/4 – DN 6 *	46
19	120	(23.4) – 26.0	(28.1) – 31.2	(35.1) – 39.0	(39.9) – 44.3	(43.9) – 48.7	4.64	3.0	G 1/4 – DN 6 *	46
19	90	(23.9) – 26.6	(28.7) – 31.9	(35.9) – 39.9	(40.8) – 45.3	(44.9) – 49.9	4.64	3.0	G 1/4 – DN 6 *	46
22	120	(31.1) – 34.6	(37.3) – 41.5	(46.7) – 51.9	(53.0) – 58.9	(58.4) – 64.8	6.28	3.0	G 1/4 – DN 10	52
22	90	(32.5) – 36.1	(39.0) – 43.3	(48.7) – 54.1	(55.4) – 61.5	(60.9) – 67.7	6.28	3.0	G 1/4 – DN 10	52
22	64	(33.7) – 37.4	(40.4) – 44.9	(50.5) – 56.1	(57.4) – 63.8	(63.1) – 70.2	6.28	3.0	G 1/4 – DN 10	52
30	64	(60.9) – 67.6	(73.0) – 81.2	(91.3) – 101.5	(103.8) – 115.3	(114.2) – 126.9	11.31	3.0	G 1/4 – DN 10	52
30	51	(62.2) – 69.1	(74.6) – 82.9	(93.3) – 103.6	(106.0) – 117.8	(116.6) – 129.6	11.31	3.0	G 1/4 – DN 10	52

* Double ball valve with female thread

Other performance variants and materials on request.

Wetted materials for Evolution E2Sa

Identity code of material	Dosing head	Diaphragm/diaphragm mounting screw	Connection on suction/discharge side	Seals	Valve seats	Valve balls up to DN 10
S2	Stainless steel 1.4404	PTFE / stainless steel 1.4462	Stainless steel 1.4404	stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic

Motor data for EVOLUTION E2Sa single-head pump

Identity code specification		Power supply			Remarks
S	3-phase, IP 55	230 V/400 V	50 Hz	0.75 kW	With PTC, speed control range 1:5
T	3-phase, IP 55	230 V/400 V 265 V/460 V	50 Hz 60 Hz	0.75 kW	
L	3-phase, IP 55, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	0.75 kW	With PTC, speed control range 1:5
Q	3-phase, IP 55, II 2G Ex de IIC T4	265 V/460 V	60 Hz	0.75 kW	With PTC, speed control range 1:5
V	3-phase, IP 55	230 V	50 Hz	0.75 kW	Variable speed motor with integrated frequency converter

Identity code ordering system for Evolution E2Sa

E2Sa	Drive type										
	V	Simplex (vertical)									
	X	Drive (without liquid end)									
		Plungers									
		010	Plunger 10 mm								
		013	Plunger 13 mm								
		015	Piston 15 mm								
		017	Piston 17 mm								
		019	Piston 19 mm								
		022	Plunger 22 mm								
		030	Plunger 30 mm								
			stroke rate								
			93	93 strokes/min.; 50 Hz							
			112	112 strokes/min.; 50 Hz							
			140	140 strokes/min.; 50 Hz							
			159	159 strokes/min.; 50 Hz							
			175	175 strokes/min.; 50 Hz							
			194	194 strokes/min.; 50 Hz							
			113	113 strokes/min.; 60 Hz							
			136	136 strokes/min.; 60 Hz							
			170	170 strokes/min.; 60 Hz							
			193	193 strokes/min.; 60 Hz							
			213	213 strokes/min.; 60 Hz							
				Pressure rating							
				A	260 bar						
				B	240 bar						
				C	190 bar						
				D	160 bar						
				E	120 bar						
				F	90 bar						
				G	64 bar						
				H	51 bar						
				I	30 bar						
				X	Drive (without liquid end)						
					Material						
					S2	Standard stainless steel; stainless steel - DIN EN					
					S3	Standard stainless steel; stainless steel - AISI					
					XX	Drive (without liquid end)					
						Valve design					
						0	Standard				
						4	Ball valve				
						6	Double ball valve				
						X	Drive (without liquid end)				
							Diaphragm monitor				
							1	Without diaphragm monitoring			
							2	Visual indication			
							3	Contact pressure gauge			
							4	Electric pressure switch			
							X	Drive (without liquid end)			
								Hydraulic connector			
								0	Standard		
								E	DIN flange		
								F	Flange ANSI		
								N	NPT connection		
								X	Drive (without liquid end)		
									Electrical Connection		
									S	3-phase 230/400 V, 50 Hz, 0.75 kW	
									T	3-phase, 230/400 V, 50/60 Hz, 0.75 kW with PTC	
									L	3-phase, 230/400 V, 50 Hz, 0.75 kW, (Exde) T4	
									Q	3-phase, 265/460 V, 60 Hz, 0.75 kW, (Exde) T4	
									V	Controllable motor with integrated frequency converter, 1-phase, 230 V, 50 Hz, 0.75 kW	
									1	Without motor, with flange 160/71	
									2	Without motor, with flange 200/80	
									3	Without motor, with NEMA 56/143 flange	
									4	Without motor, with 160/71 ATEX flange	
									5	Without motor, with 200/80 ATEX flange	
									6	Without motor, with NEMA 56/143 ATEX flange	
									X	Without motor, without flange	
										Stroke length adjustment	
										0	Stroke length adjustment standard
										A	Stroke control motor 0-20 mA; 230 V
										B	Stroke control motor 4-20 mA; 230 V
										C	Stroke control motor 0-20 mA; 115 V
										D	Stroke control motor 4-20 mA; 115 V

2.3 Hydraulic Diaphragm Metering Pumps

E	EXd stroke control motor 0-20 mA; 230 V
F	EXd stroke control motor 4-20 mA; 230 V
G	EXd stroke control motor 0-20 mA; 115 V
H	EXd stroke control motor 4-20 mA; 115 V

Temperature (ambient)

0	-20 °C ... +40 °C
1	-10 °C ... +50 °C

Paint

0P	C3 Standard textured paint - RAL 2003
1P	C3 Standard gloss paint - RAL 2003
2P	C4 Outdoor - RAL 2003
3P	C5 Offshore - RAL 2003
XX	Drive, unpainted with rust protection

Tests

S1	Standard performance test
S2	Performance test including 3.1 certificate
S3	As S1 + 3.1 certificate wetted material
S4	As S2 + 3.1 certificate wetted material
A1	API complete test including certificate
A2	As A1 + NPSH
A3	As A1 + NPIP
A4	As A1 + 3.1 material certificate
XX	Drive (without liquid end)

Approvals

0	CE
1	CE + ATEX
2	CE + EAC
3	CE + EAC + ATEX
4	CE + UKCA
5	CE + UKCA + ATEX
N	without approval
X	Drive (without liquid end)

Documentation

DE	German
EN	English
FR	French
ES	Spanish
RU	Russian
ZH	Chinese
XX	Power end (without liquid end)
M0	Modified

Measuring unit

0	bar, l/h
1	psi, gph
2	kPa, l/h
X	Drive (without liquid end)

Spare parts kits for ORLITA Evolution E2Sa

Scope of delivery:
1 spare diaphragm complete, 1 sealing set, 2 valve seats, 2 valve balls

Plunger Ø mm	Material	Suitable for identity code	Order no.
10, 13	S1	E2Sa.010....S1, E2Sa.013....S1	1125627
15, 17, 19	S1	E2Sa.015...S1, E2Sa.017...S1, E2Sa.019...S1	1125628
22, 30	S1	E2Sa.022....S1, E2Sa.030....S1	1125629

Metering diaphragm for maintenance assembly PTFE/1.4404 for Evolution E2Sa

Plunger Ø mm	Material	Suitable for identity code	Order no.
10, 13	S1	E2Sa.010....S1, E2Sa.013....S1	1129268
15, 17, 19	S1	E2Sa.015...S1, E2Sa.017...S1, E2Sa.019...S1	1129197
22, 30	S1	E2Sa.022....S1, E2Sa.030....S1	1129201

Standard oil for maintaining hydraulics and gearbox Evolution E2Sa

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

	Required quantity	Order no.
Mobilube 1SHC 75W-90 gear oil, 1 litre	2 l	1006010

2.3 Hydraulic Diaphragm Metering Pumps

2.3.6 Hydraulic Diaphragm Metering Pump ORLITA Evolution mikro

For the smallest quantities at high pressures

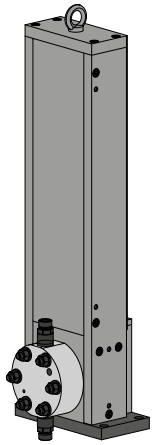
Capacity range 0.01 – 18 l/h, 250 – 10 bar

The ORLITA Evolution mikro is an innovative micro-metering pump for high pressures. The hydraulic diaphragm metering pump is the first of its kind with an electronically regulated linear direct power end. The power end has few mechanical functional elements and thus operates with virtually minimal maintenance.

With a capacity range of 0.01 - 18 l/h at pressures of up to 250 bar (400 bar design), the hydraulic diaphragm metering pump ORLITA Evolution mikro EMFa is ideally suited to ultra-precise micrometering in a very wide range of processes. Typical applications include metering additives in processes in the oil, gas and petrochemical industries as well as the chemical industry. It is also used in R&D and research for high-pressure laboratory use and pilot plants. Other typical applications include filling processes. The Evolution mikro variant with a metal diaphragm is also used in gas odourisation.

The ORLITA Evolution mikro is the first of its kind with an electronically regulated direct power end.

A metering usage range in a control ratio of 1:200 and the combination of individually independent metering profiles with 3-parameter control make optimum adaptation to the respective application possible.



Pump

Your Benefits

Maximum process reliability:

- Precise micro-metering even at high pressures
- Hermetically sealed by PTFE multi-layer safety diaphragm or metal diaphragm
- Long service life thanks to its sturdy construction with low-wear, contact-less power end
- High positioning accuracy guarantees reproducibility of better than ±1 %

Excellent flexibility:

- Greatly extended control range of up to 1:200
- Universally controllable with electronically integrated overload protection
- Individually process-dependent metering profiles combined with 3-parameter control are possible
- Space-saving, easy-to-fit solution

Technical Details

- Precise metering of 0.01 l/h up to a max. of 18 l/h at up to 250 bar (400 bar design)
- Stroke length: 0 - 60 mm
- Stroke rate: 0 - 200 strokes/min.
- Stroke length adjustment range of 0 - 100 %, stroke rate range of 0 – 100 %
- The metering reproducibility is better than ±1 % under defined conditions and with correct installation
- PTFE multi-layer safety diaphragm with integrated diaphragm rupture signalling system or metal diaphragm
- Large real volumetric flow control range: 1:200
- Materials in contact with fluids: Stainless steel 1.4404, special materials such as Hastelloy C, PVDF etc. available on request
- Universal control options - with 0-10 V / 4-20 mA analogue signal as standard - other variants, such as fieldbus or contact control, are possible
- Individual process-dependent metering profiles are possible
- Space-saving, easy-to-install solution
- Degree of protection IP 55
- Designs compliant with API 675 and ATEX

Field of Application

- Additive metering in the oil, gas, chemical and petrochemical industry
- General filling processes in industry
- Additive metering in the pharmaceutical and food industry
- Universal lab applications
- Gas metering applications

Technical data for ORLITA Evolution Mikro EMFa with aluminium housing

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min									Theor. stroke volume	Suction lift	Connection on suction/ discharge side	Shipping weight
		30	60	80	100	120	140	160	180	200				
mm	bar	l/h	l/h	l/h	l/h	l/h	l/h	l/h	l/h	l/h	ml/ stroke	m WC	G-DN	kg
3	250	0.3	0.6	0.8	1.0	1.1	1.3	1.5	1.7	1.9	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	160	0.4	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	100	0.5	1.0	1.3	1.6	1.9	2.2	2.6	2.9	3.2	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	80	0.5	1.0	1.3	1.6	1.9	2.2	2.6	2.9	3.2	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	64	0.5	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	40	0.5	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	25	0.6	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	10	0.6	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	0.42	1	1/4" NPTi - DN 3 - DKV	25
6	40	2.1	4.1	5.5	6.9	8.2	9.6	11.0	12.3	13.7	1.69	1	1/4" NPTi - DN 6 - DKV	25
6	25	2.7	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	1.69	1	1/4" NPTi - DN 6 - DKV	25
6	10	2.8	5.6	7.5	9.4	11.3	13.2	15.0	16.9	18.8	1.69	1	1/4" NPTi - DN 6 - DKV	25

Technical data for ORLITA Evolution Mikro EMFa with stainless steel housing

Plunger Ø	Max. pressure	Max. pump capacity in l/h at strokes/min									Theor. stroke volume	Suction lift	Connection on suction/ discharge side	Shipping weight
		30	60	80	100	120	140	160	180	200				
mm	bar	l/h	l/h	l/h	l/h	l/h	l/h	l/h	l/h	l/h	ml/ stroke	m WC	G-DN	kg
3	250	0.3	0.6	0.8	1.0	1.1	1.3	1.5	1.7	1.9	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	160	0.4	0.8	1.1	1.4	1.6	1.9	2.2	2.4	2.7	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	100	0.5	1.0	1.3	1.6	1.9	2.2	2.6	2.9	3.2	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	80	0.5	1.0	1.3	1.6	1.9	2.2	2.6	2.9	3.2	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	64	0.5	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	40	0.5	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	25	0.6	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	0.42	1	1/4" NPTi - DN 3 - DKV	25
3	10	0.6	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	0.42	1	1/4" NPTi - DN 3 - DKV	25
6	40	2.6	5.1	6.8	8.6	10.3	12.0	13.7	15.4	17.1	1.69	1	1/4" NPTi - DN 6 - DKV	25
6	25	2.7	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	1.69	1	1/4" NPTi - DN 6 - DKV	25
6	10	2.8	5.6	7.5	9.4	11.3	13.2	15.0	16.9	18.8	1.69	1	1/4" NPTi - DN 6 - DKV	25

Performance data applies at ambient temperature of 40 °C, 50 °C and 55 °C and at 24 and 72 V DC. Performance data for ambient temperature of 60 °C is available on request.

Performance data for ambient temperature of 60°C is available on request.

Performance data for 320, 400 bar (piston diameter 3 mm) and for 64 bar (piston diameter 6 mm) is available on request.

Performance data for metal diaphragm variant is available on request.

Housing unpainted.

Wetted materials for ORLITA Evolution mikro EMFa

Dosing head	Diaphragm retaining screw	Diaphragm
Stainless steel 1.4404	Stainless steel 1.4462	PTFE multi-layer diaphragm

Identity code of material	Connection on suction/discharge side	Valve/head seal	Valve balls	Valve seats	Valve housing
DN 3 (double ball)	Stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic	Stainless steel 1.4404	Stainless steel 1.4404
DN 6 (double ball)	Stainless steel 1.4404	Stainless steel 1.4404	Al_2O_3 ceramic	Stainless steel 1.4404	Stainless steel 1.4404

Scope of delivery

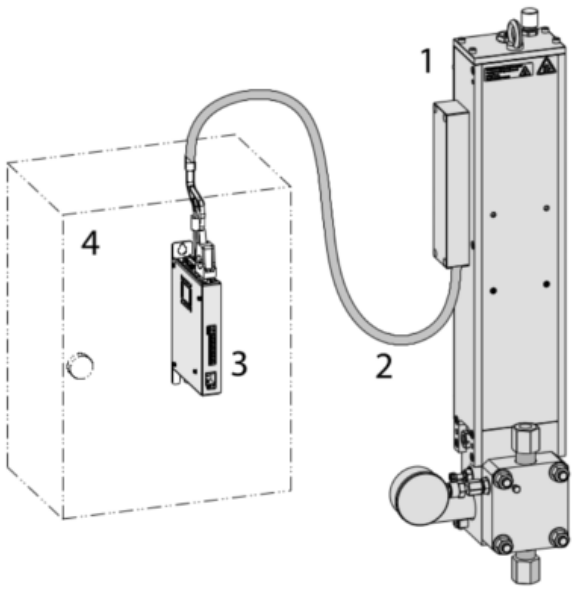
- Pump
- 2 m cable
- Drive Control

1: Pump ORLITA Evolution mikro

2: Universal cable 2 m (other lengths as options)

3: Drive Control

(4: Control cabinet provided by customer, not included in scope of delivery)



Identity code ordering system for the ORLITA Evolution mikro EMFa

EMFa	Drive type															
	V	Simplex (vertical)														
	P	Replacement pump without cable and control														
		Plungers														
		003	Plunger 3 mm													
		006	Plunger 6 mm													
			stroke rate													
			030	30 strokes / min.												
			060	60 strokes / min.												
			080	80 strokes / min.												
			100	100 strokes / min.												
			120	120 strokes / min.												
			140	140 strokes / min.												
			160	160 strokes / min.												
			180	180 strokes / min.												
			200	200 strokes / min.												
				Pressure rating												
				A	10 bar											
				D	25 bar											
				E	40 bar											
				H	64 bar											
				J	80 bar											
				K	100 bar											
				N	160 bar											
				P	250 bar											
					Material											
					S2	Standard stainless steel; 1.4404										
						Valve design										
						0	Standard									
							Diaphragm monitor									
							1	None								
							2	Visual indication								
							3	Contact pressure gauge								
							4	Electric pressure switch								
								Hydraulic connector								
								0	Standard							
									Electrical Connection							
									G	Standard linear motor with 2 m cable, 24 V DC						
									H	Standard linear motor with 4 m cable, 24 V DC						
									J	Standard linear motor without cable, 24 V DC						
									K	ATEX linear motor with 2 m cable, 24 V DC						
									L	ATEX linear motor with 4 m cable, 24 V DC						
									M	ATEX linear motor without cable, 24 V DC						
									A	Standard linear motor with 2 m cable, 72 V DC						
									B	Standard linear motor with 4 m cable, 72 V DC						
									C	Standard linear motor without cable, 72 V DC						
									D	ATEX linear motor with 2 m cable, 72 V DC						
									E	ATEX linear motor with 4 m cable, 72 V DC						
									F	ATEX linear motor without cable, 72 V DC						
										Control Variants						
										2	Analogue - 1 parameter (stroke rate, control range 1:200)					
										P	Replacement pump without cable and control					
											Ambient temperature					
											0	-20 °C … +40 °C				
											3	-10 °C … +55 °C				
											4	0 °C … +55 °C				
												Paintwork / pump housing				
												0A	Unpainted - aluminium			
												0S	Unpainted - stainless steel			
												2S	C5 outdoor RAL 2003 - stainless steel			
													Tests			
													S1	Standard performance test		
													S2	Standard performance test including 3.1 certificate		
													S3	As S1 + 3.1 certificate wetted material		
													S4	As S2 + 3.1 certificate wetted material		
													A1	API test complete including 3.1 certificate		
													A4	As A1 + 3.1 certificate wetted material		
														Approvals		
														0	CE	
														1	CE + ATEX	
															Documentation	
															DE	German
															EN	English
															FR	French

2.3 Hydraulic Diaphragm Metering Pumps

| | | |

Maintenance parts for ORLITA Evolution mikro

The maintenance parts generally include the wear parts for liquid ends and/or power ends.

Maintenance kits for ORLITA Evolution mikro EMFa

Scope of delivery

1 spare diaphragm assembly, 4 valve balls, 2 valve seats, sealing set

Plunger Ø mm	Material	Suitable for identity code	Order no.
3	S2	EMFaV003....S2, EMFaP003....S2	1128659
6	S2	EMFaV006....S2, EMFaP006....S2	1128660

Metering diaphragms for maintenance assembly for ORLITA Evolution mikro EMFa

Plunger Ø mm	Material	Suitable for identity code	Order no.
3	S2	EMFaV003....S2, EMFaP003....S2	1128661
6	S2	EMFaV006....S2, EMFaP006....S2	1128662

Maintenance parts for ORLITA Evolution mikro EMFa

2 items required in each case

Plunger Ø mm	Material		Remark	Order no.
3	S2	Double ball valve complete DN 3	-	1035931
6	S2	Double ball valve complete DN 6	-	1038943
3, 6	S2	Bearing for linear motor	only with ATEX	1113156

Standard oil for maintaining hydraulics and gearbox Evolution mikro

	Required quantity	Order no.
Shell Tellus S2V32 hydraulic oil, 1 litre	50 ml	1050416

Accessories for ORLITA Evolution mikro

Converter cable for service, analysis functions and software adaptations.

	Order no.
USB-RS232 converter cable for control C1100, C1150	1115604

2.3 Hydraulic Diaphragm Metering Pumps

2.3.7 Hydraulic Diaphragm Metering Pump ORLITA MF

Reliable capacity even at high-pressure

Capacity range of single-head pump: 0 – 9200 l/h, 400 – 30 bar

The hydraulic diaphragm metering pump ORLITA MF offers reliable dosing rates even under high pressure and has a modular construction, making it highly versatile. Thanks to its modular design, this pump is tailored to meet your requirements even at very high pump capacities.



ORLITA MFS 35/30



ORLITA MFS 600b/81



ORLITA MFS 1400/46

ORLITA MF hydraulic diaphragm metering pumps (MFS 35 to MFS 1400) with a stroke length of 20 to 60 mm provide a capacity ranging from 0 to 9200 l/h at 400 – 30 bar. A wide range of power end versions is available, including some for use in Zone 1 or Zone 2 areas at risk from explosion with ATEX certification. The ORLITA MF product range is designed to comply with API 675. Its modular construction permits the free combination of drives, power ends and dosing heads, producing a pump for a range of different feed rates and media operating at different working pressures.

Your Benefits

Excellent process safety and reliability:

- PTFE double diaphragm with integrated diaphragm rupture warning system ensures precise and low-wear operation despite high pressures
- The product chamber is hermetically separated from the hydraulic part
- Integrated hydraulic relief valve and automatic bleed valve for the hydraulic chamber
- Wear-free, valveless enforced anti-cavitation of the hydraulic leakage guarantees optimum dosing precision
- Cone valves for use as suction and/or discharge valves with minimal wear, good self-cleaning and low pressure loss (NPSHR)

Excellent flexibility:

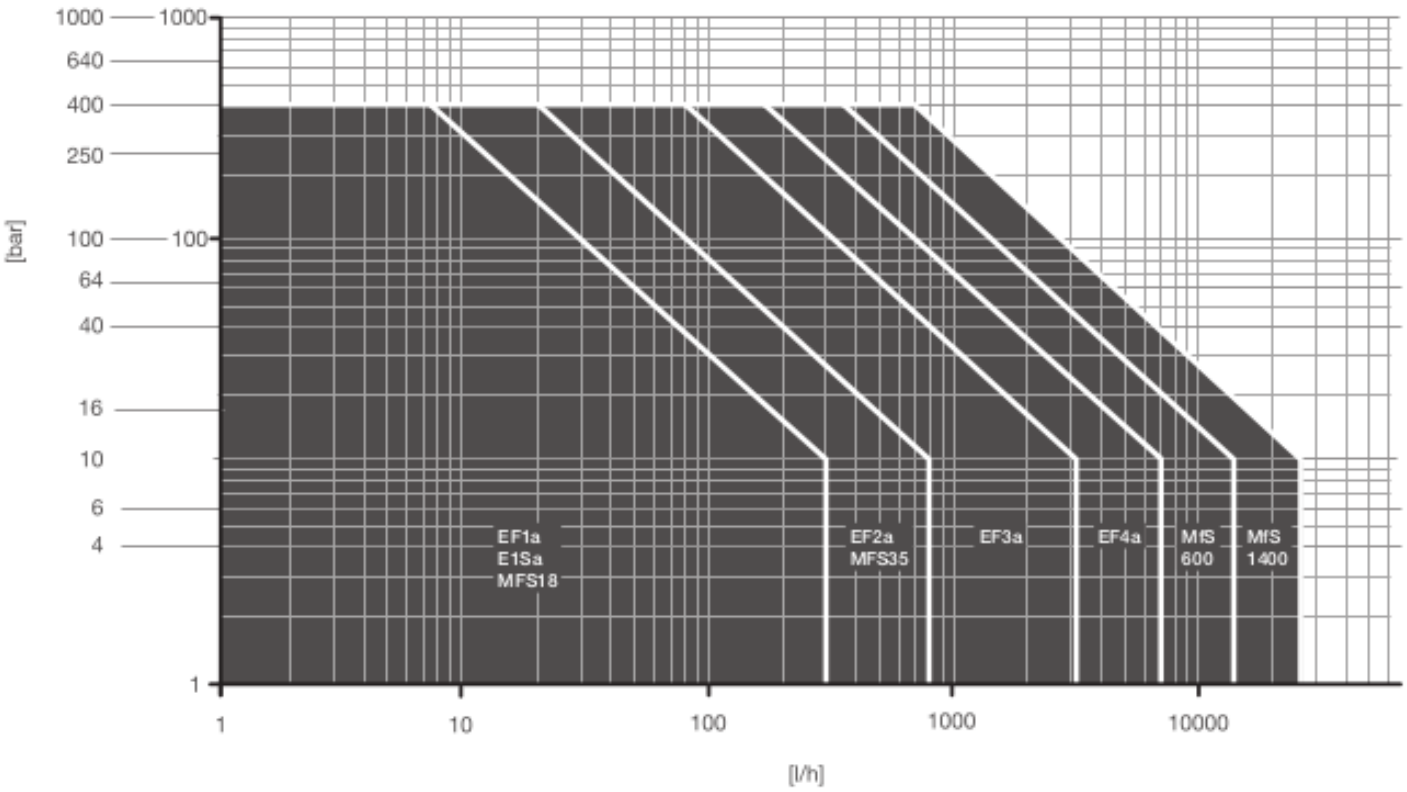
- The modular construction allows a wide range of uses. In multiple pump systems it is possible to combine up to 6 metering units, even with different pump capacities. In single pumps the drive arrangement may be either vertical or horizontal.
- 10 different gear ratios are available
- Temperature range -40 to +150 °C
- Customised designs are available on request

Technical Details

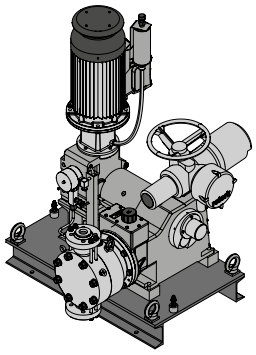
- MfS 35 (MF2a) – stroke length: 0-20 mm, rod force: 3500 N
- MfS 600 (MF5b) – stroke length: 0-40 mm, rod force: 40000 N
- MfS 1400 (MF6a) – stroke length: 0-60 mm, rod force: 60000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- Stroke length adjustment: manually using manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- The dosing precision is better than ± 1 % within the 10 – 100 % stroke length range under defined conditions and with correct installation (API 675).
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning / signalling system via a contact
- Integrated hydraulic relief and vent valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 40 °C to + 150 °C
- Suction lift up to 8 m
- Design in compliance with API 675 among others

Field of Application

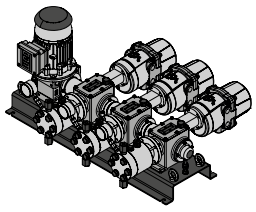
- Oil/ gas production (onshore/offshore)
- Refineries
- Chemical/Petrochemical industry
- Pharmaceuticals & cosmetics
- Food production



Pressure [bar] depending on the metering volume [l/h] at 50 Hz



Orlita MFS with stroke length controller



ORLITA MFS 35/12-12-12 with control drives

Actuation of ORLITA MF, MH, PS, DR

Control drive consisting of an actuator with servo motor and integral servo controller for stroke length adjustment via a standard signal. Standard current input 0/4 – 20 mA, corresponds to stroke length 0 – 100 %, mechanical position display of actual stroke length value output 0/4 – 20 mA for remote display. Control drives can also sometimes be designed with bus systems, like HART, PROFIBUS®, Fieldbus Foundation ...

Variable speed motors with integrated frequency converter

Power supply 1-phase 230 V, 50/60 Hz (up to 3 kW). Externally controllable with 0/4 - 20 mA.

The following functions are integrated in the terminal box cover:

- Start/stop switch
- Switch-over for manual/external operation
- Potentiometer for speed control in manual mode

2.3 Hydraulic Diaphragm Metering Pumps

Technical data for ORLITA MFS 35 single head pump 50 Hz

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min							Max. pressure	Efficiency		Nominal diameter
		36	58	73	91	112	145	207				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
7	0.77	1.7	2.7	3.3	4.2	5.2	6.7	9.6	400	0.50	0.70	DN 3
8	1.01	2.2	3.5	4.4	5.5	6.7	8.7	12.5	400	0.50	0.70	DN 3
10	1.57	3.4	5.5	6.8	8.5	10.5	13.7	19.5	400	0.50	0.70	DN 6
11	1.90	4.1	6.6	8.3	10.3	12.7	16.5	23.6	368	0.65	0.75	DN 6
12	2.26	4.9	7.9	9.8	12.3	15.1	19.7	28.1	309	0.79	0.85	DN 6
14	3.08	6.7	10.7	13.4	16.7	20.6	26.8	38.3	227	0.81	0.85	DN 6
16	4.02	8.7	14.0	17.5	21.9	26.9	35.0	50.0	174	0.83	0.86	DN 6
20	6.28	13.7	21.9	27.3	34.2	42.0	54.7	78.1	111	0.86	0.88	DN 6
22	7.60	16.5	26.5	33.1	41.3	50.9	66.1	94.5	92	0.86	0.88	DN 10
25	9.82	21.4	34.2	42.7	53.4	65.7	85.4	122.0	71	0.87	0.88	DN 10
27	11.45	24.9	39.8	49.8	62.3	76.6	99.6	142.3	61	0.87	0.88	DN 10
30	14.14	30.7	49.2	61.5	76.9	94.6	123.0	175.7	50	0.88	0.89	DN 10
36	20.36	44.3	70.8	88.6	110.7	136.2	177.1	253.0	34	0.88	0.89	DN 16
40	25.13	54.7	87.5	109.3	136.7	168.2	218.7	312.4	28	0.89	0.89	DN 16
44	30.41	66.1	105.8	132.3	165.4	203.5	264.6	378.0	23	0.89	0.89	DN 16
50	39.27	85.4	136.7	170.8	213.5	262.8	341.6	488.1	18	0.89	0.89	DN 16
60	56.55	123.0	196.8	246.0	307.5	378.4	492.0	702.8	12	0.89	0.90	DN 25
65	66.37	144.3	231.0	288.7	360.9	444.1	577.4	824.8	11	0.89	0.90	DN 25

Valve type: Ball or double ball valve up to DN 6, conical valve as of DN 10

Technical data for ORLITA MFS 600 single head pump 50 Hz

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min							Max. pressure	Efficiency		Nominal diameter
		65	76	88	105	139	166	192				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
33	34.21	133	157	180	215	286	342	395	400	0.76	0.83	DN 16
36	40.72	158	187	214	256	340	407	470	393	0.76	0.83	DN 16
37	43.01	167	197	226	270	359	430	496	372	0.77	0.83	DN 16
38	45.36	176	208	238	285	379	453	523	353	0.78	0.83	DN 16
40	50.27	195	231	264	316	420	502	580	318	0.78	0.84	DN 25
44	60.82	237	279	320	382	508	608	702	263	0.80	0.85	DN 25
46	66.48	259	305	349	418	556	664	767	241	0.81	0.85	DN 25
50	78.54	305	360	413	493	656	784	906	204	0.83	0.86	DN 25
55	95.03	370	436	499	597	794	949	1,097	168	0.84	0.87	DN 32
60	113.10	440	519	594	710	945	1,130	1,305	141	0.84	0.87	DN 32
65	132.73	516	609	697	834	1,109	1,326	1,532	121	0.85	0.87	DN 32
70	153.94	599	706	809	967	1,287	1,538	1,776	104	0.86	0.88	DN 40
75	176.71	687	811	928	1,110	1,477	1,765	2,039	91	0.86	0.88	DN 40
80	201.06	782	923	1,056	1,263	1,680	2,008	2,320	80	0.87	0.88	DN 40
90	254.47	990	1,168	1,337	1,598	2,127	2,542	2,936	63	0.87	0.88	DN 40
100	314.16	1,222	1,442	1,650	1,973	2,626	3,138		51	0.88	0.89	DN 50
115	415.48	1,616	1,906	2,183	2,610	3,472	4,150		39	0.88	0.89	DN 65
125	490.87	1,909	2,252	2,579	3,083	4,102	4,903		33	0.89	0.89	DN 65
130	530.93	2,065	2,436	2,789	3,335	4,437	5,303		30	0.89	0.89	DN 65
135	572.56	2,227	2,627	3,008	3,597	4,785	5,719		28	0.89	0.89	DN 65
142	633.47	2,464	2,907	3,328	3,979	5,294	6,327		25	0.89	0.89	DN 65

Valve type: Ball or plate valve available

Note

All performance data applies to 50 Hz. If a 60 Hz motor is used, the performance will be correspondingly higher.

Abridged presentation of our complete product range. Other types on request.

Technical data for ORLITA MFS 1400 single head pump 50 Hz

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min							Max. pressure	Efficiency		Nominal diameter
		66	76	86	100	134	166	191				
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	At 100 % pressure	At 50 % pressure	
42	83.13	329	380	430	498	670	830	953	433	0.76	0.83	DN 25
44	91.23	361	417	472	547	736	911	1,046	395	0.76	0.83	DN 25
46	99.71	394	456	516	598	804	996	1,143	361	0.76	0.83	DN 25
48	108.57	429	496	562	651	875	1,084	1,245	332	0.78	0.83	DN 25
50	117.81	465.9	538.3	610.1	706.4	949.9	1,167.7	1,350.4	306	0.79	0.84	DN 25
53	132.37	523	605	685	794	1,067	1,322	1,517	272	0.79	0.84	DN 32
57	153.11	605	700	793	918	1,234	1,529	1,755	235	0.81	0.84	DN 32
58	158.52	627	724	821	950	1,278	1,583	1,817	227	0.84	0.85	DN 32
60	169.65	671	775	879	1,017	1,368	1,695	1,945	212	0.82	0.86	DN 32
70	230.91	913	1,055	1,196	1,384	1,862	2,306	2,647	156	0.83	0.87	DN 40
75	265.07	1,048	1,211	1,373	1,589	2,137	2,648	3,038	136	0.84	0.87	DN 40
80	301.59	1,193	1,378	1,562	1,808	2,432	3,012	3,457	119	0.84	0.87	DN 40
85	340.47	1,346	1,556	1,763	2,041	2,745	3,401	3,903	106	0.85	0.87	DN 50
90	381.70	1,509	1,744	1,977	2,289	3,078	3,813	4,375	94	0.88	0.88	DN 50
100	471.24	1,863.5	2,153.2	2,440.3	2,825.5	3,799.6	4,707.0		76	0.86	0.87	DN 65
108	549.65	2,173.6	2,511.5	2,846.4	3,295.6	4,431.9	5,490.2		65	0.88	0.89	DN 65
115	623.21	2,464.5	2,847.7	3,227.4	3,736.7	5,025.0	6,225.0		58	0.88	0.89	DN 65
120	678.58	2,683	3,101	3,514	4,069	5,471	6,778		53	0.88	0.89	DN 80
125	736.31	2,912	3,364	3,813	4,415	5,937	7,355		49	0.88	0.89	DN 80
140	923.63	3,653	4,220	4,783	5,538	7,447	9,226		39	0.89	0.89	DN 80

Valve type: Ball or double ball valve up to DN 6, conical valve as of DN 10

Note

All performance data applies to 50 Hz. If a 60 Hz motor is used, the performance will be correspondingly higher.

Abridged presentation of our complete product range. Other types on request.

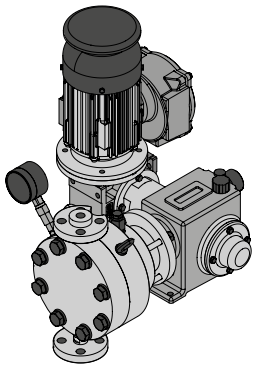
2.3 Hydraulic Diaphragm Metering Pumps

2.3.8 Hydraulic Diaphragm Metering Pumps with Metal Diaphragm ORLITA MH

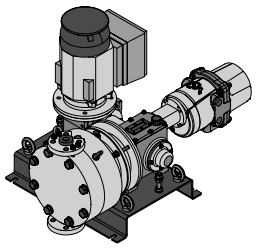
Reliable capacity even at very high-pressure

Capacity range of single pump: up to 320 l/h, up to 900 bar

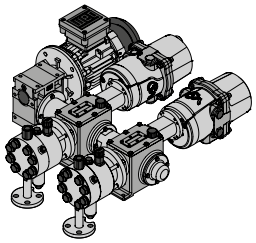
The diaphragm metering pump ORLITA MH has a robust metal diaphragm. This permits precise pump capacities even at very high pressure. The ORLITA MH has a modular construction and is therefore very versatile. For example, a range of drive versions is available and drives and dosing heads can be freely combined.



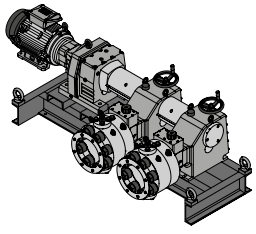
ORLITA MHS 18-20



ORLITA MHS 35/45



ORLITA MHS 35-8-8



ORLITA MHS 600-28-28

ORLITA MH hydraulic diaphragm metering pumps (MHS 18 to MHS 600) with a stroke length of 15 to 40 mm provide a capacity range of up to 320 l/h at pressures of up to 780 bar. A wide range of power end versions is available, including some for use in areas at risk from explosion with ATEX certification. The ORLITA MH product range is designed to comply with API 675. Its modular construction permits the free combination of drives, power ends and dosing heads, producing a pump for a range of different feed rates and media operating at different working pressures.

Your Benefits

Excellent process reliability:

- Metal double diaphragm with integrated diaphragm rupture warning /signalling system ensures precise and low-wear operation even at very high pressure
- The product chamber is hermetically separated from the hydraulic part
- Integrated hydraulic relief valve and automatic vent valve for the hydraulic chamber
- Wear-free, valveless enforced anti-cavitation of the hydraulic leakage guarantees optimum dosing precision
- Cone valves for use as suction and/or discharge valves with minimal wear, good self-cleaning and low pressure loss (NPSHR)

Excellent flexibility:

- It is possible to combine up to 6 metering units, even with different pump capacities, in multiple pump systems
- The modular construction ensures a wide range of uses
- 6 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Temperature range -40 °C to +200 °C
- Customised designs are available on request

Technical Details

- MHS 18 – stroke length: 0-15 mm, rod force: 1800 N
- MHS 35 – stroke length: 0-20 mm, rod force: 3500 N
- MHS 600 – stroke length: 0-40 mm, rod force: 40000 N
- Stroke length adjustment range: 0 – 100% in operation and idle.
- Stroke length adjustment: manually using manual adjustment wheel and scaled display (optionally with electric actuator or control drive).
- The dosing precision is better than ± 1 % within the 10 – 100 % stroke length range under defined conditions and with correct installation (API 675).
- Metal diaphragm with diaphragm rupture monitoring system
- Integrated hydraulic relief and vent valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 40 °C to + 200 °C
- Design in compliance with API 675 among others

Field of Application

- Oil/ gas production (onshore/offshore)
- Chemical/Petrochemical industry
- Pharmaceuticals & cosmetics
- Food production
- Packaging industry (bottling pumps)

Technical data for ORLITA MhS 18 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		36	45	73	91	112	145	207		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
3	0.11	0.2	0.3	0.5	0.6	0.7	0.9	1.3	100	DN 3
5	0.29	0.6	0.8	1.3	1.6	2.0	2.6	3.7	400	DN 3
6	0.42	0.9	1.2	1.8	2.3	2.8	3.7	5.3	400	DN 3
20	4.71	10.2	12.8	20.5	25.6	31.5	41	58.6	80	DN 6

Technical data for ORLITA MhS 35 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		36	45	73	91	112	145	207		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
7	0.77	1.7	2.1	3.3	4.2	5.2	6.7	9.6	900	DN 3.5
8	1.01	2.2	2.7	4.4	5.5	6.7	8.7	12.5	630	DN 3
10	1.57	3.4	4.3	6.8	8.5	10.5	13.7	19.5	446	DN 6
16	4.02	8.7	10.9	17.5	21.9	26.9	35.0	50.0	174	DN 6
25	9.82	21.4	26.7	42.7	53.4	65.7	85.4	122.0	71	DN 10
45	31.81	69.2	86.5	138.4	173.0	212.9	276.7	395.3	22	DN 16

Technical data for ORLITA MhS 600 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		65	76	105	121	139	166	192		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
26	21.24	83	97	133	154	177	212	245	753	DN 6
28	24.63	96	113	155	179	206	246	284	650	DN 10
29	26.42	103	121	166	192	221	264	305	606	DN 16

Note

All performance data applies to 50 Hz. If a 60 Hz motor is used, the performance will be correspondingly higher.

Important note:

Abridged presentation of our complete product range. Other types on request

MhS 35/8-8 LHD and MhS 35/8-8 RHD



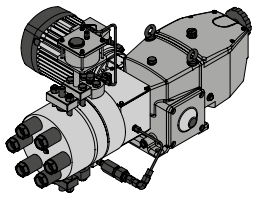
Flexible arrangement possible: drive on the left or right

2.3.9 Hydraulic metal diaphragm metering pump high-pressure ORLITA MHRH

Reliable capacity even at maximum pressure

Capacity range of a single pump: 3 – 4 l/h; 3000 bar

The metal diaphragm metering pumps ORLITA MHHP are special pumps, which provide precise pump capacities even at maximum pressures of up to 3000 bar.



ORLITA MhR 150/7

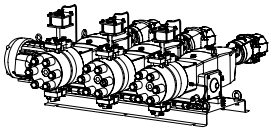
The hydraulic metal diaphragm metering pumps ORLITA MHRH 150 have a metal diaphragm, which is designed to meter precisely at maximum pressures of up to 3000 bar. Only in this way can excellent process reliability be ensured.

Your Benefits

High process reliability:

- Robust single diaphragm enables reliable and low-maintenance operation - even at high pressures in non-hazardous areas
- Product chamber hermetically separated from the hydraulic section
- Dosing precision is better than ±1 % in the stroke length range 10-100 % under defined conditions and correct installation

Technical Details



Mh3R150-7-7-7

- MHRH: Stroke length: 0 – 32 mm, Rod force: 15000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- The dosing precision is better than +/- 1 % within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Metal diaphragm
- Wetted materials: Stainless steel
- A wide range of power end/drive versions is available: Three-phase standard motors, motors for use in areas at risk from explosion, different flange designs for the use of customer-specific motors
- Degree of protection: IP 55
- Temperature range -10 °C to +60 °C

Field of Application

- Chemical/petrochemical industry
- Maximum pressure applications of up to 3,000 bar

Technical Data

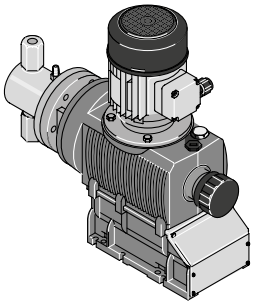
Pump type	Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)				Max. pressure
			58	87	116	145	
	mm	ml/stroke	l/h	l/h	l/h	l/h	bar
MHRH 150/7	7	1.23	4.2	6.4	8.5	10.7	3,000

2.4.1 Plunger Metering Pump Sigma SBKa (Basic Type)

Sigma plunger pump – durable and high-performance

Capacity range 2 – 76 l/h, 320 – 12 bar

The plunger metering pump Sigma SBKa is an extremely robust plunger metering pump with high-performance plunger and the option to adjust the pump capacity in 0.2% increments. It offers a wide range of power end versions, such as three-phase or 1-phase AC motors, even for Exe and Exde areas with ATEX certification.



Sigma Basic Type SBKa

The plunger metering pump Sigma/ 2 (Basic Type) (SBKa) is a metering pump, the pump capacity of which can be precisely adjusted in 0.2% increments, either manually or optionally with an electric actuator or control drive. A wide range of power end versions is available for use in areas at risk from explosion with ATEX certification.

Your Benefits

Excellent process safety and reliability:

- Metering reproducibility is better than ± 1% within the 10 – 100% stroke length range under defined conditions and with correct installation

Flexible adaptation to the process:

- Wide range of power end versions, also for use in Exe and Exde areas and different flange designs for the use of customised motors
- Customised designs are available on request

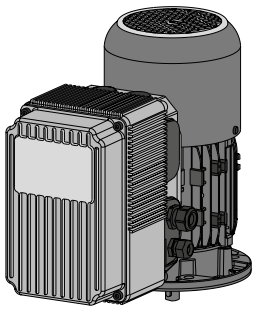
Technical Details

- Stroke length: 15 mm
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 0.2% increments (optionally with electric actuator or control drive)
- The dosing precision is better than ± 1 % within the 10-100 % stroke volume adjustment range under defined conditions and with correct installation
- Wetted materials: Stainless steel 1.4571/1.4404, special materials are available on request
- High-performance oxide ceramic plunger
- A wide range of power end versions is available: Three-phase standard motor, 1-phase AC motor, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection IP 55
- High-strength fibreglass-reinforced plastic housing with excellent chemical resistance
- For safety reasons, provide suitable overflow equipment with all plunger metering pumps during installation

Field of Application

- Volume-proportional metering of chemicals in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

Control of Sigma Basic type SBKa



Variable speed motor with integrated frequency converter

Stroke length actuator/control drive

Actuator for automatic stroke length adjustment, actuating period approx. 1 second for 1 % stroke length, return potentiometer 1 kΩ degree of protection IP 54.

Control drive consisting of an actuator and an integral servo controller for stroke length adjustment via a standard signal. Standard current input 0/4-20 mA corresponds to stroke length 0 - 100%. Switch-over for manual/automatic operation, key switch for stroke adjustment in manual mode, mechanical position display of actual stroke length value output 0/4-20 mA for remote display.

Variable speed motors with integrated frequency converter (identity code specification V)

Power supply 1-phase 230 V, 50/60 Hz, 0.37 kW

Externally controllable with 0/4-20 mA (see Fig. pk_2_103).

(Speed controllers, see page → PL)

Speed controllers in metal housing (identity code specification Z)

The speed controller assembly consists of a frequency converter and a variable speed motor of 0.37 kW.

(Speed controllers, see page → PL)

2.4 Plunger Metering Pumps

Technical data for Sigma SBKa

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure with 1800 rpm motor at 60 Hz				Suction lift	Perm. pre-pressure suction side	Connector Suction/ Discharge Side	Shipping weight	Plunger Ø
	l/h	bar	ml/ stroke	Max. stroke rate Strokes/ min	l/h	psi	gph (US)	Max. stroke rate Strokes/ min	m WC	bar	G-DN	kg	mm
32002	1.9	320	0.46	71	2.3	4,641	0.61	84	5.0	160	1/4	24	8
23004	4.0	230	0.52	129	4.8	3,336	1.27	154	5.0	115	1/4	24	8
14006	6.1	140	1.42	71	7.1	2,031	1.88	84	4.0	70	1/4	24	12
10006	6.4	100	0.55	195	7.6	1,450	2.01	233	5.0	50	1/4	24	8
10011	11.0	100	1.43	129	13.1	1,450	3.46	153	4.0	50	1/4	24	12
07012	12.4	70	2.90	71	14.8	1,015	3.91	85	4.0	35	1/4	24	17
05016	16.7	50	1.43	195	20.0	725	5.28	233	4.0	25	1/4	24	12
04022	22.4	40	5.26	71	26.5	580	7.00	84	4.0	20	3/8	25	23
04522	22.5	45	2.91	129	26.7	653	7.05	153	4.0	22.5	1/4	24	17
02534	34.1	25	2.92	195	40.8	363	10.78	233	4.0	12.5	1/4	24	17
02541	41.5	25	5.37	129	49.2	363	13.00	153	4.0	12.5	3/8	25	23
01264	64.0	12	5.45	195	76.0	174	20.08	233	4.0	6	3/8	25	23

Wetted materials for Sigma SBKa

Identity code of material	Dosing head	Suction / discharge connection on dosing head DN 25	Seals/ball seat	Balls	Ball seat
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE or PTFE +25 % carbon	Ceramic	Stainless steel 1.4404

Motor data for Sigma SBKa

Identity code specification		Power supply			Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	0.25 kW	
R	3-phase, IP 55*	230 V/400 V	50/60 Hz	0.37 kW	With PTC, speed control range 1:20 with external fan 1-phase 230 V; 50/60 Hz
V0	1-phase, IP 55*	230 V	50/60 Hz	0.37 kW	Variable speed motor with integrated frequency converter
M	1-phase AC, IP 55	230 V ± 5 %	50/60 Hz	0.18 kW	
N	1-phase AC, IP 55	115 V ± 5 %	60 Hz	0.18 kW	
L1	3-phase, II 2G Ex e II T3	220 – 240 V/380 – 420 V	50 Hz	0.18 kW	On request
L2	3-phase, II 2G Ex de IIC T4	220 – 240 V/380 – 420 V	50 Hz	0.18 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

2.4 Plunger Metering Pumps

Identity code ordering system for Sigma SBKa

SBKa	Drive type												
	HK	Main drive, plunger											
		Type		Capacity									
		32002		320 bar	1.9								
		23004		230 bar	4.0								
		10006		100 bar	6.4								
		14006		140 bar	6.1								
		10011		100 bar	11.0								
		05016		50 bar	16.7								
		07012		70 bar	12.4								
		04522		45 bar	22.5								
		02534		25 bar	34.1								
		04022		40 bar	22.4								
		02541		25 bar	41.5								
		01264		12 bar	64.0								
			Liquid end material										
			SS	Stainless steel									
				Sealing material									
				T	PTFE								
					Diaphragm								
					4	Plunger (oxide ceramic)							
						Liquid end version							
						0	No valve springs (standard)						
						1	With 2 valve springs, Hastelloy C, 0.1 bar						
							Hydraulic connections						
							0	Standard threaded connector (according to technical data)					
								Version					
								0	With ProMinent logo				
								1	Without ProMinent logo				
								M	Modified				
									Electrical power supply				
									S	3-phase, 230 V/400 V 50 Hz, 0.18 kW			
									R	3 ph, Variable speed motor, 230 V/400 V, 0.37 kW			
									V0	Variable speed stroke control motor with integrated frequency converter, 1-phase, 230 V, 50/60 Hz, 0.37 kW			
									M	1 ph, AC, 230 V/ 50/60 Hz, 0.18 kW			
									N	1 ph, AC 115 V 60 Hz, 0.18 kW			
									L	3 ph, 230 V/400 V, 50 Hz, (EExe, EExd), 0.18 kW			
									1	No motor, with B 14 flange (size 71 (DIN)			
									2	No motor, C 56 flange (NEMA)			
									3	No motor, B 5 size 63 (DIN)			
										Enclosure rating			
										0	IP 55 (standard)		
										2	Exd design ATEX-T4 (L2, P2)		
										A	ATEX drive		
											Stroke sensor		
											0	No stroke sensor (standard)	
											2	Pacing relay (reed relay)	
											3	Stroke sensor (Namur) for hazardous locations	
												Stroke length adjustment	
												0	Manual (Standard)
												1	With stroke positioning motor, 230 V/50/60 Hz
												2	With stroke positioning motor, 115 V/50/60 Hz
												3	With stroke control motor 0...20 mA 230 V/50/60 Hz
												4	With stroke control motor 4...20 mA 230 V/50/60 Hz
												5	With stroke control motor 0...20 mA 115 V/50/60 Hz
												6	With stroke control motor 4...20 mA 115 V/50/60 Hz

Spare parts kits for Sigma SBKa

consists of: 1 ceramic metering piston, 4 valve balls, 4 ball seat discs, 2 piston packings made from PTFE / graphite, 2 piston guide bands, 14 flat seals, 2 O-rings

		Product designation
Liquid end FK 08	Applies to identity code: 32002, 23004, 10006	1001572
Liquid end FK 12.5	Applies to identity code: 14006, 10011, 05016	910470
Liquid end FK 25	Applies to identity code: 07012, 04522, 02534	910471
Liquid end FK 50	Applies to identity code: 04022, 02541, 01264	910472

Standard oil for maintaining hydraulics and gearbox Sigma SBKa

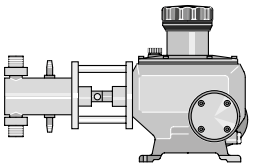
	Required quantity	Order no.
Mobilgear 600 XP 460 gear oil, 1 litre	0.5 l	1004542

2.4.2 Plunger Metering Pump Makro TZ

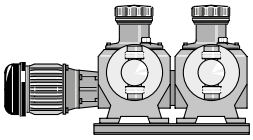
Powerful, built to last with a plunger

Capacity range of single head pump: 8 – 1,141 l/h, 320 – 11 bar

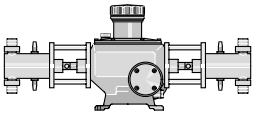
The plunger metering pump Makro TZ impresses with its excellent process reliability, outstanding flexibility and its modular construction enables it to be outstandingly adapted to the performance requirements of the respective application.



MAKRO TZ plunger metering pump



MAKRO TZ TZKa externally mounted pump



MAKRO TZ TZKa double-head pump

The plunger metering pump Makro TZ (TZKa) has an adjustable eccentric drive mechanism and, together with the Makro TZ diaphragm metering pump, forms a range of drive mechanisms with stroke lengths of 10 and/or 20 mm. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

Your Benefits

Process reliability:

- The dosing precision is better than ± 0.5 % within the 10-100 % stroke length range under defined conditions and with correct installation

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs (boxer principle) being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 4 different gear ratios are available
- Customised designs are available on request

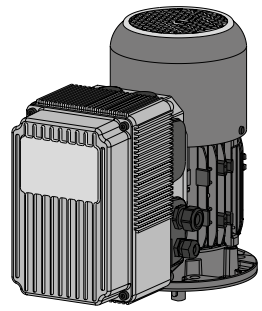
Technical Details

- Stroke length: 0-20 mm
- Rod force: 8000 N
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually using shift ring in 0.5% increments (optionally with electric actuator or control drive)
- The dosing precision is better than ± 0.5 % within the 10 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions.
- High-performance ceramic-coated stainless steel plunger Wetted materials: Stainless steel 1.4571. Special materials are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- For safety reasons, provide suitable overflow equipment with all plunger metering pumps during installation

Field of Application

- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering

Control of MAKRO TZ metering pumps



Variable speed motor with integrated frequency converter

Stroke length actuator/control drive MAKRO TZ

Actuator MAKRO TZ

Servomotor for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, including 1 kΩ return potentiometer for stroke position response signal; degree of protection: IP 54. Electrical connection 230 V (±10 %), 50/60 Hz, 40 W mechanical stroke length display present on the MAKRO TZ drive.

Special voltage/higher degrees of protection/explosion protection on request.

Control drive MAKRO TZ

Control drive consisting of an actuator with servomotor and integral microprocessor controller for stroke length adjustment via a standard signal. Technical data, see actuator.

Design:

Standard current input 0/4-20 mA corresponds to stroke length 0 – 100 %, switch-over for manual/automatic operation, key switch for stroke adjustment in manual mode. Actual value output 0/4 – 20 mA for remote display.

Variable speed motors with integrated frequency converter (identity code specification V)

The following functions are integrated in the terminal box cover:

- Start/Stop switch
- Manual/external operation switch-over (0/4 – 20 mA)
- Potentiometer for speed control in manual mode
- On request externally controllable via PROFIBUS® DP

Variable speed motors with integrated frequency converter, IP 55 degree of protection, see page→ PL

2.4 Plunger Metering Pumps

Technical data for MAKRO TZKa

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure at 60 Hz			Suction lift	Connector Suction/Discharge Side	Shipping weight	Plunger Ø
	l/h	bar	ml/stroke	Max. stroke rate Strokes/min	psi	l/h / gph (US)	Max. stroke rate Strokes/min	m WC	G-DN	kg	mm
320009 *	8.7	320	2.0	72	4,627	10/2.6	86	4.0	Rp 1/4–8	50	12
320012 *	11.6	320	2.0	96	4,627	14/3.7	115	4.0	Rp 1/4–8	50	12
320014 *	14.5	320	2.0	120	4,627	17/4.5	144	4.0	Rp 1/4–8	50	12
320017 *	17.4	320	2.0	144	4,627	21/5.5	173	4.0	Rp 1/4–8	50	12
320018 *	17.7	320	4.1	72	4,627	21/5.5	86	4.0	Rp 1/4–8	50	17
320024 *	23.6	320	4.1	96	4,627	28/7.4	115	4.0	Rp 1/4–8	54	17
320030 *	29.5	320	4.1	120	4,627	35/9.2	144	4.0	Rp 1/4–8	54	17
313035 *	35.4	313	4.1	144	4,526	42/11.1	173	4.0	Rp 1/4–8	54	17
192033 *	32.9	192	7.6	72	2,776	39/10.3	86	4.0	Rp 3/8–10	55	23
192044 *	43.9	192	7.6	96	2,776	59/15.6	115	4.0	Rp 3/8–10	55	23
192055 *	54.8	192	7.6	120	2,776	66/17.4	144	4.0	Rp 3/8–10	55	23
168066 *	65.8	168	7.6	144	2,437	79/20.9	173	4.0	Rp 3/8–10	55	23
113057 *	57.5	113	13.3	72	1,634	69/18.2	86	4.0	Rp 3/8–10	56	30
113077 *	76.6	113	13.3	96	1,634	92/24.3	115	4.0	Rp 3/8–10	56	30
113096 *	95.8	113	13.3	120	1,634	115/30.4	144	4.0	Rp 3/8–10	56	30
096115 *	114.9	96	13.3	144	1,392	138/36.5	173	4.0	Rp 3/8–10	56	30
063104	104.3	63	24.2	72	911	125/33.0	86	4.0	G 1 1/4–20	58	40
063139	139.0	63	24.2	96	911	167/44.1	115	4.0	G 1 1/4–20	58	40
063174	173.8	63	24.2	120	914	209/55.2	144	4.0	G 1 1/4–20	58	40
052208	208.5	52	24.2	144	754	250/66.0	173	4.0	G 1 1/4–20	58	40
040163	162.9	40	37.7	72	578	195/51.5	86	4.0	G 1 1/4–20	58	50
040217	217.2	40	37.7	96	578	261/68.9	115	4.0	G 1 1/4–20	58	50
040271	271.5	40	37.7	120	580	326/86.1	144	4.0	G 1 1/4–20	58	50
033326	325.8	33	37.7	144	479	391/103.3	173	4.0	G 1 1/4–20	58	50
028237	237.0	28	54.9	72	405	284/75.0	86	4.0	G 1 1/2–25	62	60
028316	315.9	28	54.9	96	405	379/100.1	115	4.0	G 1 1/2–25	62	60
027395	394.9	27	54.9	120	392	474/125.2	144	4.0	G 1 1/2–25	62	60
022474	473.9	22	54.9	144	319	569/150.3	173	4.0	G 1 1/2–25	62	60
020322	322.5	20	74.7	72	289	387/102.2	86	4.0	G 1 1/2–25	62	70
020430	430.0	20	74.7	96	289	516/136.3	115	4.0	G 1 1/2–25	62	70
020538	537.6	20	74.7	120	290	645/170.4	144	4.0	G 1 1/2–25	62	70
016645	645.1	16	74.7	144	232	774/204.5	173	4.0	G 1 1/2–25	62	70

* The suction and discharge side Rp 1/4 and Rp 3/8 connectors have an internal thread connection and are configured as double ball valves.

Other gear reduction ratios are available upon request.

The permissible priming pressure on the suction side is approximately 50% of the max. permitted back pressure.

Wetted materials for MAKRO TZKa

Identity code of material	Hydraulic Ø mm	Dosing head	Connection on suction/discharge side	Ball seat	Valve balls	Plungers
SST	…12 S to 50 S	Stainless steel 1.4571/1.4404	Stainless steel 1.4571/1.4404	Stainless steel/PTFE	Oxide ceramic	Stainless steel/ceramic
SST	…60 S to 70 S	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	Stainless steel/ceramic

Motor data for Makro TZKa

Identity code specification	Power supply			Remarks
S	3-phase, IP 55˙	230 V/400 V	50 Hz	1.5 kW

Identity code specification		Power supply			Remarks
R	3-phase, IP 55*	230 V/400 V	50/60 Hz	2.2 kW	With PTC, speed control range 1:20, with external fan 1-phase 230 V; 50/60 Hz
V0	3-phase, IP 55*	400 V	50 Hz	3.0 kW	Variable speed stroke control motor with integrated frequency converter
L1	3-phase,II 2G Ex eb IIC T3 Gb	220 – 240 V/380 – 420 V	50 Hz	1.5 kW	
L2	3-phase,II 2G Ex db IIC T4 Gb	220 – 240 V/380 – 420 V	50 Hz	1.5 kW	With PTC, speed control range 1:5
P1	3-phase,II 2G Ex e IIC T3	250 – 280 V/440 – 480 V	60 Hz	2.0 kW	On request
P2	3-phase,II 2G Ex de IIC T4	250 – 280 V/440 – 480 V	60 Hz	1.5 kW	With PTC, speed control range 1:5, available on request

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Identity Code Ordering System TZKa

TZKa	Drive type										
	H	Main drive									
	A	Add-on drive									
	D	Double main drive									
	B	Double add-on power end									
		Type *	Capacity								
		320009	320 bar	8.7 l/h							
		320012	320 bar	11.6 l/h							
		320014	320 bar	14.5 l/h							
		320017	320 bar	17.4 l/h							
		320018	320 bar	17.7 l/h							
		320024	320 bar	23.6 l/h							
		320030	320 bar	29.5 l/h							
		313035	313 bar	35.4 l/h							
		192033	192 bar	32.9 l/h							
		192044	192 bar	43.9 l/h							
		192055	192 bar	54.8 l/h							
		168066	168 bar	114.9 l/h							
		113057	113 bar	57.5 l/h							
		113077	113 bar	76.6 l/h							
		113096	113 bar	95.8 l/h							
		096115	96 bar	114.9 l/h							
		063104	63 bar	104.3 l/h							
		063139	63 bar	139.0 l/h							
		063174	63 bar	173.8 l/h							
		052208	52 bar	208.5 l/h							
		040163	40 bar	162.9 l/h							
		040217	40 bar	217.2 l/h							
		040271	40 bar	271.5 l/h							
		033326	33 bar	352.8 l/h							
		028237	28 bar	237.0 l/h							
		028316	28 bar	315.9 l/h							
		027395	27 bar	394.9 l/h							
		022474	22 bar	473.9 l/h							
		020322	20 bar	322.5 l/h							
		020430	20 bar	430.0 l/h							
		020538	20 bar	537.6 l/h							
		016645	16 bar	645.1 l/h							
		014475	14 bar	475.1 l/h							
		014634	14 bar	634.1 l/h							
		013793	13 bar	792.6 l/h							
		011951	11 bar	951.1 l/h							
			Liquid end material								
			SS	Stainless steel							
				Sealing material							
				T	PTFE						
					Displacement body						
					S	Stainless steel plunger, chromium dioxide-coated					
						Liquid end version					
						0	No valve spring				
						1	With valve springs				
							Hydraulic connections				
							0	Standard connection			
							4	SS union nut and insert			
								Version			
								0	With ProMinent® logo, no frame		
								2	Without ProMinent® logo, no frame		
								A	With ProMinent® logo, with frame, simplex		
								B	With ProMinent® logo, with frame, duplex		
								C	With ProMinent® logo, with frame, triplex		
								M	Modified		
									Electrical power supply		
									S	3 ph. 230/400 V 50/60 Hz (WBS)	
									R	Variable speed motor 4-pole, 230/400 V	
									V0	Variable speed motor with integr. frequency converter	
									Z	1 ph, variable speed control set 1 ph, 230 V, 50/60 Hz	
									P	3 ph. 230/400 V 60 Hz (Exe, Exd)	
									L	3 ph. 230/400 V 50 Hz (Exe, Exd)	
									V2	With integrated frequency converter (Exd)	
									4	No motor, with 56 C flange	
									7	No motor, with 120/80 flange	
									8	No motor, with 160/90 flange	
									0	Without motor, externally mounted drive	
										Enclosure rating	
										0	IP 55 (standard)

| | | |

Spare Parts Kits for Plunger Metering Pump Makro TZ

consists of:

- valve balls
- valve plate with spring
- ball seat discs
- piston packings made from PTFE/graphite
- piston guide bands
- flat seals/ O-rings

	Order no.
Maintenance kit for MAKRO TZ FK 12/20 S DN 8	1019106
Maintenance kit for MAKRO TZ FK 17/20 S DN 8	1019107
Maintenance kit for MAKRO TZ FK 23/20 S DN 10	1019108
Maintenance kit for MAKRO TZ FK 30/20 S DN 10	1019109
Maintenance kit for MAKRO TZ FK 40/20 S DN 20	1019110
Maintenance kit for MAKRO TZ FK 50/20 S DN 20	1019111
Maintenance kit for MAKRO TZ FK 60/20 S DN 25	1019112
Maintenance kit for MAKRO TZ FK 70/20 S DN 25	1019113
Maintenance kit for MAKRO TZ FK 85/20 S DN 40	1019124

Standard oil for maintaining hydraulics and gearbox MAKRO TZKa

The oils are available in 1l containers. For example, if 1.8 l is required for maintenance work, 2 containers are needed.

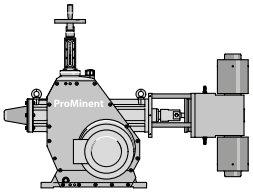
	Required quantity	Order no.
Mobilgear 600 XP 460 gear oil, 1 litre	3.2 l	1004542

2.4.3 Plunger Metering Pump Makro/ 5

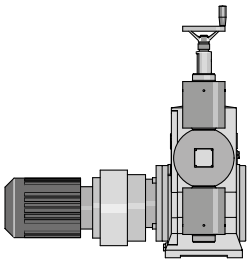
Powerful, built to last with a plunger

Capacity range of single head pump: 38 – 6,014 l/h, 320 – 6 bar

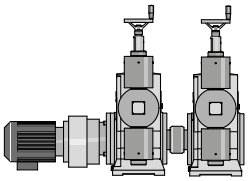
The plunger metering pump Makro/ 5 can virtually be used throughout the low-pressure range and its modular construction enables it to be outstandingly adapted to the performance requirements of the respective application.



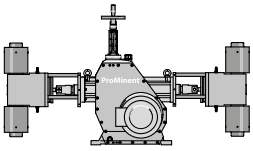
MAKRO M5Ka



MAKRO M5Ka



MAKRO M5Ka externally mounted pump



MAKRO double-head pump

The plunger metering pump MAKRO M5Ka together with the MAKRO hydraulic diaphragm and diaphragm metering pumps form a range of drive mechanisms with stroke lengths of 20 or 50 mm. A wide range of drive versions is available for use in areas at risk from explosion with ATEX certification.

Your Benefits

Process reliability:

- The dosing precision is better than ± 0.5 % within the 10-100 % stroke length range under defined conditions and with correct installation

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs (boxer principle) being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

Technical Details

- Stroke length: 0-50 mm
- Rod force: 10000 N
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually using manual adjustment wheel and scaled display in 0.5% increments (optionally with electric control drive)
- The dosing precision is better than ± 0.5 % within the 10 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- High-performance ceramic-coated stainless steel plunger
- Wetted materials: Stainless steel 1.4571, special materials are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- For safety reasons, provide suitable overflow equipment with all plunger metering pumps during installation
- Design in compliance with API 675 among others

Field of Application

- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering

Control of MAKRO M5Ka metering pumps

Stroke length controller MAKRO M5Ka

Control drive consisting of an actuator with servomotor and integral microprocessor controller for stroke length adjustment via a standard signal. Actuating period approx. 100 sec for 100% stroke length, equipped with 2 limit switches for min./max. position, degree of protection: IP 54. Electrical connection 230 V (±10%), 50/60 Hz, approx. 40 W mechanical stroke length display fitted on the Makro/ 5 drive.

Special voltage/higher degrees of protection/explosion protection available on request.

Design with:

0/4-20 mA standard current input (corresponds to stroke length 0-100%); internal switch-over for manual/ automatic operation, key switch for stroke adjustment in manual mode. 0/4-20 mA actual value output for remote display.

Stroke sensor with Namur signal

Mounting on the crank drive mechanism of the Makro/ 5 gearbox. For precise measurement of each metering stroke, comprising electronic cams and inductive proximity switches, switching signal according to Namur. In combination with electronic pre-selection meters suitable for batch metering or proportional metering in conjunction with proportional control.

Retrospective fitting only possible in the factory.

Approved for explosion protection operation with degree of protection EEx ia II C T6.

Technical data for MAKRO M5Ka

Type	Capacity at max. back pressure with 1500 rpm motor at 50 Hz				Capacity at max. back pressure with 1800 rpm motor at 60 Hz				Suction lift	Connector Suction/ Discharge Side	Ship- ping weight	Plunger Ø
	l/h	bar	ml/ stroke	Max. stroke rate Strokes/ min	l/h	psi	gph (US)	Max. stroke rate Strokes/ min	m WC	G-DN	kg	mm
3200066	66	320	11	103	78	4,640	21	123	3.0	Rp 1/4–8	300	17
3200038	38	320	11	60	44	4,640	12	71	3.0	Rp 1/4–8	300	17
3200048	48	320	11	75	56	4,640	15	89	3.0	Rp 1/4–8	300	17
3200085	85	320	11	133	101	4,640	27	159	3.0	Rp 3/8–10	300	17
3200100	100	320	11	156	-	-	-	-	3.0	Rp 3/8–10	300	17
1700184	184	170	21	156	-	-	-	-	3.0	G 1–15	300	23
2160157	157	216	21	133	187	3,132	49	159	3.0	Rp 3/8–10	300	23
2400070	70	240	21	60	82	3,480	22	71	3.0	Rp 3/8–10	300	23
2400088	88	240	21	75	104	3,480	27	89	3.0	Rp 3/8–10	300	23
2400121	121	240	21	103	144	3,480	38	123	3.0	Rp 3/8–10	300	23
1000314	314	100	35	156	-	-	-	-	3.0	G 1 1/4–20	302	30
1270267	267	127	35	133	319	1,842	84	159	3.0	G 1 1/4–20	302	30
1400120	120	140	35	60	142	2,030	38	71	3.0	G 1–15	302	30
1400151	151	140	35	75	179	2,030	47	89	3.0	G 1–15	302	30
1400207	207	140	35	103	247	2,030	65	123	3.0	G 1–15	302	30
0800214	214	80	63	60	253	1,160	67	71	3.0	G 1 1/4–20	303	40
0560558	558	56	63	156	-	-	-	-	3.0	G 1 1/2–25	303	40
0700476	476	70	63	133	569	1,015	150	159	3.0	G 1 1/2–25	303	40
0800268	268	80	63	75	318	1,160	84	89	3.0	G 1 1/4–20	303	40
0800368	368	80	63	103	439	1,160	116	123	3.0	G 1 1/4–20	303	40
0350872	872	35	98	156	-	-	-	-	3.0	G 1 1/2–25	303	50
0450744	744	45	98	133	889	653	235	159	3.0	G 1 1/2–25	303	50
0500335	335	50	98	60	396	725	105	71	3.0	G 1 1/2–25	303	50
0500419	419	50	98	75	497	725	131	89	3.0	G 1 1/2–25	303	50
0500576	576	50	98	103	687	725	181	123	3.0	G 1 1/2–25	303	50
0251257	1,257	25	141	156	-	-	-	-	3.0	G 2–32	311	60
0301071	1,071	30	141	133	1,280	435	338	159	3.0	G 2–32	311	60
0350483	483	35	141	60	571	508	151	71	3.0	G 1 1/2–25	311	60
0350604	604	35	141	75	716	508	189	89	3.0	G 1 1/2–25	311	60
0350829	829	35	141	103	989	508	261	123	3.0	G 2–32	311	60
0250658	658	25	192	60	778	363	206	71	3.0	G 2–32	311	70
0181710	1,710	18	192	156	-	-	-	-	3.0	G 2 1/4–40	311	70
0231458	1,458	23	192	133	1,743	334	460	159	3.0	G 2 1/4–40	311	70
0250822	822	25	192	75	975	363	258	89	3.0	G 2–32	311	70
0251129	1,129	25	192	103	1,348	363	356	123	3.0	G 2–32	311	70
0161665	1,665	16	284	103	1,988	232	525	123	3.0	G 2 1/4–40	317	85
0160970	970	16	284	60	1,147	232	303	71	3.0	G 2 1/4–40	317	85
0161212	1,212	16	284	75	1,438	232	380	89	3.0	G 2 1/4–40	317	85
0162150	2,150	16	284	133	2,570	232	679	159	3.0	G 2 3/4–50	317	85
0162522	2,522	16	284	156	-	-	-	-	3.0	G 2 3/4–50	317	85
0103491	3,491	10	393	156	-	-	-	-	3.0	G 2 3/4–50	331	100
0121343	1,343	12	393	60	1,589	174	420	71	3.0	G 2 3/4–50	331	100
0121678	1,678	12	393	75	1,991	174	526	89	3.0	G 2 3/4–50	331	100
0122305	2,305	12	393	103	2,752	174	727	123	3.0	G 2 3/4–50	331	100
0122977	2,977	12	393	133	3,558	174	940	159	3.0	G 2 3/4–50	331	100
0063896	3,896	6	664	103	4,652	87	1,229	123	3.0	G 2 1/2–65	350	130
0062269	2,269	6	664	60	2,684	87	709	71	3.0	G 2 1/2–65	350	130
0062837	2,837	6	664	75	3,366	87	889	89	3.0	G 2 1/2–65	350	130
0065031	5,031	6	664	133	6,014	87	1,589	159	3.0	G 2 1/2–65	350	130
0066000	6,000	6	664	156	-	-	-	-	3.0	G 2 1/2–65	350	130

Identity Code Ordering System for M5Ka

M5Ka	Drive type									
	H	Main drive								
	A	Add-on drive								
	D	Double main drive								
	B	Double add-on power end								
		Type *	Capacity							
		3200038	320 bar	38 l/h						
		3200048	320 bar	48 l/h						
		3200066	320 bar	66 l/h						
		3200085	320 bar	85 l/h						
		3200100	320 bar	100 l/h						
		2400070	240 bar	70 l/h						
		2400088	240 bar	88 l/h						
		2400121	240 bar	121 l/h						
		2160157	216 bar	157 l/h						
		1700184	170 bar	184 l/h						
		1400120	140 bar	120 l/h						
		1400151	140 bar	151 l/h						
		1400207	140 bar	207 l/h						
		1270267	127 bar	267 l/h						
		1000314	100 bar	314 l/h						
		0800214	80 bar	214 l/h						
		0800268	80 bar	268 l/h						
		0800368	80 bar	368 l/h						
		0700476	70 bar	476 l/h						
		0560558	56 bar	558 l/h						
		0500335	50 bar	335 l/h						
		0500419	50 bar	419 l/h						
		0500576	50 bar	576 l/h						
		0450744	45 bar	744 l/h						
		0350872	35 bar	872 l/h						
		0350483	35 bar	483 l/h						
		0350604	35 bar	604 l/h						
		0350829	35 bar	829 l/h						
		0301071	30 bar	1,071 l/h						
		0251257	25 bar	1,257 l/h						
		0250658	25 bar	658 l/h						
		0250822	25 bar	822 l/h						
		0251129	25 bar	1,129 l/h						
		0231458	23 bar	1,458 l/h						
		0181710	18 bar	1,710 l/h						
		0160970	16 bar	970 l/h						
		0161212	16 bar	1,212 l/h						
		0161665	16 bar	1,665 l/h						
		0162150	16 bar	2,150 l/h						
		0162522	16 bar	2,522 l/h						
		0121343	12 bar	1,343 l/h						
		0121678	12 bar	1,678 l/h						
		0122305	12 bar	2,305 l/h						
		0122977	12 bar	2,977 l/h						
		0103491	10 bar	3,491 l/h						
		0062269	6 bar	2,269 l/h						
		0062837	6 bar	2,837 l/h						
		0063896	6 bar	3,896 l/h						
		0065031	6 bar	5,031 l/h						
		0066000	6 bar	6,000 l/h						
			Liquid end material							
			SS	Stainless steel						
				Sealing material *						
				T	PTFE					
					Displacement body					
					S	Stainless steel plunger, chromium dioxide-coated				
						Liquid end version				
						0	No valve spring			
						1	With valve springs			
							Hydraulic connections			
							0	Standard connection		
							4	SS union nut and insert		
								Version		
								0	With ProMinent® logo, no frame	
								2	Without ProMinent® logo, no frame	
								A	With ProMinent® logo, with frame, simplex	
								B	With ProMinent® logo, with frame, duplex	
								C	With ProMinent® logo, with frame, triplex	
								D	With ProMinent® logo, with frame, quadruplex	

									M	Modified						
										Electrical power supply						
										S	3 ph. 230/400 V 50/60 Hz (WBS)					
										R	Variable speed motor 4-pole, 230/400 V					
										V0	Motor with integrated frequency converter					
										P	3 ph. 230/400 V 60 Hz (Exe, Exd)					
										L	3 ph. 230/400 V 50 Hz (Exe, Exd)					
										V2	Motor with integrated frequency converter (Exd)					
										5	No motor, with gearbox IEC 100					
										6	No motor, with gearbox IEC 112					
										0	No motor, no gearbox					
											Enclosure rating					
											0	IP 55 (standard)				
											1	Exe motor version ATEX-T3				
											2	Exd motor version ATEX-T4				
											A	ATEX power end				
												Stroke sensor				
												0	No stroke sensor			
												1	With stroke sensor (Namur)			
													Stroke length adjustment			
													0	Stroke length adjustment, manual		
													3	230 V 0-20 mA stroke controller		
													4	230 V 4-20 mA stroke controller		
													5	115 V 0-20 mA stroke controller		
													6	115 V 4-20 mA stroke controller		
													G	Control drive 230 V 0-20 mA Exde		
													H	Control drive 230 V 4-20 mA Exde		
														Application		
														0	Standard	
														3	Temperature up to -20 °C	

* Figure 1 - 3=back pressure [bar]; figure 4 - 7=flow rate [l/h]

2.4 Plunger Metering Pumps

Wetted materials for MAKRO M5Ka

Type	Identity code of material	Dosing head	Connection on suction/ discharge side	Valve seat/seals	Valve balls	Plungers
M5Ka	DN 8 - DN 10	Stainless steel 1.4571/1.4404	Stainless steel 1.4571/1.4404	Stainless steel/PTFE	Oxide ceramic	Stainless steel/ceramic
M5Ka	DN 15 - DN 25	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE	Stainless steel 1.4401	Stainless steel/ceramic
M5Ka	DN 32 - DN 65	Stainless steel 1.4571/1.4404	Stainless steel 1.4581/1.4404	PTFE	Stainless steel 1.4404 (plate/spring)	Stainless steel/ceramic

The permissible priming pressure on the suction side is approximately 50% of the max. permitted back pressure.

Motor data for MAKRO M5Ka

Identity code specification	Power supply				Remarks
S	3-phase, IP 55*	230 V/400 V	50 Hz	3 kW	
R	3-phase, IP 55*	230 V/400 V	50/60 Hz	3 kW	With PTC, speed control range 1:5
V0	3-phase, IP 55	400 V	50 Hz	3 kW	Variable speed stroke control motor with integrated frequency converter
L2	3-phase, II 2G Ex de IIC T4 Gb	230 V/400 V	50 Hz	4 kW	With PTC, speed control range 1:5
P2	3-phase, II 2G Ex de IIC T4	265 V/460 V	60 Hz	4 kW	With PTC, speed control range 1:5

* Three-phase motor according to IEC 60034-1

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 2014/34/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label correspond to or are superior to the conditions prevalent in the intended application.

Maintenance Kits

Spare parts kit for Makro M5Ka, consisting of:

- Valve balls
- Valve plate with spring
- Ball seat discs
- Plunger packings made from PTFE/graphite
- Plunger guide bands
- Flat seals / O-rings

	Order no.
Maintenance kit for MAKRO M5Ka FK 17/50 S DN 8	1005899
Maintenance kit for MAKRO M5Ka FK 17/50 S DN 10	1005536
Maintenance kit for MAKRO M5Ka FK 23/50 S DN 10	1005004
Maintenance kit for MAKRO M5Ka FK 23/50 S DN 15	1005900
Maintenance kit for MAKRO M5Ka FK 30/50 S DN 15	1005901
Maintenance kit for MAKRO M5Ka FK 30/50 S DN 20	1005537
Maintenance kit for MAKRO M5Ka FK 40/50 S DN 20	1005902
Maintenance kit for MAKRO M5Ka FK 40/50 S DN 25	1005538
Maintenance kit for MAKRO M5Ka FK 50/50 S DN 25	1005539
Maintenance kit for MAKRO M5Ka FK 60/50 S DN 25	1005903
Maintenance kit for MAKRO M5Ka FK 60/50 S DN 32	1005540
Maintenance kit for MAKRO M5Ka FK 70/50 S DN 32	1005541
Maintenance kit for MAKRO M5Ka FK 70/50 S DN 40	1005904
Maintenance kit for MAKRO M5Ka FK 85/50 S DN 40	1005542
Maintenance kit for MAKRO M5Ka FK 85/50 S DN 50	1005905
Maintenance kit for MAKRO M5Ka FK 100/50 S DN 50	1005543
Maintenance kit for MAKRO M5Ka FK 130/50 S DN 65	1005544

Standard oil for maintaining hydraulics and gearbox MAKRO M5Ka

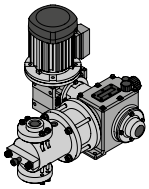
	Required quantity	Order no.
Mobilgear 634 VG 460 gear oil, 20 litres	16.5 l	1006284

2.4.4 Plunger Metering Pump ORLITA PS

ORLITA PS - simple, robust and reliable.

Capacity range of single-head pump: 0 – 2800 l/h, 800 – 11 bar

The high-performance plunger metering pump ORLITA PS enables precise pump capacities even at maximum pressure and temperatures of up to +400 °C. The ORLITA PS pump has a modular construction and is therefore very flexible.



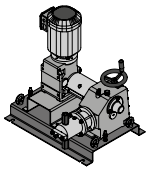
ORLITA PS

ORLITA PS plunger metering pumps (PS 35 to PS 600) with a stroke length of 20 to 40 mm provide a capacity ranging from 0 to 2800 l/h at 600 – 11 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The ORLITA PS product range is designed to comply with API 675. Its modular construction permits the free combination of drive units, drives and dosing heads, producing a pump for a range of different feed rates and media operating at different working pressures.

Your Benefits

Flexible adaptation to the process:

- Precise capacity even at maximum pressure
- The dosing precision is better than ± 1 % within the 10-100 % stroke length range under defined conditions and with correct installation.
- Cone valves for use as suction and/or discharge valves with minimal wear, good self-cleaning and low pressure loss (NPSHR)
- Excellent hydraulic efficiency

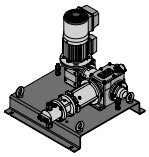


ORLITA PS 80-30

Excellent flexibility:

- The modular construction ensures a wide range of uses
- It is possible to combine up to 6 metering units, even with different pump capacities, in multiple pump systems
- 6 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Customised designs are available on request

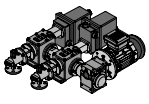
Technical Details



ORLITA PS 18-12 high-temperature

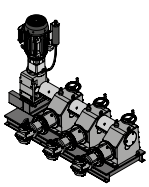
- PS 35 – stroke length: 0-20 mm, rod force: 3500 N
- PS 80 – stroke length: 0-20 mm, rod force: 14000 N
- PS 180 – stroke length: 0-40 mm, rod force: 18000 N
- PS 600 – stroke length: 0-40 mm, rod force: 40000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- The plunger packing can be tightened by the tensioning screw on the front even during operation
- The dosing precision is better than ± 1 % within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 40 °C to + 400 °C
- Design in compliance with API 675 among others

Field of Application



ORLITA PS 35-7-7

- Oil/ gas production (onshore/offshore)
- Refineries
- Chemical/Petrochemical industry
- Pharmaceuticals & cosmetics
- Packaging industry (bottling pumps)
- Maximum temperature applications of up to +400 °C



ORLITA PS 600-40-40-40

Technical data for ORLITA PS 35 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		36	45	58	91	112	145	207		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
5	0.39	0.9	1.1	1.4	2.1	2.6	3.4	4.9	250	DN 3
6	0.57	1.2	1.5	2.0	3.1	3.8	4.9	7.0	250	DN 3
7 *	0.77	1.7	2.1	2.7	4.2	5.2	6.7	9.6	250	DN 3
8	1.01	2.2	2.7	3.5	5.5	6.7	8.7	12.5	250	DN 3
10	1.57	3.4	4.3	5.5	8.5	10.5	13.7	19.5	250	DN 6
12	2.26	4.9	6.1	7.9	12.3	15.1	19.7	28.1	250	DN 6
16	4.02	8.7	10.9	14.0	21.9	26.9	35.0	50.0	174	DN 6
20	6.28	13.7	17.1	21.9	34.2	42.0	54.7	78.1	111	DN 6
25	9.82	21.4	26.7	34.2	53.4	65.7	85.4	122.0	71	DN 10
30	14.14	30.7	38.4	49.2	76.9	94.6	123.0	175.7	50	DN 10
36	20.36	44.3	55.3	70.8	110.7	136.2	177.1	253.0	34	DN 16
40	25.13	54.7	68.3	87.5	136.7	168.2	218.7	312.4	28	DN 16
50	39.27	85.4	106.8	136.7	213.5	262.8	341.6	488.1	18	DN 16
65	66.37	144.3	180.4	231.0	360.9	444.1	577.4	824.8	11	DN 25

* Plunger diameter 7 mm also available as high-pressure version

Technical data for ORLITA PS 80 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		68	78	86	104	134	160	193		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
20	6.28	26	29	33	39	51	60	73	250	DN 6
30	14.14	58	66	73	88	114	136	163	198	DN 10
36	20.36	83	95	105	127	164	195	235	138	DN 16
40	25.13	102	118	130	157	203	241	290	111	DN 16
50	39.27	160	184	203	245	317	377	454	71	DN 16
60	56.55	230	265	293	353	456	543	653	50	DN 25
65	66.37	270	310	344	414	535	637	767	37	DN 25
100	157.08	639	735	814	980	1,267	1,508		18	DN 32
125	245.44	998	1,148	1,272	1,531	1,979	2,357		11	DN 40

Technical data for ORLITA PS 180 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		68	78	86	104	134	160	193		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
30	28.27	115	132	147	176	228	272	327	250	DN 16
40	50.27	204	235	260	313	405	483	581	143	DN 16
50	78.54	319	367	407	490	633	754	907	92	DN 25
54	91.61	373	428	475	571	739	880	1,058	79	DN 25
80	201.06	818	940	1,042	1,254	1,621	1,931	2,323	36	DN 40

Technical data for ORLITA PS 600 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)							Max. pressure	Nominal diameter
		72	79	90	117	134	156	173		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	
40	50.27	217	240	270	353	404	471	521	250	DN 16
70	153.94	665	734	828	1,081	1,237	1,442	1,596	104	DN 32
80	201.06	869	959	1,082	1,412	1,615	1,883	2,085	80	DN 40
94	277.59	1,199	1,324	1,494	1,949	2,230	2,600	2,878	58	DN 50

All performance data applies to 50 Hz. If a 60 Hz motor is used, the performance will be correspondingly higher.

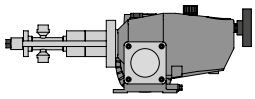
Abridged presentation of our complete product range. Other types on request.

2.4.5 Plunger Metering Pump ORLITA DR

For the precise metering of high-viscosity and extremely high-viscosity media even containing solid fractions

Capacity range of single-head pump: 0 – 273 l/h, 400 – 76 bar

The plunger metering pump ORLITA DR does not need valves and can therefore be operated within a broad stroke rate range. It is therefore suitable for use with high-viscosity and extremely high-viscosity media of up to 10^6 mPas within a wide temperature range of -30 °C to +200 °C.

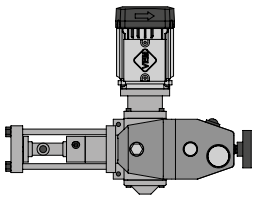


ORLITA DR

ORLITA DR plunger metering pumps (DR 15 to DR 150) are special pumps for high-viscosity and extremely high-viscosity media, which can also contain solids. The pump can be operated within a broad stroke rate range due to its operation without valves.

Your Benefits

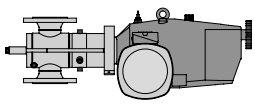
Optimum adaptation to processes with high-viscosity and extremely high-viscosity media, even those containing solid fractions:



ORLITA DR 15/12

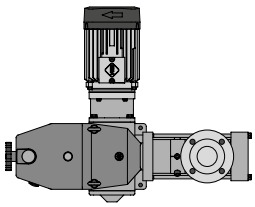
- Low-wear and precise operation even at high pressures thanks to the rotary piston with abrasion-resistant / wear-resistant surface coating
- Valve-free operation guarantees a broad stroke rate range
- Wide range of uses: Operating pressure of up to 400 bar, temperature range of -30°C to +200°C
- Pumping direction can be selected depending on the fitting position of the piston
- A reverse suction effect can be set in a continuously variable manner by rotating the pump head around its longitudinal axis
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Excellent hydraulic efficiency
- 2 different gear ratios are available
- Customised designs are available on request

Technical Details



ORLITA 150/36

- DR 15 - stroke length: 0-15 mm, rod force: 1800 N
- DR 150 - stroke length: 0-32 mm, rod force: 15000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- Stroke length adjustment: manually using manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- The dosing precision is better than ± 0.5 % within the 10 – 100% stroke length range under defined conditions and with correct installation
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end/drive versions is available: Three-phase standard AC motors, motors for use in areas at risk from explosion and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range -30°C to +200°C
- The play between the piston and cylinder responsible for the sealing effect is selected depending on the viscosity
- Turret on the rear head end, either designed as a circular collecting vessel for leaks or exposed to a sealing medium
- The turret is sealed by elastomer lip sealing rings



ORLITA DR 150/36

Field of Application

- Metering of high-viscosity and extremely high-viscosity media containing solid fractions.

Technical data for ORLITA DR 15 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)			Max. pressure	Nominal diameter
		58	77	116		
mm	ml/stroke	l/h	l/h	l/h	bar	
7	0.58	2.0	2.7	4.0	400	DN 4
12	1.70	5.9	7.9	11.8	159	DN 8
18	3.82	13.3	17.7	26.6	71	DN 10
25	7.36	25.6	34.1	51.2	37	DN 16
36	15.27	53.1	70.8	106.3	18	DN 25

Technical data for ORLITA DR 150 single-head pump 50 Hz

Plunger Ø	Theor. stroke volume	Theoretical pump capacity in l/h at strokes/min					Max. pressure	Nominal diameter
		58	77	97	116	145		
mm	ml/stroke	l/h	l/h	l/h	l/h	l/h	bar	
12	3.62	12.6	16.8	21.0	25.2	31.5	400	DN 8
18	8.14	28.3	37.8	47.2	56.7	70.8	400	DN 8
25	15.71	54.7	72.8	91.0	109.3	136.7	250	DN 16
36	32.57	113.4	151.0	188.8	226.7	283.4	147	DN 25

Note

All performance data applies to 50 Hz. If a 60 Hz motor is used, the performance will be correspondingly higher.

Abridged presentation of our complete product range. Other types on request.

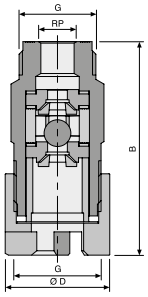
2.5 Accessories for Process Metering Pumps

2.5.1 Hydraulic/Mechanical Accessories

Hydraulic/mechanical accessories for metering pumps such as injection valves and foot valves, can be found in Chapter 1.4.2, sorted by nominal width DN 8 ... DN 40:

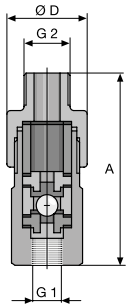
Please observe the permitted pressure stages or material combinations in your selection. Further accessories are available on request.

2.5.1.1 Foot Valve SST for High-Pressure Metering Pumps



	Dim. G	Dim. B mm	Dim. Rp	Diameter Ø D mm	Order no.
DN 10	3/4	70	1/4	41	803730
DN 10	3/4	70	3/8	41	803731

2.5.1.2 Injection Valve SST for High-Pressure Metering Pumps



To fit metering pumps of the sigma, META and MAKRO TZ-HK product ranges.

Housing and valve spring made of stainless steel no. 1.4571, ball made of stainless steel no. 1.4401, PTFE seals, priming pressure approx. 0.1 bar.

Application

90 °C - max. operating pressure, see table

	Max. pressure bar	G1	G2	Diameter Ø D mm	Dim. A mm	Order no.
DN 8	320	Rp 1/4	Rp 1/2	42	85	803732
DN 10	190	Rp 3/8	Rp 1/2	42	90	803733

2.5.1.3 Return/Pressure Relief Valve, Spring-loaded

Spring-loaded valves, inline version, designed as pump valves, i.e. to cope with a very high number of load cycles. Also suitable for use without pulsation damper.

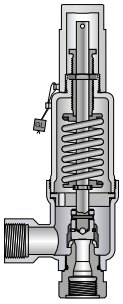
Features:

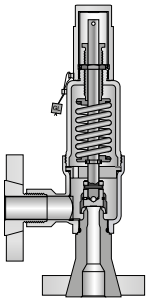
- Female thread on both sides or with sealing surface
- For bracing between 2 flanges
- PN 200 or PN 400
- Settings factory-set
- Standard design in stainless steel, hastelloy also available on request, as is Inconel

Also available heatable on request.

Dimension DN	Adjustable pressure bar	Construction	Order no.
6	2.0	Ball	1020074
6	4.0	Ball	1019224
6	8.0 – 9.0	Ball	1019097
10	2.0	Cone, fixed	1019649
10	3.0 – 6.0	Cone, adjustable	1023053
10	8.0 – 14.0	Cone, adjustable	1024065
16	2.0	Cone, fixed	1017937
16	3.0	Cone, fixed	1035266
16	4.5 – 5.4	Cone, fixed	1017936
25	1.0 – 2.0	Cone, fixed	1021843

2.5.1.4 Safety Valve





Regulations:

Safety valves are designed to comply with the following regulations:

- Pressurised Vessel and Steam Boiler Directive
- TRD 421, 721
- TRB 403
- AD 2000 Bulletins A2 and A4
- DIN EN ISO 4126
- Pressure Equipment Directive 97/23/EC
- ASME Code, Sections II and VIII
- API 526, 520, 527
- Others

The relevant product-specific certificates are available to prove compliance with these regulations and thus also the safety of the products.

Safety valves carry a parts label (specification label) stipulating the following data:

- Order date (serial no.)
- Technical data
- Set pressure
- VdTÜV Parts test number
- CE mark with number of nominated centre
- Further data, e.g. UV stamp with ASME-approved safety valves

Inspection / Labelling:

Following adjustment and inspection, every safety valve is sealed by the manufacturer.

Connections: NPT threaded connectors, threaded sockets and flange connections comply with DIN / ANSI. Other connections are available on request.

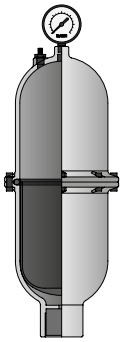
Inlet body material	
Material description	X 14 CrNiMo 17 – 12 – 2
Material no.	1.4404
ASME	316L

Dimensions, pressure ranges, weights	Standard 10 mm
Pressure stage at inlet	320 PN
Pressure stage at outlet	160 PN
Min. response pressure	0.1 bar
Max. response pressure (4373/4374)	68 bar
Narrowest flow cross-section	78.5 mm^2
Narrowest flow diameter	10 mm
Leg length (outlet/inlet)	30 mm/33 mm
Pin length (G 1/2/G 3/4)	15 mm/16 mm
Flange design	100 mm
Height (H2/H4)	137/162 mm
Weight	1.2 kg

2.5.1.5 Pulsation Damper

Pulsation dampers with separating membrane/bubble/bellows for providing separation between the gas cushion and metered chemical are used for low-pulsation metering as well as for reducing flow resistance in long metering lines and with viscous media. The response pressure of the gas cushion should be approx. 60-80% of the operating pressure.

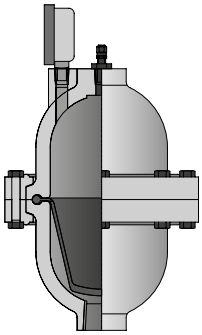
Important: A pressure relief valve should always be fitted with an adjustable back pressure valve when using a pulsation damper.



Bladder dampers, metal

Volume	0.066 – 379 l
Pressure	20.7 bar
Material of bladder/diaphragm	EPDM or FKM
Housing material	316 L stainless steel, Hastelloy C, PTFE

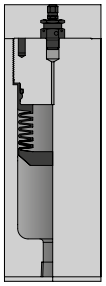
Further material versions and details available on request.



Bladder damper, plastic

Volume	0.066 – 19 l
Pressure	17.2 bar
Material of bladder/diaphragm	EPDM or FKM
Housing material	PVDF

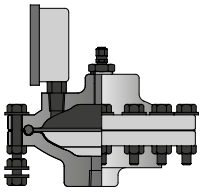
Further material versions and details available on request.



Bladder damper, high-pressure

Volume	0.13 – 0.39 l
Pressure	793 bar
Material of bladder/diaphragm	EPDM or FKM
Housing material	316 L stainless steel, Hastelloy C, Alloy 20

Further material versions and details available on request.



Diaphragm damper with PTFE diaphragm

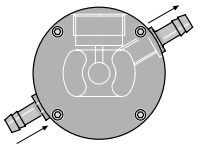
Volume	0.20 l
Pressure	137 bar
Material of bladder/diaphragm	PTFE
Housing material	316 L stainless steel, Hastelloy C, Alloy 20

Further material versions and details available on request.

2.5.2 Electrical Accessories

Accessories for metering pumps, such as frequency converters etc., can be found in Chapter 1.4.4. depending on the motor capacity DN 8 ... DN 40.

2.5.2.1 Cooling/Heating Equipment, Plunger Metering Pumps

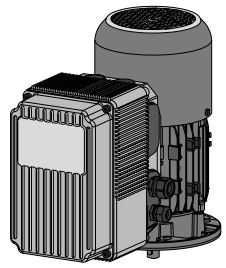


The cooling/heating device is integrated in the dosing head. Connecting sockets Ø 10 mm. Modification at a later date is not possible.

For pump	Order no.
Sigma HK - 08 S	1040459
META/Sigma HK - 12.5 S	803551
META/Sigma HK - 25 S	803552
META/Sigma HK - 50 S	803553
MAKRO TZ FK 30	1036645
MAKRO TZ FK 50	1036655
MAKRO TZ FK 85	1024665

Cooling/heating device for Makro TZ HK available on request.

2.5.3 Variable speed motors with integrated frequency converter with IP 55 degree of protection



Variable speed motor with integrated frequency converter

Externally controllable by 5 digital inputs, 1 analogue output 0 - 20 mA, 1 analogue input 0 - 10 V.

Max. motor output kW	Voltage supply	Control range	Flange Ø mm	For pump	Order no.
0.37	1-phase, 230 V, 50/60 Hz	1:20	160	HYDRO HP2a	1106898
0.75	1-phase, 230 V, 50/60 Hz	1:20	160	HYDRO HP3a	1106900
1.50	3-phase, 400 V, 50/60 Hz	1:20	200	HYDRO HP4a, MAKRO TZ (TZMb)	1106899
3.00	3-phase, 400 V, 50/60 Hz	1:20	200	MAKRO 5, MAKRO TZ (TZKa)	1106901

Motor data sheets can be requested for more information. Versions 265/460V - 60Hz, special motors or special motor flanges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IE3 standard in compliance with the Ecodesign Directive 2009/125/EC.

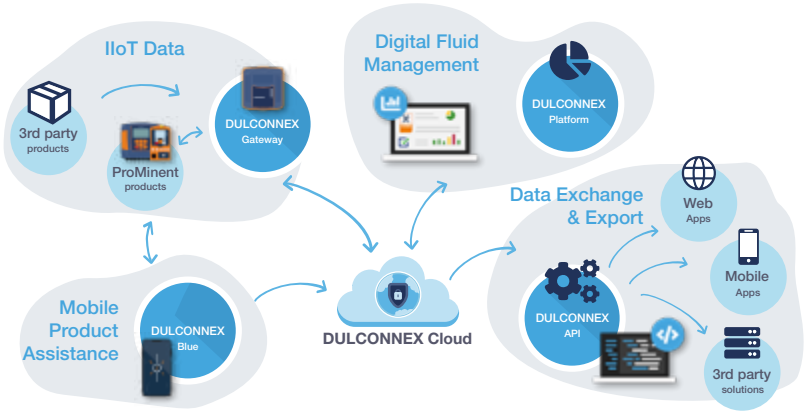
3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

3.1.1 Smart Process Monitoring – Any time, Anywhere

Improved process safety, reliability and transparency due to real-time monitoring, individual alarms and automated reports.

ProMinent's DULCONNEX is the cloud-based IIoT solution for digitally networking your system components. The solution consists of individual solution modules, which can be combined specifically to meet customer requirements:

	Pricing logic	Order no.
DULCONNEX Gateway AGIb	One-time price	1098723
DULCONNEX Gateway DACb	One-time price	1098756
DULCONNEX Gateway pumps and I/O modules	One-time price	1105889
DULCONNEX Gateway UVCb, CDLb	One-time price	1098757
DULCONNEX API	One-time price	1136479
CAN connection kit UVCb	One-time price	1107357
DULCONNEX Blue	Free app (Google Play Store / Apple App Store)	-
DULCONNEX Platform	Monthly fee per connected device	1093138
DULCONNEX Inventory Management	Monthly fee per connected Inventory Management-enabled device	DX000004
DULCONNEX API	Monthly fee per connected device	1110567



The DULCONNEX Cloud lies at the heart of the DULCONNEX solution. It meets stringent safety standards, receives data from connected devices and makes this data available to target applications, such as the DULCONNEX Platform. A DULCONNEX Gateway is needed to integrate both ProMinent products as well as third-party products into the cloud.

Using the DULCONNEX Blue app, our digital wizard, ProMinent products can also be connected to the user's mobile via a Bluetooth connection without connecting to the cloud, greatly simplifying user interactions.

On the basis of data available in the cloud, external services can be fed data via API.

Location-independent system monitoring in real time

With DULCONNEX, you always have access to all the key data and measured values for your pump installations. Monitor the status of your system in real time and benefit from continuous documentation. Check your device data safely and reliably when you're out and about. Simply use the terminal device of your choice: smartphone, tablet or PC. Configurable alarms and notifications inform you of relevant events 24/7.

Be in a position to act promptly at all times with DULCONNEX. No matter whether you work with industrial and process water, cooling water, potable water or swimming pool water – DULCONNEX supports you in ensuring the reliable treatment of your fluids.

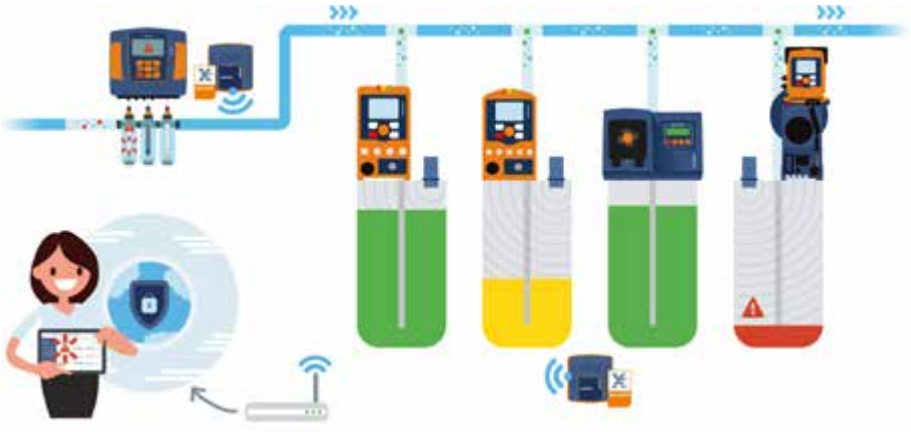
3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

3.1.2 Use case - chemical metering

Whether you are concerned about conformity with regulatory requirements governing the metering of chemicals, or about guaranteeing efficient and effective metering: DULCONNEX continuously provides you with automatic evidence of the metering performed by the connected metering pumps.

Using individually configurable alarms, DULCONNEX monitors a series of pump parameters, from the metering volume to any error and warning messages that occur. E-mail notifications allow you to react immediately to potential faults, thereby guaranteeing seamless processes. By networking the liquid level measurement to the metering stations you can avoid shortages in the metering of hydrogen peroxide, sulfuric acid, chloride dioxide, flocculants or corrosion inhibitors, among others.

DULCONNEX also continuously logs the operating parameters of all connected components and makes them available to you in the form of value diagrams and summarised reports to ensure that you always retain an overview of your processes.



3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

3.1.3 Your Benefits of Digital Fluid Management



- **Complete overview of all your devices and installations** – any time and from anywhere.
- **Reliable saving of your complete value history** including alarms and warnings that occur.
- **Individual alarms by e-mail** – Keep up to date at all times.
- **Continuous logging and automatic reports** – Documentation and evidence of correct operation.
- **Clear visualisation** – Graphic display of value and parameter combinations.
- **Access via the web** – Simply use any of your smart devices with an installed browser. You do not need an additional app nor a permanent link to the connected device.

The DULCONNEX Platform can be accessed at **https://dulconnex.prominent.com**. Please contact us for free access to try out the solution and send us your questions.

Privacy and data security



The architecture of DULCONNEX is already designed to achieve maximum safety and reliably protect your data. For example, there is a systematic separation of user-specific data and measured values. In addition, all measured values are anonymised internally and the entire system is regularly inspected by professional IT safety service providers for possible safety gaps.

Examples of relevant safety measures:

- Encryption in accordance with the latest state of the art
- Multiple redundant data memories
- Systematic control of the equipment ownership

Constantly growing portfolio of supported products

- **Pumps**
  - gamma/ X
  - gamma/ XL
  - DULCOFLEX DFXa
  - DULCOFLEX DFYa
  - sigma/ X
  - DULCOFLEX DF4a
- **Controllers**
  - DULCOMETER diaLog X
  - DULCOMETER diaLog DACb
  - DULCOPOOL Pro
  - AEGIS II
  - SlimFLEX 5a
  - AEGIS S
- **Radar sensor** DULCOLEVEL
- **Water treatment and disinfection systems**
  - UV systems DULCODES MP, LP/LP certified/LP F&B/LP-PE
  - Chlorine dioxide systems Bello Zon CDLb, CDKd and CDVd
  - Electrolysis system CHLORINSITU IIa 60–2500 g/h
- **Industrial standard signals via dedicated I/O modules**
  - Digital inputs (relays, with counters too)
  - Analogue inputs (4…20 mA)

3.1.4 DULCONNEX Gateway

Secure and reliable provision of IIoT data

The DULCONNEX Gateway safely and reliably transfers the data of all products supported as standard to the DULCONNEX Cloud



Our DULCONNEX Gateway enables all smart products to be connected to our web-based fluid management platform.

Using a gateway matched to the relevant product guarantees smooth and reliable operation. The customer must provide a WiFi access point with an internet connection in order to communicate with the DULCONNEX Platform.

	Suitable for system types	Order no.
DULCONNEX Gateway AGIb	AEGIS II	1098723
DULCONNEX Gateway DACb	DULCOMETER diaLog DACb	1098756
DULCONNEX Gateway pumps and I/O modules	gamma/ X, gamma/ XL, delta, DULCOFLEX DF4a, DULCOFLEX DFXa, DULCOFLEX DFYa, I- and M-modules (DULCOMARIN II), Frenzel+Berg modules (CIO50, CIO57, CIO58, CIO60, CIO300), Sigma X	1105889
DULCONNEX Gateway UVCb, CDLb	DULCODES LP/MP, chlorine dioxide systems Bello Zon CDLb	1098757
DULCONNEX API	DULCOLEVEL	1136479

3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

3.1.5 DULCONNEX Blue

Efficient and safe operation of pumps by smartphone

Mobile app for Android and iOS

The next generation of mobile product assistance from ProMinent – DULCONNEX Blue. The smart app enables intelligent pumps to be conveniently controlled by Bluetooth.



Your Benefits

- Easy operation and configuration of gamma/ X pumps in installation environments that are hard to access
- Live monitoring of device status and performance data from a safe distance
- Reliable remote control of supported ProMinent products
- User-friendly operation by means of intuitive interface and multilingual displays
- Efficient commissioning by simply copying of the configuration from one pump to other pumps
- Obtain professional support quickly in an emergency case – generate error logs at the press of a button and share them directly with service personnel

Technical Details

Important functions

- **Safe communication** - Easy authentication and pairing with supported devices for secure data exchange via Bluetooth interface.
- **Reliable remote control** - Easily operate ProMinent devices in hard-to-reach installation environments from a safe distance.
- **Intuitive design** - Thanks to the modern and multilingual user interface, pumps can now be operated even more conveniently.
- **Always up to date** - The clear dashboard provides the most important information on all devices at a glance. Information on current device status and performance data, as well as firmware updates, is available at all times.
- **Simple pump configuration** - Once saved, device configurations can be restored at any time and quickly copied from one pump to another.
- **Complete documentation** - The automatic logging of important operating data in the log book and the integrated commissioning report help to fulfill regulatory documentation requirements.
- **Direct access to product documentation** - Permanent access to the latest version of product-specific documents or relevant files.

Technical requirements

- Supported device model with the latest firmware version
- Integrated Bluetooth module (Bluetooth Classic or Bluetooth Low Energy)
- Mobile device with supported operating system (Android from version 9.0 (“Pie”) and iOS from version 12)

Supported devices

- Solenoid-Driven Metering Pump beta/ X, gamma/ X and gamma/ XL
  with Bluetooth Classic module from firmware version: 02.05.06.02
  with Bluetooth Low Energy module from firmware version: 02.06.01.01
- Radar liquid level sensor DULCOLEVEL

Further models will follow continuously in the future.

Supported languages

- English (DE)
- English (EN)
- French (FR)
- Spanish (ES)
- Polish (PL)

Availability

- Apple App Store for mobile devices with iOS (iPhone/iPad)
- Google Play Store for Android devices

3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

Field of Application

- **Enhanced safety for personnel and processes** – Adapt the settings of connected devices directly or control the pump capacity and metering volume from a safe distance without having to put on protective equipment in advance. The opportunity to simply save device configurations and reset them to earlier statuses at any time provides for additional safety.
- **Commissioning in record time** – Significant time saved particularly when setting up multiple devices by transmitting the configuration of one pump to other pumps.
- **Everything under control** – Keep an eye on the statuses and performance data of connected pumps at all times, thanks to the clearly laid out dashboard. Access real-time operating data, including dosing rate, liquid level and system pressure, and make changes immediately if you need to.
- **Minimise downtimes** – The device automatically generates a logbook with all errors, warnings and events that have occurred. Detailed error logs can be generated at the press of a button, which can be shared quickly and easily with local service personnel. This guarantees the fastest possible help in an emergency to avoid long downtimes.
- **Provision of evidence** – The built-in commissioning report provides straightforward evidence of the set-up and commissioning of systems. Automatic recording of key operating data, including the current feed rate or number of strokes, simplifies compliance with regulatory documentation obligations.

3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

3.1.6 DULCONNEX Platform

Location-independent monitoring and documentation of system and process data

Web-based IIoT platform for digital fluid management

DULCONNEX Platform is a web-based IIoT platform for digital fluid management. The web application offers simple and location-independent access to all relevant system and process data and thus increases system availability. By continuously monitoring important parameters, the process quality can be optimized and the safety of employees increased. Comprehensive logging and automated generation of reports facilitate the fulfilment of documentation obligations.



Your Benefits

- **Always one step ahead of events** - keep an eye on the status and functionality of systems at all times and react early thanks to configurable alarms with email notification function. Easily create and share documentation in the event of an emergency in order to receive competent assistance as quickly as possible.
- **Greater transparency and safety** - gain knowledge of the exact process and system status on site before entering potentially dangerous environments. The complete history of all measured values and system data and their reliable storage in the cloud also offer additional protection against manipulation and data loss. Different user authorizations and one-time passwords can be used to limit functions and prevent unintentional or unauthorized changes.
- **Plan service calls more efficiently and prepare more effectively** - With the help of location-independent access to condition and performance data, trips for pure inspection and documentation purposes can be minimized. Knowing the exact condition of the system before arriving on site also allows service activities to be optimally prepared.
- **Increased system availability and optimized process quality** - The visualization of freely combinable parameters in diagrams allows detailed analyses of processes and supports the identification of optimization potential.
- **Easier compliance with regulatory documentation requirements** - Thanks to continuous logging, automated report generation and the simple export function, the manual effort required to provide proof of proper operation is significantly reduced.

Technical Details

The responsive design and intuitive user interface of the web application ensure that users can quickly and easily benefit from the numerous functions of the IIoT platform:

- **Dashboards** - Customizable dashboards show the most important information of different systems or process sections at a glance
- **Alarms** - Freely configurable alarm messages by email provide information about exceeding or falling below individually configurable limit values and other important events
- **Log book** - The continuous logging of all system data and events creates increased transparency and additional safety
- **Data history** - A complete history of operating data and measured values supports operators in fulfilling regulatory documentation obligations and forms the basis for comprehensive analyses
- **Visualization** - Both current and historical measured values can be freely combined and displayed in diagrams, facilitating detailed analyses of system performance and process quality. It also supports the operator in fulfilling regulatory documentation obligations
- **Reports** - With the help of automated report generation and the simple creation of individual documentation in exportable file formats, proof of proper operation can be provided with minimal effort

3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

Field of Application

- **Increase transparency** - Whether pumps, controllers, sensors or systems, the current status and performance data is retrieved from all installation locations in real time and stored securely in the DULCONNEX Cloud. With the help of the DULCONNEX Platform, operators have access to the complete history of their process data at any time and from anywhere and can easily keep an eye on critical measured values such as dosing rate, liquid level or system pressure at all times.
- **Ensure system availability** - The comprehensive logging of the device status, including all errors, Warnings and events that occur, is particularly useful in time-critical situations. Detailed documentation can be generated at the touch of a button and shared quickly and easily with local service contacts. This guarantees the fastest possible assistance in an emergency and minimizes the risk of longer downtimes.
- **Optimize processes** - Current liquid levels can be clearly displayed on the customizable dashboards and reliably monitored with the help of configurable alarms. If desired, automated notifications can inform responsible employees or chemical suppliers when critical limit values are reached so that they can ensure replenishment in good time. Process-critical chemicals can thus be delivered and stocked with pinpoint accuracy.
- **Protect employees** - The DULCOnneX Platform gives operators, employees or service technicians knowledge of the exact process and system status on site before entering potentially dangerous environments. This means that every operation can be optimally prepared and safety increased.
- **Prove compliance** - The continuous logging of all relevant operating data facilitates the fulfillment of regulatory documentation requirements. Customized, automatically generated reports significantly reduce manual effort and the proper operation of systems can be easily verified at any time.
- **Increase responsiveness** - Adjustments to changing conditions can be viewed from anywhere and conveniently changed remotely.

	Pricing logic	Order no.
DULCONNEX Platform	Monthly fee per connected device	1093138

3.1 DULCONNEX: IIoT Solution for Digital Fluid Management

3.1.7 DULCONNEX Inventory Management

The ideal DULCONNEX extension for your tank level application

The DULCONNEX Inventory Management add-on is an extension to the DULCONNEX Platform. It can be used to monitor tank levels and inventory levels of chemicals at various sites regardless of your location. Tank level monitoring is based on the data of the DULCOLEVEL radar level sensor.



The DULCONNEX Inventory Management add-on is an extension to the DULCONNEX Platform. It can be used to monitor tank levels and inventory levels of chemicals at various sites regardless of your location.

It also provides specific dashboards, reports and views to allow you to use your tank level application as efficiently as possible.

- Simple integration of existing or new tank level applications
- Detailed overview of all elements of the application, such as tank levels with warning levels, inventory levels, chemicals and locations
- Geographic overview of all systems with colour visualisation of tank levels and inventory levels
- Specific reports for tank level applications such as a detailed usage certificate for compliance with specifications

	Pricing logic	Order no.
DULCONNEX Inventory Management	Monthly fee per connected Inventory Management-enabled device	DX000004

3.1.8 DULCONNEX API

Integrate the raw data from your application into any system of your choice

With DULCONNEX API, you can access your data on request from the DULCONNEX Cloud. Use this for integration into existing process control systems, SCADA, mobile or online apps as well as MES or share data with other digital solutions.



Your Benefits

- Simple integration of existing or new tank level applications
- Detailed overview of all elements of the application, such as tank levels with warning levels, inventory levels, chemicals and locations
- Geographic overview of all systems with colour visualisation of tank levels and inventory levels
- Specific reports for tank level applications such as a detailed usage certificate for compliance with specifications

Technical Details

The responsive design and intuitive user interface of the web application ensure that users quickly and easily benefit from the numerous functions of the Inventory Management module in the IIoT platform:

Dashboard – The Inventory Management dashboard helps to provide a clear view of all key information, such as designation, location, current liquid level, critical classification of the liquid level, remaining tank range, chemicals as well as associated inventory levels for all tank level applications.

List view – The list view allows all tank level applications to be displayed grouped in one complete overview or by location. Inventory levels, tanks, locations and complete tank level applications can be managed within these views. In addition, detailed filters can be used to align the view to the user's needs.

Map – The overview map features colour indicators and so can be used to quickly and easily view all liquid and inventory levels. More detailed information can be displayed by selecting a location.

Inventory report – All inventory movements of the chemicals can be provided in PDF or Excel format for the desired time period, allowing transparency to be improved and documentation to be simplified.

Consumption report – All consumption of chemicals for each location and the total consumption of a chemical is documented in PDF or Excel format when using this report. The data is provided accurate to the day, ensuring a high level of traceability.

Compliance report – When using certain chemicals, this report helps you to comply with regulations as it generates a usage certificate per device.

	Pricing logic	Order no.
DULCONNEX API	Monthly fee per connected device	1110567

Data Required for Specification of Metering Pump and Accessories

Pump Specification Data	
Min./max. required feed rate	l/h
Available power supply	V, Hz
Min./max. operating temperature	°C
Properties of process chemical	
Name, concentration %	
Solids content %	
Dynamic viscosity mPa (= cP)	
Vapour pressure at operating temperature	bar
Remarks, e.g. abrasive,	
gaseous, flammable,	
corrosive towards	

Suction conditions:

Min./max. suction lift	m
Min./max. positive suction head	m
Pressure in chemical tank	bar
Suction line length	m
Suction line diameter	mm

Discharge conditions:

Min./max. back pressure	bar
Min./max. discharge head	m
Min./max. negative discharge head	m
Discharge line length	m
Discharge line diameter	mm
Number of valves and fittings in suction and discharge line	

Data required for proportional dosing:

Water flow Q min./max.	m^3/h
Required final concentration	g/m^3, ppm

ProMinent Chemical Resistance List

Resistance of Materials Used in Liquid Ends to the Chemicals Most Frequently Used

This data applies to standard conditions (20 °C, 1,013 mbar).

s	saturated solution in water
+	resistant
+/o	practically resistant
o	conditionally resistant
-	not resistant
n	resistance not known
=>	see under
*	The resistance of the adhesive (e.g. Tangit) should be taken into account for bonded connections. (We would not recommend materials rated as 'o' and '-' !)
**	Does not apply to fibre glass-reinforced material

Concentrations are stated as weight percentages with reference to aqueous solutions. If the level of resistance is provided with a percentage figure, it only applies up to this concentration.

NOTE:

The **CSM (Hypalon®)** and **IIR (butyl rubber)** elastomers used as the diaphragm materials in bladder dampers have similar characteristics to **EPDM**.

PTFE is resistant to all the chemicals in this list.

However, **PTFE filled with carbon** is attacked by aggressive oxidants such as bromine (anhydrous) or concentrated acids (nitric acid, sulfuric acid, chromic acid).

The resistance of PVC-U connections bonded with Tangit deviates from the list below for the following chemicals:

Medium	Concentration range
Chromo-sulfuric acid	≥ 70 % H_2SO_4 + 5 % $K_2Cr_2O_7$/$Na_2Cr_2O_7$
Chromic acid	≥ 10 % CrO_3
Hydrochloric acid	≥ 25 % HCl
Hydrogen peroxide	≥ 5 % H_2O_2
Hydrofluoric acid	≥ 0 % HF

Abbreviations used in the column designations:

Acrylic:	Resistance of poly(methyl methacrylate) (clear acrylic)
PVC:	Resistance of polyvinyl chloride, hard (PVC-U)
PP:	Resistance of polypropylene
PVDF:	Resistance of polyvinylidene fluoride (PVDF)
1.4404:	Resistance of stainless steel 1.4404, 1.4571 and 1.4435
FKM:	Resistance of fluorine rubber (e. g. Viton® A and B)
EPDM:	Resistance of ethylene propylene diene monomer
PharMed®:	Resistance of PharMed®
PE:	Resistance of polyethene
2.4819:	Resistance of Hastelloy C-276
WGK:	Water hazard class

Viton® is a registered trademark of DuPont Dow Elastomers

Water Hazard Classes (WGK):

1	Low hazard to waters
2	Hazard to waters
3	Severe hazard to waters
(X)	Not classified. Classified through conclusion by analogy. To be used with reservations.

Safety data sheets

Safety data sheets for our products can be found on our website and are available in versions for numerous different countries: www.prominent.com/MSDS

ProMinent Chemical Resistance List

The data has been taken from relevant manufacturers' literature and supplemented by our own tests and experience. As the resistance of materials also depends on other factors (operating conditions, state of surface etc.), this list should merely be regarded as an initial guide and does not claim to offer any guarantees. Take into consideration the fact that conventional feed chemicals are largely compounds, the corrosiveness of which cannot simply be calculated by adding together the corrosiveness of each individual component. In cases such as these the material compatibility data produced by the chemical manufacturer must be read as a matter of priority when selecting a material. Safety data sheets do not provide this information and cannot therefore replace application-specific documentation.

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	Pharmed®	PE	HastelloyC	WGK
1,2-Dichloroethene	$C_2H_2Cl_2$	100	-	-	o	+	+	o	-	o	-	+	2
1-Hexanol	$C_6H_{13}OH$	100	-	-	+	+	+	n	+	o	+	+	1
1-Octanol	$C_8H_{17}OH$	100	-	-	+	+	+	+	+	-	+	+	1
1-Pentanol	$C_5H_{11}OH$	100	+	+	+	+	+	-	+	-	+	+	1
2-Chloroethanol	$ClCH_2CH_2OH$	100	-	-	+	o	+	-	o	+	+	+	3
2-Ethylhexanol	$C_8H_{16}O$	100	n	+/o	+	+	+	+	+	-	+	+	2
4-Methylcatechol	$C_6H_3(OH)_2CH_3$	s	+	+	+	+	+	+	-	+/o	+	+	1
Acetaldehyde	CH_3CHO	100	-	-	o	-	+	-	+/o	-	+	+	2
Acetamide	CH_3CONH_2	s	+	+	+	+	+	o	+	+/o	+	+	1
Acetic acid	CH_3COOH	100	-	50%	+	+	+	-	o	60%	70%	+	1
Acetic acid anhydride	$(CH_3CO)_2O$	100	-	-	o	-	+	-	+/o	+	o	+	1
Acetic anhydride	$(CH_3CO)_2O$	100	-	-	o	-	+	-	+/o	+	o	+	1
Acetic ester	$CH_3COOC_2H_5$	100	-	-	35%	+	+	-	+/o	+/o	+	+	1
Acetone	CH_3COCH_3	100	-	-	+	-	+	-	+	-	+	+	1
Acetophenone	$C_6H_5COCH_3$	100	-	n	+	-	+	-	+	n	+	+	-
Acetyl chloride	CH_3COCl	100	-	+	n	-	o	+	-	o	n	+	1
Acetyl chloride	CH_3COCl	100	-	+	n	-	o	+	-	o	n	+	1
Acetylacetone	$CH_3COCH_2COCH_3$	100	-	-	+	-	+	-	+	n	+	+	1
Acetylene tetrachloride	$C_2H_2Cl_4$	100	-	-	o	+	+	o	-	o	o	+	3
Acrylonitrile	CH_2=CH-CN	100	-	-	+	+	+	-	-	-	+	+	3
Adipic acid	$HOOC(CH_2)_4COOH$	s	+	+	+	+	+	+	+	+/o	+	+	1
Allyl alcohol	CH_2CHCH_2OH	96	-	o	+	+	+	-	+	o	+	+/o	2
Aluminium acetate	$Al(CH_3COO)_3$	s	+	+	+	+	+	+	+	+	+	+/o	1
Aluminium bromide	$AlBr_3$	s	+	+	+	+	n	+	+	+	+	+	2
Aluminium chloride	$AlCl_3$	s	+	+	+	+	-	+	+	+	+	+	1
Aluminium fluoride	AlF_3	10	+	+	+	+	-	+	+	+	+	+/o	1
Aluminium hydroxide	$Al(OH)_3$	s	+	+	+	o	+	+	+	+	+	+	1
Aluminium nitrate	$Al(NO_3)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Aluminium phosphate	$AlPO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Aluminium sulfate	$Al_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Ammonia	"NH_4OH"	30	+	+	+	+ (25 °C)	+	-	+	+	+	+	2
Ammonia solution	"NH_4OH"	30	+	+	+	+ (25 °C)	+	-	+	+	+	+	2
Ammonium acetate	CH_3COONH_4	s	+	+/o	+	+	+	+	+	+	+	+	1
Ammonium aluminium sulfate	$NH_4Al(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium bicarbonate	NH_4HCO_3	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium carbonate	$(NH_4)_2CO_3$	40	+	+	+	+	+	+	+	+	+	+	1
Ammonium carbonate	$(NH_4)_2CO_3$	40	+	+	+	+	+	+	+	+	+	+	1
Ammonium chloride	NH_4Cl	s	+	+	+	+	-	+	+	+	+	+/o	1
Ammonium fluoride	NH_4F	s	+	o	+	+	o	+	+	+	+	+	1
Ammonium hydroxide	"NH_4OH"	30	+	+	+	+ (25 °C)	+	-	+	+	+	+	2
Ammonium nitrate	NH_4NO_3	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium nitrate	NH_4NO_3	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium oxalate	$(COONH_4)_2 * H_2O$	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium perchlorate	NH_4ClO_4	10	+	+	+	+	+	+	+	+	+	+	1
Ammonium peroxodisulfate	$(NH_4)_2S_2O_8$	s	+	+	+	+	5%	+	+	+	+	5%	2
Ammonium phosphate	$(NH_4)_3PO_4$	s	+	+	+	+	10%	+	+	+	+	10%	1
Ammonium sulfate	$(NH_4)_2SO_4$	s	+	+	+	+	10%	+	+	+	+	10%	1
Ammonium sulfide	$(NH_4)_2S$	s	+	+	+	+	n	+	+	n	+	n	2
Amyl alcohol	$C_5H_{11}OH$	100	+	+	+	+	+	-	+	-	+	+	1
Aniline	$C_6H_5NH_2$	100	-	-	+	+	+	-	+/o	o	+	+	2
Anilinium chloride	$C_6H_5NH_2 * HCl$	s	n	+	+	+	-	+/o	+/o	o	+	+	2
Antimony trichloride	$SbCl_3$	s	+	+	+	+	-	+	+	+	+	n	2
Aqua regia	$3\ HCl + HNO_3$	100	-	+	-	+[2)]	-	-	o	-	-	-	2
Arsenic acid	H_3AsO_4	s	+	+	+	+	+	+	+	o	+	+	3
Askarels	$C_6H_{10}O$	100	-	-	+	-	+	-	+/o	-	+	+	1
Barium carbonate	$BaCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Barium chloride	$BaCl_2$	s	+	+	+	+	-	+	+	+	+	+	1
Barium hydroxide	$Ba(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Barium hydroxide	$Ba(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Barium nitrate	$Ba(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Barium sulfate	$BaSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Barium sulfide	BaS	s	+	+	+	+	+	+	+	+	+	+	1
Battery acid	H_2SO_4	98%	30%	50%	85%	+	20%	+	80%	30%	80%	+	1
Benzaldehyde	C_6H_5CHO	100	-	-	+	-	+	+	+	-	o	+	1
Benzene	C_6H_6	100	-	-	o	+	+	o	-	-	o	+	3
Benzenesulfonic acid	$C_6H_5SO_3H$	10	n	n	+	+	+	+	-	-	n	+	2

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Benzine	-	100	-	-	+	+	+	+	-	-	+	+	2
Benzoic acid	C_6H_5COOH	s	+	+	+	+	+	+	+	+/o	+	+	1
Benzoyl chloride	C_6H_5COCl	100	-	n	o	n	o	+	+	n	o	+	2
Benzyl alcohol	$C_6H_5CH_2OH$	100	-	-	+	+	+	+	-	+	+	+	1
Benzyl benzoate	$C_6H_5COOC_7H_7$	100	-	-	+	o	+	+	-	-	+	+	2
Benzyl chloride	$C_6H_5CH_2Cl$	90%	-	n	o	+	+	+	-	-	o	+	2
Bleaching lye	NaOCl + NaCl	12%	+	+	o	+	-	o	+	+	o	> 10%	2
Borax	$Na_2B_4O_7 * {}_{10H2}O$	s	+	+	+	+	+	+	+	+	+	+	1
Borax	$NaBO_2$	s	+	+	+	+	+	+	+	+	+	+	1
Boric acid	H_3BO_3	s	+	+	+	+	+	+	+	+	+	+	1
Bromine (dry)	Br_2	100	-	-	-	+	-	-	-	-	-	+	2
Bromine water	$Br_2 + H_2O$	s	-	+	-	+	-	-	-	n	-	n	2
Bromobenzene	C_6H_5Br	100	n	n	o	+	+	o	-	-	o	+	2
Bromochloromethane	CH_2BrCl	100	-	-	-	+	+	n	+/o	-	o	+	2
Bromochlorotrifluoroethane	$HCClBrCF_3$	100	-	-	o	+	+	+	-	+	o	+	3
Butanediol	HOC_4H_8OH	10	n	+	+	+	+	o	+	+	+	+	1
Butanetriol	$C_4H_{10}O_3$	s	+	+	+	+	+	o	+	+	+	+	1
Butanol	C_4H_9OH	100	-	+	+	+	+	o	+/o	-	+	+	1
Butanone	$CH_3COC_2H_5$	100	-	-	+	-	+	-	+	-	+	+	1
Butyl acetate	$CH_3COOC_4H_9$	100	-	-	o	+	+	-	+/o	+/o	-	+	1
Butyl acetate	$CH_3COOC_4H_9$	100	-	-	o	+	+	-	+/o	+/o	-	+	1
Butyl acrylate	$C_7H_{13}O_2$	100	-	-	+	+	+	-	-	+/o	+	+	1
Butyl alcohol	C_4H_9OH	100	-	+	+	+	+	o	+/o	-	+	+	1
Butyl benzoate	$C_6H_5COOC_4H_9$	100	-	-	o	n	+	+	+	-	o	+	2
Butyl mercaptan	C_4H_9SH	100	n	n	n	+	n	+	-	n	n	n	3
Butyl oleate	$C_{22}H_{42}O_2$	100	n	n	n	+	+	+	+/o	n	n	+	1
Butyl stearate	$C_{22}H_{44}O_2$	100	o	n	n	+	+	+	-	n	n	+	1
Butylamine	$C_4H_9NH_2$	100	n	n	n	-	+	-	-	n	+	+	1
Butyraldehyde	C_3H_7CHO	100	-	n	+	n	+	-	+/o	-	+	+	1
Butyric acid	C_3H_7COOH	100	5%	20%	+	+	+	+	+	+/o	+	+	1
Calcium acetate	$(CH_3COO)_2Ca$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium bisulfite	$Ca(HSO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium bisulfite	$Ca(HSO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium carbonate	$CaCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium chloride	$CaCl_2$	s	+	+	+	+	-	+	+	+	+	+	1
Calcium cyanide	$Ca(CN)_2$	s	+	+	+	+	n	+	+	+	+	n	3
Calcium hydroxide	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium hydroxide	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium hypochlorite	$Ca(OCl)_2$	s	+	+	o	+	-	o	+	+	+	+	2
Calcium nitrate	$Ca(NO_3)_2$	s	+	50%	50%	+	+	+	+	+	+	+	1
Calcium nitrate	$Ca(NO_3)_2$	s	+	50%	50%	+	+	+	+	+	+	+	1
Calcium phosphate	$Ca_3(PO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium sulfate	$CaSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium sulfide	CaS	s	+	+	+	+	n	+	+	+	+	+	2
Calcium sulfite	$CaSO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium thiosulfate	CaS_2O_3	s	+	+	+	+	-	+	+	+	+	+	1
Caprylic aldehyde	$C_5H_{11}CHO$	100	n	n	+	+	+	-	+/o	-	+	+	1
Carbolic acid	C_6H_5OH	100	-	-	+	+	+	+	-	+	+	+	2
Carbon disulfide	CS_2	100	-	-	o	+	+	+	-	-	o	+	2
Carbon disulfide	CS_2	100	-	-	o	+	+	+	-	-	o	+	2
Carbon tetrachloride	CCl_4	100	-	-	-	+	+	+	-	-	o	+	3
Carbonic acid	"H_2CO_3"	s	+	+	+	+	+	+	+	+	+	+	1
Caustic potash	KOH	50	+	+	+	+ (25 °C)	+	-	+	10%	+	+	1
Chile saltpeter	$NaNO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Chloracetone	$ClCH_2COCH_3$	100	-	-	n	n	+	-	+	-	n	+	3
Chloral hydrate	$CCl_3CH(OH)_2$	s	-	-	o	-	+	o	o	n	+	+	2
Chloric acid	$HClO_3$	20	+	+	-	+	-	o	o	+	10%	+	2
Chlorinated lime	$Ca(OCl)_2$	s	+	+	o	+	-	o	+	+	+	+	2
Chlorine bleaching	NaOCl + NaCl	12%	+	+	o	+	-	o	+	+	o	> 10%	2
Chlorine dioxide solution	$ClO_2 + H_2O$	0.5%	o	+	o	+[1)]	-	o	-	-	o	+	-
Chlorine water	$Cl_2 + H_2O$	s	+	+	o	+	-	+	+	-	o	+	-
Chlorobenzene	C_6H_5Cl	100	-	-	+	+	+	+	-	-	o	+	2
Chloroethylbenzene	$C_6H_4ClC_2H_5$	100	-	-	o	n	+	o	-	-	o	+	2
Chloroform	$CHCl_3$	100	-	-	o	+	+	+	-	o	-	+	2
Chloroformic acid ethyl ester	$ClCO_2C_2H_5$	100	n	n	n	n	n	+	-	n	n	n	2
Chlorophenol	C_6H_4OHCl	100	-	n	+	+	+	n	-	-	+	+	2
Chloroprene	C_4H_5Cl	100	-	-	n	n	+	+	-	-	n	+	1
Chloroprene	C_4H_5Cl	100	-	-	n	n	+	+	-	-	n	+	1
Chlorosulfuric acid	$SO_2(OH)Cl$	100	-	o	-	+	-	-	-	-	-	o	1
Chlorotoluene	C_7H_7Cl	100	-	-	n	+	+	+	-	-	n	+	2
Chromic acid	H_2CrO_4	50	-	+	o	+	10%	+	-	o	+	10%	3
Chromium(III) potassium sulfate dodecahydrate	$KCr(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Chromium(III) potassium sulfate dodecahydrate	$KCr(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Chromium(III) sulfate	$Cr_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Chromo-sulfuric acid	$K_2CrO_4 + H_2SO_4$	s	-	+	-	+	n	n	n	-	-	n	3

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	Pharmed®	PE	HastelloyC	WGK
Citric acid	$C_6H_8O_7$	s	+	+	+	+	+	+	+	+	+	+	1
Cobalt chloride	$CoCl_2$	s	+	+	+	+	-	+	+	+	+	+	2
Colamine	$HOC_2H_4NH_2$	100	o	n	+	-	+	-	+/o	o	+	+	1
Copper arsenite	$Cu_3(AsO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Copper(II) acetate	$Cu(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Copper(II) carbonate	$CuCO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Copper(II) chloride	$CuCl_2$	s	+	+	+	+	1%	+	+	+	+	+	2
Copper(II) cyanide	$Cu(CN)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Copper(II) fluoride	CuF_2	s	+	+	+	+	+	+	+	+	+	+	2
Copper(II) nitrate	$Cu(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+/o	2
Copper(II) sulfate	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	2
Cresol	$C_6H_4CH_3OH$	100	o	o	+	+	+	+	-	-	+	+	2
Crotonaldehyde	$CH_3C_2H_2CHO$	100	n	-	+	+	+	-	+	-	+	+	3
Cumene	$C_6H_5CH(CH_3)_2$	100	-	-	o	+	+	+	-	-	o	+	1
Cyclohexane	C_6H_{12}	100	+	-	+	+	+	+	-	-	+	o	1
Cyclohexanol	$C_6H_{11}OH$	100	o	+/o	+	+	+	+	-	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100	-	-	+	-	+	-	+/o	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100	-	-	+	-	+	-	+/o	-	+	+	1
Cyclohexyl alcohol	$C_6H_{11}OH$	100	o	+/o	+	+	+	+	-	-	+	+	1
Cyclohexylamine	$C_6H_{11}NH_2$	100	n	n	n	n	+	-	n	n	n	+	2
Decahydronaphthalene	$C_{10}H_{18}$	100	-	+/o	o	+	n	o	-	-	o	+	2
Decalin	$C_{10}H_{18}$	100	-	+/o	o	+	n	o	-	-	o	+	2
Dextrin	-	s	+	+	+	+	+	+	+	+	+	+	1
Dextrose	$C_6H_{12}O_6$	s	+	+	+	+	+	+	+	+	+	+	1
Diacetone alcohol	$C_6H_{12}O_2$	100	-	-	+	o	+	-	+	-	+	+	1
Dibromoethane	$C_2H_4Br_2$	100	-	-	n	+	+	+	-	-	-	+	3
Dibutyl ether	$C_4H_9OC_4H_9$	100	-	-	+	+	+	-	o	-	+	+	2
Dibutyl phthalate	$C_{16}H_{22}O_4$	100	-	-	+	+	+	+	+/o	+	o	+	2
Dibutylamine	$(C_4H_9)_2NH$	100	n	n	+	+	+	-	-	n	+	+	1
Dichloroacetic acid	$Cl_2CHCOOH$	100	-	+	+	+	+	-	+	o	+	+	1
Dichloroacetic acid methyl ester	$Cl_2CHCOOCH_3$	100	-	-	+	n	+	-	n	-	+	+	2
Dichlorobenzene	$C_6H_4Cl_2$	100	-	-	o	+	+	+	-	-	o	+	2
Dichlorobutane	$C_4H_8Cl_2$	100	-	-	o	+	+	+	-	-	o	+	3
Dichlorobutene	$C_4H_6Cl_2$	100	-	-	o	+	+	o	-	-	o	+	3
Dichlorobutene	$C_4H_6Cl_2$	100	-	-	o	+	+	o	-	-	o	+	3
Dichloroethane	$C_2H_4Cl_2$	100	-	-	o	+	+	+	-	o	-	+	3
Dichloroethene	$C_2H_2Cl_2$	100	-	-	o	+	+	o	-	o	-	+	2
Dichloroisopropyl ether	$(C_3H_6Cl)_2O$	100	-	-	o	n	+	o	o	-	o	+	2
Dichloromethane	CH_2Cl_2	100	-	-	o	o	o	+	-	o	-	+	2
Dicyclohexylamine	$(C_6H_{12})_2NH$	100	-	-	o	n	+	-	-	-	o	+	2
Diethyl ether	$C_2H_5OC_2H_5$	100	-	-	o	+	+	-	-	o	o	+	1
Diethylene glycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	1
Diethylene glycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	1
Diethylene glycol monoethyl ether	$C_8H_{18}O_3$	100	n	n	+	+	+	n	+/o	o	+	+	1
Diglycolic acid	$C_4H_6O_5$	30	+	+	+	+	+	+	n	+/o	+	+	3
Dihexyl phthalate	$C_{20}H_{26}O_4$	100	-	-	+	+	+	-	n	+	+	+	1
Diisobutyl ketone	$C_9H_{18}O$	100	-	-	+	+	+	-	+	-	+	+	1
Diisononyl phthalate	$C_{26}H_{42}O_4$	100	-	-	+	+	+	n	n	+	+	+	1
Diisopropyl ketone	$C_7H_{14}O$	100	-	-	+	+	+	-	+	-	+	+	1
Dimethyl carbonate	$(CH_3O)_2CO$	100	n	n	+	+	+	+	-	n	+	+	1
Dimethyl ketone	CH_3COCH_3	100	-	-	+	-	+	-	+	-	+	+	1
Dimethyl phthalate	$C_{10}H_{10}O_4$	100	-	-	+	+	+	-	+/o	+	+	+	1
Dimethylformamide	$HCON(CH_3)_2$	100	-	-	+	-	+	-	+	+/o	+	+	1
Dimethylhydrazine	$H_2NN(CH_3)_2$	100	n	n	+	n	+	-	+	n	+	+	3
Dioctyl phthalate	$C_4H_4(COOC_8H_{17})_2$	100	-	-	+	+	+	-	+/o	+	+	+	1
Dioxane	$C_4H_8O_2$	100	-	-	o	-	+	-	+/o	-	+	+	1
Disodium hydrogen phosphate	Na_2HPO_4	s	+	+	+	+	+	+	+	+	+	+	1
Disulfur dichloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Disulfur dichloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Disulfur dichloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Disulfuric acid	$H_2SO_4 + SO_3$	s	n	-	-	-	+	+	-	+	-	+	2
DMF	$HCON(CH_3)_2$	100	-	-	+	-	+	-	+	+/o	+	+	1
DOP	$C_4H_4(COOC_8H_{17})_2$	100	-	-	+	+	+	-	+/o	+	+	+	1
Epichlorohydrin	C_3H_5OCl	100	-	n	+	-	+	+	o	+	+	+	3
Epsomite	$MgSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	1
Ethanol	C_2H_5OH	100	-	+	+	+	+	-	+	+	+	+	1
Ethanolamine	$HOC_2H_4NH_2$	100	o	n	+	-	+	-	+/o	o	+	+	1
Ether	$C_2H_5OC_2H_5$	100	-	-	o	+	+	-	-	o	o	+	1
Ethyl acetate	$CH_3COOC_2H_5$	100	-	-	35%	+	+	-	+/o	+/o	+	+	1
Ethyl acetoacetate	$C_6H_{10}O_3$	100	n	-	+	+	+	-	+/o	+/o	+	+	1
Ethyl acrylate	$C_2H_3COOC_2H_5$	100	-	-	+	o	+	-	+/o	-	+	+	2
Ethyl alcohol	C_2H_5OH	100	-	+	+	+	+	-	+	+	+	+	1
Ethyl benzoate	$C_6H_5COOC_2H_5$	100	n	-	+	o	+	+	-	-	+	+	1
Ethyl bromide	C_2H_5Br	100	-	n	+	+	n	+	-	o	+	+	2
Ethyl chloroacetate	$ClCH_2COOC_2H_5$	100	-	o	+	+	+	+	-	-	+	+	2

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Ethylacrylic acid	C_4H_7COOH	100	n	n	+	+	+	n	+/o	n	+	+	1
Ethylbenzene	C_6H_5-C_2H_5	100	-	-	o	+	+	o	-	-	o	+	1
Ethylcyclopentane	$C_5H_4C_2H_5$	100	+	+	+	+	+	+	-	-	+	+	1
Ethylene dibromide	$C_2H_4Br_2$	100	-	-	n	+	+	+	-	-	-	+	3
Ethylene dichloride	$C_2H_4Cl_2$	100	-	-	o	+	+	+	-	o	-	+	3
Ethylene dichloride	$C_2H_4Cl_2$	100	-	-	o	+	+	+	-	o	-	+	3
Ethylene glycol	$C_2H_4(OH)_2$	100	+	+	+	+	+	+	+	+	+	+	1
Ethylene glycol ethyl ether	$HOC_2H_4OC_2H_5$	100	n	n	+	+	+	n	+/o	o	+	+	1
Ethylenediamine	$(CH_2NH_2)_2$	100	o	o	+	-	o	-	+	n	+	o	2
Fatty acids	R-COOH	100	+	+	+	+	+	+	o	o	+	+	1
Ferrous sulfate	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Fluorobenzene	C_6H_5F	100	-	-	+	+	+	o	-	-	o	+	2
Fluoroboric acid	HBF_4	35%	+	+	+	+	o	+	+	-	+	+	1
Formaldehyde	CH_2O	40	+	+	+	+	+	-	+/o	-	+	+	2
Formalin	CH_2O	40	+	+	+	+	+	-	+/o	-	+	+	2
Formamide	$HCONH_2$	100	+	-	+	+	+	+	+	n	+	+	1
Formic acid	HCOOH	s	-	+/o	+	+	+	-	-	+/o	+	+	1
Furan	C_4H_4O	100	-	-	+	-	+	-	n	-	+	+	3
Furanaldehyde	$C_5H_5O_2$	100	n	n	n	o	+	-	+/o	-	n	n	2
Furfural	$C_5H_4O_2$	100	n	n	n	o	+	-	+/o	-	n	n	2
Furfuryl alcohol	$OC_4H_3CH_2OH$	100	-	-	+	o	+	n	+/o	-	+	+	1
Gallic acid	$C_6H_2(OH)_3COOH$	5%	+	+	+	+	+	+	+/o	+	+	+	1
Glacial acetic acid	CH_3COOH	100	-	50%	+	+	+	-	o	60%	70%	+	1
Glauber's salt	Na_2SO_4	s	+	+	+	+	+	+	+	+	+	+	1
Glucose	$C_6H_{12}O_6$	s	+	+	+	+	+	+	+	+	+	+	1
Glycerol	$C_3H_5(OH)_3$	100	+	+	+	+	+	+	+	+	+	+	1
Glycerol chlorohydrin	C_3H_5OCl	100	-	n	+	-	+	+	o	+	+	+	3
Glycine	NH_2CH_2COOH	10	+	+	+	+	+	+	+	+	+	+	1
Glycine	NH_2CH_2COOH	10	+	+	+	+	+	+	+	+	+	+	1
Glycol	$C_2H_4(OH)_2$	100	+	+	+	+	+	+	+	+	+	+	1
Glycolic acid	$CH_2OHCOOH$	70%	+	37%	+	+	+	+	+	+/o	+	+	1
Green vitriol	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Heptane	C_7H_{16}	100	+	+	+	+	+	+	-	-	+	+	1
Hexachloroplatinic acid	H_2PtCl_6	s	n	+	+	+	-	n	+	n	+	-	-
Hexafluorosilicic acid	H_2SiF_6	100	+	30%	30%	+	o	+	+	o	40%	+/o	2
Hexafluorosilicic acid	H_2SiF_6	100	+	30%	30%	+	o	+	+	o	40%	+/o	2
Hexanal	$C_5H_{11}CHO$	100	n	n	+	+	+	-	+/o	-	+	+	1
Hexane	C_6H_{14}	100	+	+	+	+	+	+	-	-	+	+	1
Hexanetriol	$C_6H_9(OH)_3$	100	n	n	+	+	+	+	+	n	+	+	1
Hexanol	$C_6H_{13}OH$	100	-	-	+	+	+	n	+	o	+	+	1
Hexene	C_6H_{12}	100	n	+	+	+	+	+	-	-	+	+	1
Hydrazin hydrate	$N_2H_4 * H_2O$	s	+	+	+	+	+	n	+	o	+	+	3
Hydrochloric acid	HCl	38%	32%	+	+	+	-	+	o	o	+	o	1
Hydrochloric acid	HCl	38%	32%	+	+	+	-	+	o	o	+	o	1
Hydrofluoric acid	HF	80%	-	40%*	40%**	+	-	+	o	-	40%	+/o	1
Hydrofluoric acid	HF	80%	-	40%*	40%**	+	-	+	o	-	40%	+/o	1
Hydrogen bromide	HBr	50	+	+	+	+	-	-	+	-	+	o	1
Hydrogen cyanide	HCN	s	+	+	+	+	+	+	+	+	+	+	3
Hydrogen peroxide	H_2O_2	90%	40%	40%*	30%	+	+	30%	30%	+	+	+	1
Hydroiodic acid	HI	s	+	+	+	+	-	-	n	-	+	n	1
Hydroquinone	$C_6H_4(OH)_2$	s	o	+	+	+	+	+	-	+/o	+	+	2
Hydroxylammonium sulfate	$(NH_2OH)_2 * H_2SO_4$	10	+	+	+	+	+	+	+	+	+	+	2
Hypochlorous acid	HOCl	s	+	+	o	+	-	+	+/o	+	o	+	1
Hypochlorous acid	HOCl	s	+	+	o	+	-	+	+/o	+	o	+	1
Iodine	I_2	s	o	-	+	+	-	+	+/o	+	o	+/o	-
Iodkalium	KI	s	+	+	+	+	+	+	+	+	+	+	1
Iron(II) chloride	$FeCl_2$	s	+	+	+	+	-	+	+	+	+	+/o	1
Iron(II) sulfate	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Iron(III) chloride	$FeCl_3$	s	+	+	+	+	-	+	+	+	+	+/o	1
Iron(III) nitrate	$Fe(NO_3)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Iron(III) phosphate	$FePO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Iron(III) sulfate	$Fe_2(SO_4)_3$	s	+	+	+	+	o	+	+	+	+	+	1
Isobutyl alcohol	$C_2H_5CH(OH)CH_3$	100	-	+	+	+	+	+	+	o	+	+	1
Isopropanol	$(CH_3)_2CHOH$	100	-	+/o	+	+	+	+	+	o	+	+	1
Isopropyl acetate	$CH_3COOCH(CH_3)_2$	100	-	-	+	+	+	-	+/o	+/o	+	+	1
Isopropyl alcohol	$(CH_3)_2CHOH$	100	-	+/o	+	+	+	+	+	o	+	+	1
Isopropyl chloride	$CH_3CHClCH_3$	80%	-	-	o	+	+	+	-	o	o	+/o	2
Isopropylbenzene	$C_6H_5CH(CH_3)_2$	100	-	-	o	+	+	+	-	-	o	+	1
Isopropylether	$C_6H_{14}O$	100	-	-	o	+	+	-	-	o	o	+	1
Lactic acid	$C_3H_6O_3$	100	-	+	+	+	+/o	+	10%	+/o	+	+	1
Lead(II) acetate / lead(IV) acetate	$Pb(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	2
Lead(II) nitrate	$Pb(NO_3)_2$	50	+	+	+	+	+	+	+	+	+	+	2
Lead(II) sulfate	$PbSO_4$	s	+	+	+	+	+	+	+	+	+	+	2
Levoxin	$N_2H_4 * H_2O$	s	+	+	+	+	+	n	+	o	+	+	3
Lime milk	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Limescale	$CaCO_3$	s	+	+	+	+	+	+	+	+	+	+	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Lithium bromide	LiBr	s	+	+	+	+	+	+	+	+	+	+	1
Lithium chloride	LiCl	s	+	+	+	+	-	+	+	+	+	n	1
Magnesium carbonate	$MgCO_3$	s	+	+	+	+	+	+	+	+	+	+/o	1
Magnesium chloride	$MgCl_2$	s	+	+	+	+	o	+	+	+	+	+	1
Magnesium hydroxide	$Mg(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Magnesium nitrate	$Mg(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Magnesium sulfate	$MgSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	1
Maleic acid	$C_4H_4O_4$	s	+	+	+	+	+	+	+	o	+	+	1
Malic acid	$C_4H_6O_5$	s	+	+	+	+	+	+	+	+	+	+	1
Manganese(II) chloride	$MnCl_2$	s	+	+	+	+	-	+	+	+	+	+	1
Manganese(II) sulfate	$MnSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
MEK	$CH_3COC_2H_5$	100	-	-	+	-	+	-	+	-	+	+	1
Mercury	Hg	100	+	+	+	+	+	+	+	+	+	+	3
Mercury(II) chloride	$HgCl_2$	s	+	+	+	+	-	+	+	+	+	+	3
Mercury(II) cyanide	$Hg(CN)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Mercury(II) nitrate	$Hg(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Mesityl oxide	$C_6H_{10}O$	100	-	-	n	n	+	-	+/o	-	n	+	1
Methacrylic acid	C_3H_5COOH	100	n	n	+	+	+	o	+/o	+/o	+	+	1
Methanol	CH_3OH	100	-	-	+	+	+	o	+	+/o	+	+	1
Methoxybutanol	$CH_3O(CH_2)_4OH$	100	-	-	+	+	+	+	o	o	+	+	1
Methyl acetate	CH_3COOCH_3	60%	-	-	+	+	+	-	+/o	+/o	+	+	2
Methyl acetoacetate	$C_5H_8O_3$	100	-	-	+	+	+	-	+/o	o	+	+	2
Methyl acrylate	$C_2H_3COOCH_3$	100	-	-	+	+	+	-	+/o	o	+	+	2
Methyl alcohol	CH_3OH	100	-	-	+	+	+	o	+	+/o	+	+	1
Methyl benzoate	$C_6H_5COOCH_3$	100	-	-	+	o	+	+	-	-	+	+	2
Methyl cellulose	-	s	+	+	+	+	+	+	+	+	+	+	1
Methyl chloroacetate	$ClCH_2COOCH_3$	100	-	o	+	+	+	o	-	-	+	+	2
Methyl chloroform	CCl_3CH_3	100	-	-	o	+	+	+	-	o	o	+	3
Methyl ethyl ketone	$CH_3COC_2H_5$	100	-	-	+	-	+	-	+	-	+	+	1
Methyl isobutyl ketone	$CH_3COC_4H_9$	100	-	-	+	-	+	-	o	-	+	+	1
Methyl isopropyl ketone	$CH_3COC_3H_7$	100	-	-	+	-	+	-	+/o	-	+	+	1
Methyl methacrylate	$C_3H_5COOCH_3$	100	-	-	+	+	+	-	-	-	+	+	1
Methyl oleate	$C_{17}H_{33}COOCH_3$	100	n	n	+	+	+	+	+/o	n	+	+	1
Methyl salicylate	$HOC_6H_4COOCH_3$	100	-	-	+	+	+	n	+/o	-	+	+	1
Methylamine	CH_3NH_2	32%	+	o	+	o	+	-	+	+	+	+	2
Methylcyclopentane	$C_5H_9CH_3$	100	+	+	+	+	+	+	-	-	+	+	1
Methylene chloride	CH_2Cl_2	100	-	-	o	o	o	+	-	o	-	+	2
Methylglycol	$C_3H_8O_2$	100	+	+	+	+	+	-	+/o	+	+	+	1
MIBK	$CH_3COC_4H_9$	100	-	-	+	-	+	-	o	-	+	+	1
Morpholine	C_4H_9ON	100	-	-	+	-	+	n	n	-	+	+	2
Motor oils	-	100	n	+/o	+	+	+	+	-	-	+	+	2
Natron	$NaHCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Nickel(II) acetate	$(CH_3COO)_2Ni$	s	+	+	+	+	+	-	+	+	+	+	2
Nickel(II) chloride	$NiCl_2$	s	+	+	+	+	-	+	+	+	+	+	2
Nickel(II) nitrate	$Ni(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+/o	2
Nickel(II) sulfate	$NiSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	2
Nitric acid	HNO_3	99%	10%	50%	o	65%[2]	50%	50%	10%	35%	50%	65%	1
Nitromethane	CH_3NO_2	100	-	-	+	o	+	-	+/o	-	+	+	2
Nitropropane	$(CH_3)_2CHNO_2$	100	-	-	+	n	+	-	+/o	-	+	+	2
Nitrotoluene	$C_6H_4NO_2CH_3$	100	-	-	+	+	+	o	-	-	+	+	2
Octane	C_8H_{18}	100	o	+	+	+	+	+	-	-	+	+	1
Octanol	$C_8H_{17}OH$	100	-	-	+	+	+	+	+	-	+	+	1
Octylcresol	$C_{15}H_{24}O$	100	-	-	+	+	+	o	n	-	+	+	1
Oil	-	100	n	+/o	+	+	+	+	-	-	+	+	2
Oleum	$H_2SO_4 + SO_3$	s	n	-	-	-	+	+	-	+	-	+	2
Orthophosphoric acid	H_3PO_4	85%	50%	+	+	+	+	+	+	+	+	+	1
Oxalic acid	$(COOH)_2$	s	+	+	+	+	10%	+	+	+/o	+	+/o	1
Pentane	C_5H_{12}	100	+	+	+	+	+	+	-	-	+	+	1
PER	C_2Cl_4	100	-	-	o	+	+	o	-	o	o	+	3
Perchloric acid	$HClO_4$	70%	n	10%*	10%	+	-	+	+/o	+	+	n	1
Perhydrol	H_2O_2	90%	40%	40%*	30%	+	+	30%	30%	+	+	+	1
Petroleum ether	C_nH_{2n+2}	100	+	+/o	+	+	+	+	-	-	+	+	1
Phenol	C_6H_5OH	100	-	-	+	+	+	+	-	+	+	+	2
Phenylethyl ether	$C_6H_5OC_2H_5$	100	-	-	+	n	+	-	-	-	+	+	2
Phenylhydrazine	$C_6H_5NHNH_2$	100	-	-	o	+	+	o	-	-	o	+	2
Phosphoric acid	H_3PO_4	85%	50%	+	+	+	+	+	+	+	+	+	1
Phosphorus trichloride	PCl_3	100	-	-	+	+	+	o	+	+/o	+	+	1
Phosphoryl chloride	$POCl_3$	100	-	-	+	+	n	+	+	n	+	+	1
Phthalic acid	$C_6H_4(COOH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Picric acid	$C_6H_2(NO_3)_3OH$	s	+	+	+	+	+	+	+	-	+	+	2
Piperidine	$C_5H_{11}N$	100	-	-	n	n	+	-	-	-	n	+	2
Plaster	$CaSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium acetate	CH_3COOK	s	+	+	+	+	+	+	+	+	+	+	1
Potassium alum	$KAl(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium aluminium sulfate	$KAl(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium bicarbonate	$KHCO_3$	40	+	+	+	+	+	+	+	+	+	+/o	1
Potassium bisulfate	$KHSO_4$	5%	+	+	+	+	+	+	+	+	+	+	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Potassium bitartrate	$KC_4H_5O_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium bromate	$KBrO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Potassium bromide	KBr	s	+	+	+	+	10%	+	+	+	+	0.1	1
Potassium bromide	KBr	s	+	+	+	+	10%	+	+	+	+	0.1	1
Potassium carbonate	K_2CO_3	s	+	+	+	+	+	+	+	55%	+	+	1
Potassium carbonate	K_2CO_3	s	+	+	+	+	+	+	+	55%	+	+	1
Potassium chlorate	$KClO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Potassium chloride	KCl	s	+	+	+	+	-	+	+	+	+	+/o	1
Potassium chromate	K_2CrO_4	10	+	+	+	+	+	+	+	+	+	+	3
Potassium cyanate	KOCN	s	+	+	+	+	+	+	+	+	+	+	2
Potassium cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	5%	3
Potassium cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	5%	3
Potassium dichromate	$K_2Cr_2O_7$	s	+	+	+	+	25%	+	+	+	+	10%	3
Potassium dichromate	$K_2Cr_2O_7$	s	+	+	+	+	25%	+	+	+	+	10%	3
Potassium ferrocyanide	$K_4Fe(CN)_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium ferrocyanide / potassium ferricyanide	$K_4Fe(CN)_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium fluoride	KF	s	+	+	+	+	+	+	+	+	+	+	1
Potassium hexacyanoferrate(III)	$K_3Fe(CN)_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium hydrogen fluoride	KHF_2	s	n	+	+	+	+	+	+	+	+	+	1
Potassium hydroxide	KOH	50	+	+	+	+ (25 °C)	+	-	+	10%	+	+	1
Potassium iodide	KI	s	+	+	+	+	+	+	+	+	+	+	1
Potassium metaborate	KBO_2	s	+	+	+	+	+	+	+	+	+	+	1
Potassium nitrate	KNO_3	s	+	+	+	+	+	+	+	+	+	+	1
Potassium perchlorate	$KClO_4$	s	+	+	+	+	n	+	+	+	+	+	1
Potassium permanganate	$KMnO_4$	s	+	+	+	+	+	+	+	6%	+	+	2
Potassium persulfate	$K_2S_2O_8$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium persulfate	$K_2S_2O_8$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium sulfate	K_2SO_4	s	+	+	+	+	+	+	+	+	+	+	1
Potassium sulfite	K_2SO_3	s	+	+	+	+	+	+	+	+	+	+	1
Propionic acid	C_2H_5COOH	100	o	+	+	+	+	+	+	+/o	+	+	1
Propionitrile	CH_3CH_2CN	100	n	n	+	+	+	+	-	-	+	+	2
Propyl acetate	$CH_3COOC_3H_7$	100	-	-	+	+	+	-	+/o	-	+	+	1
Propyl acetate	$CH_3COOC_3H_7$	100	-	-	+	+	+	-	+/o	-	+	+	1
Propylene glycol	$CH_3CHOHCH_2OH$	100	+	+	+	+	+	+	+	+	+	+	1
Prussic acid	HCN	s	+	+	+	+	+	+	+	+	+	+	3
Pyridine	C_5H_5N	100	-	-	o	-	+	-	-	o	+	+	2
Pyrrole	C_4H_4NH	100	n	n	+	n	+	-	-	-	+	+	2
Salicylic acid	HOC_6H_4COOH	s	+	+	+	+	+	+	+	+	+	+/o	1
Salmiac	NH_4Cl	s	+	+	+	+	-	+	+	+	+	+/o	1
Salt water	-	s	+	+/o	+	+	+/o	+	+	+	+	+	1
Saltpetre	KNO_3	s	+	+	+	+	+	+	+	+	+	+	1
Silicic acid	$SiO_2 * x H_2O$	s	+	+	+	+	+	+	+	+	+	+	1
Silver bromide	AgBr	s	+	+	+	+	+/o	+	+	+	+	+	1
Silver chloride	AgCl	s	+	+	+	+	-	+	+	+	+	+/o	1
Silver nitrate	$AgNO_3$	s	+	+	+	+	+	+	+	+	+	+/o	3
Silver nitrate	$AgNO_3$	s	+	+	+	+	+	+	+	+	+	+/o	3
Sodium acetate	$NaCH_3COO$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium benzoate	C_6H_5COONa	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bicarbonate	$NaHCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bisulfate	$NaHSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bisulfite	$NaHSO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bromate	$NaBrO_3$	s	+	+	+	+	+	+	+	+	+	+	3
Sodium bromide	NaBr	s	+	+	+	+	+	+	+	+	+	+	1
Sodium carbonate	Na_2CO_3	s	+	+	+	+	+/o	+	+	+	+	+	1
Sodium chlorate	$NaClO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Sodium chloride	NaCl	s	+	+	+	+	-	+	+	+	+	+	1
Sodium chloride (table salt)	NaCl	s	+	+	+	+	-	+	+	+	+	+	1
Sodium chlorite	$NaClO_2$	24%	+	+	+	+	10%	+	+	+	+	10%	2
Sodium chromate	Na_2CrO_4	s	+	+	+	+	+	+	+	+	+	+	3
Sodium cyanide	NaCN	s	+	+	+	+	+	+	+	+	+	+	3
Sodium dichromate	$Na_2Cr_2O_7$	s	+	+	+	+	+	+	+	+	+	+	3
Sodium dithionite	$Na_2S_2O_4$	s	+	10%*	10%	+	+	n	n	+	10%	+/o	1
Sodium fluoride	NaF	s	+	+	+	+	10%	+	+	+	+	+	1
Sodium hydrogen sulfate	$NaHSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium hydroxide	NaOH	50	+	+	+	+ (60%/25 °C)	+	-	+	30%	+	+	1
Sodium hydroxide solution	NaOH	50	+	+	+	+ (60%/25 °C)	+	-	+	30%	+	+	1
Sodium hypochlorite	NaOCl + NaCl	12%	+	+	o	+	-	o	+	+	o	> 10%	2
Sodium iodide	NaI	s	+	+	+	+	+	+	+	+	+	+	1
Sodium metabisulfite	$Na_2S_2O_5$	s	+	+	+	+	+	n	n	+	+	+	1
Sodium metaphosphate	$(NaPO_3)_n$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium nitrate	$NaNO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium nitrite	$NaNO_2$	s	+	+	+	+	+	+	+	+	+	+	2
Sodium oxalate	$Na_2C_2O_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium perborate	$NaBO_2*H_2O_2$	s	+	+/o	+	+	+	+	+	+	+	+/o	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	Pharmed®	PE	HastelloyC	WGK
Sodium perchlorate	$NaClO_4$	s	+	+	+	+	10%	+	+	+	+	10%	1
Sodium peroxide	Na_2O_2	s	+	+	+	+	+	+	+	n	-	+	1
Sodium peroxodisulfate	$Na_2S_2O_8$	s	n	+	+	+	+	+	+	+	+	+	1
Sodium salicylate	$C_6H_4(OH)COONa$	s	+	+/o	+	+	+	+	+	+	+	+	1
Sodium silicate	Na_2SiO_3	s	+	+	+	+	+	+	+	+	+	+	1
Sodium sulfate	Na_2SO_4	s	+	+	+	+	+	+	+	+	+	+	1
Sodium sulfide	Na_2S	s	+	+	+	+	+	+	+	+	+	+	2
Sodium sulfite	Na_2SO_3	s	+	+	+	+	50%	+	+	+	+	50%	1
Sodium tetraborate	$Na_2B_4O_7 * {}_{10H2}O$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium thiosulfate	$Na_2S_2O_3$	s	+	+	+	+	25%	+	+	+	+	25%	1
Sodium thiosulfate	$Na_2S_2O_3$	s	+	+	+	+	25%	+	+	+	+	25%	1
Sodium tripolyphosphate	$Na_5P_3O_{10}$	s	+	+	+	+	+	+/o	+	+	+	+	1
Starch	$(C_6H_{10}O_5)_n$	s	+	+	+	+	+	+	n	+	+	+	1
Styrene	$C_6H_5CHCH_2$	100	-	-	o	+	+	o	-	-	o	+	2
Succinic acid	$C_4H_6O_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sugar of lead	$Pb(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	2
Sugar solution	-	s	+	+	+	+	+	+	+	+	+	+	1
Sulfur chloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Sulfuric acid	H_2SO_4	98%	30%	50%	85%	+	20%	+	80%	30%	80%	+	1
Sulfuric acid, fuming	$H_2SO_4 + SO_3$	s	n	-	-	-	+	+	-	+	-	+	2
Sulfurous acid	H_2SO_3	s	+	+	+	+	10%	+	+	+	+	+	1
Sulfuryl chloride	SO_2Cl_2	100	-	-	-	o	n	+	o	-	-	n	1
Tannin	$C_{76}H_{52}O_{46}$	50	+	+	+	+	+	+	+	+	+	+	1
Tartaric acid	$C_4H_6O_6$	s	50%	+	+	+	+	+	+/o	+	+	+	1
Tetrachloroethane	$C_2H_2Cl_4$	100	-	-	o	+	+	o	-	o	o	+	3
Tetrachloroethylene	C_2Cl_4	100	-	-	o	+	+	o	-	o	o	+	3
Tetrachloroethylene	C_2Cl_4	100	-	-	o	+	+	o	-	o	o	+	3
Tetrachloromethane	CCl_4	100	-	-	-	+	+	+	-	-	o	+	3
Tetraethyl lead	$Pb(C_2H_5)_4$	100	+	+	+	+	+	+	-	n	+	+	3
Tetraethyllead	$Pb(C_2H_5)_4$	100	+	+	+	+	+	+	-	n	+	+	3
Tetrahydrofuran	C_4H_8O	100	-	-	o	-	+	-	-	-	o	+	1
Tetralin	$C_{10}H_{12}$	100	-	-	-	+	+	+	-	-	o	+	3
Thionyl chloride	$SOCl_2$	100	-	-	-	+	n	+	+	+	-	n	1
Thiophene	C_4H_4S	100	n	-	o	n	+	-	-	-	o	+	3
Tin(II) chloride	$SnCl_2$	s	+	o	+	+	-	+	+	+	+	+/o	1
Tin(II) sulfate	$SnSO_4$	s	n	+	+	+	+	+	+	+	+	+/o	1
Tin(IV) chloride	$SnCl_4$	s	n	+	+	+	-	+	+	+	+	+	1
Titanium tetrachloride	$TiCl_4$	100	n	n	n	+	n	o	-	n	n	n	1
Toluene	$C_6H_5CH_3$	100	-	-	o	+	+	o	-	-	o	+	2
Toluene diisocyanate	$C_7H_3(NCO)_2$	100	n	n	+	+	+	-	+/o	n	+	+	2
Triacetin	$C_3H_5(CH_3COO)_3$	100	n	n	+	+	+	-	+	n	+	+	1
Tributyl phosphate	$(C_4H_9)_3PO_4$	100	n	-	+	+	+	-	+	+	+	+	1
Trichloroacetic acid	CCl_3COOH	50	-	+	+	+	-	-	o	+/o	+	+	1
Trichloroethane	CCl_3CH_3	100	-	-	o	+	+	+	-	o	o	+	3
Trichloroethylene	C_2HCl_3	100	-	-	o	+	+/o	o	-	o	o	+	3
Tricresyl phosphate	$(C_7H_7)_3PO_4$	90%	-	-	+	n	+	o	+	+	+	+	2
Triethanolamine	$N(C_2H_4OH)_3$	100	+	o	+	n	+	-	+/o	o	+	+	1
Tripotassium phosphate	KH_2PO_4	s	+	+	+	+	+	+	+	+	+	+	1
Tris(2-ethylhexyl) phosphate	$(C_8H_{17})_3PO_4$	100	n	-	+	+	+	o	+	+	+	+	2
Trisodium phosphate	Na_3PO_4	s	+	+	+	+	+	+	+	+	+	+	1
Urea	$CO(NH_2)_2$	s	+	+/o	+	+	+	+	+	20%	+	+	1
Vinyl acetate	$CH_2=CHOOCCH_3$	100	-	-	+	+	+	n	n	+/o	+	+	2
Vitriol of copper	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	2
Xylene	$C_6H_4(CH_3)_2$	100	-	-	-	+	+	o	-	-	o	+	2
Zinc acetate	$(CH_3COO)_2Zn$	s	+	+	+	+	+	-	+	+	+	+	1
Zinc chloride	$ZnCl_2$	s	+	+	+	+	-	+	+	+	+	n	1
Zinc sulfate	$ZnSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	1

[1] Chlorine dioxide is capable of penetrating PVDF without destroying it. This can lead to damage to PVDF-coated parts.

[2] Nitric acid is a highly diffusive acid and tends to permeate depending on temperature and concentration. For potential limitations on its use in piston diaphragm valves, please contact ProMinent.

The statements made in this list do not necessarily apply to components, such as valves, even if they are made from the same materials.

Overview of the Resistance of Soft PVC Hoses (Guttasyn®) to the Most Common Chemicals

This data applies to standard conditions (20 °C, 1,013 mbar).

+	resistant
o	conditionally resistant
-	not resistant

The data has been taken from relevant manufacturers' literature and supplemented by our own tests and experience. As the resistance of a material also depends on other factors, especially pressure and operating conditions etc., this list should merely be regarded as an initial guide and does not claim to offer any guarantees. Take into consideration the fact that conventional feed chemicals are largely compounds, the corrosiveness of which cannot simply be calculated by adding together the corrosiveness of each individual component. In cases such as these the material compatibility data produced by the chemical manufacturer must be read as a matter of priority when selecting a material. Safety data sheets do not provide this information and cannot therefore replace application-specific documentation.

Corrosive agent	Concentration in %	Evaluation
Acetic acid	50	o
Acetic acid (wine vinegar)	-	o
Acetic acid anhydride	100	-
Acetic acid, aqueous	10	+
Acetic ester	100	-
Acetone	all	-
Acetylene tetrabromide	100	-
Aluminium salts, aqueous	all	+
Alums of all kinds, aqueous	all	+
Ammonium salts, aqueous	all	+
Ammonium, aqueous	saturated	-
Ammonium, aqueous	15	-
Aniline	100	-
Benzene	100	-
Bisulfite, aqueous	40	+
Borax solution	all	+
Boric acid, aqueous	10	+
Bromine, vaporous and liquid	-	-
Butanol	100	+
Butyl acetate	100	-
Butyric acid, aqueous	20	+
Butyric acid, aqueous	conc.	-
Calcium chloride, aqueous	all	+
Carbon disulfide	100	-
Carbonic acid	all	+
Caustic potash	15	+
Chlorinated hydrocarbons	all	-
Chrome-alum, aqueous	all	+
Chromic acid, aqueous	50	-
Copper sulfate, aqueous	all	+
Creosote	-	-
Dextrin, aqueous	saturated	+
Diesel oils, compressed oils	100	o
Diethyl ether	100	-
Difluorodichloromethane	100	-
Ethanol	96	-
Ethyl acetate	100	-
Ethylene glycol	30	+
Ferric chloride, aqueous	all	+
Fertilizing manure salt, aqueous	all	+
Formaldehyde, aqueous	30	o
Glacial acetic acid	100	-
Glucose, aqueous	saturated	+
Glycerol	100	-
Halogens	all	-
Hydrochloric acid	15	+
Hydrogen bromide	10	+
Hydrogen peroxide	up to 10	+
Hydrogen sulfide, gaseous	100	-
Ink	-	+

ProMinent Chemical Resistance List

Corrosive agent	Concentration in %	Evaluation
Magnesium salts, aqueous	all	+
Methyl alcohol	100	+
Methylene chloride	100	-
Nitric acid, aqueous	25	+
Oils	-	-
Perchloric acid	all	o
Phenol, aqueous	all	o
Phosphoric acid, aqueous	100	-
Potassium bichromate, aqueous	saturated	+
Potassium persulfate, aqueous	saturated	+
Silver nitrate	10	+
Sodium chloride, aqueous	all	+
Sodium hydroxide solution	aqueous	+
Sodium hypochlorite	15	+
Sodium salts	-	-
Sulfur dioxide, gaseous	all	+
Sulfuric acid	30	+
Tetrachloromethane	100	-
Toluene	100	-
Trichloroethylene	100	-
Urea, aqueous	all	+
Xylene	100	-
Zinc salts	all	+

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