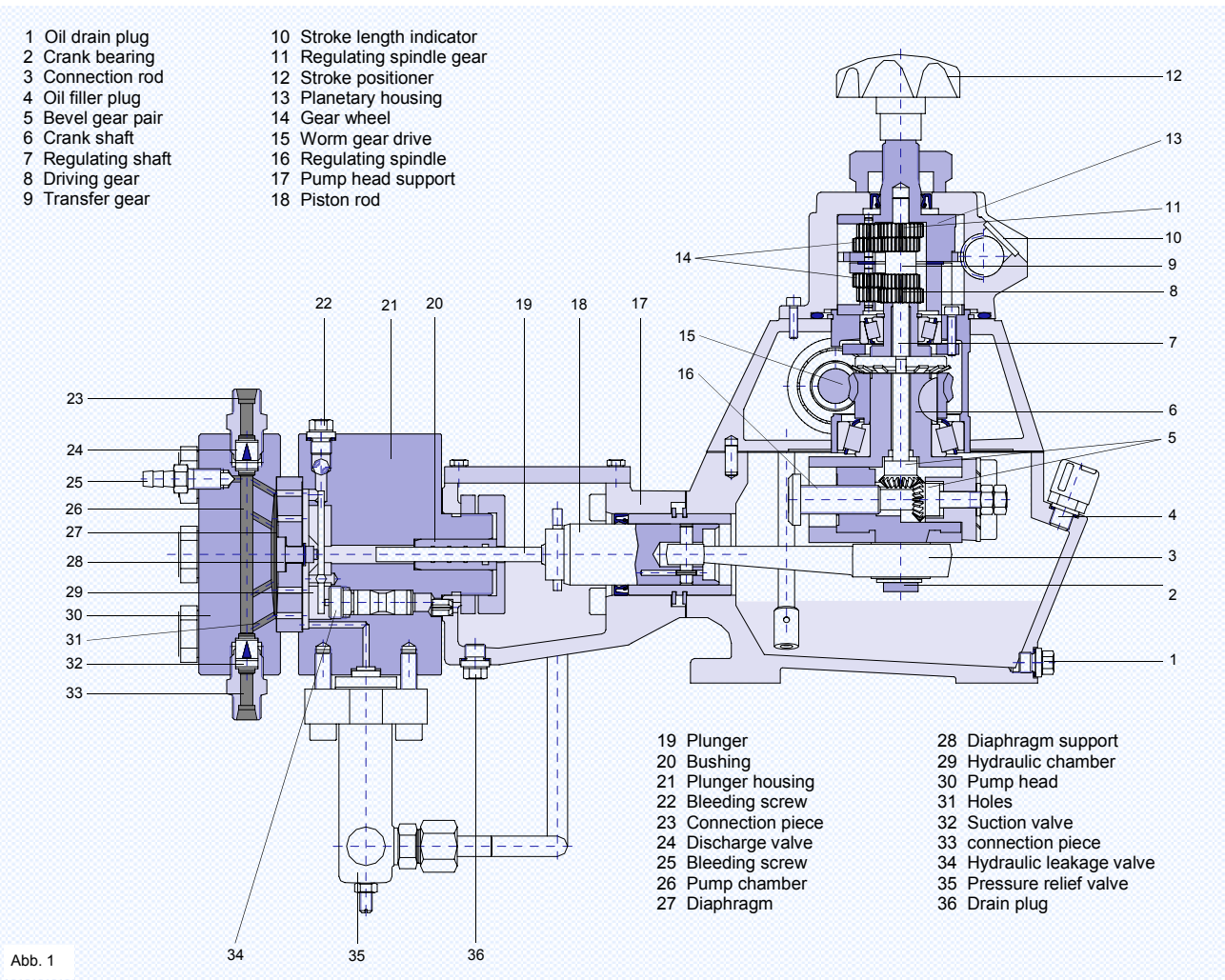

Abb. 1

Description

The diaphragm metering pump series MV is a glandless, oscillating metering pump with hydraulically actuated pump chamber. It consists of pump head and drive mechanism.

❑ The pump head

The pump chamber (26) is completely sealed against the hydraulic chamber (29) by means of a diaphragm. During the discharge stroke the plunger (19), which is coupled to the piston rod (18), presses the hydraulic fluid through the holes of the diaphragm support (28). As a result the diaphragm deforms and displaces the process fluid through the discharge valve (24).
During the suction stroke the diaphragm is hydraulically expanded and returns to its initial position. This creates a vacuum within the pump chamber and effects refilling through the suction valve (32). The pump head is fully protected against both vacuum and overpressure.

Vacuum protection
The hydraulic leakage valve (34) which is fitted within the hydraulic chamber (29) is so constructed that the hydraulic fluid is required to compensate for effective leaks only, which may occur at the plunger bushing (20). Clogged suction line, closed valves, low suction head or high viscosity of the medium cannot damage the pump because the hydraulic chamber can never be overfilled. Due to these features the pump is selfpriming and can accommodate vacuum suction (limited by the vapour pressure of the hydraulic fluid).

Overpressure protection
The pump head is equipped with an internal hydraulic pressure relief valve (35). An additional relief valve on the discharge side of the pump is therefore not necessary and would also be too expensive since its construction material must be resistant to the process fluid.

❑ The drive mechanism

The V-type drive mechanism is a motor driven crank gear with variable eccentricity. The stroke length is adjustable either whilst running or stationary by means of a stroke positioner (12). The adjusted stroke length is indicated on a stroke length indicator (10) with an increment of 0.1 mm.
The movable parts of the drive mechanism are manufactured to close tolerances. Sufficient lubrication action is provided by means of a built-in oil pump. Due to the inherent design of the drive mechanism the pump gives excellent metering accuracy (less than 0.1 % under ideal operating conditions) and reproducibility together with long life.

❑ Driver

Pumps are normally equipped with a three-phase electric motor, protection class IP 54. Explosion proof motors are also available. DC-motor, hydraulic motor or other versions of drivers can be provided. The drive can also be via a hydraulic coupling or a variable speed gearbox.

Construction materials

Elastomer tube (28) of Viton, Perbunan or EPDM, valves (23 and 33), tube flanges (25 and 32) and connecting pieces (24 and 34) are in stainless steel. For special application they are also available in Hastelloy alloys, nickel, monel, titanium, tantallum, molybdenum, bronze, ceramics and plastics (PTFE, PVDF, PVC, Polypropylene, Nylon and others).

Range of applications

The diaphragm metering pump is the most meritorious pump within the line (ask for details of other glandless constructions, especially for tube and bellows metering pumps).

- ❑ The pump protects its surrounding against contamination by leakage because the pump chamber is hermetically sealed. There is no risk to health when operating with dangerous fluids such as poisonous, easily flammable, explosive, corrosive or obnoxious products.
- ❑ The pump protects the product against deteriorating influences of the atmosphere or light (oxidation, polymerisation, crystallisation or microbiological damage).
- ❑ The pump is suitable for operation with nonlubricating process fluids such as distilled water etc., and thus avoids the need for stuffing box lubrication systems as required by plunger or piston pumps.
- ❑ The pump can be designed for an operating pressure up to 1000 bar
- ❑ The pump gives an excellent performance for use with small capacities when high metering accuracies are required.

Pump head variations and modifications

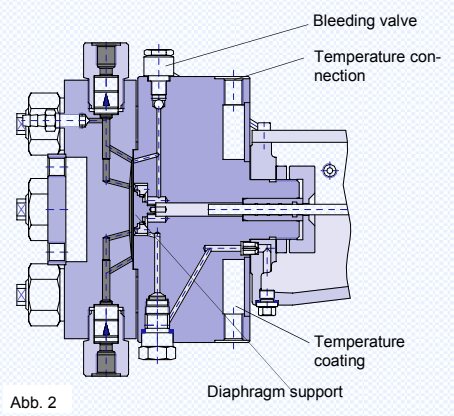

Abb. 2

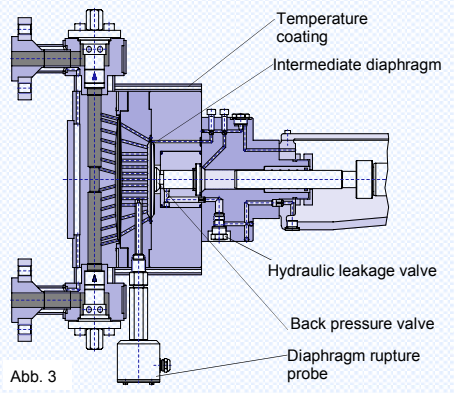

Abb. 3

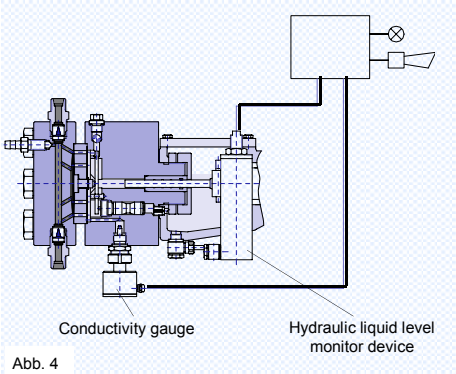

Abb. 4

Designed for pre-pressurized suction conditions and vapour sterilization with/without intermediate chamber

The standard version of the pump heads are suitable for flooded suction. In some cases the process requires pre-pressurized suction conditions for applications such as:

- ❑ metering of liquid gas (i.e. SO_2, CO_2, Freon.)
- ❑ metering of high viscous products which are fed to the suction by means of gas pressure or booster pumps.
- ❑ circulation of gaseous and liquid products under process system pressurisation.
- ❑ steam sterilisation above 110 °C.

The pump can be provided with a modified hydraulic system. For these applications, where the pump can be subjected to pre-pressurized suction conditions to include either a specially designed diaphragm supporting plate or a back pressure valve, if the pump head is equipped with an intermediate chamber.

Diaphragm failure monitoring

On special request diaphragm pump heads can be equipped with a diaphragm failure monitoring system. Generally conductivity probes are used. According to the nature of the liquid to be pumped and the hydraulic fluid, other probe types may be installed (e.g. based on photo-electric principle).

Standard pump heads (without intermediate chamber) can be monitored by a liquid level probe in the reservoir.

Diaphragm pump head for liquid gas

Metering of liquid gas is a difficult problem, especially when the suction container is set slightly above the vapour pressure of the liquid gas. A typical application is metering of Freon which is an important process in plastic moulding. Due to the fact that Freon is a non-lubricating product, diaphragm pumps are the most suitable units. For this special application the pump head is subject to a certain modification so that caritation by mass acceleration is avoided. Ask for special documentation concerning complete metering systems for Freon.

Heating-/Cooling jackets - automatic bleeding

❑ Heating-/Cooling jacket

In some cases it is necessary to heat the process fluid in order to make or keep it pumpable (high viscous material, glucose, plastics, inverted sugar solution, honey, grease, etc.). Also a specific processes could require high or low temperature. In these cases a heating or cooling jacket is recommended (partially or totally jacketed including valves connecting pieces and hydraulic chamber).
Sufficient heating in many cases can be achieved by means of a thermostatically controlled electric cartridge.

❑ Automatic bleeding device

Pump heads can be equipped with an automatic bleeding device which ensures continuous bleeding of the hydraulic chamber (viscous products or difficult suction conditions could effect evaporation of hydraulic fluid). The automatic bleeding device is equipped with a fixed capillary allowing effective air bleeding with a minimum of volumetric efficiency losses.

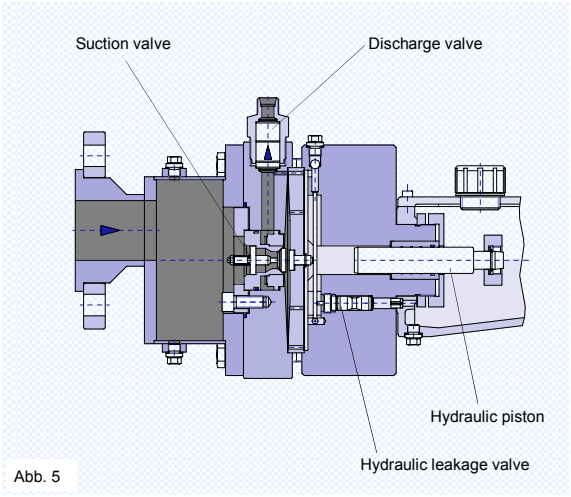

Abb. 5

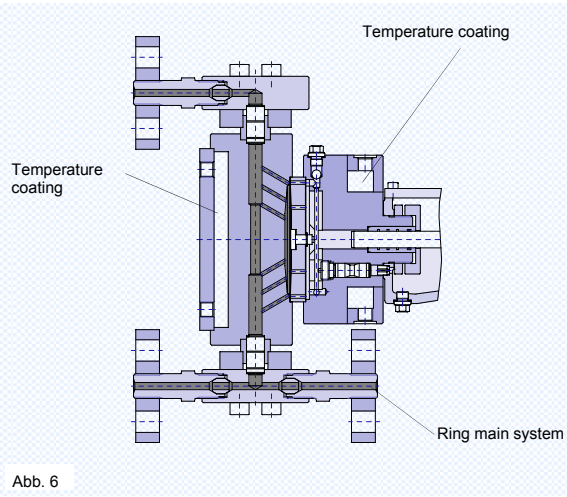

Abb. 6

Valve modifications

The diaphragm pump heads are supplied as standard with single ball valves (cone valves for larger sized models). For special applications modified valve assemblies are available. For high metering accuracy and small capacities double or multiple valve assemblies are recommended.

Valves can also be supplied spring-loaded with stellite coated valve seats or elastomer coated seats.

Multiple pump assemblies

Multiple pump assemblies with common driver can be supplied. Each head is separately adjustable and controllable. If necessary, common stroke control equipment can be fitted to multiple pumps.

The standard types are equipped with threads or flanges according to DIN, ASA (ANSI) or BSS.

On special request pumps can be delivered with connections to suit the customers requirements. If required connections can be constructed so that valves are removable without dismantling the pipework (cross-head design).

Metering pump accessories
(please ask for special documentation)

- ⇨ Pulsation dampers
- ⇨ Relief valves, back pressure valves and non-return valves
- ⇨ Flow meters
- ⇨ Vessels and fittings
- ⇨ Static and dynamic mixers
- ⇨ Jets and injection nozzles
- ⇨ Low level switches and conductivity probes
- ⇨ Monitoring systems

Required data for enquires:

- ⇨ **Process fluid**
  Type, concentration, specific gravity, viscosity, vapour pressure, size and percentage of solids.
- ⇨ **Operating conditions**
  Temperature, suction head, discharge head (max./ min.), static head and quantity.
- ⇨ **Driver**
  Type, voltage, current, phase, frequency, protection.
- ⇨ **Connections**
  Type, rating and facing

Pump data

Series	Pump type	Theoretic capacity[1]	Operating pressure	Head size	Plunger diameter	Stroke volume	Piping size[2]		Valve size	Relief valve size	Gear box data	
		(l/h)	(bar)		(mm)	(cm³)	(mm)	(Zoll)				
MV 055 (120 strokes/minute)	MV 055.3/3	1,6	1000	0	3	0,23	6	1/4	011	011	Stroke length:	32 mm
	MV 055.3/4	2,8	1000	1	4	0,4	6	1/4	011	011	Max. power:	0,58 kW
	MV 055.3/5	4,5	1000	2	5	0,63	6	1/4	011	011	Piston load:	300 kp
	MV 055.3/7	8,8	779	3	7	1,23	6	1/4	011	011	Gear ratio:	i = 11,5
	MV 055.3/9	14,4	471	4	9	2,0	6	1/4	011	011		
	MV 055.3/11	21,6	315	5	11	3,0	8	1/4	028	011		
	MV 055.3/14	35,3	194	6	14	4,9	8	1/4	028	011		
	MV 055.3/18	58	117	7	18	8,1	10	3/8	028	011		
	MV 055.3/22	87	78	8	22	12,2	10	3/8	028	011		
	MV 055.3/28	141	48	9	28	19,7	12	3/8	045	011		
	MV 055.3/35	221	31	10	35	30,8	15	1/2	070	028		
	MV 055.3/45	366	18	11	45	50,9	20	3/4	110	028		
	MV 055.3/56	567	12	12	56	78,8	25	1	180	045		
MV 150 (120 strokes/minute)	MV 150.5/4	4,5	1000	2	4	0,63	6	1/4	011	011	Stroke length:	50 mm
	MV 150.5/5	7,0	1000	3	5	0,98	6	1/4	011	011	Max. power:	1,06 kW
	MV 150.5/7	13,6	961	4	7	1,9	6	1/4	011	011	Piston load:	370 kp
	MV 150.5/9	22,9	581	5	9	3,2	8	1/4	028	011	Gear ratio:	i = 11,5
	MV 150.5/11	34,2	389	6	11	4,8	8	1/4	028	011		
	MV 150.5/14	55	240	7	14	7,7	10	3/8	028	011		
	MV 150.5/18	91	145	8	18	12,7	10	3/8	028	011		
	MV 150.5/22	136	97	9	22	19	12	3/8	045	011		
	MV 150.5/28	221	60	10	28	30,8	15	1/2	070	011		
	MV 150.5/35	346	38	11	35	48,1	20	3/4	110	028		
	MV 150.5/45	572	23	12	45	79,5	25	1	180	045		
	MV 150.5/56	886	15	13	56	123,2	40	1 1/2	280	070		
	MV 150.5/70	1385	9,5	14	70	192,4	40	1 1/2	450	110		
MV 410 (115 strokes/minute)	MV 410.8/5	10,8	1000	4	5	1,6	6	1/4	011	011	Stroke length:	80 mm
	MV 410.8/7	21,2	1000	5	7	3,1	8	1/4	028	011	Max. power:	4,28 kW
	MV 410.8/9	35,1	1000	6	9	5,1	8	1/4	028	011	Piston load:	1050 kp
	MV 410.8/11	52	1000	7	11	7,6	10	3/8	028	011	Gear ratio:	i = 12,67
	MV 410.8/14	84	682	8	14	12,3	10	3/8	028	011		
	MV 410.8/18	140	412	9	18	20,4	12	3/8	045	011		
	MV 410.8/22	209	276	10	22	30,4	15	1/2	070	028		
	MV 410.8/28	339	170	11	28	49,3	20	3/4	110	028		
	MV 410.8/35	531	109	12	35	77	25	1	180	045		
	MV 410.8/45	877	66	13	45	127,2	40	1 1/2	280	070		
	MV 410.8/56	1359	42	14	56	197	40	1 1/2	450	110		
	MV 410.8/70	2124	27	15	70	307,9	50	2	700	180		
	MV 410.8/90	3511	16	16	90	508,9	65	2 1/2	1100	280		
MV 1350 (108 strokes/minute)	MV 1350.12/7	31	1000	6	7	4,8	8	1/4	028	011	Stroke length:	125 mm
	MV 1350.12/9	51	1000	7	9	8	10	3/8	028	011	Max. power:	7,58 kW
	MV 1350.12/11	76	1000	8	11	11,9	10	3/8	028	011	Piston load:	1200 kp
	MV 1350.12/14	124	779	9	14	19,2	12	3/8	045	011	Gear ratio:	i = 13,33
	MV 1350.12/18	206	471	10	18	31,8	15	1/2	070	028		
	MV 1350.12/22	307	315	11	22	47,5	20	3/4	110	028		
	MV 1350.12/28	498	194	12	28	77	25	1	180	045		
	MV 1350.12/35	779	124	13	35	120,3	40	1 1/2	280	070		
	MV 1350.12/45	1288	75	14	45	198,8	40	1 1/2	450	110		
	MV 1350.12/56	1995	48	15	56	307,9	50	2	700	180		
	MV 1350.12/70	3117	31	16	70	481,1	65	2 1/2	1100	280		
	MV 1350.12/90	5152	18	17	90	795,2	80	3	1800	450		

[1] Capacity data refer to standard stroke frequency. Pumps operating with externally linked valves and pumps for viscous products are run at reduced speed.
[2] Standard piping size. High viscous products require increased piping diameter (especially suction). Specify connection type (flange, thread etc.) at enquiry!

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