General description

The MINIDOS A series is the result of a consistent, ongoing development of proven technology and the use of modern plastics.
With metering rates of 3 l/h up to 39 l/h the MINIDOS leak-proof diaphragm metering pump has a wide range of application.
The MINIDOS A is available as single metering pump with the metering head mounted on the right-hand side.

Metering head

Standard materials for the metering heads are rigid PVC, PVDF and stainless steel.
Other materials are available upon request.

Valves

Priming and discharge valves are designed as double-ball valves. For metering chemicals with a viscosity higher than approx. 400 mPas spring-loaded single-ball valves are recommended.

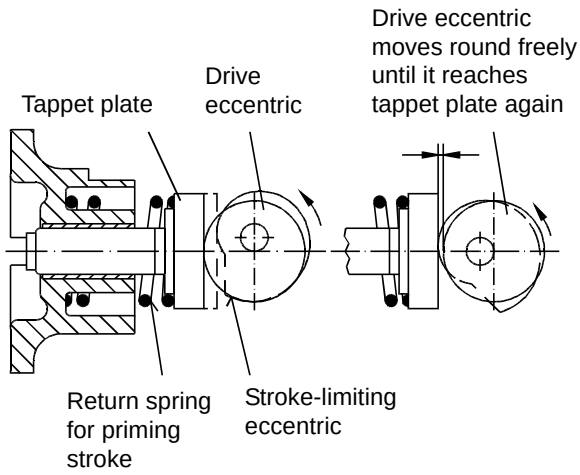
Separation chamber

The diaphragm flange between metering head and gearbox is designed as separation chamber. In the case of diaphragm rupture resulting from wear the leakage is directed downwards by means of a drainage pipe.

Drive

A three-phase sectional motor provides the electrical drive. AC operation is also possible.
In the case of this sectional motor the conventional motor end plates are replaced by the pump base and the gearbox. This gives the MINIDOS A a compact form.
For metering pumps with variable-speed DC (ATG) or explosion-proof motors, see MB 1 04 05.
The gearing consists of a single-stage worm gear and the gearing components as well as the bearing are lifetime lubricated.
The discharge stroke is carried out by an eccentric actuating the diaphragm by means of a spring-loaded tappet. The suction stroke is effected by spring return.
Stroke adjustment can be carried out either manually or electrically (ATE).

Functional diagram



MINIDOS A

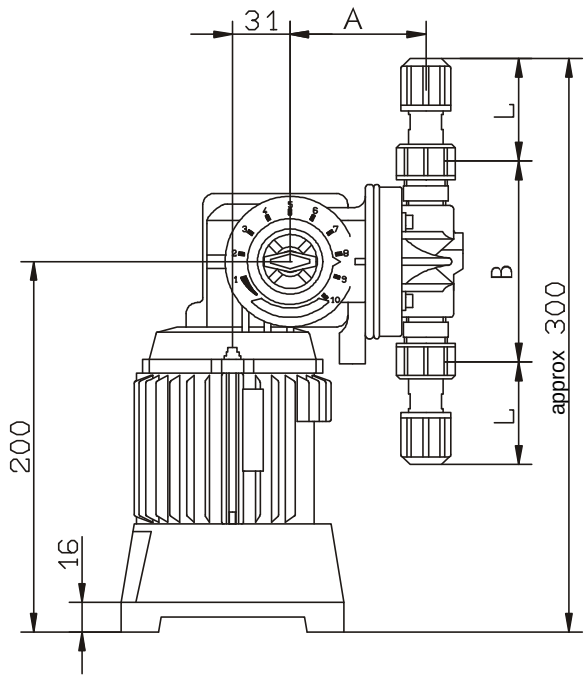
Optional accessories

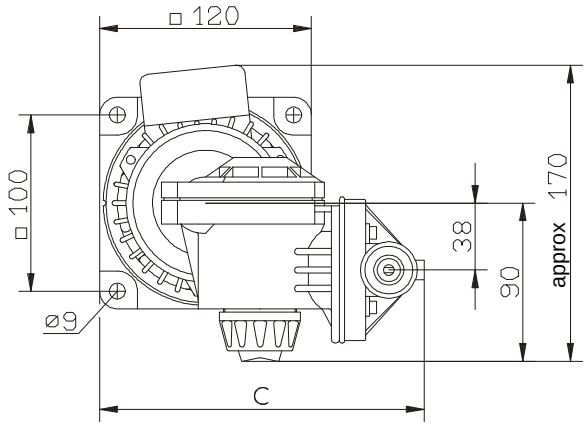
Stroke counter

For batch processes the pump can be equipped with an inductive detector for the eccentric shaft which is available upon request.

ATE

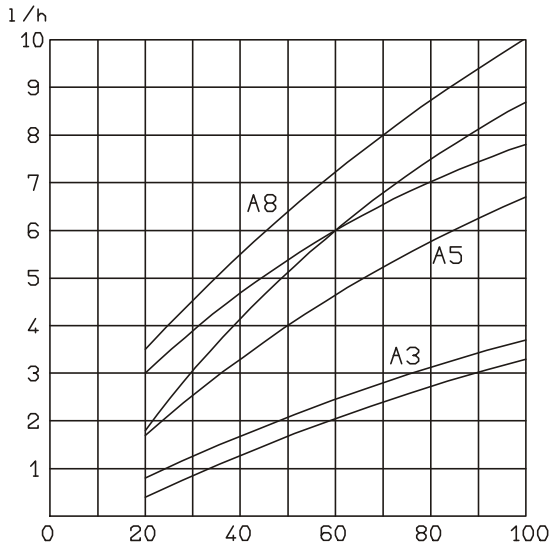
Electrical, reversible actuator for remote stroke length adjustment by means of hand-held keypad or 3-point step controler.



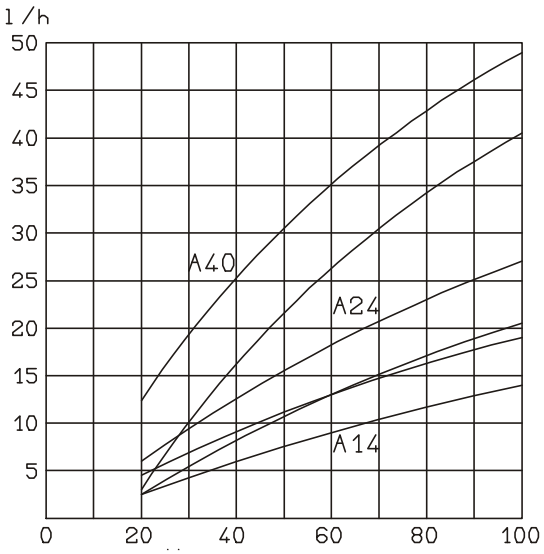


	A	B	C
A3...24	73	184	108
A40	109	218	153

Performance curves



Stroke adjustment

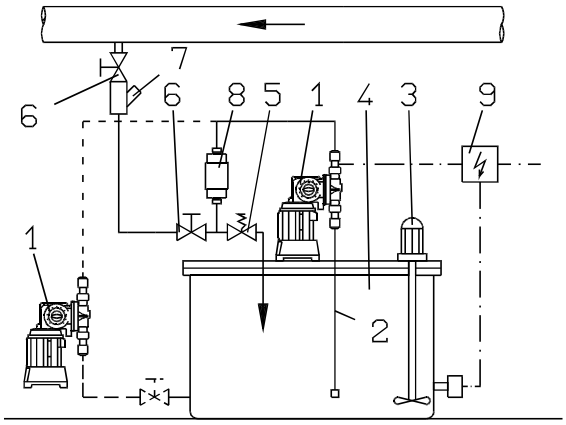


Stroke adjustment

- A3 ... A24
  Top curve shows capacity at zero pressure.
  Bottom curve shows capacity against 10 bar.

  A40
- Top curve shows capacity against 2 bar.
  Bottom curve showes capacity against 5 bar.

Installation example



Technical data

If an AC motor is used as electrical drive the indicated pressure cannot be exploited (MINIDOS A 24 - 5 bar).

Minidos A...		3	5	8	14	24	40
Max.pressure	[bar]	10					5
Output at	[l/h]	3,2	6,4	8	14	24	39*
10 bar (* 5 bar)	[ml/str.]	1,5			2,6		4,7*
Stroke frequency	[min-1]	36	72	90		138	
Diaphragm ø	[mm]	38			52		64
Suction height	[mbar]	120					
Motor output	[kW]	0,03	0,05	0,03		0,05	
max. temperature	[°C]	40					
Weight [kg]	Plastic.	4,4					4,7
Metering head	stainl.st.	4,7					7

Selection tables

In order to be able to offer the user a wide variety of pumps, we classified the metering pumps into functional groups. Thus each metering pump can be delivered according to the individual requirements of the customer.
The following functional groups are available:

1 Gearbox **2** Motor **3** Metering head
4 Valves **5** Connections

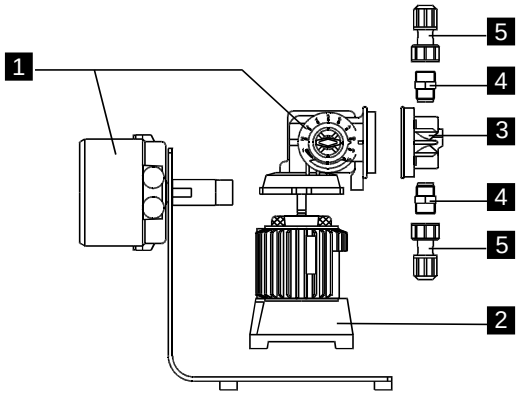
The numbers in the exploded view of the pump lead to the corresponding selection tables.

1 Gearbox		
Pump type (230V)	Capacity adjustment manual Diaphragm	ATE
EPDM/PTFE coated		
A 3	29969	29973
A 5	29969	29973
A 8	29970	29974
A 14	29971	29975
A 24	29972	29976
A 40	35129	–

2 Motor				
Pump type	Standard motor 230/400 V; 50 Hz; IP 55; ISO cl.F			
	Output [kW]	n [1/min]	Current [A]	Part No.
A 3	0,03	1420	0,23 / 0,40	23067
A 5	0,05	2880	0,3 / 0,52	23097
A 8	0,03	1420	0,23 / 0,40	23228
A 14	0,03	1420	0,23 / 0,40	23228
A 24	0,05	2880	0,3 / 0,52	23258
A 40	0,05	2880	0,3 / 0,52	23258

Key

1 Minidos A MB 1 03 02
2 Priming line MB 1 22 01
3 Elecrical mixer MB 1 36 03
4 Tank MB 1 20 01
5 Relief valve MB 1 25 01
6 Diaphragm stop valve MB 1 24 01
7 Injection point MB 1 23 01
8 Pulsation damper MB 1 27 01
9 Switch box

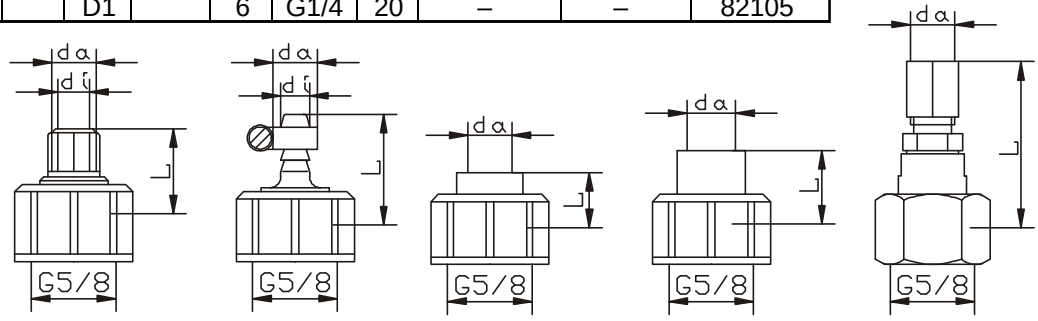


3 Metering head			
Typ	PVC	PVDF	1.4571
A 3	23810	28119	23813
A 5			
A 8			
A 14	23811	29178	23814
A 24			
A 40	23909	–	23911

4 Valves								
		A 3 ... A 24			A 40		
Housing material		PVC	PVDF	1.4571	PVC		1.4571
Sealing material		Viton	PTFE	PTFE	Viton	Hypalon	AF
Double ball valves	Priming	20890	28111	24029	18185	18187	26967
	Discharge	20891	28112		24030	18186	18188
26968 Spring-loaded valves	Priming	25087	29385	25089	25162	25161	28775
	Discharge	25088	29384		25090	27517	27516

28776 **5 Connections**

Type	DN	Abb.	D	di	da	L	Part No.		
							PVC	PVDF	1.4571
	4	A	G 5/8	4	6	23	20975	29387	–
	4	E		–	6	43	–	–	24959
	6	A		6	8	30	25176	–	–
	6	A		6	9	34	34925	–	–
	6	A		6	12	51	19180	28124	–
	6	B		6	12	30	23092	–	23093
	6	C		–	10	15	23087	–	–
	8	C		–	12	15	23089	–	–
	6	D		–	G 1/4	20	23088	29179	22999
	6	E		–	10	46	–	–	23090
	8	E	–	12	–	46	–	–	23091
	6	A	G 3/4	6	9	34	34926	–	–
		A		6	12	55	19175	–	–
		B		6	12	30	23342	–	–
		B1	d20	6	12	29	–	–	23426
		C	G 3/4	–	10	15	25167	–	–
		C		–	12	15	27518	–	–
		C		–	16	17	25625	–	–
		D		6	G1/4	20	25165	–	–
		D1		6	G1/4	20	–	–	82105



Ordering example

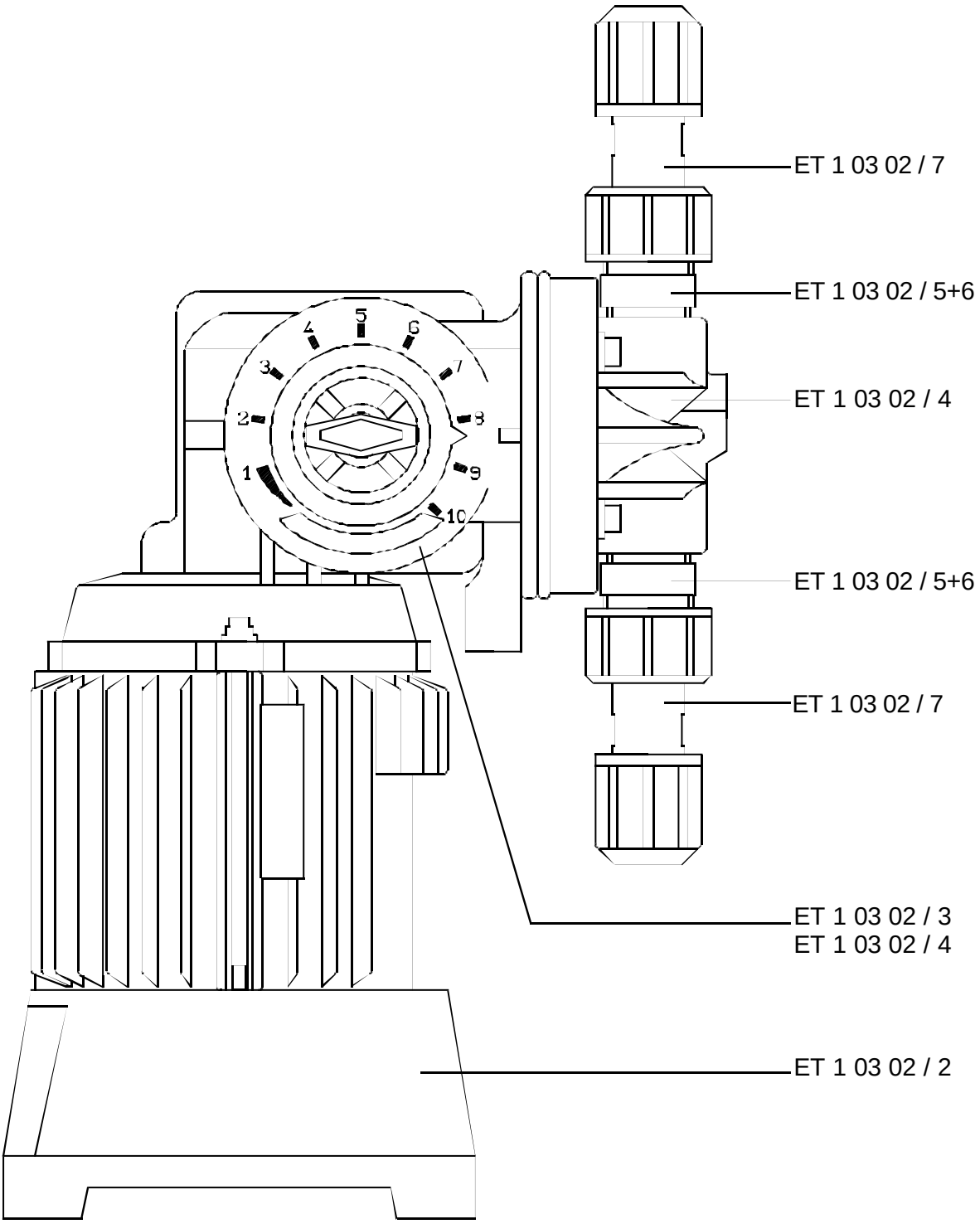
In a water purification plant a flocculation agent with a dilution similar to water is to be metered at a rate of 9 l/h. Priming and discharge side are to be connected using tubes. In this case the pressure and the chemical are such that standard materials (PVC), Teflon coated diaphragms and Viton gaskets can be used.

In this case the MINIDOS A8 would just be able to meter 9 l/h against 6 bar. However, line losses and the "loading" pressure at the injection fitting also have to be taken into account so that the A14 would be a better choice. It will meter the desired quantity at a stroke length setting of 60%.

The metering pump is made up of the following components:

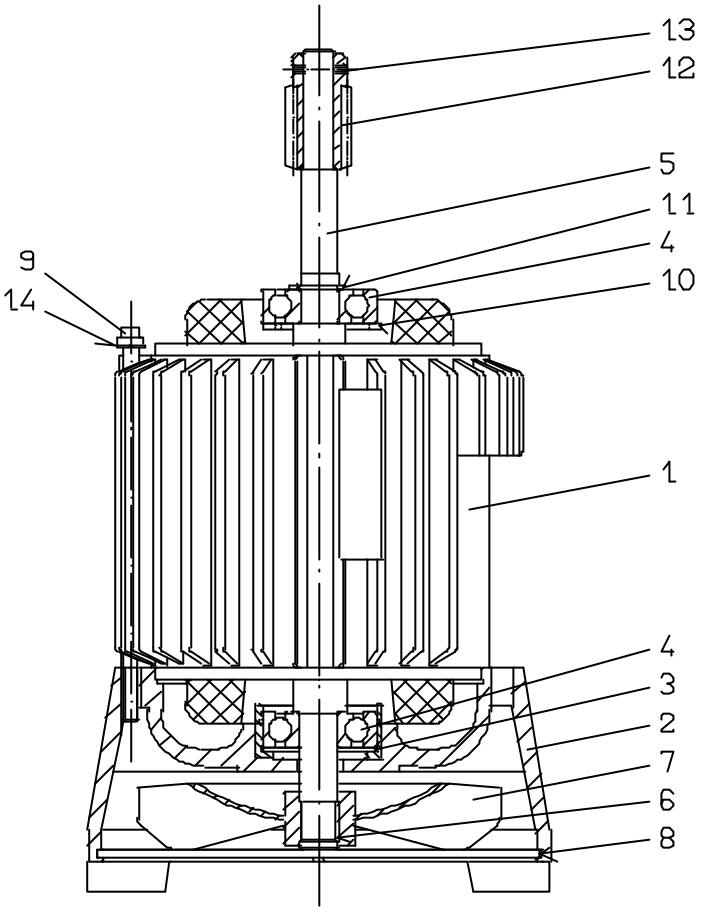
1	Gearbox	Part No. 29971
2	Drive motor	
	Three-phase supply 400 V	Part No. 23228
3	Metering head PVC	Part No. 23811
4	PVC double ball valves	
	Priming valve	Part No. 20890
	Discharge valve	Part No. 20891
5	Connections	
	Priming side	Part No. 19180
	Discharge side	Part No. 19180

General view of modules ET 1 03 02 / 1



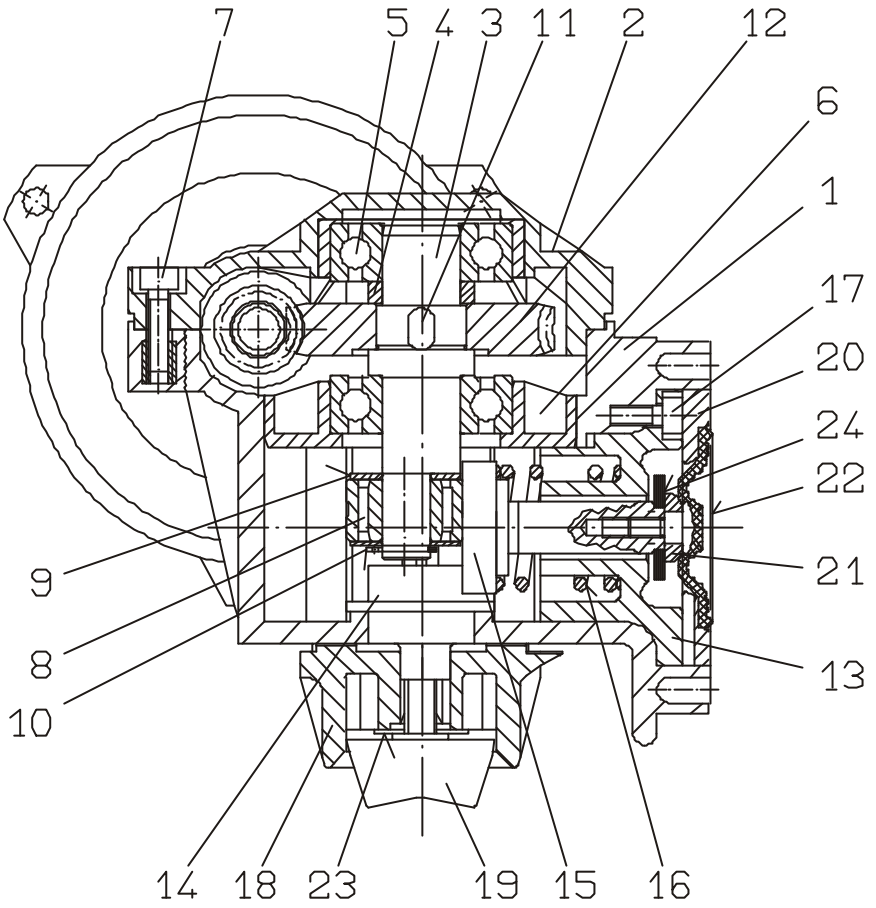
Drive Motor

ET 1 03 02 / 2

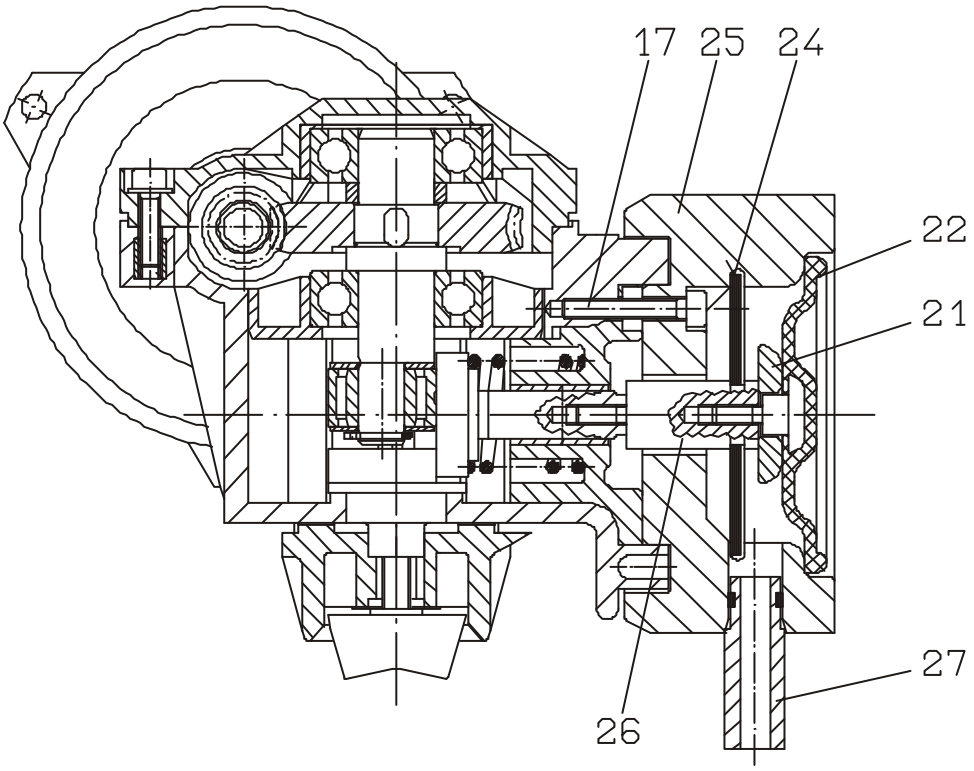


Item	Description	Part No.	Parts motor for MINIDOS			
			A 3	A 5	A 8 + A 14	A 24 + A 40
			23067	23097	23228	23258
1	Stator	21216	1	—	1	—
		21221	—	1	—	1
2	Pump base	29457	1	1	1	1
3	Ball bearing compensating disc	84141	1	1	1	1
4	Ball bearing	86049	2	2	2	2
5	Rotor	21215	1	—	1	—
		21220	—	1	—	1
6	Impeller mounting	21218	1	1	1	1
7	Impeller	21217	1	1	1	1
8	Cover plate	29960	1	1	1	1
9	Pull rod	21219	3	3	3	3
10	Circlip	84134	1	1	1	1
11	Circlip	84084	1	1	1	1
12	Worm shaft	11378	1	1	—	—
		11376	—	—	1	—
		19157	—	—	—	—
13	Locking sleeve	83414	1	1	1	1
14	Spring washer	84171	3	3	3	3

Minidos A 3 ... A 24



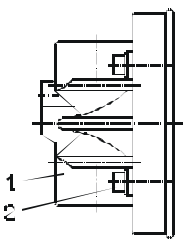
Minidos A 40



Single Drive, manual stroke adjustment ET 1 03 02 / 4

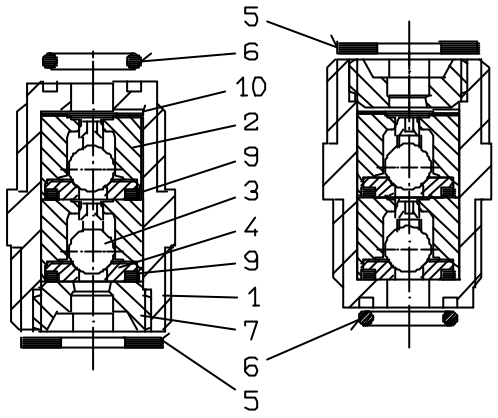
Item	Description	Material	Part No.	A 3 + A 5 29969	A 8 29970	A 14 29971	A 24 29972	A 40 35129
1	Gearbox casing	Plastic	29456	1	1	1	1	–
	Gearbox casing	Plastic	35128	–	–	–	–	1
2	Casing cover	Plastic	29458	1	1	1	1	1
3	Drive shaft	Steel	21203	1	1	1	1	1
4	Spacer	Steel	21210	1	1	1	1	1
5	Ball bearing	Steel	86006	2	2	2	2	2
6	Bearing insert	Brass	29964	1	1	1	1	1
7	Socket head cap screw	Steel	83409	4	4	4	4	4
8	Needle Bearing	Steel	86097	1	1	1	1	1
9	Sealing washer	Steel	21209	2	2	2	2	2
10	Circlip	Spring steel	84135	1	1	1	1	1
11	Key way	Steel	83406	1	1	1	1	1
12	Worm gear	Bronze	18014	1	–	–	–	–
	Worm gear	Bronze	18160	–	1	1	–	–
	Worm gear	Bronze	21188	–	–	–	1	1
13	Guide bush	Plastic/bz	29460	1	1	1	1	1
14	Adjusting eccentric	Plastic	29763	1	1	1	1	1
15	Diaphragm rod	Steel	21204	1	1	1	1	1
16	Compression spring	Spring steel	18027	1	1	1	1	1
17	Lens head Screw	Steel	83653	4	4	4	4	4
	Cylinder head screw	Stainless steel	83482	4	4	4	4	4
18	Adjusting knob	Plastic	29764	1	1	1	1	1
19	Wing screw	Plastic/steel	83661	1	1	1	1	1
20	Diaphragm insert ø 38	Plastic	29461	1	1	–	–	–
	Diaphragm insert ø 52	Plastic	29462	–	–	1	1	–
21	Support plate for ø 38 Viton	Brass	10205	1	1	–	–	–
	Support plate for ø 38 PTFE-coated	Brass	23892	1	1	–	–	–
22*	Diaphragm ø 38 Viton	Viton	81252	1	1	–	–	–
	Diaphragm ø 38 PTFE-coated	EPDM	81463	1	1	–	–	–
	Diaphragm ø 52 PTFE-coated	EPDM	81464	–	–	1	1	–
	Diaphragm ø 64 PTFE-coated	EPDM	81465	–	–	–	–	1
23	Tension disc	Stainless steel	84179	1	1	1	1	1
24	Deflector plate	Hypalon	81260	1	1	1	1	–
	Deflector plate	Hypalon	22056	–	–	–	–	1
25	Spacer	Plastic	35126	–	–	–	–	1
26	Extension	Stainless steel	35127	–	–	–	–	1
27	Leakage pipe	Plastic/Viton	25174	–	–	–	–	1

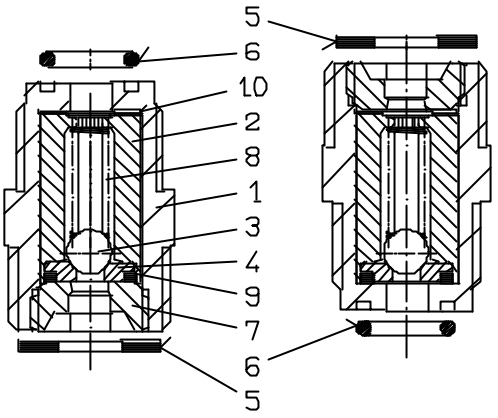
* Alternative, PTFE-coated diaphragm as standard



Item	Qty	Description	Material	Metering head assembly							
				A3...8	A14...24	A40	A3...8	A14...24	A3...8	A14...24	A40
				PVC			PVDF		1.4571		
				23810	23811	23909	28119	23178	23813	23814	23911
1	1	Diaph. housing		21222	22399	18113	28118	28689	21612	21613	23912
2	4	Screw	A2	83409	83409	83110	83409	83409	83622	83622	83110
3	4	Washer	A2	–	–	84160	–	–	–	–	84160

DN 4 Valves for A3...A24

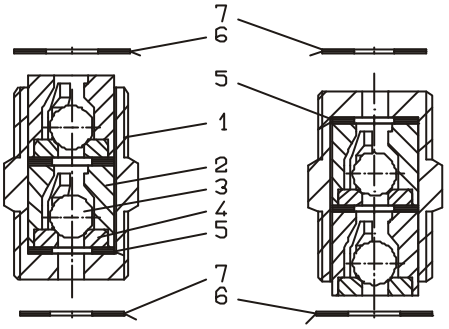




Item	Description	Material	Part No.	Double-ball valve			Spring-loaded valve		
				PVC	PVDF	1.4571	PVC	PVDF	1.4571
1	Valve body	PVC	20845	1	–	–	1	–	–
	Valve body	PVDF	28108	–	1	–	–	1	–
	Valve body	1.4571	19289	–	–	1	–	–	1
2	Ball guide	PVC	19294	2	–	–	–	–	–
	Ball guide	PVDF	28109	–	2	–	–	–	–
	Ball guide	1.4571	19293	–	–	2	–	–	–
	Ball guide	PVC	24066	–	–	–	1	–	–
	Ball guide	PVDF	29386	–	–	–	–	1	–
	Ball guide	1.4571	24067	–	–	–	–	–	1
3	Valve ball ø 6.5	Glass	29778	2	2	–	1	1	–
	Valve ball ø 6.5	1.4401	18044	–	–	2	–	–	1
4	Valve seat	PVDF	81460	2	2	2	1	1	1
5	Gasket	Viton	81371	1	–	–	1	–	–
	Gasket	PTFE	81677	–	–	1	–	–	1
	Gasket	PTFE	81580	–	1	–	–	1	–
6	O-ring	Viton	81384	1	–	–	1	–	–
	O-ring	PTFE	80617	–	1	1	–	1	1
7	Plug	PVC	19299	1	–	–	1	–	–
	Plug	PVDF	28110	–	1	–	–	1	–
	Plug	1.4571	24031	–	–	1	–	–	1
8	Valve spring	Hastelloy	25081	–	–	–	1	1	1
9	O-ring	Viton	80013	2	–	–	1	–	–
	O-ring	PTFE	80627	–	2	2	–	1	1
10	Gasket	Viton	81526	1	–	–	1	–	–
	Gasket	PTFE	81585	–	1	1	–	1	1
	Suction valve assembly			20890	28111	24029	25087	29385	25089
	Discharge valve assembly			20891	28112	24030	25088	29384	25090

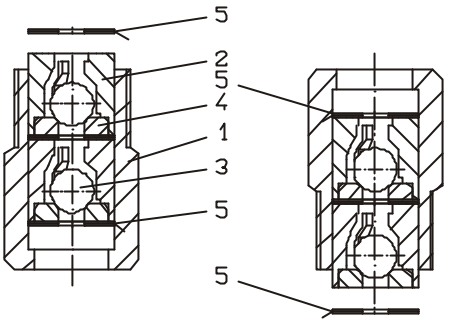
DN 6 Valves for A40

PVC version Double-ball valves



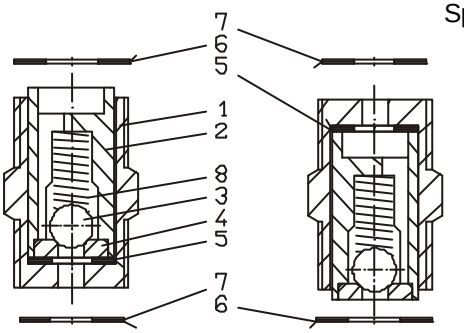
Suction valve Discharge valve

Stainless steel version

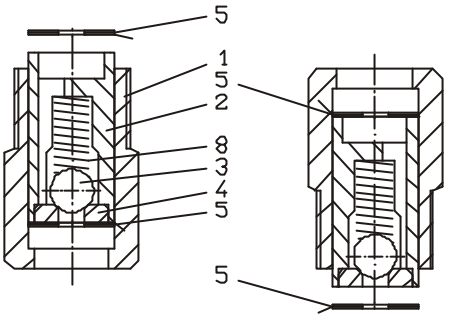


Suction valve Discharge valve

Spring-loaded valves



Suction valve Discharge valve

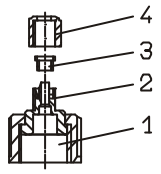
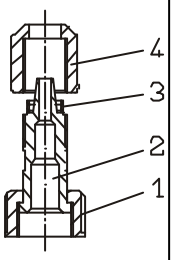
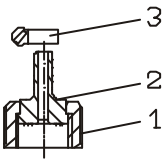
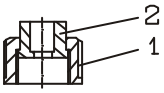
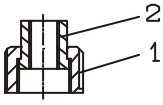
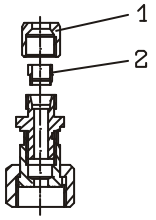


Suction valve Discharge valve

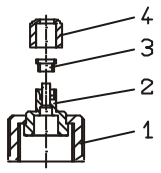
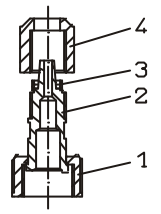
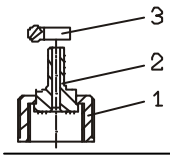
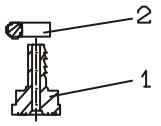
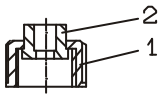
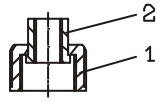
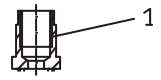
Item	Description	Part No	Material	Double-ball valve			Spring-loaded valve		
				PVC		1.4571	PVC		1.4571
				Hypalon	Viton	AF	Hypalon	Viton	AF
1	Valve housing	18189	PVC	1	1	–	1	1	–
		19601	1.4571	–	–	1	–	–	1
2	Ball guide	82405	PVC	2	2	–	–	–	–
		82102	1.4581	–	–	2	–	–	–
		23412	PVC	–	–	–	1	1	–
		25169	1.4571	–	–	–	–	–	1
3	Valve ball	10017	Glass	2	2	–	1	1	–
		10136	1.4401	–	–	2	–	–	1
4	Valve seat	82406	PVC	2	2	–	1	1	–
		82103	1.4571	–	–	2	–	–	1
5	Gasket	81037	Hypalon	2	–	–	1	–	–
		81138	Viton	–	2	–	–	1	–
		81625	AF	–	–	3	–	–	2
6	Gasket	81033	Hypalon	1	–	–	1	–	–
		81285	Viton	–	1	–	–	1	–
7	Gasket	81041	Hypalon	1	–	–	1	–	–
		81141	Viton	–	1	–	–	1	–
8	Valve spring	25082	Hastelloy	–	–	–	1	1	1
	Suction valve assembly			18187	18185	26967	25161	25162	28775
	Discharge valve assembly			18188	18186	26968	27516	27517	28776

Connections A3...A24

ET 1 03 02 / 7

	Connect. Type	Material	Size	Connection assy Part Number	Item	Spare Parts Description	Spare Parts Part No.
		PVC	4/6	20975	1	Union nut	88116
					2	Connection	88012
					3	Clamping ring	88003
					4	Union nut	88004
			6/8	25176	1	Union nut	82087
					2	Connection	31370
					4	Union nut	19397
			6/9	34925	1	Union nut	88116
					2	Connection	88199
					3	Clamping ring	34762
					4	Union nut	34696
			6/12	19180	1	Union nut	82087
					2	Connection	18094
					3	Clamping ring	10178
					4	Union nut	82139
		PVDF	4/6	29387	1	Union nut	28120
					2	Connection	88028
					3	Clamping ring	88003
					4	Union nut	88004
			6/12	28124	1	Union nut	28120
					2	Connection	28121
					3	Clamping ring	10178
					4	Union nut	28122
		PVC	6/12	23092	1	Union nut	82087
					2	Tubing connection	18042
					3	Hose clamp	82398
		1.4571	6/12	23093	1	Union nut	19303
					2	Tubing connection	18045
					3	Tubing connection	82398
		PVC	10	23087	1	Union nut	82087
					2	Cemented conn.	82014
			12	23089	1	Union nut	82087
					2	Cemented conn.	82013
		PVC	G 1/4	23088	1	Union nut	82087
					2	Threaded conn.	82185
		PVDF	G 1/4	29179	1	Union nut	28120
					2	Threaded conn.	28292
		1.4571	G 1/4	22999	1	Union nut	19303
					2	Threaded conn.	82186
		1.4571	10	23090	1	Union nut	88038
					2	Olive	88039
			12	23091	1	Union nut	88040
					2	Olive	88041

Connection for A40

	Connection Type	Material	Size	Connection assy Part Number	Item	Spare parts Description	Part-No.
	**A**	PVC	6/12	19175	1	Union nut	82156
					2	Tubing connection	18094
					3	Olive	10178
					4	Union nut	82139
			6/9	34926	1	Union nut	82156
					2	Tubing connection	88199
					3	Olive	34762
					4	Union nut	34696
	**B**	PVC	ø 6/12	23342	1	Union nut	82156
					2	Hose socket	18042
					3	Hose clamp	82398
	**B1**	1.4571	ø 6/12	23426	1	Hose socket	18268
					2	Hose clamp	82398
	**C**	PVC	ø 10	25167	1	Union nut	82156
					2	Cemented conn.	82014
			ø 12	27518	1	Union nut	82156
					2	Cemented conn.	82013
			ø 16	25625	1	Union nut	23685
					2	Cemented conn.	22508
	**D**	PVC	G 1/4	25165	1	Union nut	82156
					2	Threaded Connection	82185
	**D1**	1.4571	G 1/4	82105	1	Threaded Connection	82105

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

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

1. Technical data

Minidos A...		3	5	8	14	24	40
Max. pressure	[bar]	10					5
Flow rate at	[l/h]	3.2	6.4	8	14	24	39*
10 bar (* 5 bar)	[ml/str.]	1.5			2.6		4.7*
Stroke frequency	[min-1]	36	72	90		138	
Diaphragm dia.	[mm]	38			52		64
Suction lift	[mbar]	120					
Motor power	[kW]	0,03	0,05	0,03		0,05	
Max. temperature	[°C]	40					
Weight[kg]	Plastic	4.4					4.7
Head of:	St. steel	4.7					7

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 immediately.

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 below table 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 installation example on the following page.

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.

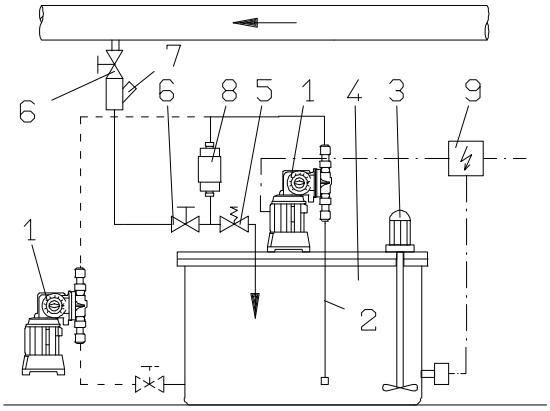
Ambient temperatures exceeding 40°C are not permitted. Radiant heat of apparatus and heat exchangers must be kept in limits allowing the pump to sufficiently dissipate its own heat. Exposure to direct sunlight should be avoided especially for metering pumps with plastic housings because the black plastic material can be damaged. If the pump is installed outside, provide an enclosure to protect it against weather.

The pump must be installed with vertical suction and discharge valves in upright position. To ensure stability of the pump screw it onto an appropriate base.

System piping must not exert any force to the connections and valves of the metering pump.

To avoid incorrect metering after the process is finished, provide an electric and hydraulic interlocking system.

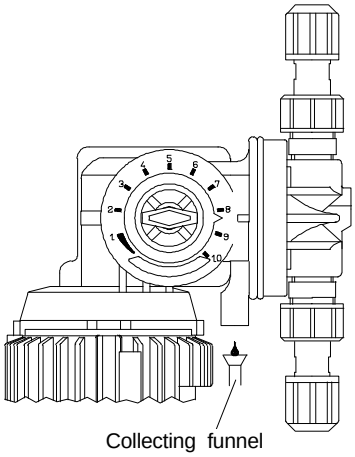
Installation example



Legend

1	Minidos A	MB 1 03 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	Switch box	

Drain pipe



The drainage or leakage must be run from the separating chamber downwards to the containment tank. By no means must the drain pipe be returned to the medium directly through the tank cover since otherwise effervescent media might enter the pump gear. The drain pipe must only be routed into 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 then be returned via the funnel through the tank cover. Furthermore, any existing leakage can be seen at the collecting funnel.

4. Electrical connection of the pump

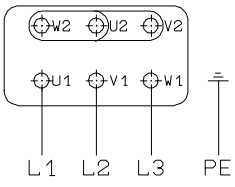
- The electrical connection of the pump must be made according to the local rules and may only be carried out by technical personnel.
- Cable type and cable cross section of the supply lines must be selected according to the motor data.
- The cable passage to the motor terminal box must be made professionally.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

Electrical connection data

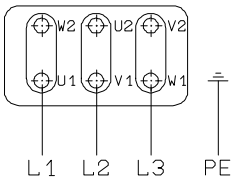
Pump model	Voltage [Volt]	Power [Watt]	Current [A]
A3, A8, A14	400/230 50 Hz	30	0.23/0.40
A5,A24,A40		50	0.30/0.52
A3, A8, A14	440/254 60 Hz	40	0.24/0.42
A5, A24,A40		60	0.30/0.52
A3, A8, A14	400/230 60 Hz	40	0.22/0.38
A5, A24,A40		60	0.29/0.50
A3, A8, A14	230/1~ 50 Hz	25	0.35
A5, A24,A40		50	0.45

Wiring diagram of the drive motor

- 3-phase supply

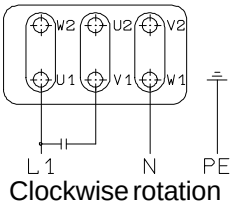


Y-connection

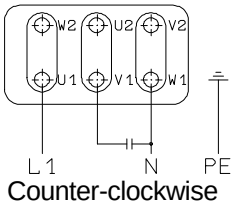


Δ-connection

- A.C. power supply with motor in Steinmetz connection



Clockwise rotation



Counter-clockwise rotation

- 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 03 02 / 7-10.

5. Safety instructions

Þ When working on chemical 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.

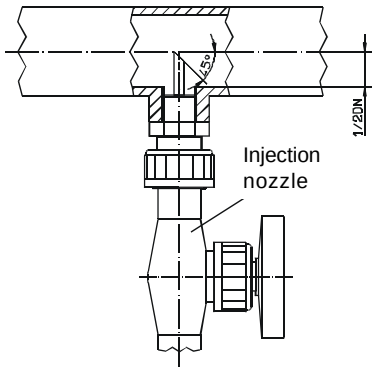
Þ If connections at the metering head are unscrewed during operation for venting or other reasons, leaking chemical must be removed completely. This is the only way to avoid the danger of physical injury and corrosion at the metering pump. Leaking chemical may also destroy the diaphragm at its mounting 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 The base area of the pump must be kept free to ensure sufficient air circulation for cooling of the motor. If liquid is likely to accumulate below the pump base, install the pump at a higher position.

6. 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 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 pumps 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, turn out 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 by remote adjustment. For approximation refer to the performance curves shown in MB 1 03 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. Lubrication

Lubrication

The diaphragm metering pump MINIDOS requires little maintenance. The gear of the pump is provided with molybdenum-disulphite lubricant for long service life. In the case of difficult operating conditions or high ambient temperature the grease should be renewed about every 5,000 operating hours. Use "Molycote BR2plus" or "OKS400" for this purpose.
Caution: This drive is not suitable for oil lubrication!

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 (monkey wrench with 3 mm hexagonal recess).
4. Grasped at the edge, the diaphragm can now be turned out counterclockwise. Check the existing support plate for damage (in the case of diaphragm dia. 38 mm) and replace, if necessary.
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.
   Make sure that the possible existing support plate is positioned correctly.
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. Apply a tightening torque of approx. 125 Ncm.
9. After connecting the metering lines the pumps is started as described in section 7, startup.
10. If the diahragm wear is excessively high, try to find out the reason. 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 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.
	Gear without molybdenum-disulphite.	Renew e.g. Molycote.
Motor hums and doesn't start.	Wrong connection.	Check electrical wiring.
	Capacitor defective, wrong size or connected incorrectly.	Connect capacitor corrrectly or replace it, if necessary.
	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.

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1. General
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3. Installation
4. Safety instructions
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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 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 continuous 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 switch for limiting the angle of rotation. Signaling of final position via terminals 16 and 17	Internal limit switch for limiting the angle of rotation.
Protection class	IP 55 (EN 60529)	
Ambient temperature	-20 ... 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.

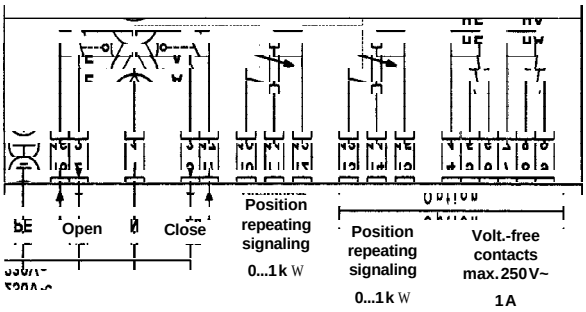
⇒ Before working on the metering pump and the ATE servomotor, disconnect the main power supply and protect it against reconnection.

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

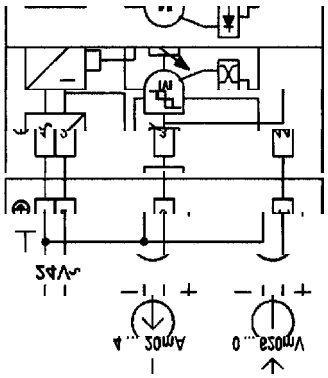
⇒ Additional limit switches might be "alive" even with the auxiliary voltage switched off.

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

5. Wiring diagrams



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



Control by 4...20mA standard signal
(24V 50...60Hz supply voltage)

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

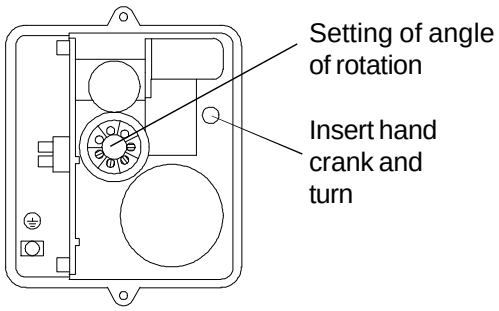
In the case of an electrical failure of the ATE servomotor, it can be adjusted manually by means of a hand crank. This part is available as accessory (Part No. 32.587).

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. "Molycote BR2plus" and "OKS400".

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

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6. Startup
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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 voltage on 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 (only as option)
Limit switch	Internal limit switch for limiting the angle of rotation. Signaling of final positions 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.

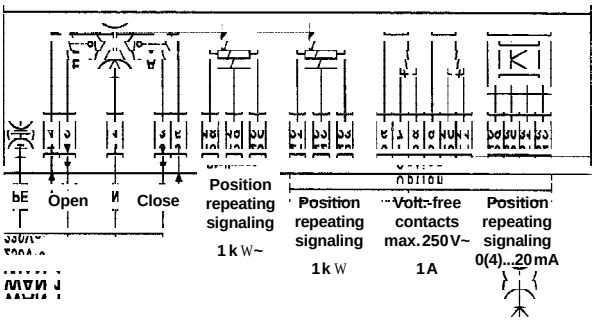
⇒ Before working on the metering pump and the ATE servomotor, disconnect the main power supply and protect it against reconnection.

⇒ 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.

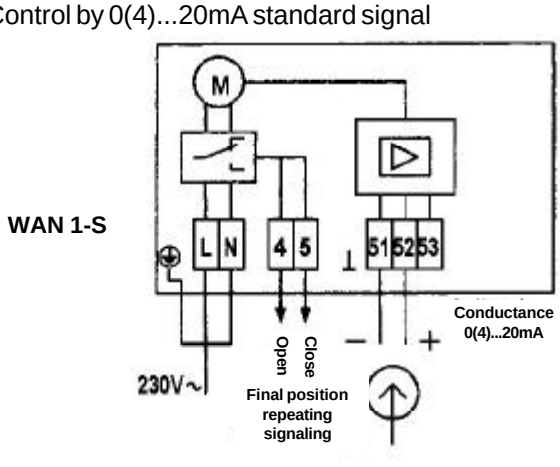
⇒ After installation works at the ATE servomotor or before startup remount the cover.

5. Wiring diagrams



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

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. "Molycote BR2plus" and "OKS400".