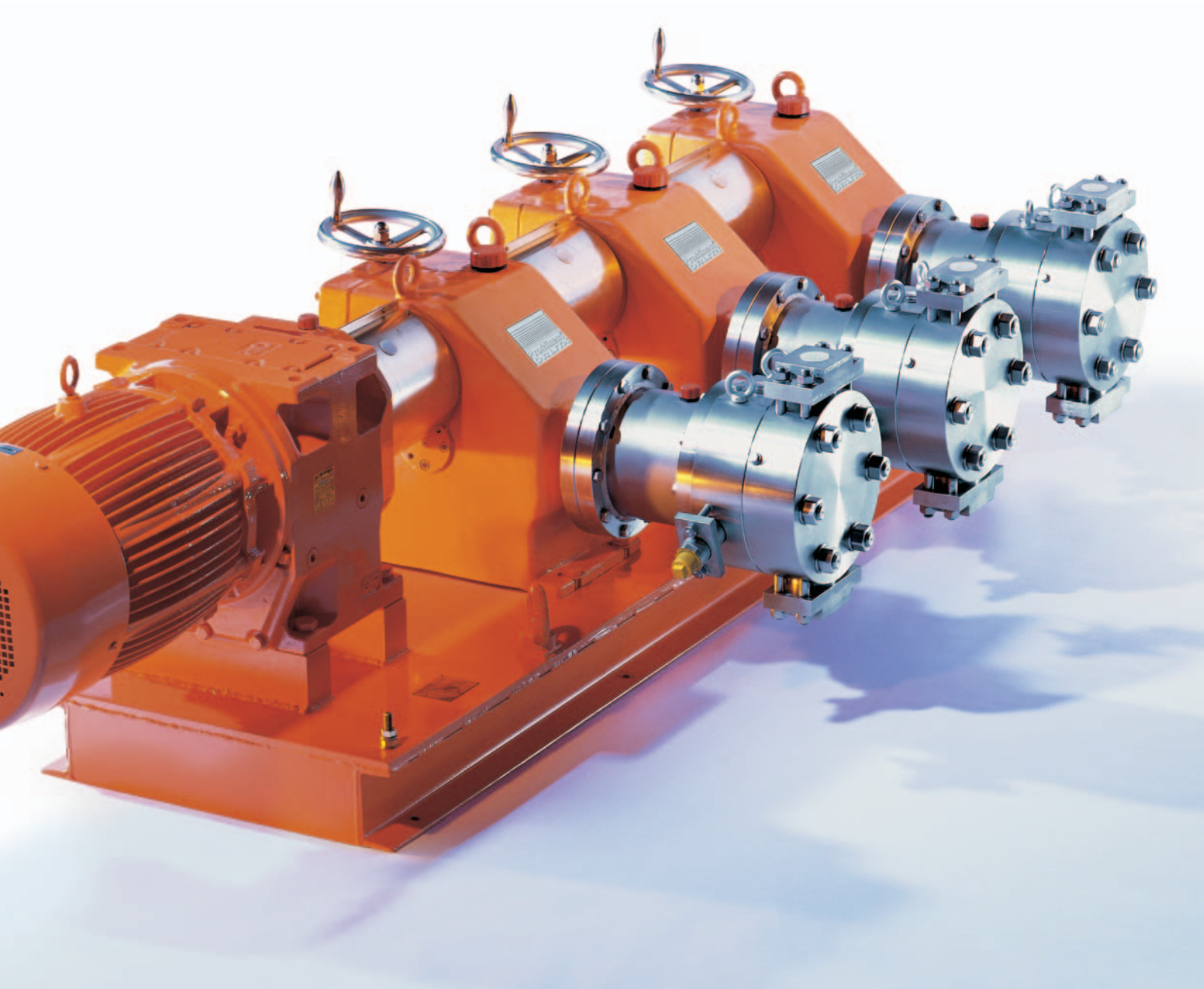
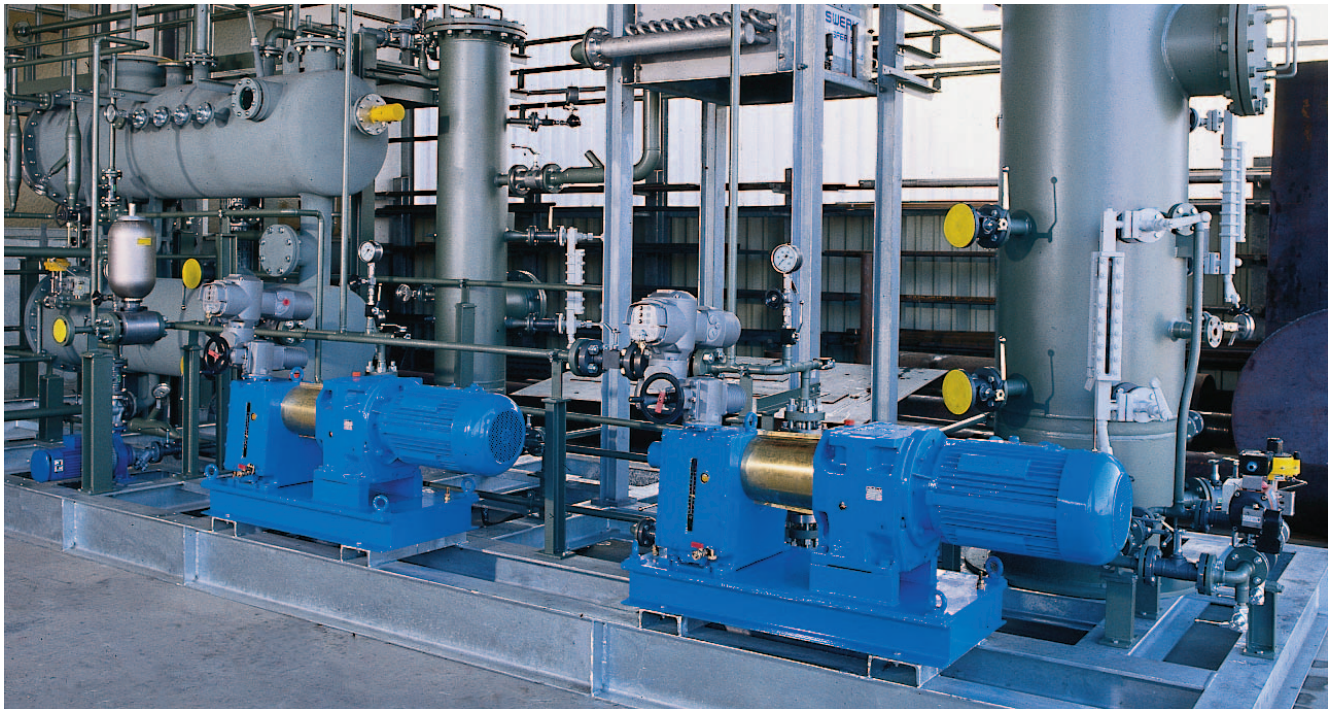
ProMinent®
ORLITA®

HIGH-END METERING PUMPS



High-end Metering Pumps

ORLITA®, one of the world's leading manufacturers of intelligent metering technology, designs, develops and produces reciprocating positive displacement pumps that combine metering functions such as liquid delivery, measurement and control in one machine.
An outstanding feature of metering pumps is their pressure-consistent characteristic that ensures the flow rate is virtually independent of the backpressure. The flow rate of a metering pump is linear dependent on the set stroke length and stroke rate, thus allowing for exact adjustment of the flow rate.



ORLITA® pumps (MfS 600/44 with electric stroke adjustment) in a glycol regeneration plant.

Applications Of ORLITA® Metering Pumps

ORLITA® pumps are completely versatile in use as they can be tailored, in part, to specific customer application requirements – a feature greatly appreciated by our customers.

Our pumps are used by satisfied customers throughout the world involved in the following fields:

- Oil/gas production (onshore/offshore)
- Refineries
- Chemicals/petrochemicals
- Pharmaceuticals
- Food production
- Packing industry (filling pumps)
- Cosmetics
- Water treatment
- Power generators
- Plant construction
- Medical industry
- Environmental technology
- Research

ATEX

Conforming to the Directive 94/9/EC, ORLITA® type Mf and Mh metering pumps are suitable for use in zones 1 and 2. Combustible liquids can also be metered in the zones using diaphragm pumps.

Accessories

The following accessories are available to ensure optimum metering results and process reliability and to effectively protect the plant in which the pump is installed:

- Pulsation dampeners (with filling unit)
- Safety valves
- Pressure control valves
- Filters
- Electric stroke adjustment systems
- Diaphragm failure indicators

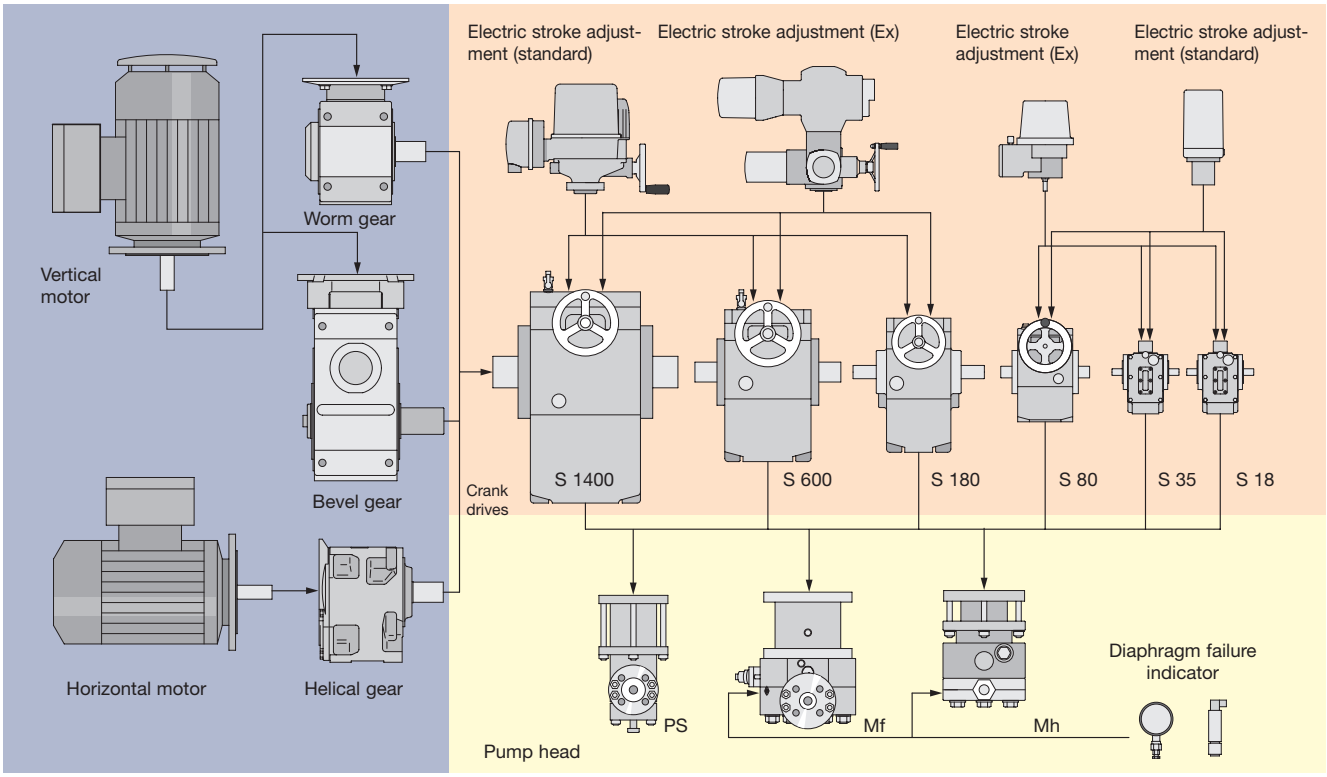
Modular Design

ORLITA® pumps are based on a modular design and essentially comprise the three function assemblies:

1) Drive motor unit
2) Crank drive
3) Pump head

Thanks to this modular system, the various types of pump head can be mounted on any drive unit.

The drive unit that converts the rotary motion of the motors into the reciprocating stroke motion for the pump head can be freely combined with each other, making it possible, for example, to meter different flow rates and media at various operating pressures with only one pump. In addition, ORLITA® pumps can be optionally equipped with electric precision-controlled stroke adjustment and diaphragm failure signalling facilities to ensure efficient pump operation while effectively increasing process reliability.



S-drive unit series as an example of modular design

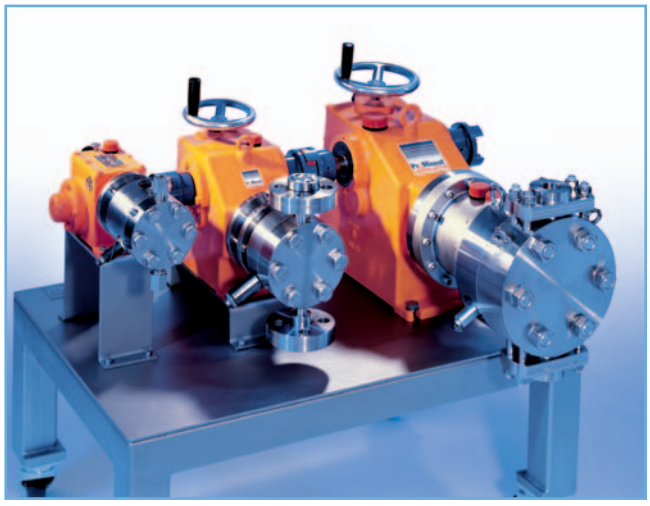
Drive motor unit
A large number of options can be used as the drive unit for ORLITA® metering pumps. The choice is aimed at meeting specific customer requirements.

The options include:
- Standard motors with IEC or NEMA connection
- Ex-protected motors
- Frequency converter controlled motors

as well as special drives

Pump heads
A choice of four different types of pump are available:

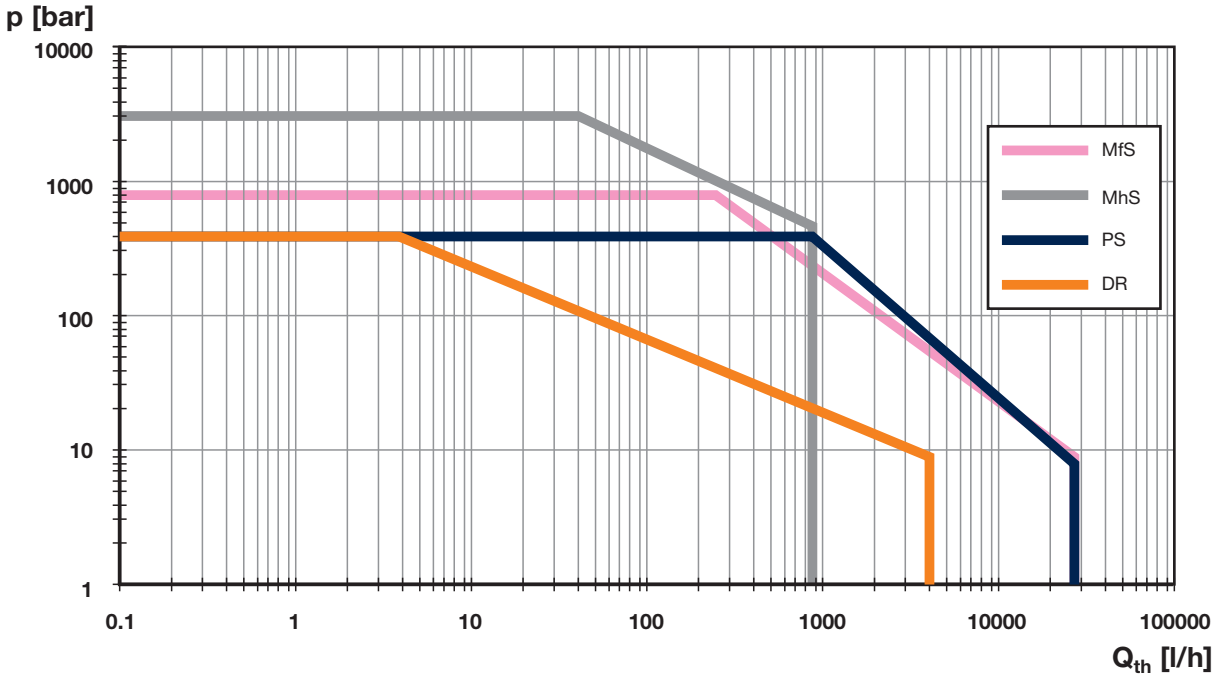
Mf Diaphragm metering pump with hydraulically driven double PTFE diaphragm
Mh Diaphragm metering pump with hydraulically driven metal diaphragm
PS Plunger metering pump with stuffing box packing
DR Valveless plunger metering pump



Combination of MfS 180/46, MfS 80/22 and MfS 18/10

Performance Overview Of ORLITA® Metering Pumps

Performance diagram of a single headed pump



The special ORLITA® valves

With the exception of DR pumps that operate using a VALVELESS system, for virtually all types of pumps, ORLITA® uses as standard specially designed non-spring-loaded cone valves. Other valves can, of course, be supplied on customer request – however, the advantages of cone valves cannot be denied as they provide:

- Longer lifetime through "wings" on the valve guides that additionally lead to a rotation of the valve during each stroke. As a result, the valve cleans itself during operation ensuring particles cannot become engrained while making the valve less sensitive to soiling.
- Particularly good intake capacity (low NPSHr value) as the weight of the valve body is much lower compared to a ball valve with the same nominal diameter.

Always on site – worldwide

The ability to react globally yet close to customers is of paramount importance. We therefore maintain constant contact with the 40 subsidiaries and the over 100 authorised representatives of our parent company ProMinent Dosiertechnik GmbH. This group has over 1400 employees worldwide. Based on this concept of geographic proximity and rapid availability, ORLITA® can respond directly – both with regard to the planning and creation of new customer projects as well as maintenance and service on site. A global presence, however, also means to be completely familiar with specific national requirements, standards and regulations.

CRANK DRIVES

ORLITA® metering pumps are equipped with robust and proven crank drives. Two different series are available. Both are of the positive return type and guarantee a reliable operation of the total pump unit.
The stroke length is adjustable both during operation and stationary – manually or optionally electric.

The stroke is infinitely variable from zero stroke to maximum stroke.
The actual setting can be read from a counter or mechanical display.

Multi headed units are built up by the combination of equal as well as various crank drives sizes.

Crank drives series S

Crank drives of series **S** are used for all ORLITA® plunger type and diaphragm metering pumps. The various sizes allow a modular combination of different pump heads to an economic solution.

The crank drives of series **S** do not have internal reduction gears. Different stroke frequencies are achieved by using external reduction gears. Especially with multi-headed aggregates a high efficiency is yielded.

The stroke adjustment of the crank drives type **S** is achieved by a lever mechanism with a constant bottom dead center. This characteristic offers advantages especially for high pressure applications.

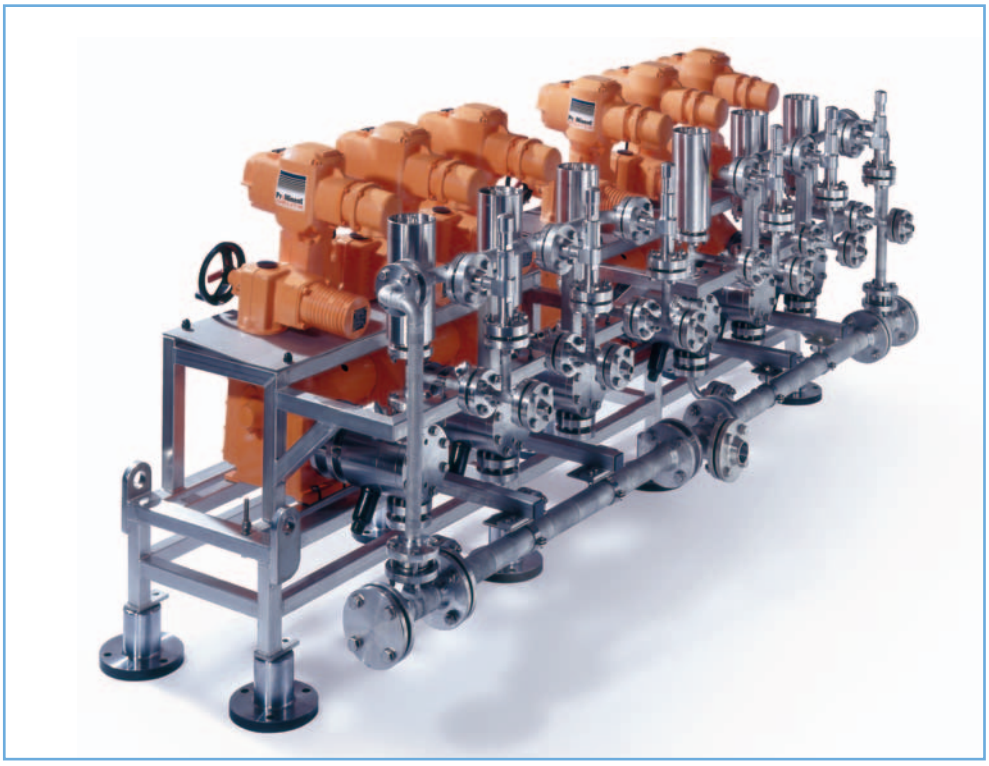
Except for the crank shaft the lever mechanism only has swivelling components where by a wear-resistant operation and a high overload safety is guaranteed.

Crank drives series Rb

Crank drives of series **Rb** are designed to operate the valveless plunger metering pump **DR**.
The special construction of the crank mechanism combines two movements:

- **reciprocating movement** (piston stroke)
- **rotation** (control of inlet and outlet)

An internal worm gear reduces the speed of the drive motor to the stroke frequency of the pump.



Injection Skid with 6 headed pump, 6 x 300 l/h at 40 bar

Highlights

- stroke adjustment 0-100 % in operation and stationary
- easy to combine
- high efficiency
- positive return mechanism
- electric stroke adjustment available
- proven, robust and reliable

ORLITA® crank drives

type	S 18	S 35	S 80	S 180	S 600	S 1400	Rb 15	Rb 150
stroke length (mm)	0-15	0-20	0-20	0-40	0-40	0-60	0-15	0-32
piston rod load (N)	1 750	3 500	14 000	18 000	40 000	60 000	1 800	15 000
hydraulic power kW/100 min^{-1}	0.044	0.117	0.467	1.200	2.667	6.000	0.045	0.800

Diaphragm head Mf

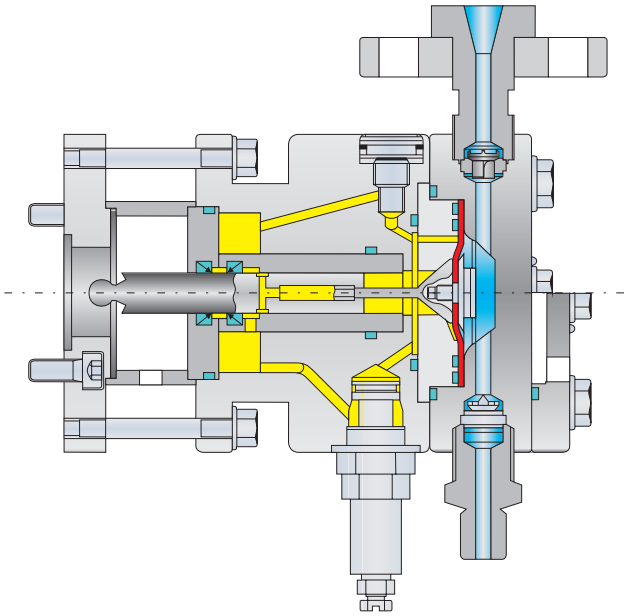
Hydraulic actuated diaphragm head. A double PTFE diaphragm hermetically separates the wetted area from the hydraulic chamber.

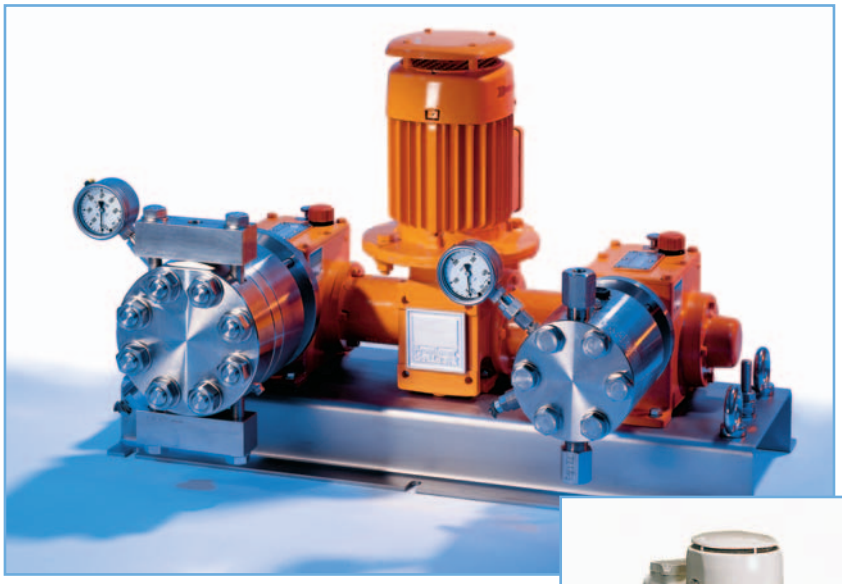
During the discharge stroke the diaphragm is balanced by the hydraulic liquid only. During the suction stroke the diaphragm operation is aided by the mechanical coupling. This combined principle offers an extraordinary suction lift capability by the Mf pump.

Integrated in the hydraulic chamber are the pressure relief valve and an automatic venting valve.
The valveless forced reflow of the internal oil leakage operates wearfree and guarantees optimum metering accuracy.

The pump check valves are of cone type. This guarantees low wear, short pressure loss ($NPSH_R$) and self-cleaning.

All wetted parts (except for the PTFE-diaphragm) are fabricated from stainless steel.





Pump with metal- and PTFE-diaphragm pump liquid ends type MhS 35/7 - MfS 18/10

3 headed PTFE-diaphragm pump Mf3S 80/22-22-22

Highlights

- hermetically tight
- pressure up to 700 bar
- temperature range -40 °C to +160 °C
- PTFE double diaphragm
- suction lift up to 8 m
- accuracy ±0.5 %
- diaphragm rupture control

Options

- special materials like Hastelloy, zirconia, titanium, Alloy 20 and tantalum
- diaphragm rupture indication
- heatable or coolable pump head
- other type of valve arrangements e.g. double valves etc.
- special nozzles on request
- specified coating e.g. for offshore applications
- design acc. to API 675
- other options on request

Diaphragm head Mh

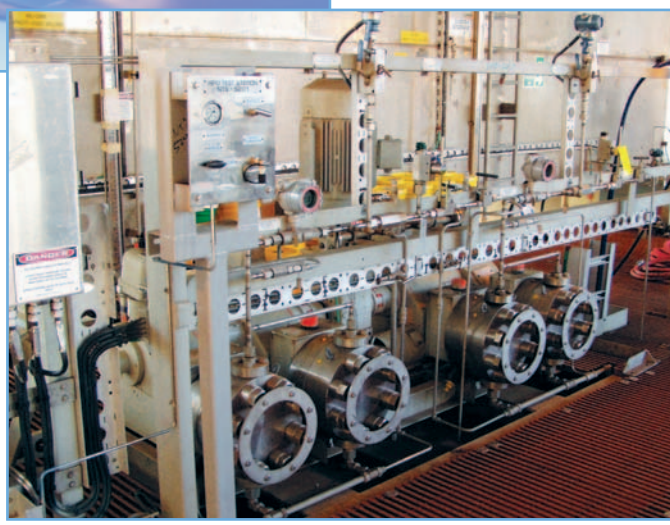
Hydraulic actuated diaphragm head. A metal diaphragm hermetically separates the wetted area from the hydraulic chamber.

Both during discharge and suction strokes the diaphragm is balanced by the hydraulic liquid which has been displaced by the piston.

Integrated in the hydraulic chamber are the pressure relief valve and an automatic venting valve.
The valveless forced reflow of the internal oil leakage operates wearfree and guarantees optimum metering accuracy.

The pump check valves are of cone, ball or prismatic type depending on size and design pressure.
All wetted parts are fabricated from stainless steel.

Stainless steel diaphragm pump MhS 80/25



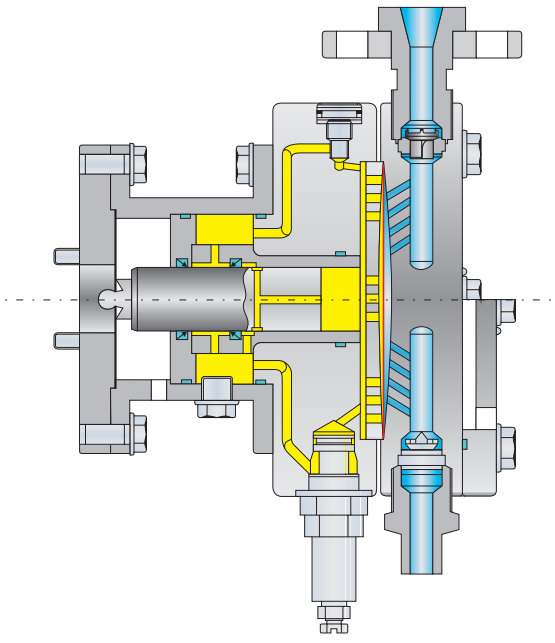
4 headed pump Mh4S 600/26-26-26-26 on an oil and gas platform

Highlights

- hermetically tight
- pressure up to 3000 bar
- temperature range -40 °C to +200 °C
- accuracy ±0.5 %
- diaphragm rupture control

Options

- special materials like Hastelloy, zirconia, titanium, Alloy 20
- multi diaphragm with failure indication
- heatable or coolable pump head
- other type of valve arrangements e.g. double valves etc.
- special nozzles on request
- specified coating e.g. for offshore applications
- design acc. to API 675
- other options on request

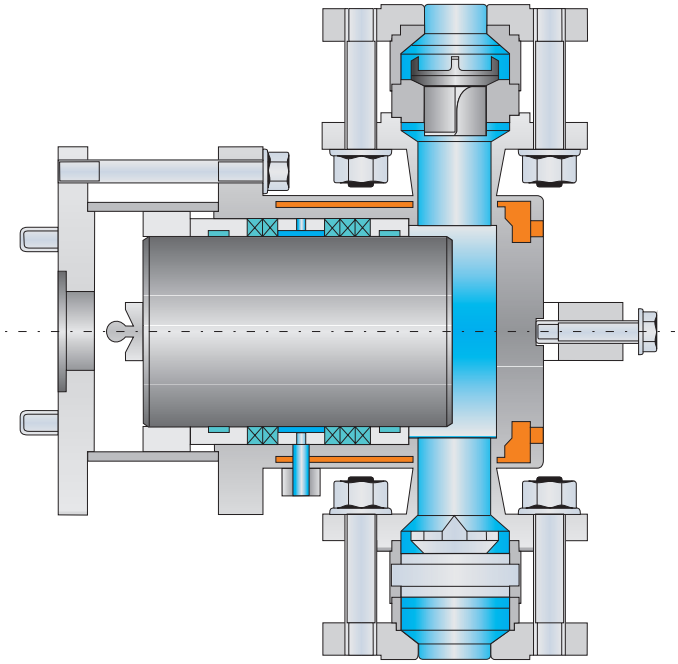


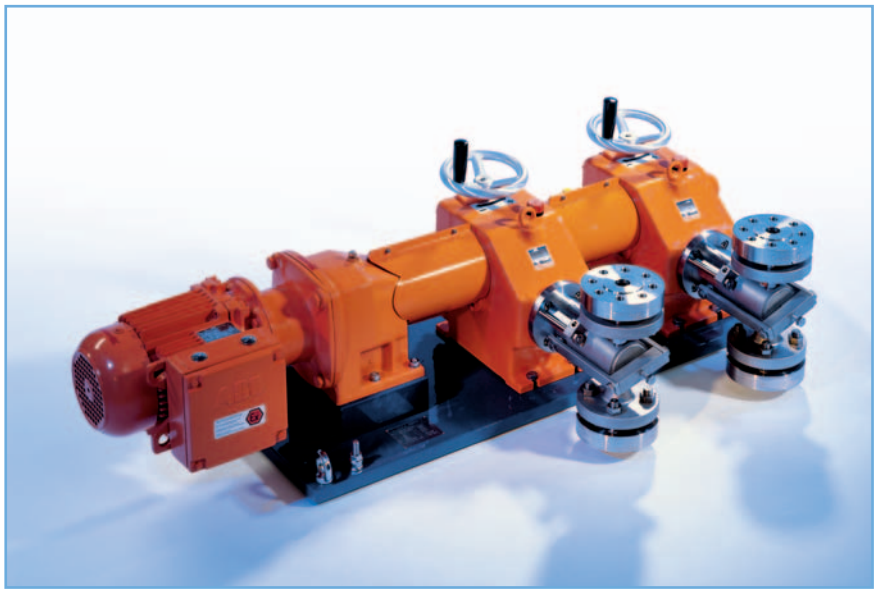
PLUNGER HEAD PS

Plunger head with stuffing box packing. The plunger oscillates in the cylinder and displaces the liquid.
The packing adjustment is achieved by a single adjusting screw on the front side. This is also possible during operation.

The lantern on the rear head end serves to drain the leakage or can be used as an area to flush, lubricate or seal the pump with suitable media.

The pump check valves are of cone type. This guarantees low wear, short pressure loss ($NPSH_R$) and self-cleaning.
All wetted parts are fabricated from stainless steel and sealed by PTFE.





Plunger metering pump P2S 80/60-60

Highlights

- best hydraulic efficiency
- pressure up to 400 bar
- temperature range -40 °C to +400 °C
- accuracy ±0.5 %
- easy to maintain by central packing adjustment

Options

- special materials like Hastelloy, titanium, Alloy 20, ceramics
- special seal materials
- pump head with heating/cooling jacket
- other type of valve arrangements e.g. double valves etc.
- special nozzles on request
- specified coating e.g. for offshore applications
- design acc. to API 675
- other options on request

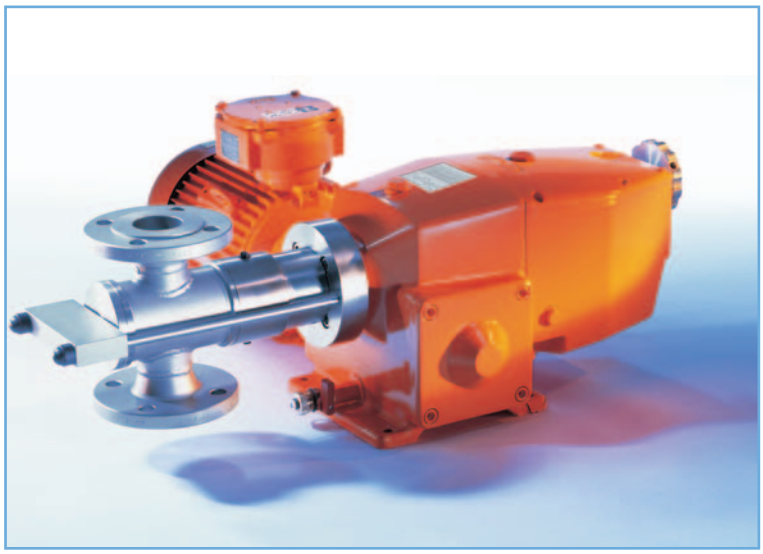
VALVELESS PLUNGER METERING PUMP DR

Valveless operating plunger metering pump with rotary control piston. It works by the combined oscillating and rotating movement of the piston. Thus the plunger itself opens and closes discharge and suction. Valves are not required. The pump can be operated through a very wide range of stroke frequencies.

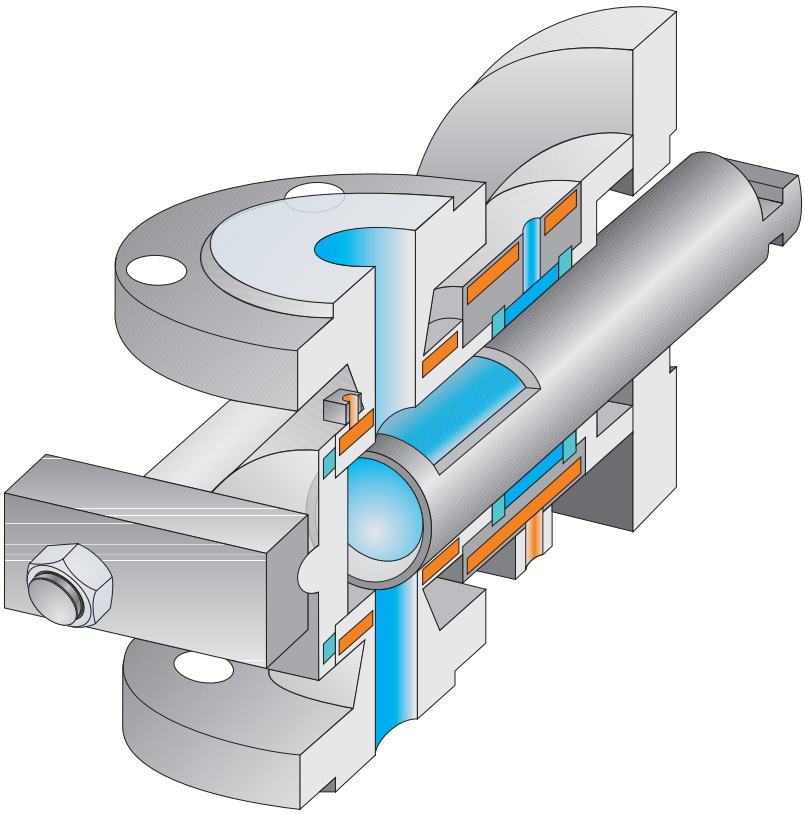
This principle enables the exact metering of highly viscous liquids which also might contain even large solids.

The pump head is fabricated from stainless steel. Piston and liner are treated by a special wear-resistant coating. Depending on the application the pump head also is available from other high performance materials.

The clearance between piston and liner which mainly seals the pump is adapted to the viscosity of the liquid.
The lantern on the rear head end serves to drain the leakage or can be used as an area to flush, lubricate or seal the pump with suitable media.
The lantern is sealed by elastomer lip rings. The flow direction is selectable by the assembly position of the piston. By turning the head around its horizontal axis an effect of re-suction is adjustable.



Valveless plunger metering pump DR 150/70 for high viscous liquids



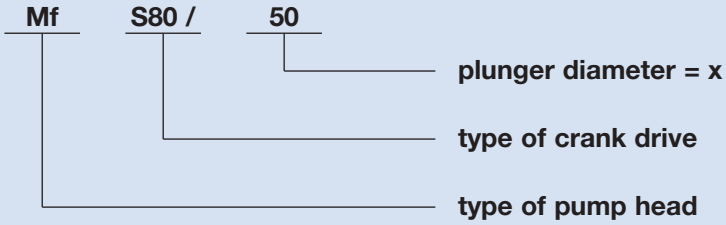
Highlights

- valveless
- viscosities up to 10^6 mPas
- pressure up to 630 bar
- temperature range -40 °C to +400 °C
- accuracy ±0.5 %
- wide range of stroke frequency

Options

- piston and liner from ceramics or hard metal
- pump head with heating or cooling jacket
- sealless with metallically sealed lantern
- other options on request

Classification of ORLITA® Pumps



Example for a 2 headed stainless steel diaphragm pump:

Mh2S 600/32-32

Example of a 3 headed valveless plunger metering pump:

D3R 150/90-90-90

Performance Overview Arranged According To Drive Unit Sizes

PS 18/x
MfS 18/x
MhS 18/x

Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]					PS 18/x	MfS 18/x	MhS 18/x
mm**	cm^3	70*	88*	108*	140*	200*	p [bar]	p [bar]	p [bar]
5	0.29	1.2	1.6	1.9	2.5	3.5	200	-	500
6	0.42	1.8	2.2	2.7	3.6	5.1	200	-	500
7	0.58	2.4	3	3.7	4.8	6.9	200	400	400
8	0.75	3.2	4	4.9	6.3	9	200	348	320
10	1.18	4.9	6.2	7.6	9.9	14	200	222	222
12	1.70	7.1	9	11	14	20	139	154	154
16	3.02	13	16	20	25	36	78	87	87
20	4.71	20	25	31	40	57	50	55	55
22	5.70	24	30	37	48	68	-	46	-
25	7.36	31	39	48	62	88	32	35	-
30	10.60	45	56	69	89	127	22	24	-
36	15.27	64	81	99	128	183	15	17	-
40	18.85	79	100	122	158	226	12	13	-
44	22.81	96	120	148	192	274	-	11	-
50	29.45	124	156	191	247	353	8	8	-
65	49.77	209	263	323	418	597	4	5	-

*) stated stroke frequencies are selected standard values at 50 Hz. Others on request.
**) stated plunger diameters are selected standard values. Others on request.

Note: Q_{th} is the theoretical flow of the pump. The effective flow rate is lower depending on discharge pressure.

PS 35/x
MfS 35/x
MhS 35/x

Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]					PS 35/x	MfS 35/x	MhS 35/x
mm**	cm^3	70*	88*	108*	140*	200*	p [bar]	p [bar]	p [bar]
5	0.39	1.6	2.1	2.5	3.3	4.7	-	-	1782
7	0.77	3.2	4.1	5.0	6.5	9.2	-	400	900
8	1.01	4.2	5.3	6.5	8.4	12	250	400	696
10	1.57	6.6	8.3	10	13	19	250	400	445
12	2.26	9.5	12	15	19	27	250	309	309
14	3.08	13	16	20	26	37	-	-	227
16	4.02	17	21	26	34	48	156	174	174
18	5.09	21	27	33	43	61	-	-	137
20	6.28	26	33	41	53	75	100	111	100
22	7.60	32	40	49	64	91	-	92	92
25	9.82	41	52	64	82	118	64	71	71
30	14.14	59	75	92	119	170	44	49	-
32	16.08	68	85	104	135	193	-	-	40
36	20.36	86	107	132	171	244	30	34	34
40	25.13	106	133	163	211	302	25	27	25
44	30.41	128	161	197	255	365	-	23	-
45	31.81	134	168	206	267	382	-	-	22
50	39.27	165	207	254	330	471	16	17	-
65	66.37	279	350	430	557	796	9	10	-
80	100.53	422	531	651	844	1206	6	-	-
100	157.08	660	829	1018	1319	1885	4	-	-

PS 80/x
MfS 80/x
MhS 80/x

Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]						PS 80/x	MfS 80/x	MhS 80/x
mm**	cm^3	68*	85*	113*	145*	174*	194*	p [bar]	p [bar]	p [bar]
14	3.08	12.6	15.7	20.9	26.8	32.1	35.8	-	-	900
16	4.02	16.4	20.5	27.3	35.0	42.0	46.8	-	400	696
18	5.09	20.8	26.0	34.5	44.3	53.1	59.2	-	-	550
20	6.28	25.6	32.0	42.6	54.7	65.6	73.1	250	400	445
22	7.60	31.0	38.8	51.5	66.1	79.4	88.5	-	360	368
25	9.82	40.1	50.1	66.6	85.4	102.5	114	250	285	285
30	14.14	57.7	72.1	95.8	123.0	148	165	178	198	-
36	20.36	83.1	104	138	177	213	237	123	100	-
40	25.13	103	128	170	219	262	293	100	111	-
44	30.41	124	155	206	265	317	354	-	92	-
50	39.27	160	200	266	342	410	457	64	71	-
60	56.55	231	288	383	492	590	658	40	-	-
65	66.37	271	338	450	577	693	773	37	40	-
80	100.53	410	513	682	875	1050	1170	25	25	-
100	157.08	641	801	1065	1367	1640	-	16	17	-
120	226.19	923	1154	1534	1968	-	-	-	12	-
125	245.44	1001	1252	1664	2135	-	-	10	-	-
140	307.88	1256	1570	2087	2679	-	-	8	9	-
150	353.43	1442	1802	2396	3075	-	-	-	7	-
160	402.12	1641	2051	2726	3498	-	-	6	6	-

*) stated stroke frequencies are selected standard values at 50 Hz. Others on request.
**) stated plunger diameters are selected standard values. Others on request.

Note: Q_{th} is the theoretical flow of the pump. The effective flow rate is lower depending on discharge pressure.

PS 180/x
MfS 180/x

Ø = x	V_H	Q_{th} [l/h] at n [min-1]						PS 180/x	MfS 180/x
mm**	cm³	72*	88*	123*	140*	172*	196*	p [bar]	p [bar]
30	28.27	122	149	209	238	292	333	229	-
36	40.72	176	215	300	342	420	479	159	176
38	45.36	196	240	335	381	468	533	-	158
40	50.27	217	265	371	422	519	591	128	143
44	60.82	263	321	449	511	628	715	-	118
46	66.48	287	351	491	558	686	782	-	108
50	78.54	339	415	580	660	811	924	82	91
54	91.61	396	484	676	770	945	1077	70	-
55	95.03	411	502	701	798	981	1118	-	75
60	13.10	489	597	835	950	1167	1330	-	63
65	132.73	573	701	980	1115	1370	1561	48	54
70	153.94	665	813	1136	1293	1589	1810	42	46
75	176.71	763	933	1304	1484	1824	2078	-	40
80	201.06	869	1062	1484	1689	2075	2364	32	35
85	226.98	981	1198	1675	1907	2342	2669	-	31
90	254.47	1099	1344	1878	2138	2626	2993	-	28
100	314.16	1357	1659	2318	2639	3242	3695	-	22
115	415.48	1795	2194	3066	3490	4288	-	-	17
125	490.87	2121	2592	3623	4123	5066	-	13	-
140	615.75	2660	3251	4544	5172	-	-	10	11
160	804.25	3474	4246	5935	6756	-	-	8	9
200	1256.64	5429	6635	9274	10556	-	-	5	5

PS 600/x
MfS 600/x
MhS 600/x

Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]						PS 600/x	MfS 600/x	MhS 600/x
mm**	cm³	71*	93*	126*	140*	179*	197*	p [bar]	p [bar]	p [bar]
10	3.14	13.4	17.5	23.8	26.4	33.7	37.1	-	-	3000
11	3.80	16.2	21.2	28.7	31.9	40.8	44.9	-	-	3000
26	21.24	90.5	119	161	178	228	251	-	783	783
28	24.63	105	137	186	207	265	291	-	-	630
30	28.27	120	158	214	238	304	334	400	565	565
32	32.17	137	180	243	270	346	380	-	-	497
36	40.72	173	227	308	342	437	481	353	392	-
38	45.36	193	253	343	381	487	536	-	352	-
40	50.27	214	280	380	422	540	594	286	318	-
44	60.82	259	339	460	511	653	719	-	263	-
46	66.48	283	371	503	558	714	786	-	240	-
50	78.54	335	438	594	660	844	928	183	200	-
54	91.61	390	511	693	770	984	1083	157	-	-
55	95.03	405	530	718	798	1021	1123	-	168	-
60	113.10	482	631	855	950	1215	1337	-	141	-
65	132.73	565	741	1003	1115	1426	1569	108	120	-
70	153.94	656	859	1164	1293	1653	1820	93	103	-
75	176.71	753	986	1336	1484	1898	2089	-	90	-
80	201.06	857	1122	1520	1689	2159	2377	71	79	-
85	226.98	967	1267	1716	1907	2438	2683	-	70	-
90	254.47	1084	1420	1924	2138	2733	3008	-	62	-
94	277.59	1183	1549	2099	2332	2981	3281	51	-	-
100	314.16	1338	1753	2375	2639	3374	3713	-	50	-
115	415.48	1770	2318	3141	3490	4462	-	-	38	-
125	490.87	2091	2739	3711	4123	5272	-	29	-	-
140	615.75	2623	3436	4655	5172	-	-	23	25	-
160	804.25	3426	4488	6080	6756	-	-	17	19	-
200	1256.64	5353	7012	9500	10556	-	-	11	12	-
240	1809.56	7709	10097	13680	15200	-	-	-	8	-

*) stated stroke frequencies are selected standard values at 50 Hz. Others on request.
**) stated plunger diameters are selected standard values. Others on request.

Note: Q_{th} is the theoretical flow of the pump. The effective flow rate is lower depending on discharge pressure.

PS 1400/x
MfS 1400/x
MhS 1400/x

Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]						PS 1400/x	MfS 1400/x	MhS 1400/x
mm**	cm³	71*	99*	123*	142*	177*	193*	p [bar]	p [bar]	p [bar]
30	42.41	181	252	313	361	450	491	-	630	800
32	48.25	206	287	356	411	512	559	-	-	700
36	61.07	260	363	451	520	649	707	-	-	589
40	75.40	321	448	556	642	801	873	400	400	477
44	91.23	389	542	673	777	969	1056	-	394	-
46	99.71	425	592	736	850	1059	1155	-	361	-
50	117.81	502	700	869	1004	1251	1364	275	305	-
55	142.55	607	847	1052	1215	1514	1651	-	250	-
60	169.65	723	1008	1252	1445	1802	1965	190	212	-
65	199.10	848	1183	1469	1696	2114	2306	-	180	-
70	230.91	984	1372	1704	1967	2452	2674	140	155	-
75	265.07	1129	1575	1956	2258	2815	3070	-	135	-
80	301.59	1285	1791	2226	2570	3203	3492	100	119	-
90	381.70	1626	2267	2817	3252	4054	4420	-	94	-
94	416.39	1774	2473	3073	3548	4422	4822	77	-	-
100	471.24	2007	2799	3478	4015	5005	5457	-	76	-
115	623.21	2655	3702	4599	5310	6619	7217	-	57	-
125	736.31	3137	4374	5434	6273	7820	8526	40	-	-
140	923.63	3935	5486	6816	7869	9809	-	35	38	-
160	1206.37	5139	7166	8903	10278	-	-	25	29	-
200	1884.96	8030	11197	13911	16060	-	-	17	19	-
280	3694.51	15739	21945	27266	-	-	-	8	9	-

DR 15/x

Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]			DR 15/x
mm**	cm³	56*	75*	112*	p [bar]
5	0.29	1	1.3	2	100
7	0.58	1.9	2.6	3.9	400
12	1.70	5.7	7.6	11	159
18	3.82	13	17	26	70
25	7.36	25	33	49	36
36	15.27	51	69	103	17
50	29.45	99	133	198	9
70	57.73	194	260	388	4

DR 150/x
MhR 150/x

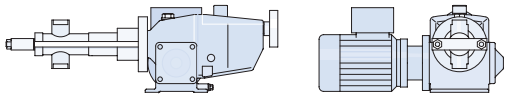
Ø = x	V_H	Q_{th} [l/h] at n [min^{-1}]				DR 150/x	MhR 150/x
mm**	cm³	56*	75*	112*	140*	p [bar]	p [bar]
6	0.90	3	4.1	6.1	7.6	-	3000
7	1.23	4.1	5.5	8.3	10.4	-	3000
12	3.62	12	16	24	30	400	-
18	8.14	27	37	55	68	250	-
25	15.71	53	71	106	132	250	-
36	32.57	109	147	219	274	147	-
50	62.83	211	283	422	528	76	-
70	123.15	414	554	828	1034	38	-
90	203.58	684	916	1368	1710	23	-
120	361.91	1216	1629	2432	3040	13	-
140	492.60	1655	2217	3310	4138	9	-

*) stated stroke frequencies are selected standard values at 50 Hz. Others on request.
**) stated plunger diameters are selected standard values. Others on request.

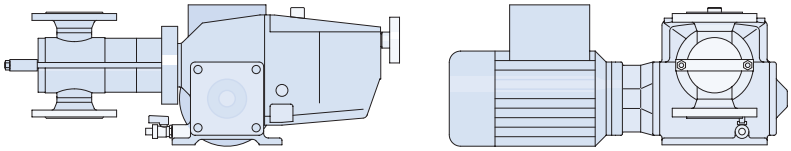
Note: Q_{th} is the theoretical flow of the pump. The effective flow rate is lower depending on discharge pressure.

SIDE VIEW OF ORLITA® PUMPS

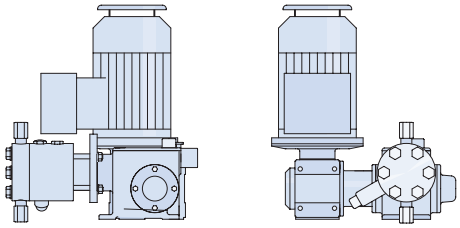
DR 15/25



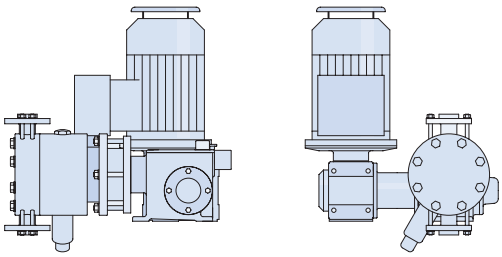
DR 150/90



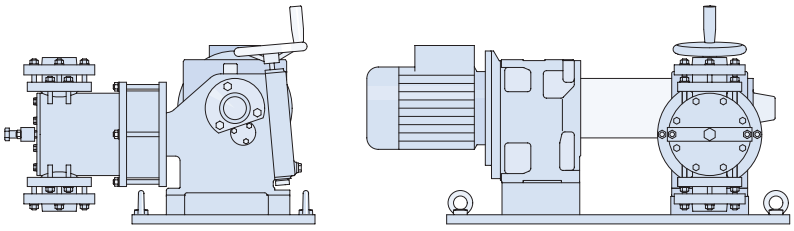
MfS 18/10



MfS 35/44

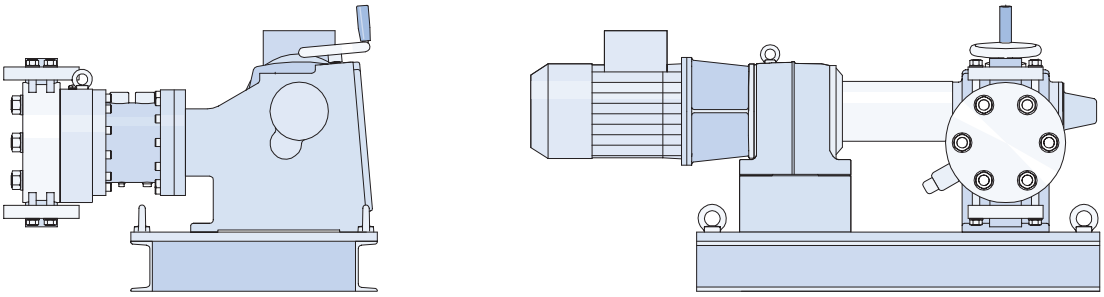


PS 80/125

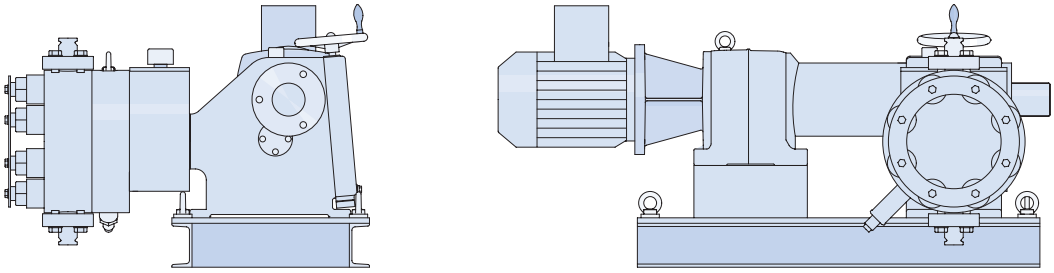


SIDE VIEW OF ORLITA® PUMPS

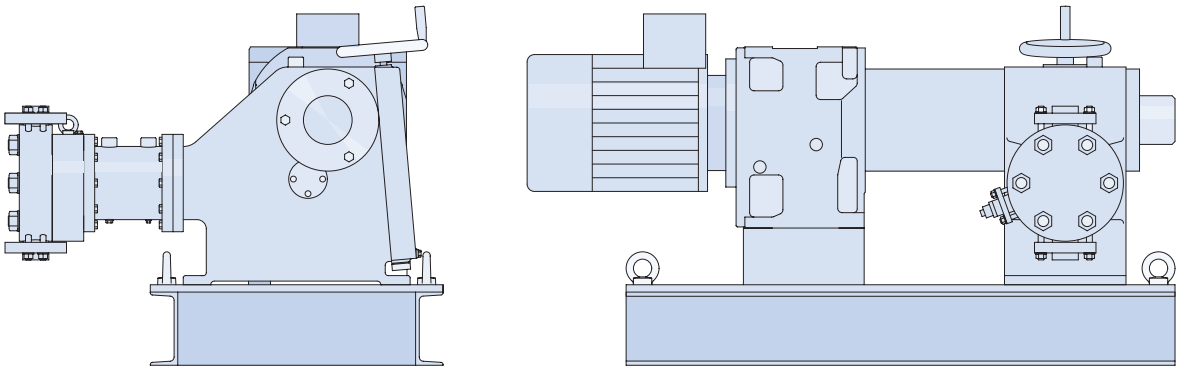
MfS 180/44



MhS 600/26



MfS 1400/60



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