Diaphragm metering pump MEMDOS MR

General

Diaphragm metering pumps of the MEMDOS MR series have been developed for a broad range of applications in metering technology. Thus they are used in the industrial sector, in process engineering and very frequently in water and waste water treatment. Diaphragm metering pumps are leakproof.

Standard versions are metering pumps with the head located on the left-hand side.
Type MR...L (Symbol)

Upon request, metering pumps with the head on the right-hand side can be supplied.
Type MR...R (Symbol)

Duplex metering pumps are available with the head combinations shown in the following tables. The heads are arranged in diagonals.
Type ZMR.../... (Symbol)

The power of the motor is the same for simplex and duplex metering pumps because the diaphragms operate in a push-pull arrangement.

Metering Head

The heads are available in polypropylene and stainless steel. Special materials upon request.

Suction and discharge valves are double-ball valves up to the MR 290 version; for the bigger pumps, spring-loaded flat-seat valves are used. For viscous media of 400 mPas and more, spring-loaded single-ball valves are recommended for the suction and the discharge side. The opening pressure of the valve is about 0.1 bar.

Separating chamber

The diaphragm flanges have been designed so that, in the case of a diaphragm rupture due to wear, no chemical can escape randomly from the pump or enter the gear. The leakage is routed downwards through a drain pipe. The diaphragm flanges thus function as a separating chamber and are protected against aggressive media by means of powdery epoxy coating. The escaping leakage can be detected by a leakage probe causing the pump to be stopped (see MB 1 31 01).

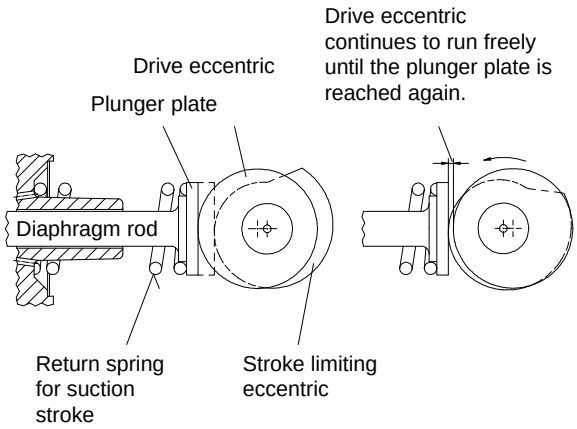
Drive

The drive unit consists of an oil-filled worm gear. The stroke is generated by an eccentric which moves back and forth a spring-loaded plunger fixed to the diaphragm. The metering stroke is achieved by the pushing force of the eccentric, the resetting of the spring causes the suction stroke. The stroke length is set by limiting the plunger return by means of a manually adjustable eccentric disk used as a stop.

The stroke length which determines the metering capacity can be adjusted manually during operation between 0 and 100 %.

The standard version is equipped with manual adjustment. Upon request, an automatic remote adjustment (ATE) can be supplied.

Functional diagram



Technical data

The capacity is valid at 50 Hz operation.

Simplex metering pumps

Memdos MR		400	600	980
max. pressure	bar	5	5	4
at max.	l/h	440	640	990
pressure	ml/stroke	165	165	165
strokes/min		47	70	101
diaphragm ø	mm	185	185	185
weight	kg plastic	38	38	38
	SS	48	48	48

Duplex metering pumps with equal heads

Memdos ZMR		50/50	75/75	115/115	140/140	210/210	290/290	400/400	600/600	980/980
max. pressure	bar	10	10	10	10	10	10	5	5	4
at max.	l/h	50/50	90/90	135/135	160/160	240/240	290/290	440/440	640/640	990/990
pressure	ml/stroke	20	20	20	37	37	48	165	165	165
strokes/min		47	70	101	70	101	101	47	70	101
diaphragm ø	mm	90	90	90	120	120	150	185	185	185
weight	kg plastic	38	38	38	38	38	40	50	50	50
	SS	48	48	48	48	48	53	60	60	60

Duplex metering pumps with different heads

Memdos ZMR		50/400	75/140	75/600	115/210	115/290	115/980	140/600	210/290	210/980	290/980
max. press.	bar	10	10	10	10	10	10	10	10	10	10
at max.	l/h	55 440	90 160	90 640	135 240	135 290	135 990	160 640	240 290	240 990	290 990
pressure	ml/stroke	20 165	20 37	20 165	20 37	20 48	20 165	37 165	37 48	37 165	48 165
strokes/min.		47	70	70	101	101	101	70	101	101	101
diaphragm ø	mm	90 185	90 120	90 185	90 120	90 150	90 185	120 185	120 150	120 185	150 185
weight	kg plastic	49	38	49	38	40	41	41	40	49	49
	SS	55	48	55	48	53	55	55	50	55	55

Additional components

Upon request, the metering pump can be supplied with an inductive sensor for the eccentric shaft allowing to use the number of strokes for batch processes.

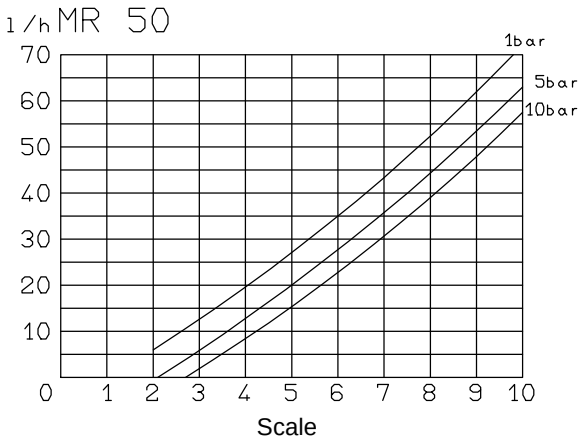
Accessories

Thyristor controller
for the control of a d.c. drive
(see MB 4 20 01).
For further accessories see "Installation example".

Frequency converter
for the control of 3-phase motors. In the case frequency converter operation, a 0.75 kW motor and an external vent must be used.

Performance curves

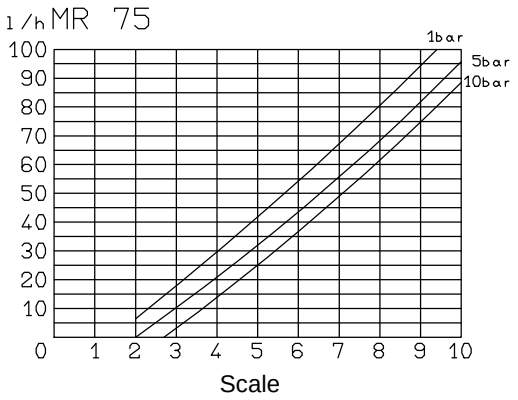
run with water, suction lift about 0.5 m

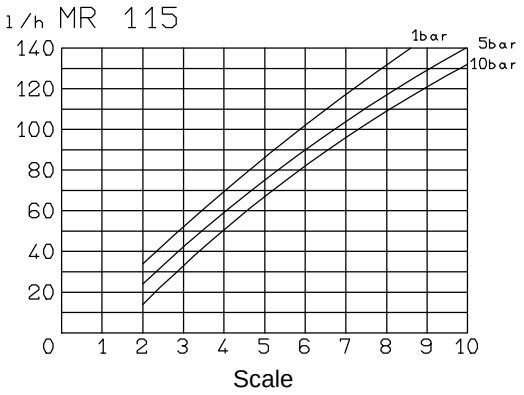


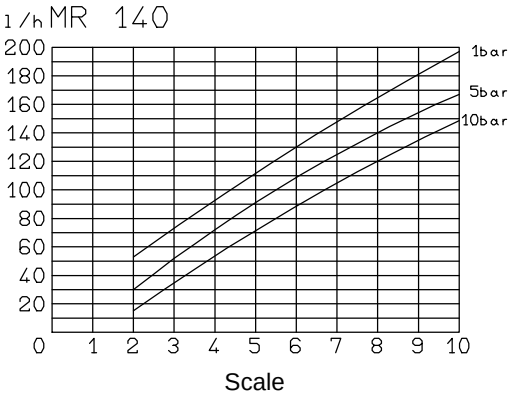
Diaphragm metering pump MEMDOS MR

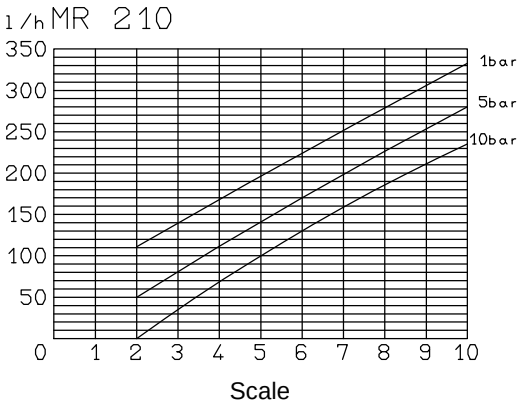
Performance curves

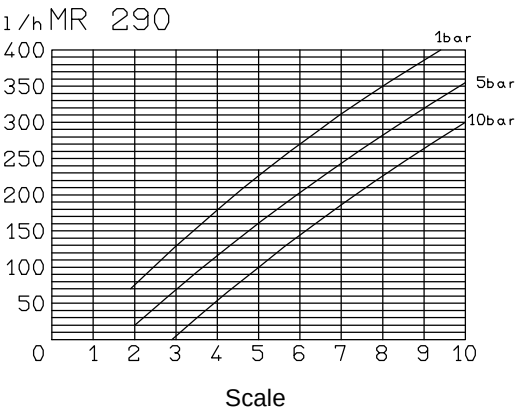
run with water, suction lift approx. 0.5 m

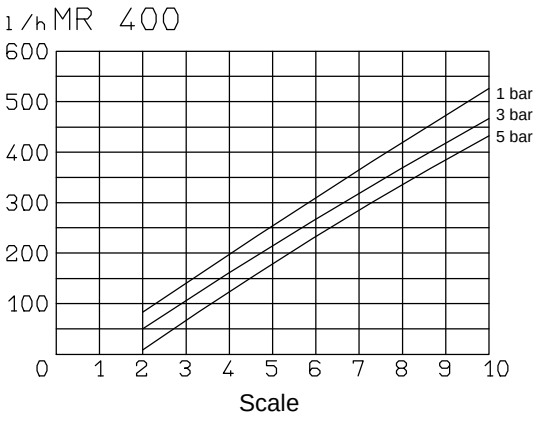


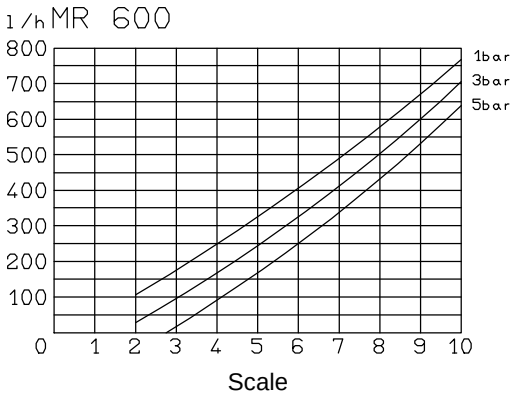


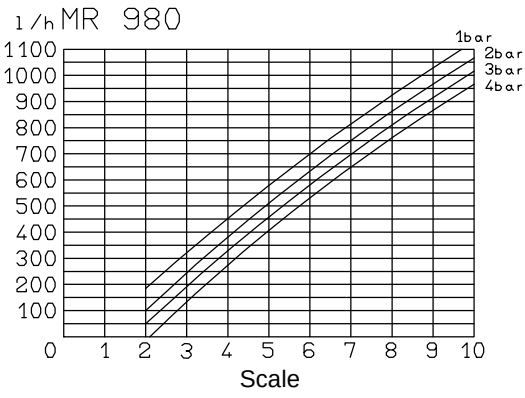












Simplex pumps

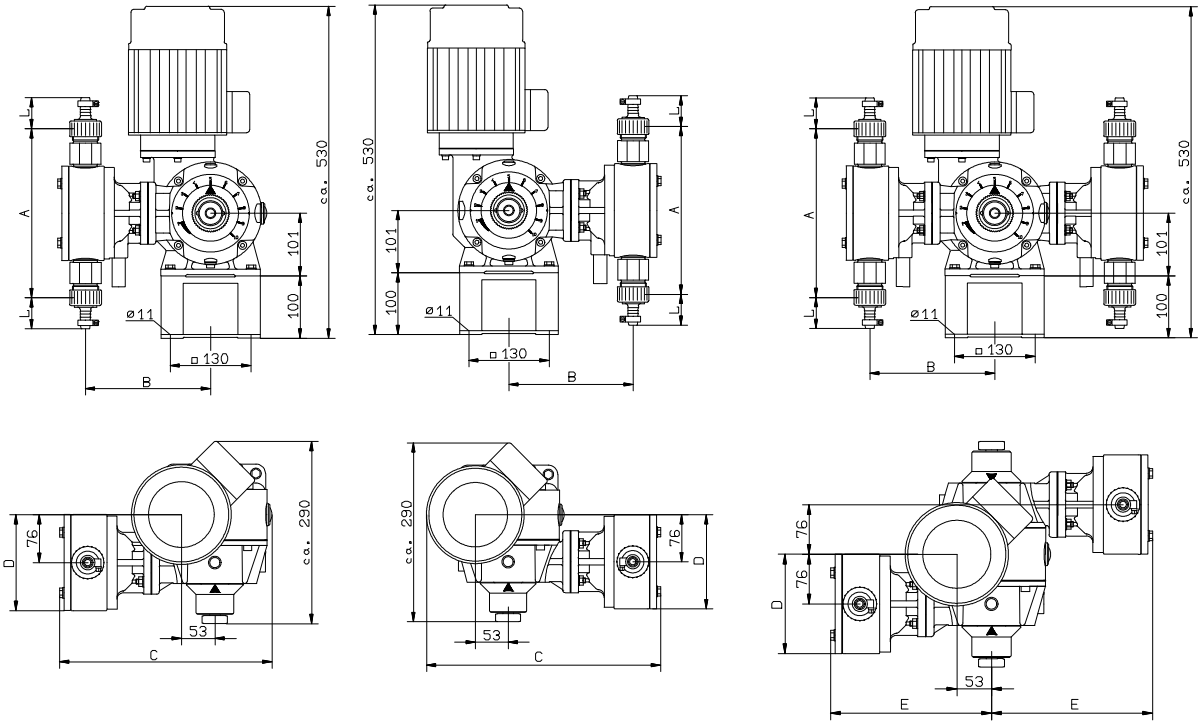
Left-hand version

MR 50 L . . . MR 980 L

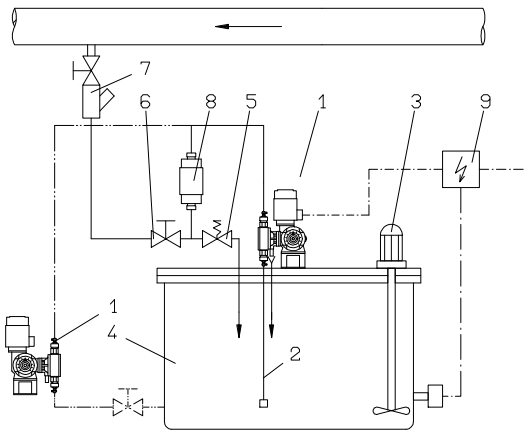
Right-hand version

MR 50 R . . . MR 980 R

Duplex pumps



Installation example



Legend

1	**Metering pump MEMDOS MR**	**MB 1 05 02**
2	Suction line	MB 1 22 01
3	Electric agitator	MB 1 36 03
4	Tank	MB 1 20 01
5	Relief valve	MB 1 25 01
6	Diaphragm shutoff valve	MB 1 24 01
7	Injection nozzle	MB 1 23 01
8	Pulsation dampener	MB 1 27 01
9	Switchbox	

In the case of duplex pumps with different metering heads the larger head must always be located on the left-hand side (L); for possible head combinations see table MB 1 05 02 / 5.

Dimensions

Model MR	A	B	C	D	E
50	272	201	370	ø152	228
75	272	201	370	ø152	228
115	272	201	370	ø152	228
140	272	201	370	ø152	228
210	272	201	370	ø152	228
290	296	201	370	□170	225
400	265	225	425	ø230	300
600	265	225	425	ø230	300
980	265	225	425	ø230	300

Dimension L see selection table 5, page 7.

Selection tables

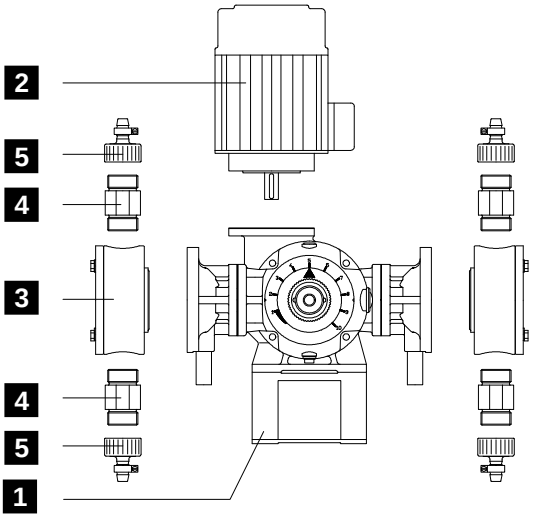
In order to offer the user a wide variety of pumps, the metering pumps have been divided into the most important functional groups. The pump can be made up according to the individual requirements.

Select the pump from the following modules:

1 Gear **2** Motor **3** Head

4 Valves **5** Connections

The numbers on the pump drawing refer to the corresponding selection tables.

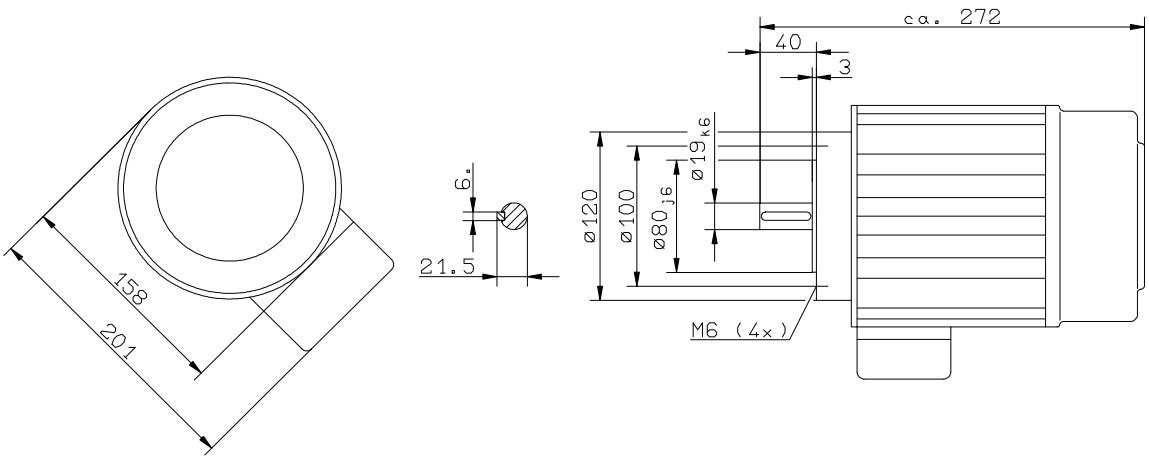


1				
Pump model MR	Simplex pumps			
	Left-hand version L		Right-hand version R	
	Capacity adjustment			
	manual	ATE	manual	ATE
400	31247	31248	31440	31441
600	31249	31250	31442	31443
980	31251	31252	31444	31445

1			
Pump model ZMR	Duplex pumps with different heads		
	Capacity adjustment		
	Symbol	manual	ATE
400/50		31653	31654
140/75		31655	31656
600/75		31657	31658
210/115		31659	31660
290/115		31661	31662
980/115		31663	31664
600/140		31665	31666
290/210		31667	31668
980/210		31669	31670
980/290		31671	31672

1			
Pump model ZMR	Duplex pumps with equal heads		
	Capacity adjustment		
	Symbol	manual	ATE
50/50		31253	31254
75/75		31647	31648
115/115		31649	31682
140/140		31683	31650
210/210		31651	31684
290/290		31261	31652
400/400		31267	31262
600/600		31267	31268
980/980		31271	31272

3			
Pump model MR	Heads		
	Diaphragm ø	PP	1.4571
50	90	23721	23727
75		23721	23727
115		23721	23727
140	120	23722	23728
210		23722	22728
290	150	23723	22334
400	185	23735	23736
600		23735	23736
980		23735	23736



2

E. motor type	Part No.	Circuit	Voltage V	Current consumption A	Power kW	Speed 1/min	Frequency Hz	Prot. Class ISO Cl.	Prot. Class IP
AF 80 / 4A-11	78629	Δ Y	230/400	2.6 / 1.55	0.55	1390	50	F	55
AF 80 / 4B-11	78903	Δ Y	230/400	3.5 / 2.0	0.75	1400	50	F	55
AF 80 / 4B-11	78982	Δ Y	230/400	3.5 / 2.0	0.75	1400	50	F*	55

* Motor fitted with cold-conductor thermometer probe

4

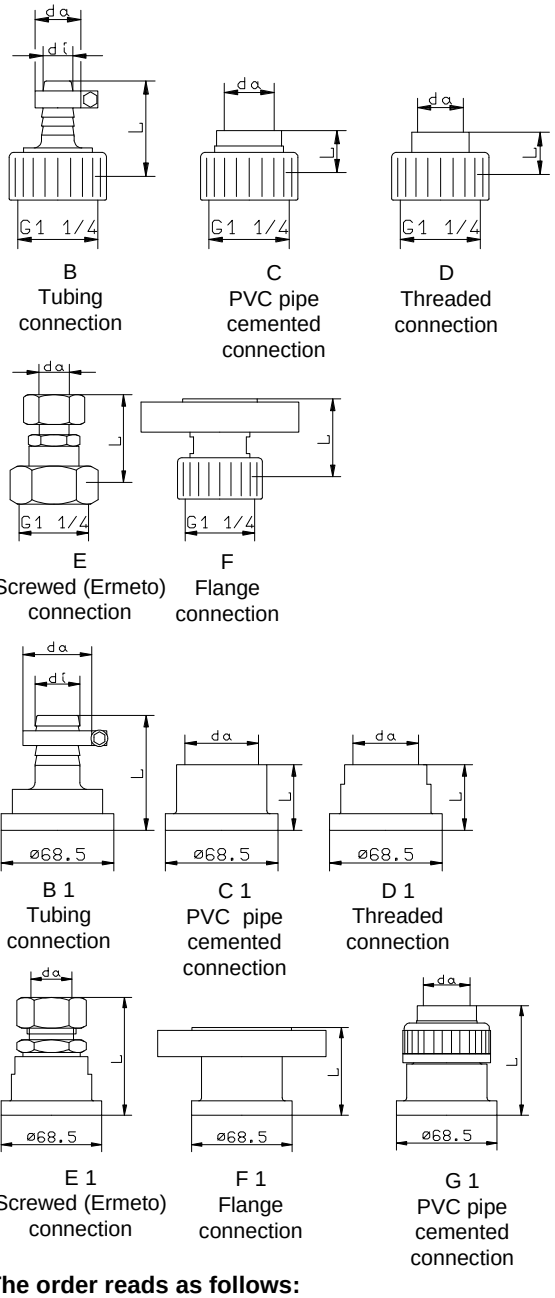
Pump model MR	Standard valves									
	MR 50...290: double-ball MR 400...980: spring-loaded with Hastelloy spring (disk valves as of 08.97)									
	Suction valve assembly					Discharge valve assembly				
	PP			1.4571		PP			1.4571	
	Seals of:									
	Hypalon	Viton	AF	Hypalon	Viton	Hypalon	Viton	AF	Hypalon	Viton
50 ... 290	26841	26842	29694	—	—	27356	27357	29695	—	—
400 ... 980	23703	23704	—	23705	25681	23703	23704	—	23705	25681

Pump model MR	Spring-loaded valves with Hastelloy spring									
	Suction valve assembly					Discharge valve assembly				
	PP			1.4571		PP			1.4571	
	Seals of:									
	Hypalon	Viton	AF	Hypalon	Viton	Hypalon	Viton	AF	Hypalon	Viton
50 ... 290	26845	25707	29696	—	—	27353	27354	29697	—	—

AF = asbestos-free

Diaphragm metering pump MEMDOS MR

5							
Pump Model	Dimensions					Part No. Version	
MR	DN	Abb.	di.	da	L	Plastic	St. steel
50	8	C	—	12	22	25923	—
75		E	—	10	51	—	25926
115	10	B	9	15	41	25921	25925
		C	—	16	22	27672	—
		D	—	G 3/8	22	25930	27037
50	15	B	16	26	50	25936	25935
75		C	—	20	22	25937	—
115		D	—	G 1/2	22	25943	25944
140		E	—	18	44	—	25939
210		F	—	—	47	25956	—
290		F	—	—	53	—	25957
400	20	D 1	—	G 3/4	40	24076	24354
400	25	B 1	25	34	70	24034	24063
600		C 1	—	32	40	21488	—
980		D 1	—	G 1	40	28458	27040
		E 1	—	28	80	—	27852
		F 1	—	—	60	25622	25623
		G 1	—	32	75	34050	—
	32	C 1	—	40	44	21491	—
		D 1	—	G 1 1/4	40	—	25252



Order example

For metering aluminum sulfate and sodium hypochlorite, metering pumps are required.
Given operating data:
380 l/h aluminum sulfate, max. pressure 4 bar
45 l/h sodium hypochlorite, max. pressure 3 bar
Mains voltage: 230/400 V, 50 Hz

In this example, both chemicals shall be metered at a fixed ratio. Therefore a manually adjustable duplex pump ZMR 400/50 should be ordered.
Resistant head material: PP

The suction and discharge valves are determined according to the resistance of the sealing materials. Hypalon is resistant to aluminum sulfate. Viton is resistant to sodium hypochlorite.

The order reads as follows:
The metering pump is made up of the following modules:

		Part No.
1	Gear ZMR 400/50	31653
2	Drive motor	78629
3	Head for MR 400	23735
	Head for MR 50	23721
4	Suction valve for MR 400	23703
	Discharge valve for MR 400	23703
	Suction valve for MR 50	26842
	Discharge valve for MR 50	27357
5	Suction connection for MR 400	24034
	Discharge connection for MR 400	24076
	Suction connection for MR 50	25936
	Discharge connection for MR 50	27672

Diaphragm metering pump MEMDOS MR-ATE

General

Metering pumps for use as correcting elements in automatic control systems or control lines are equipped with electrical servomotors. Thus the stroke length can be adjusted by sender-key contacts or controllers with relay output. In the case of duplex pumps, each head may be fitted with a separate servomotor and adjusted independently.

The pumps are identified by the letters ATE added to the model:

e.g. MR 50 L - ATE

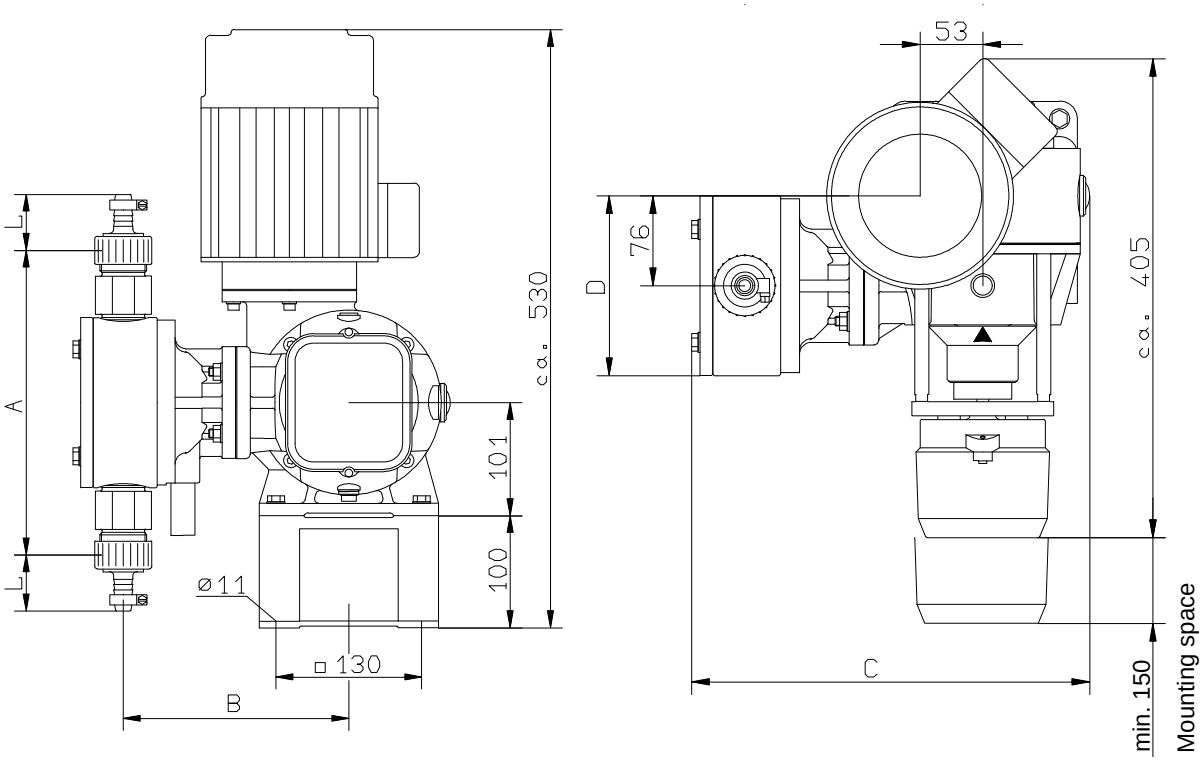
Mechanical manual adjustment of the pumps with ATE drive is possible by using a separate hand crank.

The non-linear performance curve of the diaphragm metering pumps remains despite all linear mechanics of the stroke adjustment. Therefore the performance curve of the pump must be taken into consideration in the case of controls without feedback of the metering result (proportional metering).

Two products with different technical data are available (see pages 10 and 11).

Upon request, also "increased safety"-type or "air-tight" servomotors can be supplied.

Dimensions



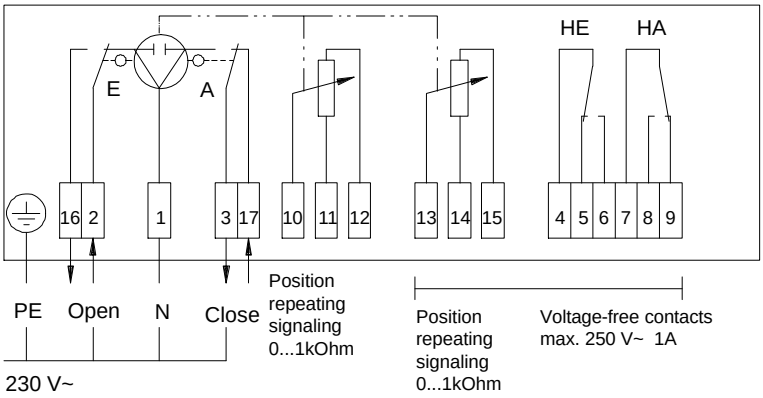
Dimension A, B, C, D, see MB 1 05 02 / 4

Technical data, types AR 30W23 and AR 30W23S

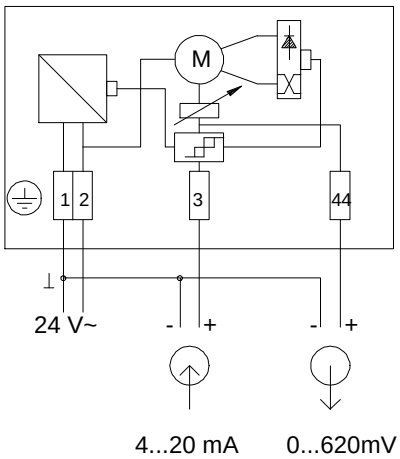
Type	AR 30W..	AR 30W..S
Design	Reversible a.c. motor with self-locking reduction gear	
Use	for controllers with switching output (3-point control)	for controllers with continous output (2...10V or 4...20mA)
Auxiliary voltage	230V~ ± 15% 50...60 Hz	24V ~ ± 20% 50...60 Hz
Control		2...10V or 4...20mA
Power consumption	2 W	7 W
Regulating time/bevel	360s / 270° = 0...100%	
Position repeating signaling for remote display	Potentiometer 0.5 W 0...1000 Ω = 0...100%	0...620mV = 0...100%
Limit switch	Internal limit switches for limiting angle of rotation. Signaling of final position via terminals 16 and 17	Internal limit switches for limiting angle of rotation.
Protection class	IP 55 (EN 60529)	
Ambient temperature	-20 ... 60°C	
Options		
2nd potentiometer	0...1000 Ω 0.5 W	
Limit switches (2 off)	max. 250V 1A	

Wiring diagrams

Types AR 30W23 F001 230V~
and AR 30W23 F020 24V ~



Type AR 30W23S F020 24V~

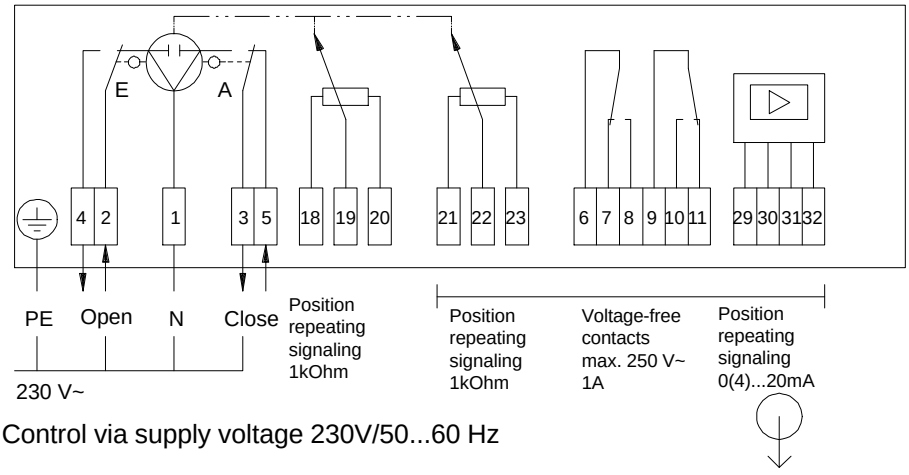


Technical data, types WAN 1 and WAN 1-S

Type	WAN 1	WAN 1-S
Design	Reversible a.c. motor with self-locking reduction gear	
Use	for controllers with switching output (3-point control)	for controllers with continuous output 0(4)...20mA
Auxiliary voltage	230V~ ± 10% 50...60 Hz Other voltages upon request	230V~ ± 10% 50...60Hz
Control		0(4)...20mA
Power consumption	approx. 11.5 W	
Regulating time/bevel	360s / 270° = 0...100%	
Position repeating signaling for remote display	Potentiometer 0.5 W 0...1000 Ω = 0...100%	0(4)...20mA (as an option only)
Limit switch	Internal limit switches for limiting the angle of rotation. Signaling of the final position via terminals 4 and 5	
Protection class	IP 54 according to DIN 40050	
Ambient temperature	max. 60°C	
Options		
2nd potentiometer	0...1000 Ω 0.5 W	
Limit switches (2 off)	max. 250V 1A	

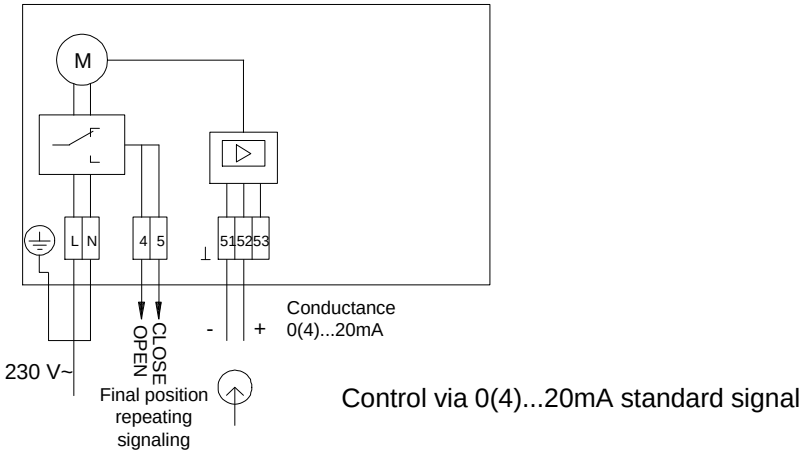
Electrical wiring diagrams

WAN 1



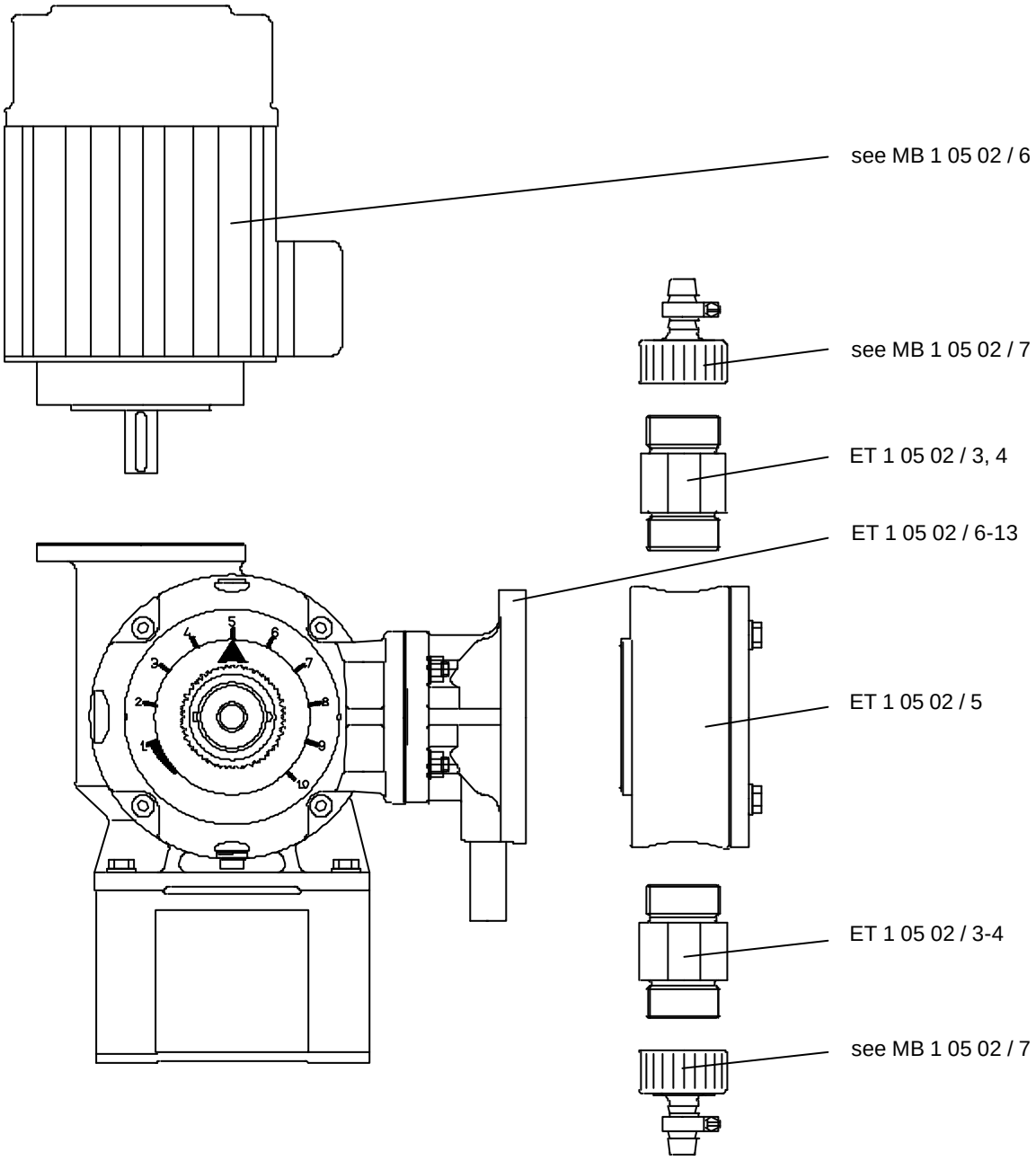
Control via supply voltage 230V/50...60 Hz

WAN 1-S



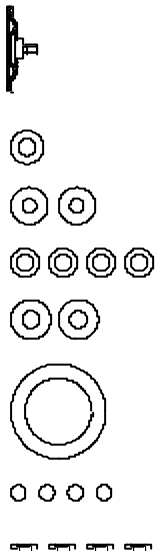
Control via 0(4)...20mA standard signal

General view of modules



Spare parts kits see ET 1 05 02 / 2

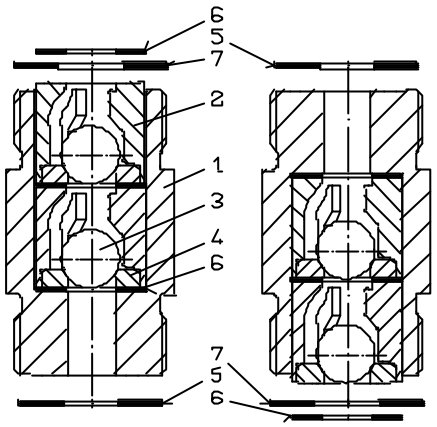
Spare parts kits

include:		Pump model:	Head / Seal materials:	Part No.
	Diaphragm Shaft packing Gaskets O-rings Valve balls Valve seats	MR 50 . . . 115	PP / Hypalon	25411
			PP / Viton	25423
			1.4571 / AF	25435
		MR 140 . . . 210	PP / Hypalon	25412
			PP / Viton	25424
			1.4571 / AF	25436
		MR 290	PP / Hypalon	25413
			PP / Viton	25425
			1.4571 / AF	25437
		MR 400 . . . 980 (until 07.97)	PP / Hypalon	25414
			PP / Viton	25426
			1.4571 / Hypalon	25438
			1.4571 / Viton	25267
		MR 400 . . . 980 (as of 08.97)	PP / Hypalon	34504
			PP / Viton	34505
			1.4571 / Hypalon	34506
			1.4571 / Viton	34507

AF = asbestos-free

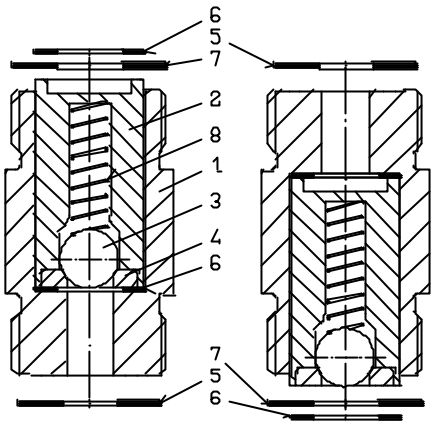
DN 10 valves for MR 50 . . . 290

Double-ball valve



Suction valve Discharge valve

Spring-loaded valve

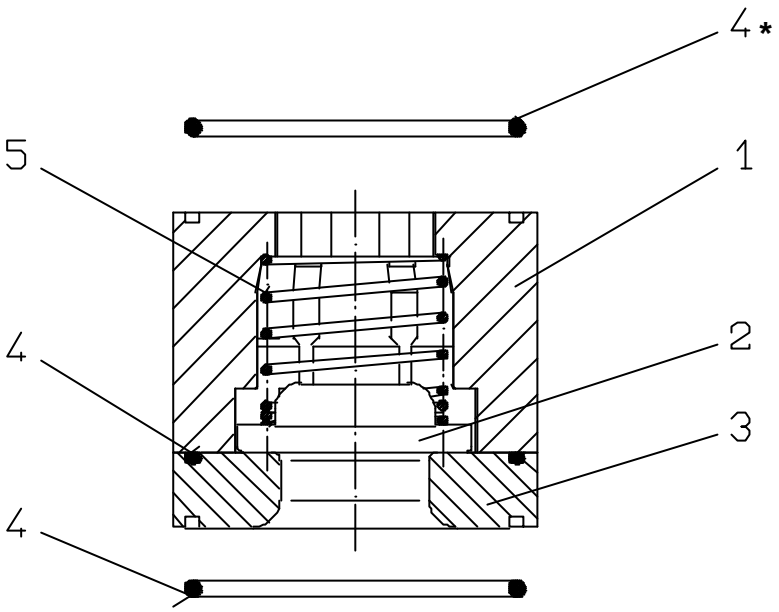


Suction valve Discharge valve

Item	Description	Material	Part No.	Double-ball valve						Spring-loaded valve					
				Suction valve			Discharge valve			Suction valve			Discharge valve		
				PP		1.4571	PP		1.4571	PP		1.4571	PP		1.4571
				Seal materials: H=Hypalon, V=Viton, AF=asbestos-free											
				H	V	AF	H	V	AF	H	V	AF	H	V	AF
				26841	26842	29694	27356	27357	29695	26845	25707	29696	27353	27354	29697
1	Valve housing	PP	32453	1	1	—	1	1	—	1	1	—	1	1	—
		1.4571	32449	—	—	1	—	—	1	—	—	1	—	—	1
2	Ball guide	PP	34142	2	2	—	2	2	—	—	—	—	—	—	—
		1.4581	82112	—	—	2	—	—	2	—	—	—	—	—	—
		PP	22882	—	—	—	—	—	—	1	1	—	1	1	—
		1.4581	22881	—	—	—	—	—	—	—	—	1	—	—	1
3	Valve ball d 16	Glass	82457	2	2	—	2	2	—	1	1	—	1	1	—
		1.4401	82114	—	—	2	—	—	2	—	—	1	—	—	1
4	Valve seat	PP	82456	2	2	—	2	2	—	1	1	—	1	1	—
		1.4571	82113	—	—	2	—	—	2	—	—	1	—	—	1
5	Gasket	Hypalon	81035	1	—	—	1	—	—	1	—	—	1	—	—
		Viton	81198	—	1	—	—	1	—	—	1	—	—	1	—
		AF	81629	—	—	1	—	—	1	—	—	1	—	—	1
6	Gasket	Hypalon	81238	2	—	—	2	—	—	1	—	—	1	—	—
		Viton	81276	—	2	—	—	2	—	—	1	—	—	1	—
		AF	81627	—	—	3	—	—	3	—	—	2	—	—	2
7	Gasket	Hypalon	81239	1	—	—	1	—	—	1	—	—	1	—	—
		Viton	81277	—	1	—	—	1	—	—	1	—	—	1	—
8	Valve spring	Hastelloy	32577	—	—	—	—	—	—	1	1	1	1	1	1

DN 25 valves for MR 400 . . . 980

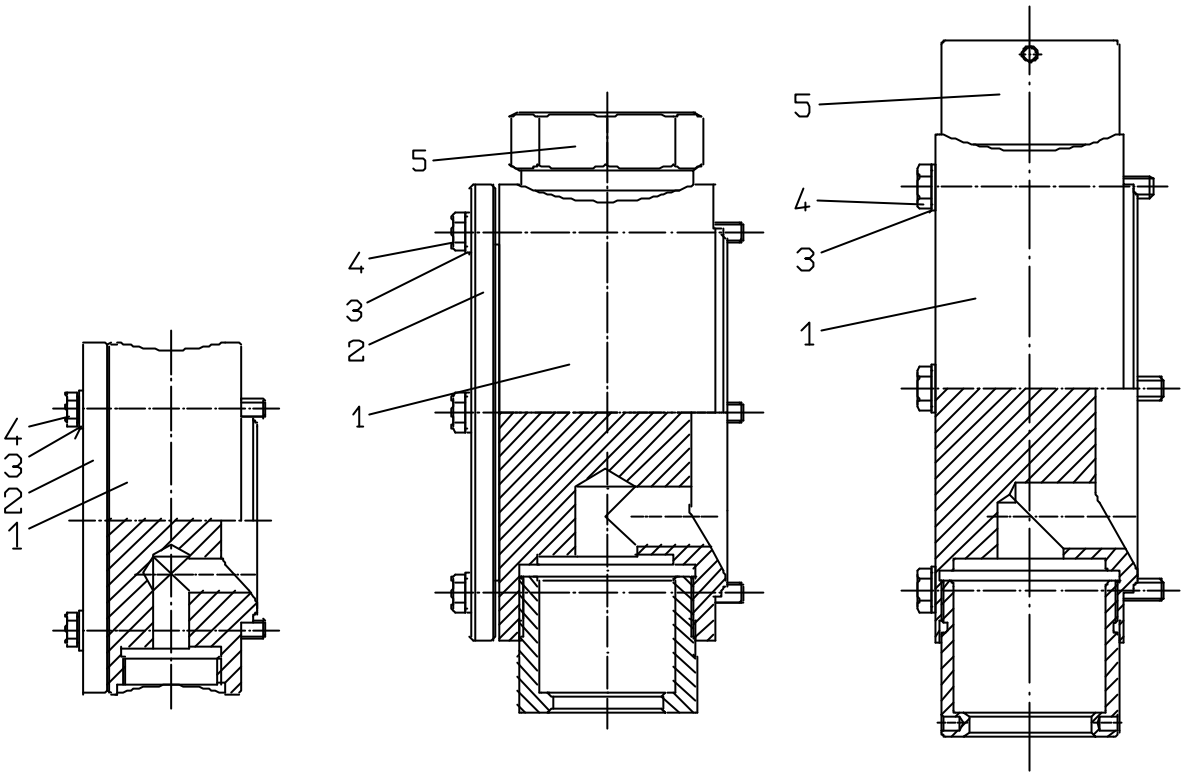
(Design as of 08.97)



* For the stainless steel version, O-ring d 62x3 is used until 12.97.

Item	Description	Material	Part No.	Suction and discharge valve			
				PP		1.4571	
				EPDM	Viton	EPDM	Viton
				Valve assembly			
				23703	23704	23705	25681
1	Valve guide	PP	34463	1	1	—	—
		1.4581	34466	—	—	1	1
2	Valve disk	PVDF	34464	1	1	—	—
		1.4571	34467	—	—	1	1
3	Flat valve seat	PP	34465	1	1	—	—
		1.4571	34468	—	—	1	1
4	O-ring	EPDM	80626	3	—	3	—
		Viton	80092	—	3	—	3
5	Valve spring	Hastelloy	25217	1	1	1	1

Head assembly



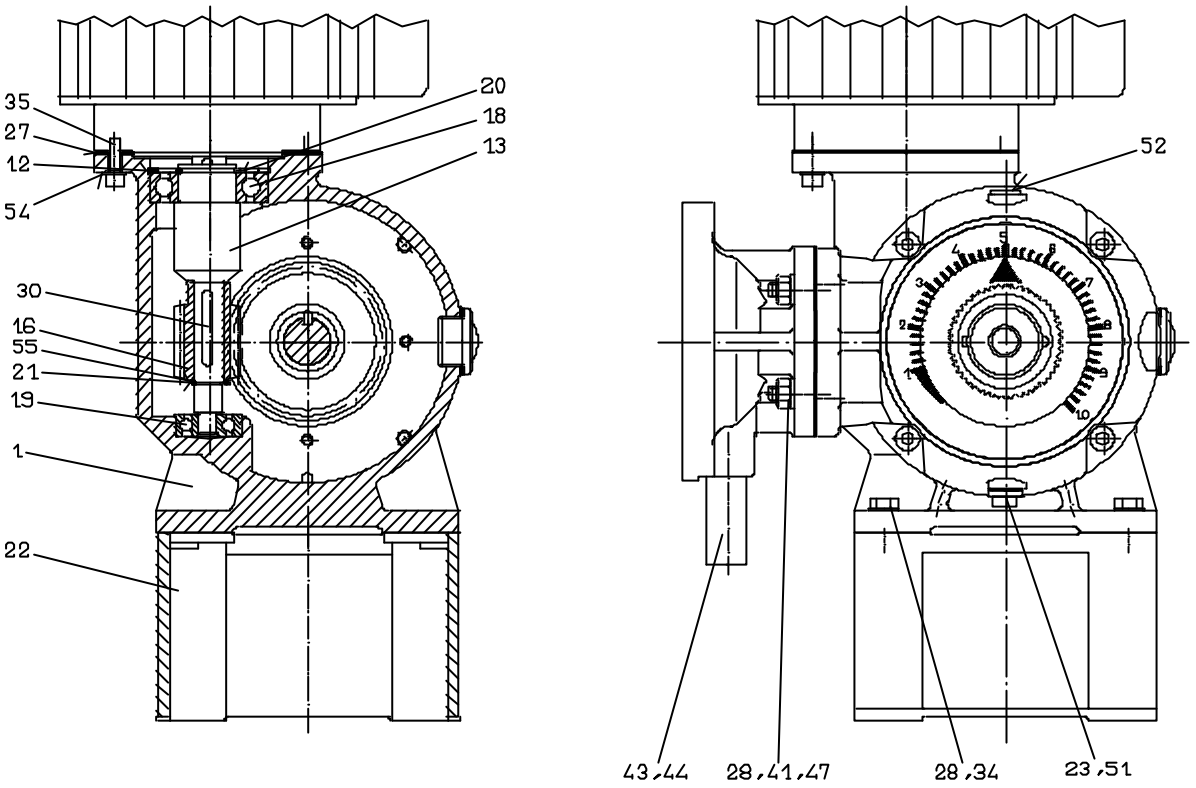
Head MR 50 ... 290
Plastic/Stainless steel

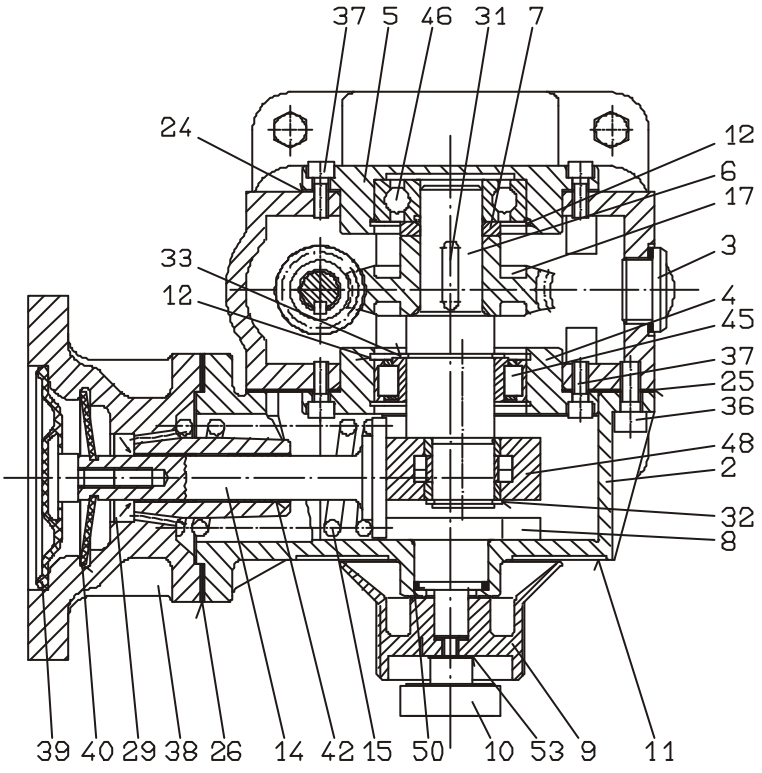
Head MR 400 ... 980
Plastic Stainless steel

Item	Quantity	Description	Material	Head for Memdos MR							
				50/75/115		140/210		290		400/600/980	
				Plastic	St. steel	Plastic	St. steel	Plastic	St. steel	Plastic	St. steel
				23721	23727	23722	23728	23723	22334	23735	23736
1	1	Diaphragm housing	PP	22044	—	22046	—	22048	—	34710	—
	1	Diaphragm housing	1.4571	—	22392	—	22394	—	18824	—	32984
2	1	Plate	Al	18453	—	18453	—	18822	—	22612	—
3	4	Washer	A2	84174	84174	84174	84174	84174	84174	—	—
	6	Washer	A2	—	—	—	—	—	—	84029	84029
4	4	Hex. head screw	A2	83495	83542	83495	83542	83495	83230	—	—
	6	Hex. head screw	A2	—	—	—	—	—	—	83827	83755
5	2	Valve housing	1.4571	—	—	—	—	—	—	—	32983
	2	Valve housing	PP	—	—	—	—	—	—	34712	—

Diaphragm metering pump MEMDOS MR

Single drive with manual capacity adjustment





Single drive with manual capacity adjustment

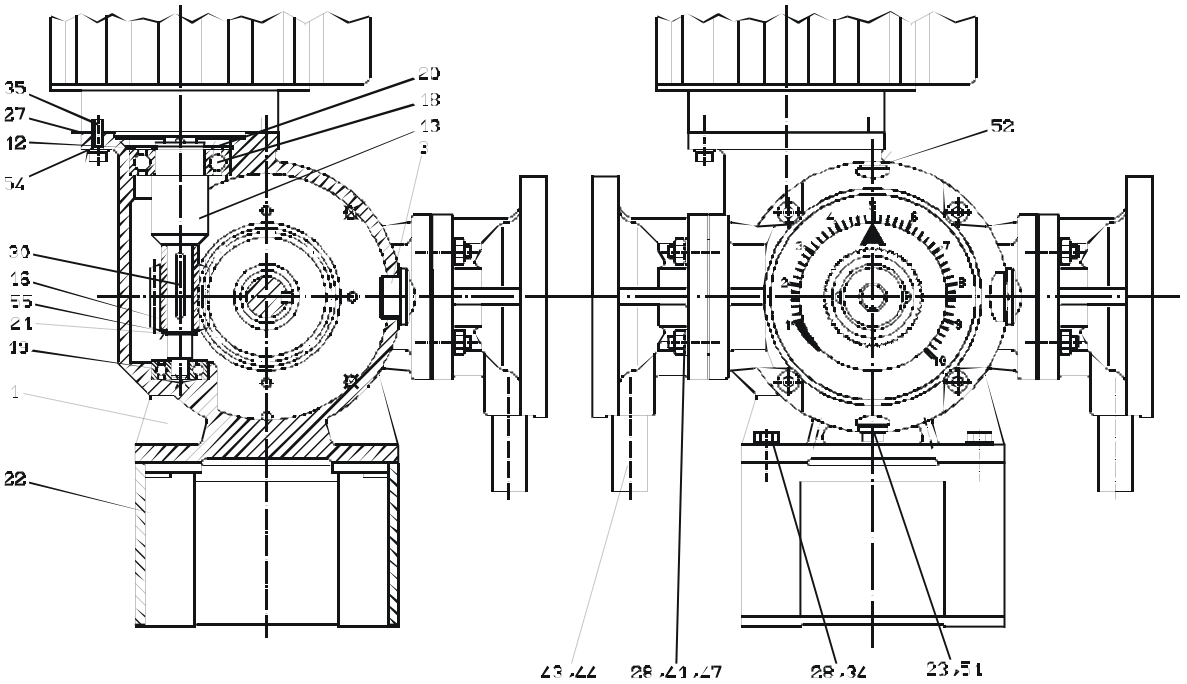
Item	Description	Material	Part No.	MR 50	MR 75	MR 115	MR 140	MR 210	MR 290	MR 400	MR 600	MR 980
1	Gearbox	Cast iron	18317	1	1	1	1	1	1	1	1	1
2	Eccentric housing	Al	31216	1	1	1	1	1	1	1	1	1
3	Oil gauge	Plexi	82181	1	1	1	1	1	1	1	1	1
4	Bearing flange	Al	18308	1	1	1	1	1	1	1	1	1
5	Bearing flange	Al	18318	1	1	1	1	1	1	1	1	1
6	Eccentric shaft	St	21999	1	1	1	1	1	1	—	—	—
	Eccentric shaft	St	22031	—	—	—	—	—	—	1	1	1
7	Spacer	St	22001	1	1	1	1	1	1	1	1	1
8	Adjusting eccentric	Plastic	31218	1	1	1	1	1	1	—	—	—
	Adjusting eccentric (for ATE)	St	32696	1	1	1	1	1	1	—	—	—
	Adjusting eccentric	St	31219	—	—	—	—	—	—	1	1	1
9	Adjusting knob	Plastic	31217	1	1	1	1	1	1	1	1	1
10	Thumbscrew	Plastic	31289	1	1	1	1	1	1	1	1	1
11	Scale	Plastic	87416	1	1	1	1	1	1	1	1	1
12	Retaining ring	Spring St.	84004	4	4	4	4	4	4	4	4	4
13	Pinion shaft	St	18323	1	1	1	1	1	1	1	1	1
14	Diaphragm rod	1.4305	18450	1	1	1	—	—	—	—	—	—
	Diaphragm rod	1.4305	18455	—	—	—	1	1	1	1	1	1
15	Return spring	Spring St.	10833	1	1	1	1	1	1	1	1	1
16	Worm shaft 1:30	St	18362	1	—	—	—	—	—	1	—	—
	Worm shaft 1:21	St	22265	—	1	—	1	—	—	—	1	—
	Worm shaft 1:14	St	18332	—	—	1	—	1	1	—	—	1
17	Worm wheel 1:30	Bronze	18361	1	—	—	—	—	—	1	—	—
	Worm wheel 1:21	Bronze	22264	—	1	—	1	—	—	—	1	—
	Worm wheel 1:14	Bronze	26403	—	—	1	—	1	1	—	—	1
18	Ball bearing	St	86105	1	1	1	1	1	1	1	1	1
19	Ball bearing	St	86071	1	1	1	1	1	1	1	1	1
20	Retaining ring	Spring St.	84086	1	1	1	1	1	1	1	1	1
21	Retaining ring	Spring St.	84010	1	1	1	1	1	1	1	1	1
22	Housing base	Al	18461	1	1	1	1	1	1	1	1	1
23	Plug	Brass	82022	1	1	1	1	1	1	1	1	1
24	Seal d 120/90/1	AF	81245	1	1	1	1	1	1	1	1	1
25[1)]	Seal d 165/90/1	AF	81249	1	1	1	1	1	1	1	1	1
26	Seal d 100/70/1	AF	81246	1	1	1	1	1	1	1	1	1
27	Seal d 120/80/1	AF	81247	1	1	1	1	1	1	1	1	1
28	Washer	A2	84131	8	8	8	8	8	8	8	8	8
29	Sealing ring	St/Gi	80502	1	1	1	1	1	1	1	1	1
30	Adjusting spring	St	83419	1	1	1	1	1	1	1	1	1
31	Adjusting spring	St	83569	1	1	1	1	1	1	1	1	1
32	Retaining ring	Spring St.	84003	1	1	1	1	1	1	1	1	1
33	Retaining ring	Spring St.	84016	1	1	1	1	1	1	1	1	1
34	Hex. head screw	A2	83701	4	4	4	4	4	4	4	4	4
35	Hex. head screw	8.8 galv.	83041	3	3	3	3	3	3	3	3	3
36	Hex. head screw	8.8 galv.	83536	4	4	4	4	4	4	4	4	4
37	Screw	8.8 galv.	83040	8	8	8	8	8	8	8	8	8

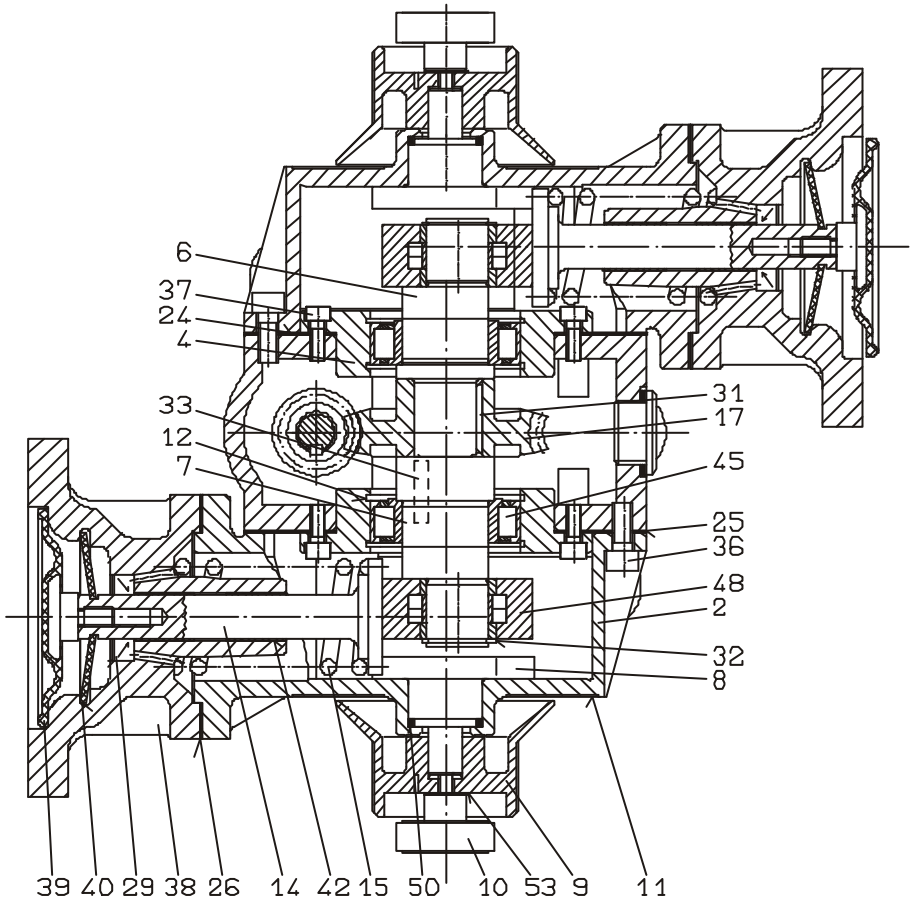
Single drive with manual capacity adjustment

Item	Description	Material	Part No.	MR 50	MR 75	MR 115	MR 140	MR 210	MR 290	MR 400	MR 600	MR 980
38	Diaphragm chamber d 90	Al	23731	1	1	1	—	—	—	—	—	—
	Diaphragm chamber d 120	Al	23732	—	—	—	1	1	—	—	—	—
	Diaphragm chamber d 150	Al	23733	—	—	—	—	—	1	—	—	—
	Diaphragm chamber d 185	Al	23734	—	—	—	—	—	—	1	1	1
39	Diaphragm d 90	PTFE	81466	1	1	1	—	—	—	—	—	—
	Diaphragm d 120	PTFE	81467	—	—	—	1	1	—	—	—	—
	Diaphragm d 150	PTFE	81468	—	—	—	—	—	1	—	—	—
	Diaphragm d 185	PTFE	81469	—	—	—	—	—	—	1	1	1
40	Sep. diaphragm d 90	Hypalon	22057	1	1	1	—	—	—	—	—	—
	Sep. diaphragm d 120	Hypalon	22058	—	—	—	1	1	—	—	—	—
	Sep. diaphragm d 150	Hypalon	22059	—	—	—	—	—	1	—	—	—
	Sep. diaphragm d 185	Hypalon	22060	—	—	—	—	—	—	1	1	1
41	Setscrew	8.8 galv.	83145	4	4	4	4	4	4	4	4	4
42	Bush	St/PTFE	19130	2	2	2	2	2	2	2	2	2
43	O-ring	Viton	80046	1	1	1	1	1	1	1	1	1
44	Leakage pipe	PVC/Viton	25193	1	1	1	1	1	1	1	1	1
45	Roller case	St	86103	1	1	1	1	1	1	1	1	1
46	Ball bearing	St	86003	1	1	1	1	1	1	1	1	1
47	Hexagonal nut	8.8 galv.	83056	4	4	4	4	4	4	4	4	4
48	Backing bearing	St	86104	1	1	1	1	1	1	1	1	1
50	O-ring	Perbunan	80036	1	1	1	1	1	1	1	1	1
51	Gasket	Cu	81722	1	1	1	1	1	1	1	1	1
52	Plug	PE	83019	1	1	1	1	1	1	1	1	1
53	Plate spring	1.4310	84179	1	1	1	1	1	1	1	1	1
54	Washer	A2	84160	3	3	3	3	3	3	3	3	3
55	Supporting disk	Spring St.	83733	1	1	1	1	1	1	1	1	1

[1)] Replacement seal d 165/121/1, material AF, Part No. 81714

Diaphragm metering pump MEMDOS MR





Duplex drive with equal heads

Item	Description	Material	Part No.	ZMR 50/50	ZMR 75/75	ZMR 115/115	ZMR 140/140	ZMR 210/210	ZMR 290/290	ZMR 400/400	ZMR 600/600	ZMR 980/980
1	Gearbox	Cast iron	23781	1	1	1	1	1	1	1	1	1
2	Eccentric housing	Al	31216	2	2	2	2	2	2	2	2	2
3	Oil gauge	Plexi	82181	1	1	1	1	1	1	1	1	1
4	Bearing flange	Al	18308	2	2	2	2	2	2	2	2	2
6	Eccentric shaft	St	22806	1	1	1	1	1	1	—	—	—
	Eccentric shaft	St	22808	—	—	—	—	—	—	1	1	1
7	Eccentric shaft	St	22807	—	—	—	—	—	—	1	1	1
	Eccentric shaft	St	22921	1	1	1	1	1	1	—	—	—
8	Adjusting eccentric	Plastic	31218	1	1	1	1	1	1	—	—	—
	Adjusting eccentric (for ATE)	St.	32696	1	1	1	1	1	1	—	—	—
	Adjusting eccentric	St	31219	—	—	—	—	—	—	1	1	1
9	Adjusting knob	Plastic	31217	2	2	2	2	2	2	2	2	2
10	Thumbscrew	Plastic	31289	2	2	2	2	2	2	2	2	2
11	Scale	Plastic	87416	2	2	2	2	2	2	2	2	2
12	Retaining ring	Spring St.	84004	5	5	5	5	5	5	5	5	5
13	Pinion shaft	St	18323	1	1	1	1	1	1	1	1	1
14	Diaphragm rod	1.4305	18450	2	2	2	—	—	—	—	—	—
	Diaphragm rod	1.4305	18455	—	—	—	2	2	2	2	2	2
15	Return spring	Spring St.	10833	2	2	2	2	2	2	2	2	2
16	Worm shaft 1:30	St	18362	1	—	—	—	—	—	1	—	—
	Worm shaft 1:21	St	22265	—	1	—	1	—	—	—	1	—
	Worm shaft 1:14	St	18332	—	—	1	—	1	1	—	—	1
17	Worm wheel 1:30	Bronze	18361	1	—	—	—	—	—	1	—	—
	Worm wheel 1:21	Bronze	22264	—	1	—	1	—	—	—	1	—
	Worm wheel 1:14	Bronze	26403	—	—	1	—	1	1	—	—	1
18	Ball bearing	St	86105	1	1	1	1	1	1	1	1	1
19	Ball bearing	St	86071	1	1	1	1	1	1	1	1	1
20	Retaining ring	Spring St.	84086	1	1	1	1	1	1	1	1	1
21	Retaining ring	Spring St.	84010	1	1	1	1	1	1	1	1	1
22	Housing base	Al	18461	1	1	1	1	1	1	1	1	1
23	Plug	Brass	82022	2	2	2	2	2	2	2	2	2
25[1)]	Seal d 165/90/1	AF	81249	2	2	2	2	2	2	2	2	2
26	Seal d 100/70/1	AF	81246	2	2	2	2	2	2	2	2	2
27	Seal d 120/80/1	AF	81247	1	1	1	1	1	1	1	1	1
28	Washer	A2	84131	16	16	16	16	16	16	16	16	16
29	Sealing ring	St/Gi	80502	2	2	2	2	2	2	2	2	2
30	Adjusting spring	St	83419	1	1	1	1	1	1	1	1	1
31	Adjusting spring	St	83569	1	1	1	1	1	1	1	1	1
32	Retaining ring	Spring St.	84003	2	2	2	2	2	2	2	2	2
33	Adjusting spring	St	83562	1	1	1	1	1	1	1	1	1
34	Hex. head screw	A2	83701	4	4	4	4	4	4	4	4	4
35	Hex. head screw	8.8 galv.	83041	3	3	3	3	3	3	3	3	3
36	Hex. head screw	8.8 galv.	83536	8	8	8	8	8	8	8	8	8
37	Screw	8.8 galv.	83040	8	8	8	8	8	8	8	8	8

Duplex drive with equal heads

Item	Description	Material	Part No.	ZMR 50/50	ZMR 75/75	ZMR 115/115	ZMR 140/140	ZMR 210/210	ZMR 290/290	ZMR 400/400	ZMR 600/600	ZMR 980/980
38	Diaphragm chamber d 90	Al	23731	2	2	2	—	—	—	—	—	—
	Diaphragm chamber d 120	Al	23732	—	—	—	2	2	—	—	—	—
	Diaphragm chamber d 150	Al	23733	—	—	—	—	—	2	—	—	—
	Diaphragm chamber d 185	Al	23734	—	—	—	—	—	—	2	2	2
39	Diaphragm d 90	PTFE	81466	2	2	2	—	—	—	—	—	—
	Diaphragm d 120	PTFE	81467	—	—	—	2	2	—	—	—	—
	Diaphragm d 150	PTFE	81468	—	—	—	—	—	2	—	—	—
	Diaphragm d 185	PTFE	81469	—	—	—	—	—	—	2	2	2
40	Sep. diaphragm d 90	Hypalon	22057	2	2	2	—	—	—	—	—	—
	Sep. diaphragm d 120	Hypalon	22058	—	—	—	2	2	—	—	—	—
	Sep. diaphragm d 150	Hypalon	22059	—	—	—	—	—	2	—	—	—
	Sep. diaphragm d 185	Hypalon	22060	—	—	—	—	—	—	2	2	2
41	Setscrew	8.8 galv.	83145	8	8	8	8	8	8	8	8	8
42	Bush	St/PTFE	19130	4	4	4	4	4	4	4	4	4
43	O-ring	Viton	80046	2	2	2	2	2	2	2	2	2
44	Leakage pipe	PVC/Viton	25193	2	2	2	2	2	2	2	2	2
45	Roller case	St	86103	2	2	2	2	2	2	2	2	2
47	Hexagonal nut	8.8 galv.	83056	16	16	16	16	16	16	16	16	16
48	Backing bearing	St	86104	2	2	2	2	2	2	2	2	2
50	O-ring	Perbunan	80036	2	2	2	2	2	2	2	2	2
51	Gasket	Cu	81722	2	2	2	2	2	2	2	2	2
52	Plug	PE	83019	2	2	2	2	2	2	2	2	2
53	Plate spring	1.4310	84179	2	2	2	2	2	2	2	2	2
54	Washer	A2	84160	3	3	3	3	3	3	3	3	3
55	Supporting disk	Spring St.	83733	1	1	1	1	1	1	1	1	1

[1)] Replacement seal d 165/121/1, material AF, Part No. 81714

Duplex drive with different heads

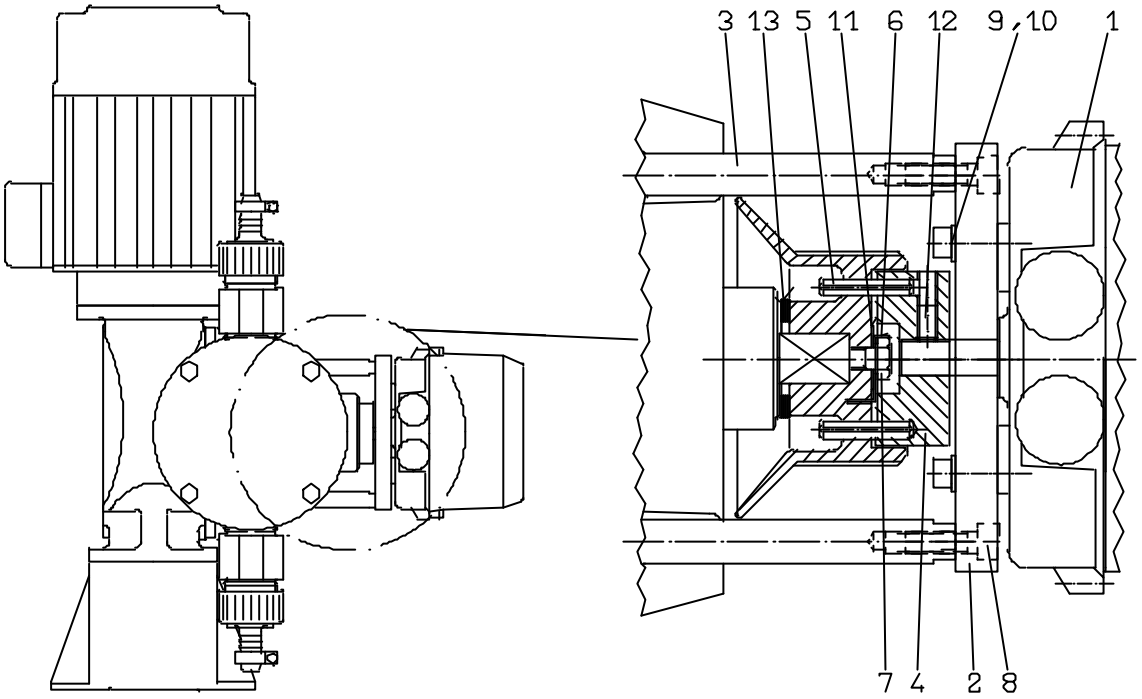
Item	Description	Material	Part No.	ZMR 50/400	ZMR 75/140	ZMR 75/600	ZMR 115/210	ZMR 115/290	ZMR 115/980	ZMR 140/600	ZMR 210/290	ZMR 210/980	ZMR 290/980
1	Gear box	Cast iron	23781	1	1	1	1	1	1	1	1	1	1
2	Eccentric housing	Al	31216	2	2	2	2	2	2	2	2	2	2
3	Oil gauge	Plexi	82181	1	1	1	1	1	1	1	1	1	1
4	Bearing flange	Al	18308	2	2	2	2	2	2	2	2	2	2
6	Eccentric shaft	St	22806	1	1	1	1	1	1	1	1	1	1
7	Eccentric shaft	St	22921	—	1	—	1	1	—	—	1	—	—
	Eccentric shaft	St	22807	1	—	1	—	—	1	1	—	1	1
8	Adjusting eccentric	Plastic	31218	1	2	1	2	2	1	1	2	1	1
	Adjusting eccentric (for ATE)	St	32696	1	2	1	2	2	1	1	2	1	1
	Adjusting eccentric	St	31219	1	—	1	—	—	1	1	—	1	1
9	Adjusting knob	Plastic	31217	2	2	2	2	2	2	2	2	2	2
10	Thumbscrew	Plastic	31289	2	2	2	2	2	2	2	2	2	2
11	Scale	Plastic	87416	2	2	2	2	2	2	2	2	2	2
12	Retaining ring	Spring St.	84004	5	5	5	5	5	5	5	5	5	5
13	Pinion shaft	St	18323	1	1	1	1	1	1	1	1	1	1
14	Diaphragm rod	1.4305	18450	1	1	1	1	1	1	—	—	—	—
	Diaphragm rod	1.4305	18455	1	1	1	1	1	1	2	2	2	2
15	Return spring	Spring St.	10833	2	2	2	2	2	2	2	2	2	2
16	Worm shaft 1:30	St	18362	1	—	—	—	—	—	—	—	—	—
	Worm shaft 1:21	St	22265	—	1	1	—	—	—	1	—	—	—
	Worm shaft 1:14	St	18332	—	—	—	1	1	1	—	1	1	1
17	Worm wheel 1:30	Bronze	18361	1	—	—	—	—	—	—	—	—	—
	Worm wheel 1:21	Bronze	22264	—	1	1	—	—	—	1	—	—	—
	Worm wheel 1:14	Bronze	26403	—	—	—	1	1	1	—	1	1	1
18	Ball bearing	St	86105	1	1	1	1	1	1	1	1	1	1
19	Ball bearing	St	86071	1	1	1	1	1	1	1	1	1	1
20	Retaining ring	Spring St.	84086	1	1	1	1	1	1	1	1	1	1
21	Retaining ring	Spring St.	84010	1	1	1	1	1	1	1	1	1	1
22	Housing base	Al	18461	1	1	1	1	1	1	1	1	1	1
23	Plug	Brass	82022	2	2	2	2	2	2	2	2	2	2
25[1)]	Seal d 165/90/1	AF	81249	2	2	2	2	2	2	2	2	2	2
26	Seal d 100/70/1	AF	81246	1	1	1	1	1	1	1	1	1	1
27	Seal d 120/80/1	AF	81247	1	1	1	1	1	1	1	1	1	1
28	Washer	A2	84131	16	16	16	16	16	16	16	16	16	16
29	Sealing ring	St/Gi	80502	2	2	2	2	2	2	2	2	2	2
30	Adjusting spring	St	83419	1	1	1	1	1	1	1	1	1	1
31	Adjusting spring	St	83569	1	1	1	1	1	1	1	1	1	1
32	Retaining ring	Spring St.	84003	2	2	2	2	2	2	2	2	2	2
33	Adjusting spring	St	83562	1	1	1	1	1	1	1	1	1	1
34	Hex. head screw	A2	83701	4	4	4	4	4	4	4	4	4	4
35	Hex. head screw	8.8 galv.	83041	3	3	3	3	3	3	3	3	3	3
36	Hex. head screw	8.8 galv.	83536	8	8	8	8	8	8	8	8	8	8
37	Screw	8.8 galv.	83040	8	8	8	8	8	8	8	8	8	8

Duplex drive with different heads

Item	Description	Material	Part No.	ZMR 50/400	ZMR 75/140	ZMR 75/600	ZMR 115/210	ZMR 115/290	ZMR 115/980	ZMR 140/600	ZMR 210/290	ZMR 210/980	ZMR 290/980
38	Diaphragm chamber d 90	Al	23731	1	1	1	1	1	1	—	—	—	—
	Diaphragm chamber d 120	Al	23732	—	1	—	1	—	—	1	1	1	—
	Diaphragm chamber d 150	Al	23733	—	—	—	—	1	—	—	1	—	1
	Diaphragm chamber d 185	Al	23734	1	—	1	—	—	1	1	—	1	1
39	Diaphragm d 90	PTFE	81466	1	1	1	1	1	1	—	—	—	—
	Diaphragm d 120	PTFE	81467	—	1	—	1	—	—	1	1	1	—
	Diaphragm d 150	PTFE	81468	—	—	—	—	1	—	—	1	—	1
	Diaphragm d 185	PTFE	81469	1	—	1	—	—	1	1	—	1	1
40	Sep. diaphragm d 90	Hypalon	22057	1	1	1	1	1	1	—	—	—	—
	Sep. diaphragm d120	Hypalon	22058	—	1	—	1	—	—	1	1	1	—
	Sep. diaphragm d 150	Hypalon	22059	—	—	—	—	1	—	—	1	—	1
	Sep. diaphragm d 185	Hypalon	22060	1	—	1	—	—	1	1	—	1	1
41	Setscrew	8.8 galv.	83145	1	1	1	1	1	1	1	1	1	1
42	Bush	ST/PTFE	19130	4	4	4	4	4	4	4	4	4	4
43	O-ring	Viton	80046	2	2	2	2	2	2	2	2	2	2
44	Leakage pipe	PVC/Viton	25193	2	2	2	2	2	2	2	2	2	2
45	Roller case	St	86103	2	2	2	2	2	2	2	2	2	2
47	Hexagonal nut	8.8 galv.	83056	16	16	16	16	16	16	16	16	16	16
48	Backing bearing	St	86104	2	2	2	2	2	2	2	2	2	2
50	O-ring	Perbunan	80036	2	2	2	2	2	2	2	2	2	2
51	Gasket	Cu	81722	2	2	2	2	2	2	2	2	2	2
52	Plug	PE	83019	2	2	2	2	2	2	2	2	2	2
53	Plate spring	1.4310	84179	2	2	2	2	2	2	2	2	2	2
54	Washer	A2	84160	3	3	3	3	3	3	3	3	3	3
55	Supporting disk	Spring St.	83733	1	1	1	1	1	1	1	1	1	1

[1] Replacement seal d 165/121/1, material AF, Part No. 81714

ATE drive



Item	Description	Material	Part No.	MR 50-980 1x 31226	ZMR 50-980 2x 31226
1	ATE servomotor 230 V	misc.	78747	1	2
2	Support	Al	31223	1	2
3	Spacer bolt	1.4571	31224	4	8
4	Coupling d 10	1.4571	31225	1	2
5	Clamping pin d 5x26	St	83102	2	4
6	Locking plate	St	84172	1	2
7	Hex. head screw	A2	83630	1	8
8	Screw	A2	83619	4	8
9	Washer	A2	84164	4	8
10	Screw	A2	83268	4	8
11	Plate spring	1.4310	84179	1	2
12	Setscrew M 8x20	A2	34221	1	2
13	Washer	Brass	32132	1	2

List of contents

1. Technical data
2. Scope of delivery
3. Installation
4. Electrical connection of pump
5. Safety instructions
6. Injection fitting assembly
7. Startup
8. Maintenance
9. Troubleshooting

Keep the operating instructions of the metering pump and the accessories readily accessible.

2. Scope of delivery

Be careful when unpacking the metering pump and possible accessories in order not to miss small parts. Compare the scope of delivery to the delivery note. If there are any discrepancies, try to find out the reason.

1. Technical data

Simplex metering pumps

Memdos MR		**400**	**600**	**980**
max. pressure	bar	5	5	4
at max.	l/h	440	640	990
pressure	ml/stroke	165	165	165
strokes/min		47	70	101
diaphragm d	mm	185	185	185

Duplex metering pumps with equal heads

Memdos ZMR		**50/50**	**75/75**	**115/115**	**140/140**	**210/210**	**290/290**	**400/400**	**600/600**	**980/980**
max. pressure	bar	10	10	10	10	10	10	5	5	4
at max.	l/h	50/50	90/90	135/135	160/160	240/240	290/290	440/440	640/640	990/990
pressure	ml/stroke	20	20	20	37	37	48	165	165	165
strokes/min		47	70	101	70	101	101	47	70	101
diaphragm d	mm	90	90	90	120	120	150	185	185	185

Duplex pumps with different heads

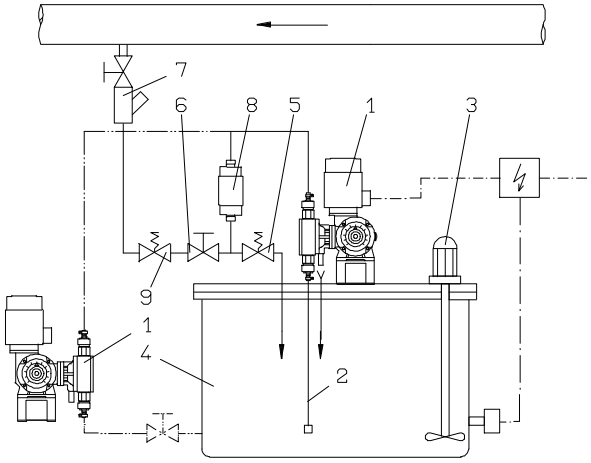
Memdos ZMR		**50/400**		**75/140**		**75/600**		**115/210**		**115/290**		**115/980**		**140/600**		**210/290**		**210/980**		**290/980**	
max. press.	bar	10	5	10	10	10	5	10	10	10	10	10	4	10	5	10	10	10	4	10	4
at max.	l/h	55	440	90	160	90	640	135	240	135	290	135	990	160	640	240	290	240	990	290	990
pressure	ml/str.	20	165	20	37	20	165	20	37	20	48	20	165	37	165	37	48	37	165	48	165
strokes/min.		47		70		70		101		101		101		70		101		101		101	
diaphragm d	mm	90	185	90	120	90	185	90	120	90	150	90	185	120	185	120	150	120	185	150	185

3. Installation

For selection of a pump during construction of a plant as well as for installation and operation, the local rules must be observed. This applies to the selection of suitable pump materials, the handling of the chemicals and the electrical installation. At the same time the technical data of the metering pump according to the above tables must be considered, and the plant must be designed correspondingly (e.g. pressure loss in lines depending on nominal diameter and length).

Both, the designer and the user are responsible to make sure that the whole plant including the metering pump is constructed so that neither plant equipment nor buildings are severely damaged in the case of chemical leakage due to the failure of wear parts (e.g. diaphragm rupture) or burst tubing. When constructing chemical plants, the installation must be carried out so that no consequential damages appear which are unreasonably high even if the metering pump fails. We recommend installing leakage probes and containment tanks.
Metering pumps are produced according to highest quality standards and have a long service life. Nevertheless some parts are subject to wear (e.g diaphragm, valve seats, valve balls). To ensure long operating life, visual checks are required regularly. Operating and maintenance personnel must be able to access the pump easily. Periodic maintenance protects the metering pump against shutdowns.
To increase the metering accuracy and reliability, we recommend using additional fittings. These include backpressure valves, relief valves, leakage probes, and chemical low level indicators, as shown in the following installation example.
Always use appropriate tools for the installation of plastic connecting parts. In order to avoid damage, never apply excessive force; plastic parts (especially PVC parts) can be screwed and unscrewed more easily if the thread is lubricated with vaseline or silicone grease before.
Note: For this purpose, the compatibility with the chemical to be metered must be checked.
Ambient temperatures exceeding 40°C are not permitted. Radiant heat of apparatus and heat exchangers must be kept in limits allowing the pump to sufficiently dissipate its own heat. Exposure to direct sunlight must be avoided. If the pump is installed outside, provide an enclosure to protect it against weather.
Mount the pump so that the suction and discharge valve are in vertical position. To ensure that the pump stands firm, fasten it with screws on an appropriate foundation.
The system piping must not exert any force on the connections and valves of the metering pump. To avoid incorrect metering after the process is finished, provide an electric and hydraulic interlocking system.

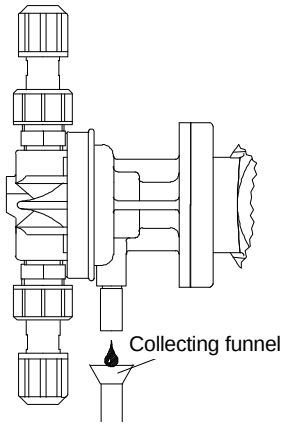
Installation example



Legend

1	Memdos MR	MB 1 05 02
2	Suction line	MB 1 22 01
3	Electric agitator	MB 1 36 03
4	Tank	MB 1 20 01
5	Relief valve	MB 1 25 01
6	Diaphragm shutoff valve	MB 1 24 01
7	Injection nozzle	MB 1 23 01
8	Pulsation dampener	MB 1 27 01
9	Backpressure valve	MB 1 25 01

Drain pipe



Drainage or leakage from the separating chamber must be routed with a certain downward slope to the containment tank. By no means must the drain pipe be returned directly to the chemical through the tank cover because otherwise effervescent media might enter the pump gear. The drain pipe may only be routed to a collecting tank free of gases (with a downward slope) or to a collecting funnel - also with a downward slope - above which the pipe ends at a sufficient distance. Leakage can be returned via the funnel through the tank cover. Besides, possible leakage can be seen at the funnel.

4. Electrical connection of pump

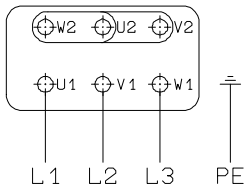
- The electrical connection of the pump must be made according to the local rules and may only be carried out by technical personnel.
- Cable type und cable cross section of the supply lines must be selected according to the motor data.
- The cable passage to the motor terminal box must be made professionally. We recommend gland screw connections with traction relief.
- The required protection class must be ensured by professional installation of the electrical connections.

Electrical connection data

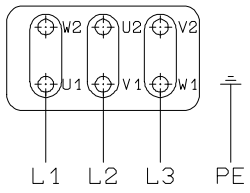
Pump model	Voltage [Volt]	Power [kW]	Current [A]
...MR 980	400/230 50 Hz	0.55	1.50/2.60
...MR 980	400/230 60 Hz	0.55	1.25/2.20
...MR 980	440/254 60 Hz	0.55	1.25/2.20
...MR 980	400/230 50 Hz	0.75	2.00/3.50
...MR 980	400/230 60 Hz	0.75	1.75/3.05
...MR 980	440/254 60 Hz	0.75	1.70/310

Wiring diagram of the drive motor

- 3-phase supply



Y-connection



Δ-connection

- Special versions
  For other special versions please refer to the corresponding separate circuit diagrams.
- Electrical servomotor ATE
  The technical data and wiring diagrams are shown on pages BW 1 05 02 / 7-10.

5. Safety instructions

Þ When working on metering equipment, observe the local safety rules (e.g. wear personal protective clothes).

Þ Before working on the metering pump and plant, disconnect it from the main power supply and secure it against reconnection. Before the voltage supply is switched on again, the metering lines must be connected so that chemical left in the metering head cannot spurt out.

Þ The metering head of the pump as well as connections and lines in the plant may be under pressure. Working on the metering plant requires special safety precautions and may only be carried out by instructed technical personnel.

Þ Before startup, all screwed connections must be checked for correct tightness and, if necessary, must be tightened up using appropriate tools.

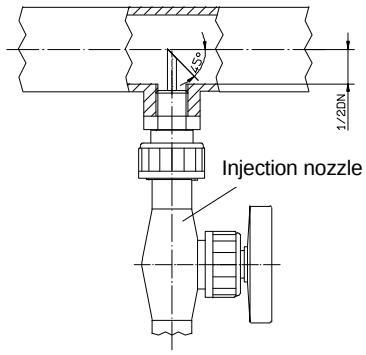
Þ If connections at the metering head are unscrewed during operation for venting or other reasons, leaking chemical must be removed completely. This is the only way to avoid the danger of physical injury and corrosion at the metering pump. Leaking chemical may also destroy the diaphragm at its mounting points.

Þ When changing the chemical, check whether the materials used for the metering pump and the other plant parts are chemically resistant.
If there is the danger of a chemical reaction between different media, a thorough cleaning first is mandatory.

Þ To operate the pump mount the fan shell in order to ensure sufficient cooling of the motor.

4. Injection fitting assembly

Injection nozzles prevent the liquid from returning to the pump by using either a spring-loaded ball valve or a hose valve. We recommend vertical injection from bottom to top to allow air to escape thereby avoiding chemical precipitation. Experience with the particular metering chemical and all appropriate characteristics must be taken into account.



7. Startup

1. Before starting the metering pump all works mentioned in section 3 "Installation" must be carried out. At the same time the safety instructions must be observed.
2. The metering pump is switched on by a control to be installed externally.
3. The manual or electrical capacity adjustment must be set to maximum stroke to improve priming. During first priming no backpressure should be applied. For this purpose we recommend to install a relief valve on the discharge side of the metering pump.
4. A previously installed priming aid must be filled with chemical first. If the pump is not priming, remove the discharge valve and fill water or chemical (if not dangerous!) into the metering head. Remount valve and start priming.
5. If a venting facility is available as separate unit, open it and wait until liquid escapes. Then close it again. In the case of effervescent liquids allow the liquid to escape permanently (approx. 1 drop for 1...3 strokes).

6. When correct operation is achieved, set to required output by means of the adjusting knob or the electrical remote adjustment. For approximation refer to the performance curves shown in MB 1 05 02. Depending on the installation and the chemicals used, these values may differ and must be checked under operating conditions.
7. The manufacturer of the metering equipment is not responsible for damages due to excessive or low flow rates resulting from faulty pump settings or incorrect and insufficient installation of peripheral fittings.

8. Maintenance

Lubrication

The diaphragm metering pump MEMDOS MR requires little maintenance. The gear of the pump is lubricated with gear oil of viscosity class ISO-VG 100 according to DIN 51519 (corresponds to SAE 80 according to DIN 51512). The enclosed first filling must be renewed after approximately 500 operating hours. Further oil changes should be carried out every 5,000 operating hours. The filling capacity is about 0.75 l for simplex gears and about 0.9 l for duplex gears. The actually required quantity of gear oil can be determined by reading the oil gauge; the oil should cover half of the oil gauge.

Replacing the diaphragm

In the case of a rupture the diaphragm can be replaced as follows:

1. The chemical contained in the metering line is drained so that the metering lines become pressureless. Please observe the aforementioned safety instructions for this purpose.
2. The flow rate of the metering pump is set to zero while the motor is running. Thus the diaphragm is moved to its front end position.
3. The head is removed using an appropriate tool.
4. Grasped at the edge, the diaphragm can now be turned out counterclockwise.
5. Before installing the new diaphragm the diaphragm flange section must be cleaned of the chemical. Otherwise the diaphragm might be attacked from the rear side.
6. The new diaphragm is turned in clockwise until it sits close.
7. The stroke adjustment is now set to maximum while the motor is running.
8. Now the head is remounted by tightening it carefully with the screws.
9. After connecting the metering lines, the pump is started as described in section 7, startup.
10. If the diaphragm wear is excessively high, try to find out the reason. For this purpose, please refer to the following section, troubleshooting.

9. Troubleshooting

TYPE OF FAULT	POSSIBLE CAUSE	RECOMMENDED ACTION
Pump not delivering.	Valves leaking.	Clean and remove air from valves. (See also startup of pump). Tighten screw connections.
	Valves incorrectly installed.	Reassemble valves. Ensure that the valve balls of suction and discharge valve are located above the valve seats.
	Suction filter, foot valve or suction pipe leaking or blocked.	Clean and seal suction line.
	No stroke movement.	Return spring broken. Replace spring. Consider density of the chemical! Suction lift too high.
Pump delivering too little or irregularly.	Valves blocked or leaking.	Clean and re-seal valves.
Pump delivering too much.	Pressure on suction side too high (pump siphoning).	Install backpressure valve in discharge line.
Frequent diaphragm ruptures.	Diaphragm was not screwed into diaphragm rod as far as stop.	Screw in new diaphragm as far as stop.
	Injection nozzle blocked.	Clean injection nozzle; fit larger one, if necessary.
	Pressure peaks because metering line is too long or too narrow.	Change line or install pulsation dampener. For increased safety install relief valve (see installation example).
Pump very noisy.	Roller bearing defective.	Replace roller bearing.
	No or little oil in gearbox.	Refill oil, as described in section "maintenance".
Motor hums and doesn't start.	Wrong connection.	Check electrical wiring.
	Pressure too high.	Check process.

If the problem cannot be corrected on the basis of the above data, return the pump to the factory or contact our Technical Sales Service for further measures. Repairs will be carried out immediately.

Keep the operating instructions of the metering pump and the accessories readily accessible.

List of contents

1. General
2. Technical data
3. Installation
4. Safety instructions
5. Wiring diagrams
6. Startup
7. Manual adjustment
8. Maintenance

1. General

The metering pump is installed according to the relevant operation instructions. The following instructions refer to the electrical ATE servomotor, types AR 30W.. and AR 30W..S, only.

3. Installation

The ATE servomotor is connected to the pump and adjusted in the factory.
For installation a sufficient mounting space of at least 150 mm must be provided for later maintenance works.
The electrical connection of the ATE drive must correspond to the local rules and may only be carried out by technical personnel.
The following wiring diagrams show the two basically realizable possibilities of connection.
Cable type and cable cross section must be chosen according to the motor data.
The cable passage to the motor terminal box must be made professionally. We recommend gland screw connections with traction relief.
The required protection class must be ensured by professional installation of the electrical connections.
Please take into account that the ATE drive can only be controlled with the main motor running, i.e.: the ATE drive must be locked electrically. Otherwise the adjusting eccentric wears out frequently or is destroyed.

2. Technical data

Type	**AR 30W23**	**AR 30W23S**
Design	Reversible a.c. motor with self-locking reduction gear. Electrical connection via 2 PG16 screw connections to screw terminals 1.5 mm^2)	
Use	for controllers with switching output (3-point control)	for controllers with continuous (0(2)...10V or 0(4)...20mA) output
Auxiliary voltage	230V~ ± 15% 50...60 Hz	24V ~ ± 20% 50...60 Hz
Control	(24 V ~ ± 20% upon request)	0(2)...10V or 0(4)...20 mA
Internal resistance	—	30 kΩ at 0-10 V, 500 Ω at 0-20mA
Power consumption	ca 5 VA	ca 6W (ca 2 VA during standstill)
Regulating time/bevel	360s / 270° = 0...100% (330s at 60 Hz)	
Position repeating signaling for remote display	Potentiometer 1 W 0...1000 Ω = 0...100%	0...620mV- ≙ 0...100% 0...10 V- ≙ 0...100%
Admissible load	—	≥ 2.5 kΩ at 0...10V- ≥ 100 kΩ 0...620 mV-
Limit switch	Internal limit switch for limiting the angle of rotation. Signaling of the final position via terminals 16 and 17 (Attention: Observe potential)	Internal limit switch for limiting the angle of rotation.
Protection class	IP 55 according to EN 60529 (with screw-type cable fitting)	
Ambient temperature	-20...60°C	-5...60°C
Option		
2nd potentiometer	0...1000 Ω 1 W	—
Limit switches (2 off)	max. 250V~ 2A	—

4. Safety instructions

The below mentioned safety instructions refer to the ATE servomotor. Furthermore, the notes listed in the operating instructions of the metering pump are also valid for this extended version.

⇒ When working on the metering equipment, observe the local safety rules.

⇒ Before working on the metering pump and the ATE servomotor, disconnect the main power supply and protect it against reconnection.

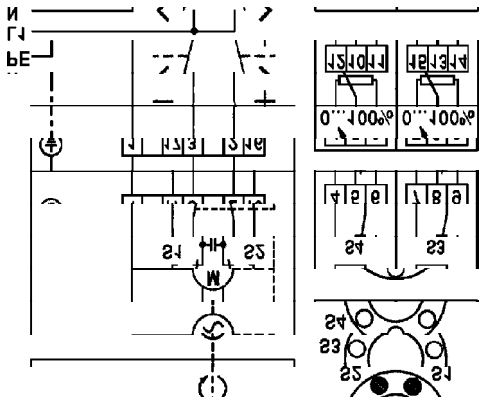
⇒ Adjustment works in the interior of the ATE drive must be carried out carefully. Connections and internal limit switches might be "alive".

⇒ Additional limit switches might be "alive" even with the auxiliary voltage switched off.

⇒ After installation works at the ATE servomotor or before startup remount the cover.

5. Wiring diagrams

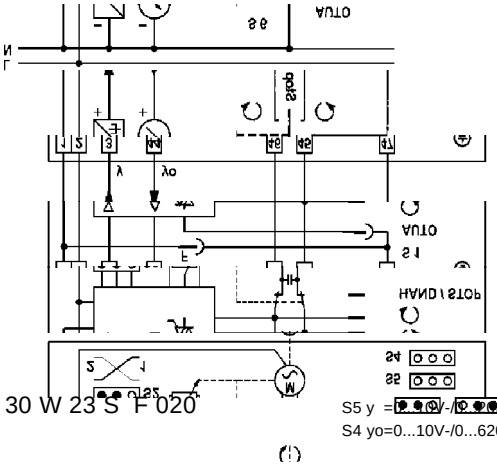
Connecting terminals 0.5 ... 2.5 mm²



AR 30 W 23 F 001 230V ~

AR 30 W 23 F 020 24V ~

24 V connecting terminals 0.5 ... 2.5 mm



AR 30 W 23 S F 020

S5 y =0...10V-/0...20mA

S4 yo=0...10V-/0...620mV

6. Startup

Switch on the main drive motor of the metering pump. With an electrical interlocking system, only then can the ATE drive be adjusted.

To check the direction of rotation send short control pulses to the ATE servomotor.

If the direction of rotation is wrong, the supply lines (terminals 2 and 3 in the case of direct controls) are reversed.

The ATE servomotor must be moved to the final positions in order to check the limit stop mechanism of the integrated limit switches. When leaving the factory, the angle of rotation is 270°. If required, the angle of rotation and thus the maximum flow rate can be restricted. To achieve this, the upper trigger cam is shifted by the required value.

7. Manual adjustment of the ATE drive

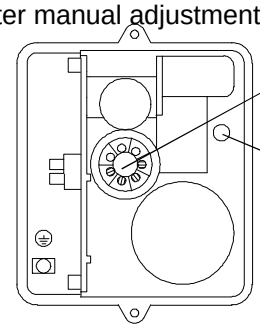
In the case of an electrical failure of the ATE servomotor, it can be adjusted manually by means of a hand crank. This part is available as accessory (Part No. 32.587).

For manual adjustment proceed as follows:

1. Switch off power supply to the ATE servomotor.
2. Remove ATE cover.
3. Switch on main drive motor.
4. Insert hand crank in corresponding opening, as shown below, and turn into desired direction.

Attention: The final positions must not be crossed !

5. After manual adjustment remount the cover.



8. Maintenance

The ATE servomotor is lubricated for life before leaving the factory. Nevertheless regular checks are recommended if the drive works under difficult operating conditions, such as a high ambient temperature or continuous operation. For relubrication of the ATE gear use molybdenum disulfite, e.g. "Molykote BR2plus" and "OKS400".

Keep the operating instructions of the metering pump and the accessories readily accessible.

List of contents

1. General
2. Technical data
3. Installation
4. Safety instructions
5. Wiring diagrams
6. Startup
7. Maintenance

1. General

The metering pump is installed according to the relevant operation instructions. The following instructions refer to the electrical ATE servomotor, types WAN 1 und WAN 1-S.

3. Installation

The ATE servomotor is connected to the pump and adjusted in the factory.
For installation a sufficient mounting space of at least 150 mm must be provided for later maintenance works.
The electrical connection of the ATE drive must correspond to the local rules and may only be carried out by technical personnel.
The following wiring diagrams show the two basically realizable possibilities of connection.
Cable type and cable cross section must be chosen according to the motor data.
The cable passage to the motor terminal box must be made professionally. We recommend gland screw connections with traction relief.
The required protection class must be ensured by professional installation of the electrical connections.
Please take into account that the ATE drive can only be controlled with the main motor running, i.e.: the ATE drive must be locked electrically. Otherwise the adjusting eccentric wears out frequently or is destroyed.

2. Technical data

Type	**WAN 1**	**WAN 1-S**
Design	Reversible a.c. motor with self-locking reduction gear.	
Use	for controllers with switching output (3-point control)	for controllers with continuous 0(4)...20mA output
Auxiliary voltage	230V~ ± 10% 50...60 Hz Other voltages upon request	230V~ ± 10% 50...60Hz
Control		0(4)...20mA
Power consumption	ca 11.5 W	
Regulating time/bevel	360s / 270° = 0...100%	
Position repeating signaling for remote display	Potentiometer 0,5 W 0...1000 Ω = 0...100%	0(4)...20mA (as option only)
Limit switch	Internal limit switch for limiting the angle of rotation. Signaling of final position via terminals 4 and 5.	
Protection class	IP 54 according to DIN 40050	
Ambient temperature	max. 60°C	
Option		
2nd potentiometer	0...1000 Ω 0.5 W	
Limit switches (2 off)	max. 250V 1A	

4. Safety instructions

The below mentioned safety instructions refer to the ATE servomotor. Furthermore, the notes listed in the operating instructions of the metering pump are also valid for this extended version.

⇒ When working on the metering equipment, observe the local safety rules.

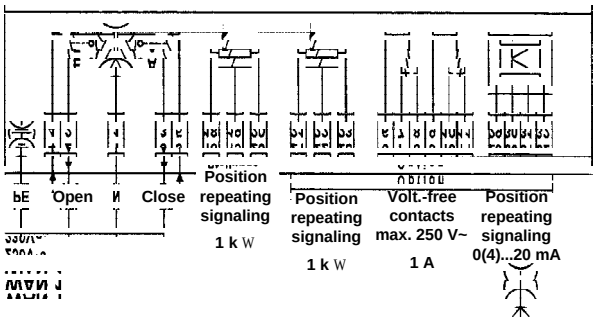
⇒ Before working on the metering pump and the ATE servomotor, disconnect the main power supply and protect it against reconnection.

⇒ Adjustment works in the interior of the ATE drive must be carried out carefully. Connections and internal limit switches might be "alive".

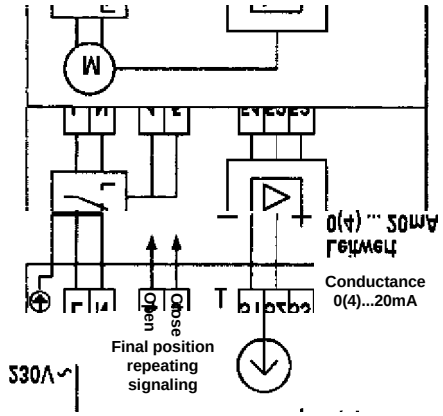
⇒ Additional limit switches might be "alive" even with the auxiliary voltage switched off.

⇒ After installation works at the ATE servomotor or before startup remount the cover.

5. Wiring diagrams



Control by 230V/50...60 Hz supply voltage



WAN 1-S

Control by 0(4)...20mA standard signal

6. Startup

Switch on the main drive motor of the metering pump. With an electrical interlocking system, only then can the ATE drive be adjusted.

To check the direction of rotation send short control pulses to the ATE servomotor.

If the direction of rotation is wrong, the supply lines (terminals 2 and 3 in the case of direct controls) are reversed.

The ATE servomotor must be moved to the final positions in order to check the limit stop mechanism of the integrated limit switches. When leaving the factory, the angle of rotation is 270°. If required, the angle of rotation and thus the maximum flow rate can be restricted. To achieve this, the upper trigger cam is shifted by the required value.

7. Maintenance

The ATE servomotor is lubricated for life before leaving the factory. Nevertheless regular checks are recommended if the drive works under difficult operating conditions, such as a high ambient temperature or continuous operation. For relubrication of the ATE gear use molybdenum disulfite, e.g. "Molykote BR2plus" and "OKS400".