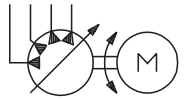




Reciprocating pump PMF / GMF

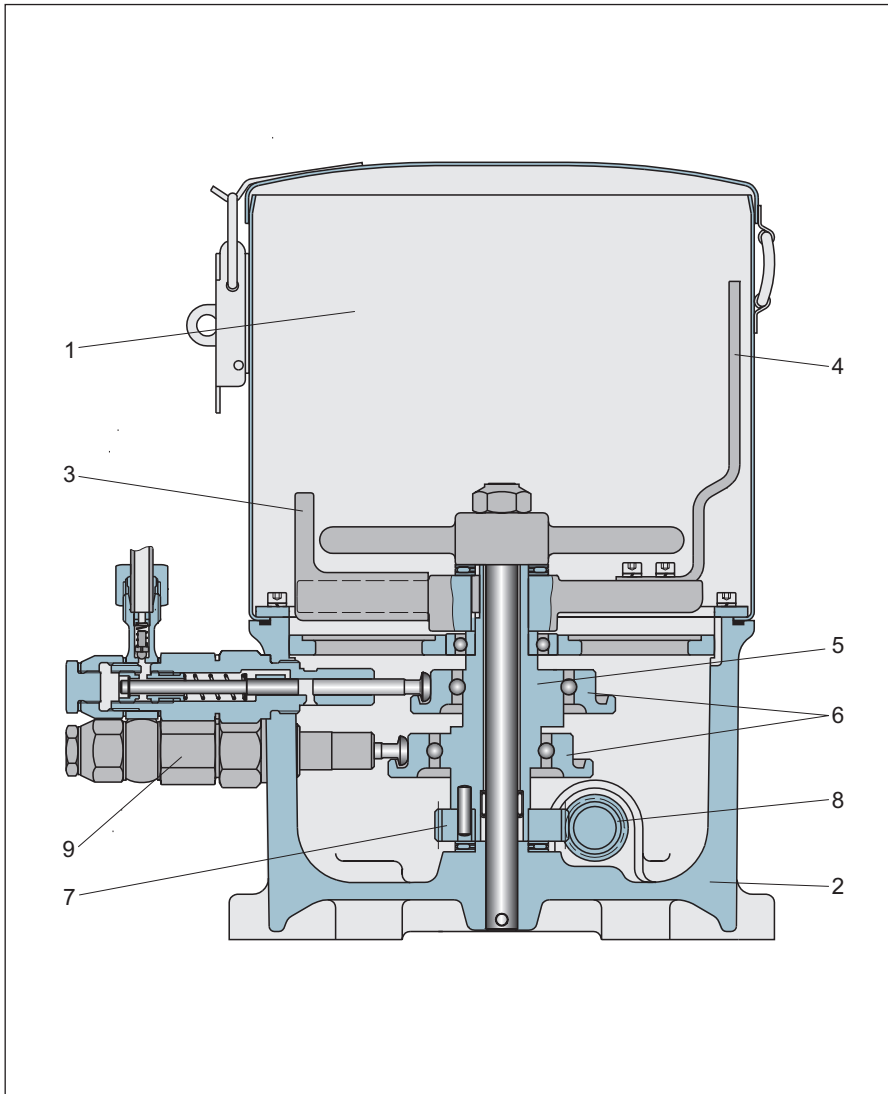


This is a multi-line reciprocating pump for many applications

- Being a universal type, our reciprocating pump is capable of meeting any challenge.
- The reciprocating pump can be fitted with various drives. Direction of rotation is as needed.
- Based on our long-standing experience, we can determine the appropriate type for every application.
- Reciprocating pumps can be used with oil and grease.

General description:

The reciprocating pump is capable of accommodating up to 24 pump elements. Delivery volume per element each is 0,08 or 0,15 cm³/stroke at maximum and can be regulated continuously. Maximum operating pressure amounts to 350 bar. The reservoirs are made of steel sheet or transparent polyester material providing capacities between 2 and 30 litres. The reservoir content can be monitored electrically.



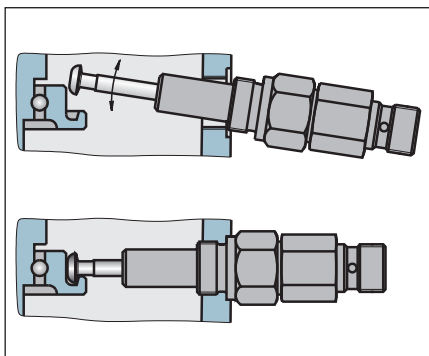
Mode of operation:

The reciprocating pump is composed of the following main parts:

The pump casing 2, the pump elements 9, the inner and outer drives 7, 8, and the reservoir 1. From the outer drive, the pump shaft 5 is driven via a worm gear 7, 8. With this pump shaft 5, a pressure ring 6 runs around eccentrically, into which the pump elements 9 are hooked. Due to the eccentricity of pressure ring 6 to the pump shaft, every delivery piston will inevitably make a steady pressure and suction stroke with every turn of pump shaft 5. For pump elements description, see: pump elements mode of operation, please. Pump shaft 5 is connected with a stirring mechanism 3 that presses the lubricant to the intake holes of the pump elements 9 and cuts air bubbles up. In the level monitor fitted version, a follow-up piston for grease usage is provided for. This piston rests on the grease surface, thus enabling precise level monitoring. If there is no level monitoring provided for, a stripper 4 is installed.

- Subject to modifications -

PMF pump elements assembly:

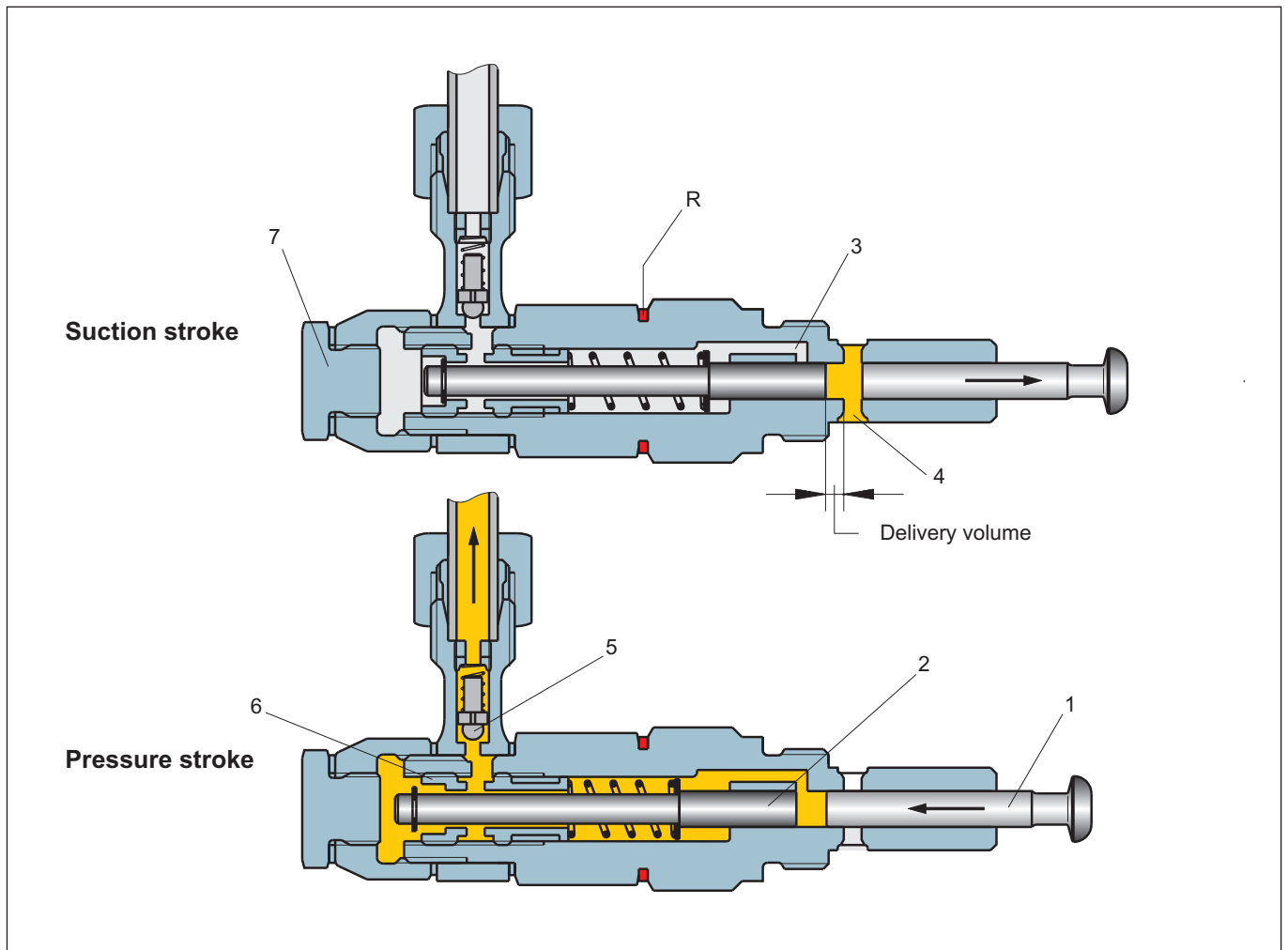


When fitting another pump element into the reciprocating pump, please proceed as shown in the sketch beside: With the delivery piston being approximately pulled out half, insert the pump element diagonally upward into the casing's reception hole. Insertion and operation will be easier when the hole that serves to accommodate the delivery piston is filled with grease. Do not put the pump element into horizontal position and screw in, unless the delivery piston's head touches the pressure ring and ratches into the latter's groove.

When demounting, pull the pump element cautiously out of the casing such that the delivery piston will remain within the pump element.

Notes to operation:

Reciprocating pumps must be operated with clean oil or grease from original drums only. If, upon start-up, filling is not made via the filling nipple, the pump, in case of initial filling, has to be filled with gear oil up to the stirrer wing's level. This way, proper deaeration is ensured. The lubricant leads must be cleaned and have no obstructions. They shall not be connected with the lubrication points, unless lubricant comes out free of bubbles. All delivery pipe connections should be checked for leakage.



- Subject to modifications -

Pump elements mode of operation:

Suction stroke is accomplished by delivery piston 1 and control piston 2. In this process, delivery piston 1 is actuated by the eccentric shaft, whilst the spring actuates control piston 2. The control piston closes pressure hole 3 and is kept in a certain position as determined by the preset delivery volume. The delivery piston moves on, causing a vacuum to be built up in the proportioning space. When the delivery piston has opened suction hole 4, lubricant starts to be sucked from the reservoir.

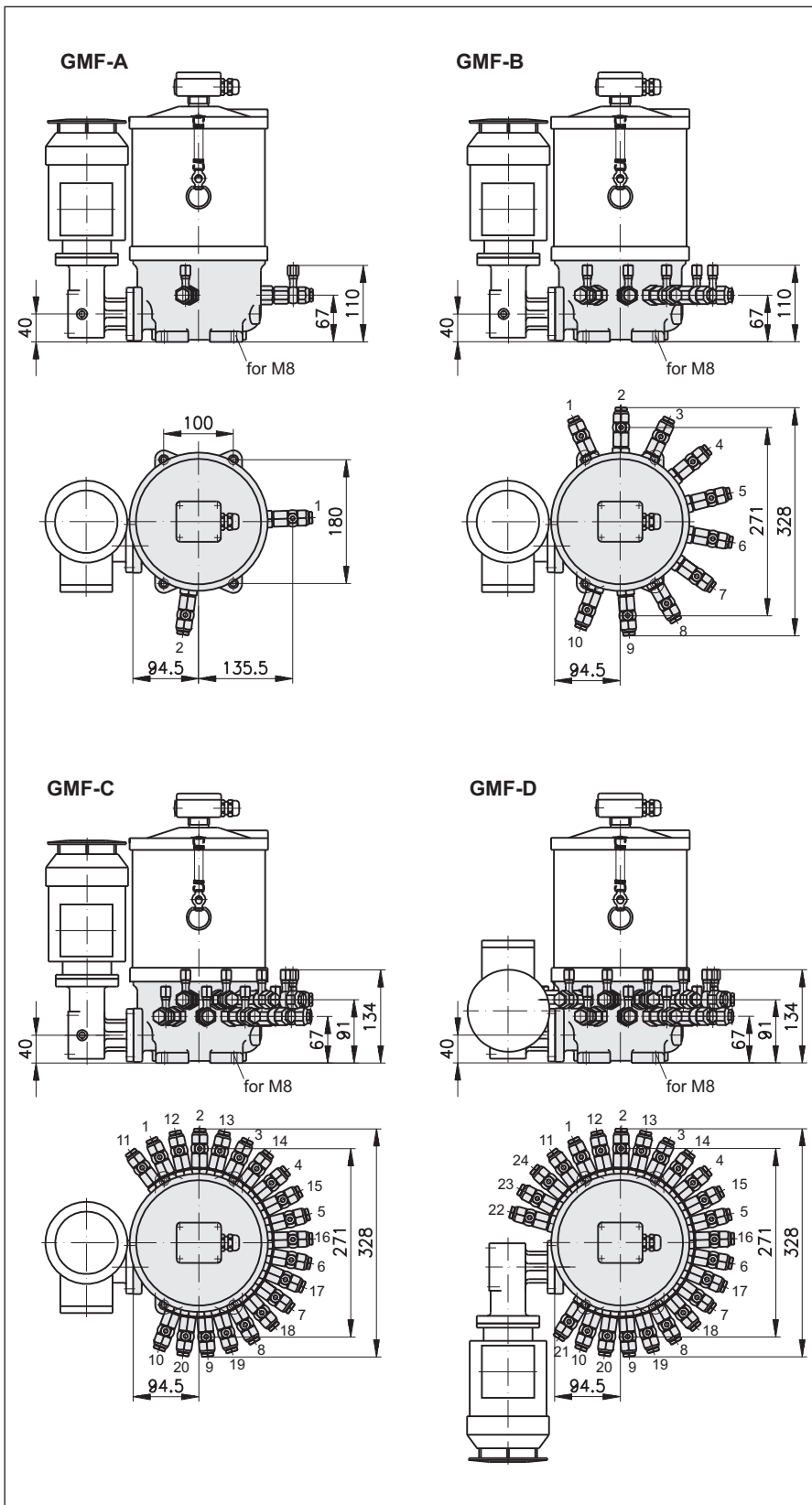
In case of **pressure stroke**, delivery piston 1 moves to the left. In this motion, suction hole 4 is closed and control piston 2 displaced by virtue of the lubricant being available in between the delivery and control pistons until it releases pressure

hole 3 and the lubricant is delivered through the delivery piston to the outlet. The pump elements are delivered with maximum delivery volume, i.e. they are set to full stroke.

The **delivery volume** can be adjusted continuously between 25 and 100% of the nominal delivery volume. After having removed lock screw 7, the stroke is to be changed by means of the enclosed spanner through adjustment nipple 6. When turning the nipple to the right, delivery volume will decrease. At the adjustment nipple, there is a hexagon against which a spring loaded piston is pressing radially. Thus, any independent change of the delivery volume will be prevented. At the same time, the latching serves as a measure for setting the delivery volume.

Six latches equal one rotation of the adjustment nipple and a reduction of the nominal delivery volume by 33%. 14 latches (minimum) equal a delivery volume reduction down to 25% of the nominal delivery volume.

The element having a piston diameter of 8 mm = 0,15 cm³/stroke is marked with a red ring "R".



Type designation:

Motor-driven reciprocating pumps are type-designated by **GMF**.

The type designation of reciprocating pumps **without motor-drive** is **PMF**.

Depending on the number of pump element installation points, additional distinction is made as follows:

Number of mountable elements	Type
at maximum 2	GMF-A PMF-A
at maximum 10	GMF-B PMF-B
at maximum 20	GMF-C PMF-C
at maximum 24	GMF-D PMF-D

General technical data:

Admissible delivery pressure: 350 bar

Number of elements: 1 ... 24

Delivery volume per stroke and element
 in case of pump element 6: 0,08 cm³
 in case of pump element 8: 0,15 cm³

Stroke numbers of elements: 1 ... 25 min⁻¹
 in case of deviation, please enquire

Temperature range
 with electric motor: -20 ... +40 °C
 without electric motor: -20 ... +80 °C
 In the presence of low temperatures, grease penetration should be observed!

Medium: Oil and grease up to NLGI-class 3

When choosing the reservoir and level monitoring, the medium should be taken into account

Lubricant: The intended lubricant must be suitable for use with centralized lubrication equipment.

Drive direction of rotation: as needed

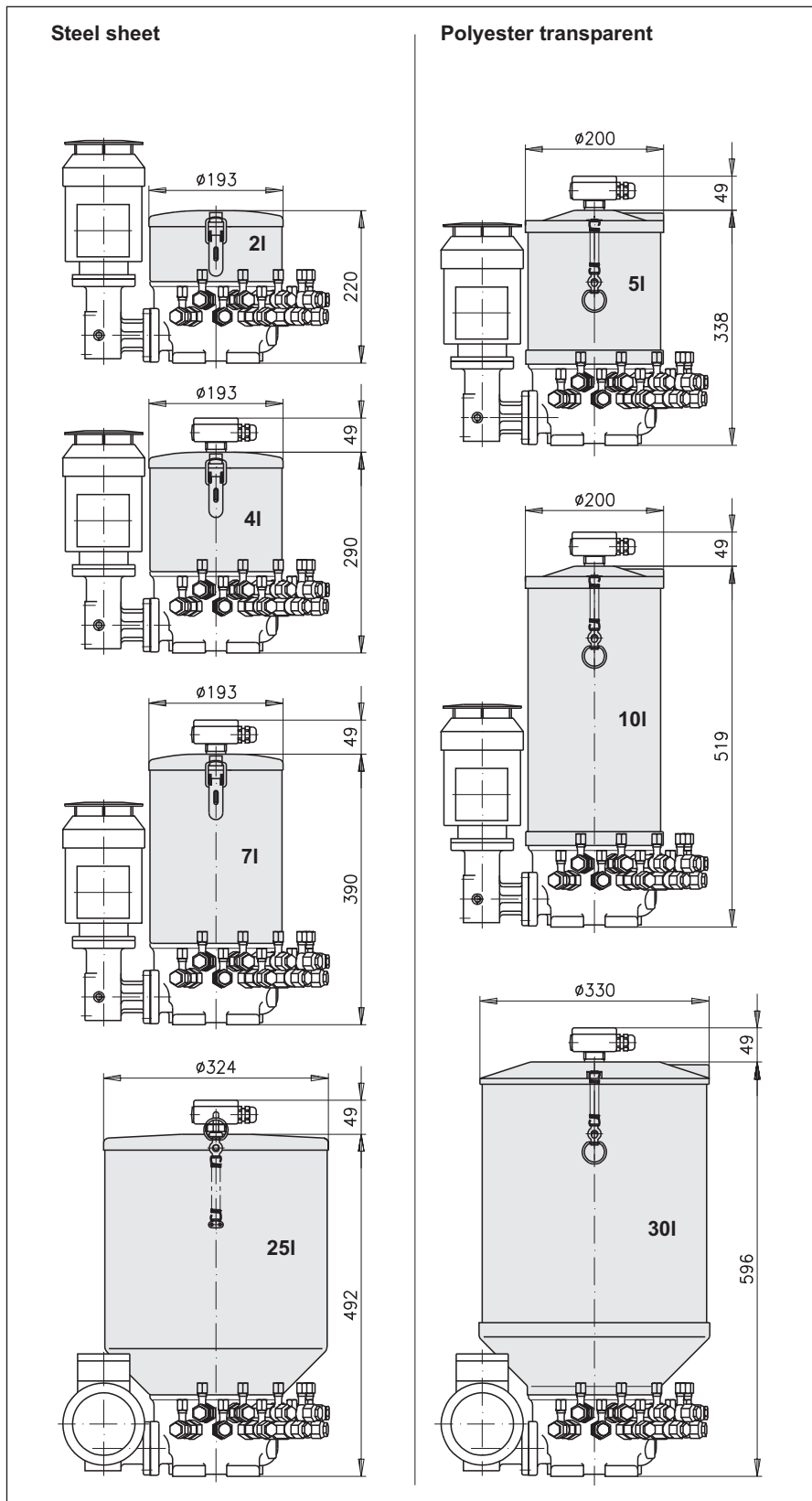
Reciprocating pump installation position: vertical

Material:
 Casing: Aluminium
 Pump element: Steel, galvanised
 Reservoir 2, 4, 7, 25l: Steel, galvanised
 Reservoir 5, 10, 30l: Polyester
 Gaskets: NBR

- Subject to modifications -



- Subject to modifications -



Reservoir:

Reservoirs with capacities ranging between 2l and 30l are available for delivery. Every pump type any of the reservoirs depicted can be assigned to.

When choosing a reservoir, level monitoring and lubricant should be taken into consideration as well.

Reservoir materials:

Capacity	Material	Weight
2 l	Steel, galvanised	1,0 kg
4 l		1,4 kg
7 l		2,0 kg
25 l	Polyester, fibreglass reinforced	4,6 kg
5 l		1,5 kg
10 l		1,8 kg
30 l		4,0 kg

Reservoirs and level monitoring capability:

Capacity	Level monitoring
2 l	impossible
4 l	for oil: Float switch min. level
7 l	for oil: Float switch min. and max. level
25 l	for oil: Float switch min. and max. level
5 l	for oil: Float switch min. and max. level
10 l	for grease: Follow-up piston min. and max. level
30 l	for grease: Follow-up piston min. and max. level

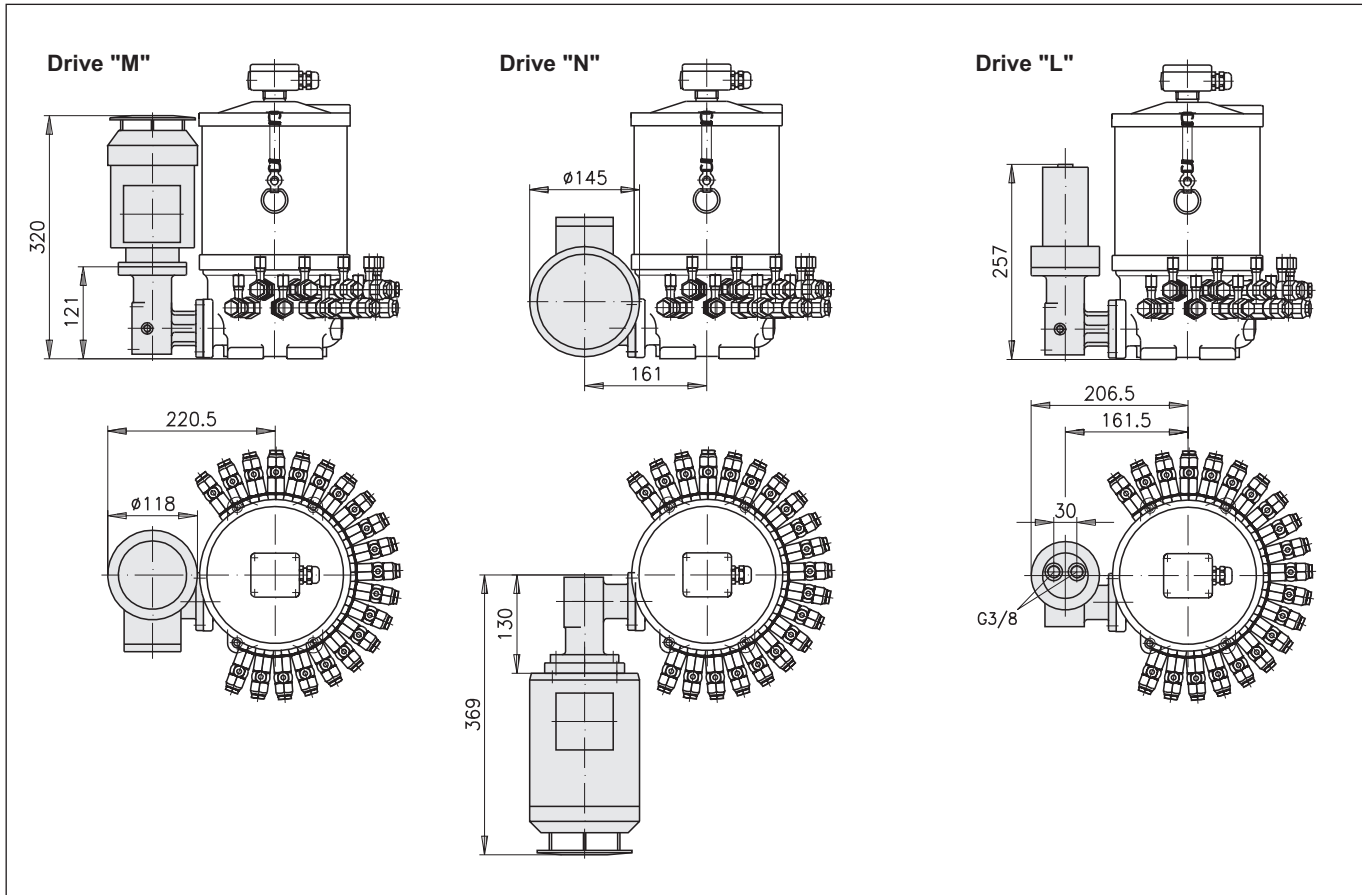
When a follow-up piston is used, the utilisable reservoir volume is reduced as follows

- Reservoir capacity 5 l and 10 l by approx. 2,5 l
- Reservoir capacity 30 l by approx. 6,0 l

For further information, see "level monitoring" description



Drive types:



- Subject to modifications -

Drive "M": with gear and motor BG63
Drive "N": with gear and motor BG71
Weight [kg]: 10,7 + reservoir weight+ 0,25 x number of elements

The gears are filled with 80 cm³ ISO VG 220 gear oil. After 3000 hours of operation, checking is required.

Motor electrical data:
 Mains voltage: 230 / 400 V
 Frequency: 50 Hz
 Special voltage and frequency possible
 Synchronous speed: 1500 min⁻¹
 Power:
 Drive "M": 0,18 kW
 Drive "N": 0,37 kW
 Protection system: IP55
 Thermal category: F

Drive "L": with gear and hydraulic motor
Weight [kg]: 7,7 + reservoir weight+ 0,25 x number of elements
 Overall reduction same as with drives "M", "N"

Motor technical data:
 When oil flow is 3,5 l/min
 Power: 0,25 kW
 Speed: 400 min⁻¹
 Speed max.: 1950 min⁻¹
 Pressure inclination max.: 100 bar
 Oil flow max.: 16 l/min
 mind permissible element stroke number!

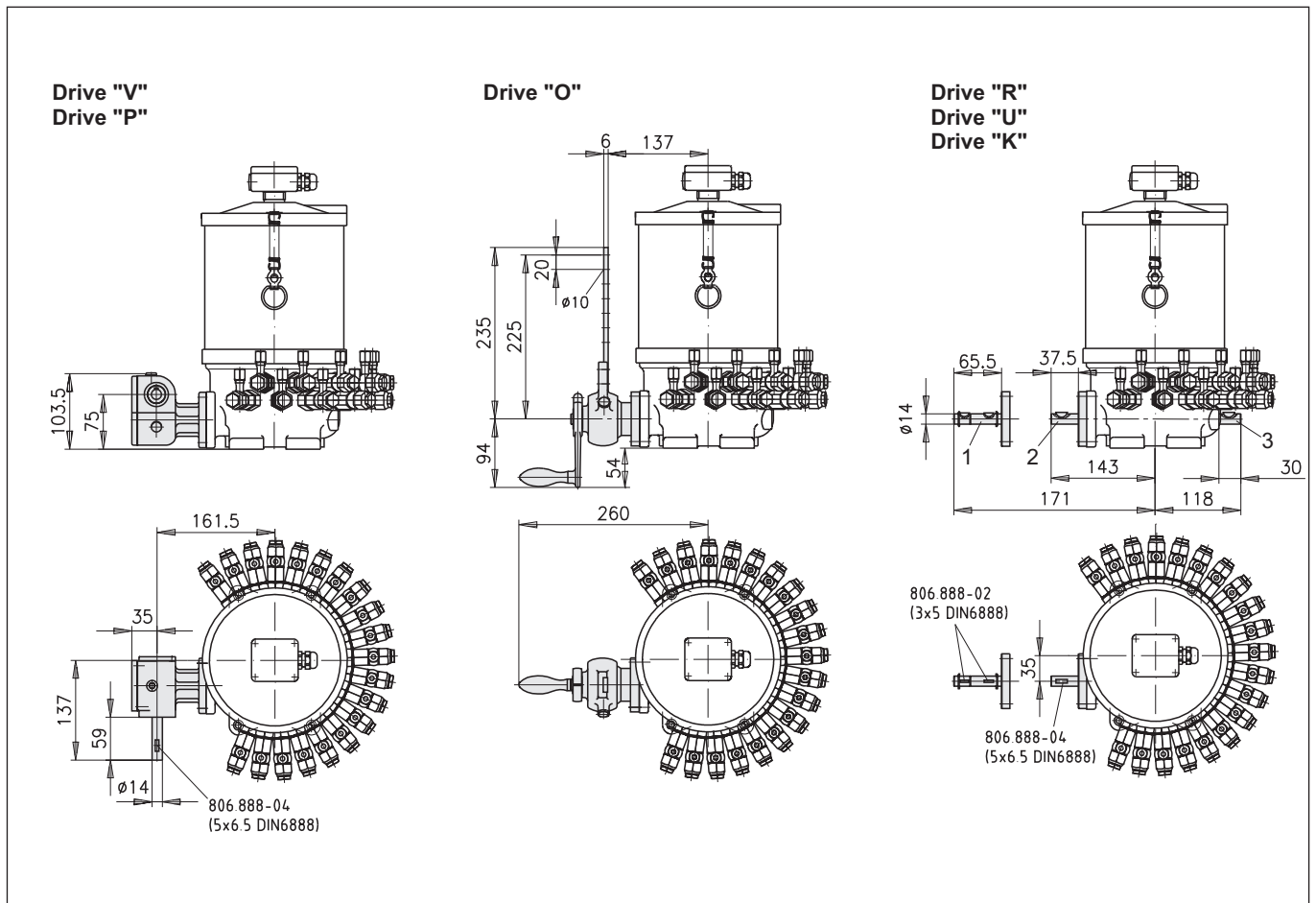
The gears are filled with 80 cm³ ISO VG 220 gear oil. After 3000 hours of operation, checking is required.

Overall transmission	Delivery flow per element [cm ³ /min]		max. operating pressure [bar] (with 20 elements installed)			
	Element Ø6	Element Ø8	Drive "M"		Drive "N"	
			Element Ø6	Element Ø8	Element Ø6	Element Ø8
60 : 1	1,82	3,4	230	100	350	200
97 : 1	1,12	2,1	330	170		350
160 : 1	0,67	1,28		270		
316 : 1	0,34	0,64		320		
625 : 1	0,17	0,32	350	350		
1250 : 1	0,087	0,163				
2500 : 1*	0,0435	0,0815				

* on request only



- Subject to modifications -



Drive "V": with gear

Weight [kg]: 6,4 + reservoir weight+
0,25 x number of elements

Transmissions:

97 : 1	160 : 1	316 : 1
625 : 1	1250 : 1	2500 : 1
3300 : 1	4356 : 1	

The gears are filled with 80 cm³ ISO VG 220 gear oil. After 3000 hours of operation, checking is required.

Drive "P": without gear, for spare parts keeping

Gears ZAF following leaflet-no. 0380 can be mounted on. Hence, pumps with the drives "M", "N" or "V" are generated.

Drive "O": oscillating

Weight [kg]: 6,8 + reservoir weight+
0,25 x number of elements

Transmissions:

1,33 : 1	1,78 : 1	2,33 : 1
4,25 : 1	7,66 : 1	12,7 : 1
25 : 1	50 : 1	66 : 1

Formula for eccentric stroke calculation:

$$h = \frac{2 \times L \times \pi \times n_1 \times i}{n}$$

h = Eccentric stroke [mm]
 L = Swivel lever length [mm]
 n₁ = Stroke number of pump elements
 [min⁻¹]
 i = Transmission
 n = Speed of the driving shaft

Drive "R": long driving shaft 1
Drive "U": short driving shaft 2
Drive "K": for coupling of 2 PMF driving shaft 2 and 3

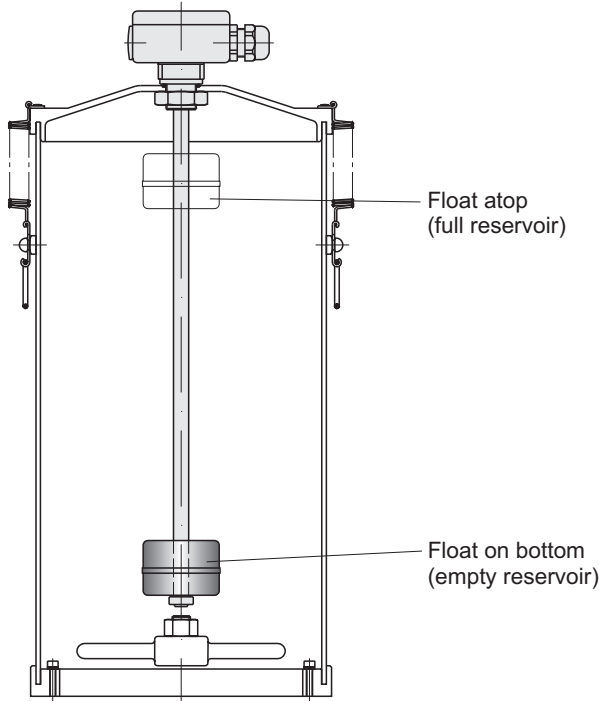
Weight [kg]: 5,2 + reservoir weight+
0,25 x number of elements

Transmissions:

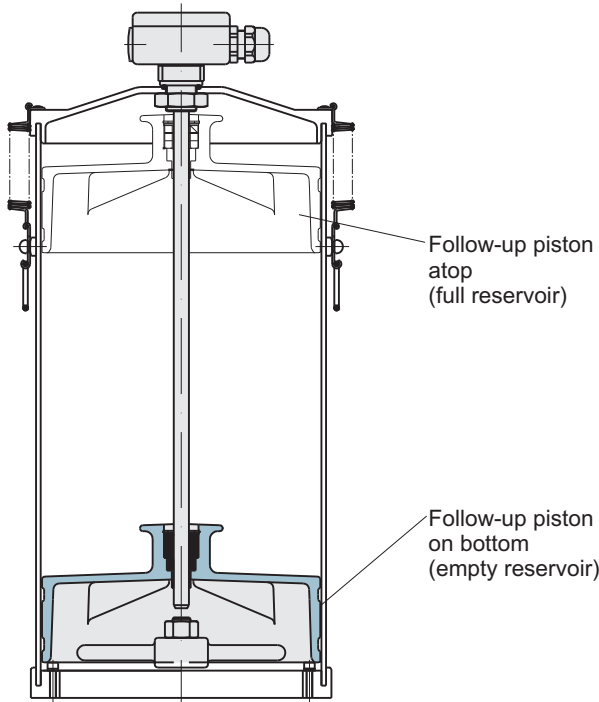
1,33 : 1	1,78 : 1	2,33 : 1
4,25 : 1	7,66 : 1	12,7 : 1
25 : 1	50 : 1	66 : 1



Level monitoring via level switch "S"



Level monitoring via level switch with follow-up piston "K"



Level monitoring:

Electrical data:

Switching power at max.: 40 W / 60 VA

Switching voltage at max.: 230 VUC

Switching current at max.: 0,5A

In case of inductive and capacitive loads, protective switchings should be provided for (diode, RC-element, varistor)

Protection system: IP 65

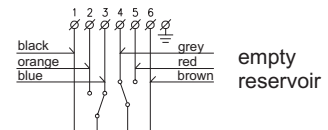
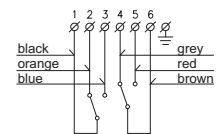
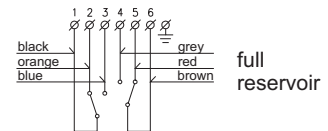
Connection type: Screw terminals

Cable gland: PG11

Conductor cross section: 0,5...1,5 mm²

Weight: 0,15 ... 0,18 kg

Connection diagram:



- Subject to modifications -

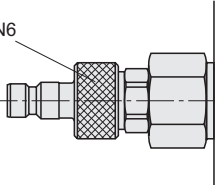
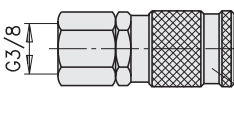
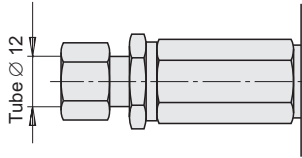
Level switches with follow-up pistons can be fitted into polyester-made reservoirs only.

Follow-up piston weight
for reservoir: 5 a. 101=0,8 kg
for reservoir: 301=2,7 kg

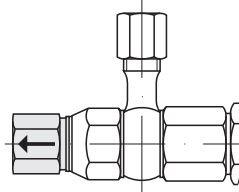


Auxiliaries

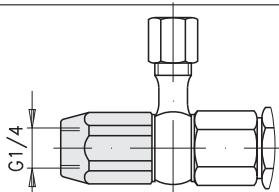
Filling connector:

Purchase-no.	Depiction	Mounting place	Use
Locking nipple "V" with dust cap 110.125-65		Instead of a pump element	for reservoir filling
Locking coupling with dust plug 110.135-65		The locking coupling serves to establish a connection between the locking nipple and the hose.	
Filling nipple (U 30) "B" 110.550-66		Instead of a pump element	

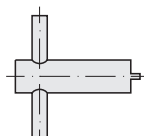
Pressure control valve:

Purchase-no.	Opening pressure [bar]	Depiction	Mounting place	Use
110.566-65	70 bar		After removal of the locking screw at the pump element, the pressure control valve can be screwed in.	To limit max. operating pressure.
110.564-65	150 bar			
110.560-65	400 bar			
preset as per customer's specification:				
110.568-65	from 50 to 160			
110.562-65	from 160 to 250			

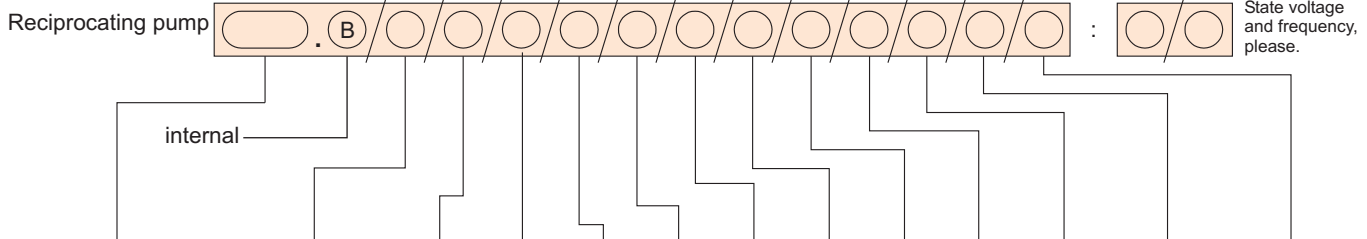
Manometer connector:

Purchase-no.	Depiction	Mounting place	Use
110.068-65		After removal of the locking cap at the pump element, the manometer connector can be screwed in.	To connect a manometer with G 1/4" male thread.

Adjustment spanner:

Purchase-no.	Depiction	Use
110.004-45		After removal of the locking cap at the pump element, the delivery volume of the pump element can be adjusted by using the adjustment spanner (included in scope of delivery = i.e. 1 piece per pump each)

- Subject to modifications -

Purchase-designation:


Type		Reservoir capacity [l]		Overall reduction	Drive type	Element 6 with pipe connection			Element 8 with pipe connection			Filling connection	Lock screw Number	Level monitoring						
with motor	without motor	Polyester	Steel			∅ 6	∅ 8	∅ 10	∅ 6	∅ 8	∅ 10									
see 1)						see 2)	see 2)	see 2)	see 2)	see 2)	see 2)	see 3)	see 4)	see 5)						
GMF-A (2 places)	PMF-A (2 places)	5	2	see table	V M N L O K R U P	Number 0 ÷ 2	Number 0 ÷ 2	Number 0 ÷ 2	Number 0 ÷ 2	Number 0 ÷ 2	Number 0 ÷ 2	without 0	0 ÷ 2 at max. 2	0 without level monitoring						
together 2 elements possible at maximum!						Number 0 ÷ 10	Number 0 ÷ 10	Number 0 ÷ 10	Number 0 ÷ 10	Number 0 ÷ 10	Number 0 ÷ 10		with B	0 ÷ 10 at max. 10	Grease ^K with level switch and follow-up piston					
GMF-B (10 places)	PMF-B (10 places)		4			together 10 elements possible at maximum!								Number 0 ÷ 20	Number 0 ÷ 20	Number 0 ÷ 20	Number 0 ÷ 20	Number 0 ÷ 20	Number 0 ÷ 20	0 ÷ 20 at max. 20
GMF-C (20 places)	PMF-C (20 places)		7			together 20 elements possible at maximum!							Number 0 ÷ 24	Number 0 ÷ 24	Number 0 ÷ 24	Number 0 ÷ 24	Number 0 ÷ 24	Number 0 ÷ 24	0 ÷ 24 at max. 24	Oil ^S with level switch without follow-up piston
GMF-D (24 places)	PMF-D (24 places)	30	25	together 24 elements possible at maximum!																

- Subject to modifications -

- Any GMF-A/B/C/D version possible in case of drive M, N or L only!
- When element installation in a certain position is required, please state such position when ordering! For instance: In case of 6 elements: "Installation into positions 1...3 and 7...9".
- Instead of an element, a filling connector can be installed!
- All element-free connections must be closed with lock screws!
- Level monitoring "K" and "F" possible in case of polyester reservoirs only!

Overall reduction table	V	M	N	L	O	K	R	U	P	
			60					1,33		
			97					1,78		
			160					2,33		
			316					4,25		
			625					7,66		
			1250					12,7		
			2500					25		
		3300						50		
		4356						66		

Purchase-example:

Pump PMF-B, reservoir 10l, overall reduction 1,33 (acc. to table), drive type U, 5 pieces of element 6 with pipe connector 8, 2 pieces of element 8 with pipe connector 6, filling connector V, 2 lock screws, level monitoring "S".

Purchase-designation:

PMF-B.B/10/1,33/U/0/5/0/2/0/0/V/2/S