Piston Diaphragm System KMS

General

The operating instructions only refer to the piston diaphragm system (KMS). For proper installation and maintenance of the metering pump gears and installation of the piping on the chemicals side, refer to the following operating and maintenance instructions:

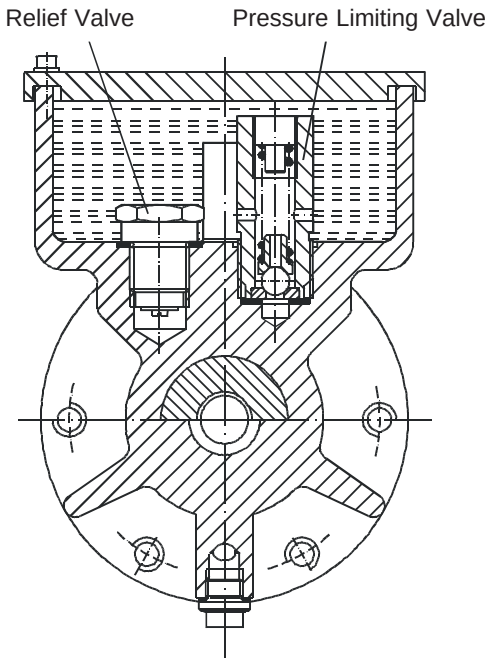
REKOS KR: BW 1 08 02
KARDOS KN: BW 1 09 01

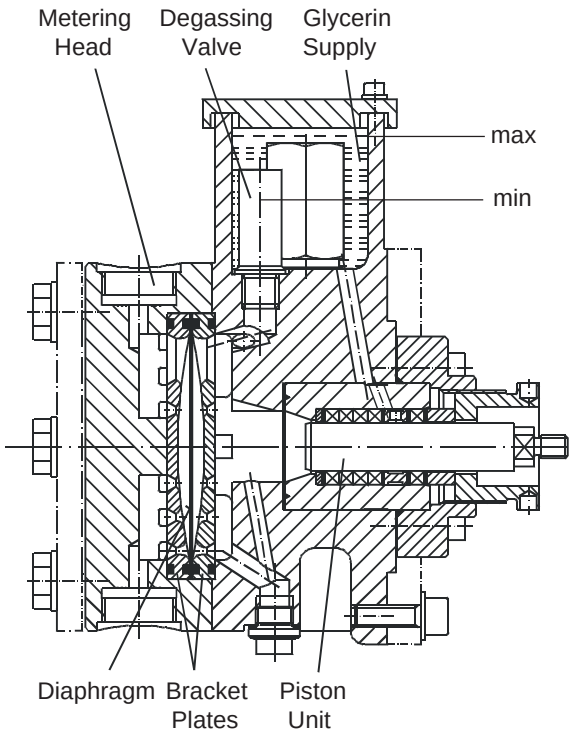
Functional Description

The function of the piston diaphragm pump is very similar to the function of a standard piston pump. The piston does, however, not plunge into the liquid to be metered but just displaces the glycerin. The glycerin volume displaced by the piston moves the diaphragm back and forth. Due to the closed surge chamber and the incompressibility of the glycerin, the diaphragm is hydraulically connected directly to the piston and transfers the pump movement to the liquid to be metered. The separating diaphragm is tightened between two spherically perforated bracket plates and can expand freely in both directions within these limits. The possible stroke volume of the diaphragm is at least 50% higher than the stroke volume of the relevant piston. Therefore the diaphragm does not touch the bracket plates with every stroke.

During operation, sealing liquid gets lost in the surge chamber due to the degassing valve and the system-related leakage of the piston packing, but is returned into the supply bin via a recirculating channel. While working, the diaphragm is moving in the direction of the piston-sided bracket plate until it touches the bracket plate with its whole surface. At this time, the piston is still carrying out a suction stroke movement. The pressure is decreasing, thus opening the relief valve set to a vacuum of 0.7 to 0.8 bar in order to compensate for the sealing liquid losses in the surge chamber and to allow the system to work correctly during the following discharge stroke.

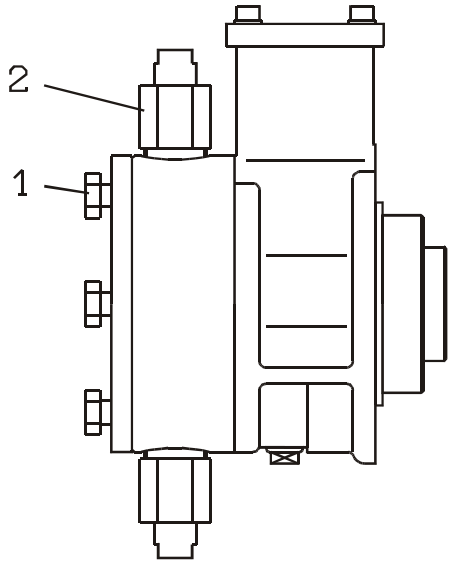
In the case of a clogged or locked suction line, there may be a congestion in the surge chamber between the piston and the diaphragm, causing the diaphragm to strike the front bracket plate during the discharge stroke. In this case, the pressure limiting valve also located in the upper part of the sealing liquid bin opens and allows the surplus glycerin to return. If the discharge line is blocked, the pressure limiting valve responds as well. If the suction or discharge line is blocked for a longer period, the diaphragm and possibly also the front bracket plate will wear out prematurely.





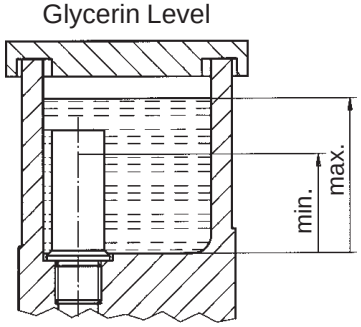
Startup

After connecting the piston diaphragm pump electrically and on the chemicals side, it should be relieved on the discharge side in order to allow the dry system to prime properly. Depending on the type and dangerousness of the chemical, the metering head can be filled either with water or with the chemical to be metered after removing the discharge valve.



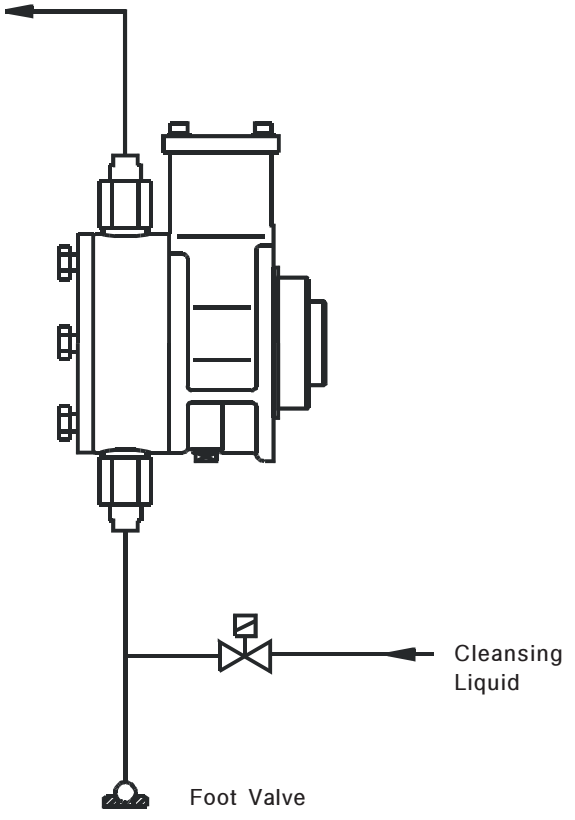
1 Loosen screws by approx. one turn.
2 Remove valves.

Note:
The valve caps of a plastic head can be moved more easily if the tightening screws of the pressure plates are loosened first. To screw and unscrew the valves, use a pipe wrench with a fabric tape.
In order to pour in the sealing liquid (glycerin) and ventily the pump surge chamber, we recommend to remove the three safety valves of the sealing liquid supply bin and to set the pump to a short stroke length for startup.
The supply bin is to be filled with glycerin up to approximately 1 cm below the top edge. Glycerin must be refilled before the level has reached the cross drilling located laterally at the degassing valve.

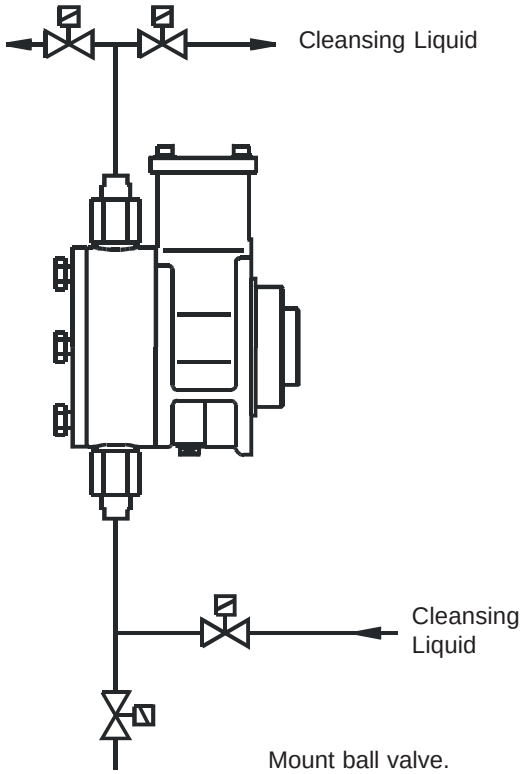


If there are no air bubbles escaping from the surge chamber anymore although the stroke length has been increased, the pump can be switched off and the pressure limiting valve, the relief valve and then the degassing valve can be remounted. Ensure that possibly adherent air bubbles are removed from the threads first. The metering pump is now ready for operation and should be running some minutes. If there are still some air bubbles escaping, these will be collected in the bolt below the degassing valve and can be removed quickly from the surge chamber by pressing down the valve ball (using an obtuse metal pin, 2 mm dia.). If bubble-free glycerin emerges and the pump has reached its full metering capacity, the system is ready for operation. Reduced output is mostly caused by incompletely vented surge or pump chambers or dirty valves.

Notes on how to meter abrasive, sedimentary or sticky liquids:
We recommend to rinse the pump with fresh pressurized water (max. 1 bar) or an appropriate solvent at least every hour until there are no deposits in the pump chamber anymore. Always repeat this procedure, before switching off the system.



The cleansing liquid may be mixed with the chemical.



The cleansing liquid must not be mixed with the chemical.

Adjusting the Pressure Limiting Valve

Start up the KMS using the chemical to be metered or water, loosen the adjusting screw of the pressure limiting valve und retighten it until no glycerin is escaping from the pressure limiting valve anymore. For checking purposes, you may keep the lateral outlets shut. Then tighten the pressure limiting valve by another quarter or half turn, ensuring that the maximally admissible back-pressure of the metering head is not exceeded.

Relief Valve

The relief valve is adjusted by the supplier and should be exchanged completely in the case of its failure because neither the valve seat turning mechanism nor the adjusting device can be repaired.

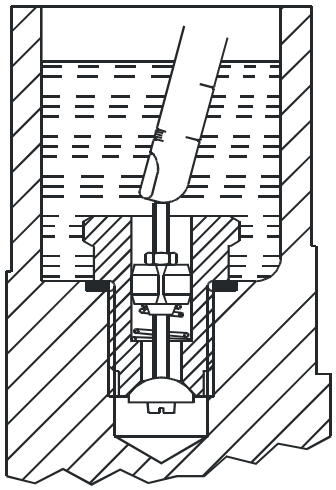
Degassing Valve

If the degassing valve fails it may be carefully disassembled, cleaned and re-assembled according to the drawing. We recommed, however, not to disassemble it in the case of a failure but to completely exchange it, if external cleaning is not successful.

Suction Lift

The relief valve for the surge chamber of the sealing liquid system is set to an opening pressure of 700 mbar by the supplier. Thus the metering pump reaches suction lifts with up to 500 mbar provided that the metering head is properly filled. If the suction lines are too long or the resistance to flow is too high, the suction pressure will be falling below the minimum limit. As a result, the metering head will not be filled properly anymore, because the relief valve will prematurely feed glycerin into the primary cycle. Consequently, the output of the piston diaphragm pump will be reduced. Besides, it will be necessary to press the surplus glycerin out of the surge chamber during the discharge stroke, thus causing the diaphragm to lay against the front bracket plate and then be pressed against this plate with the maximum working pressure of the pressure limiting valve. Premature wear of the diaphragm and possibly of the bracket plate may be the result.

Note:
The „cone“ of the relief valve must not move but remain in a closed position during operation, i.e.: it must not pulsate with every suction stroke (finger-tip test).



Conductivity Probe

If the liquids to be metered have another conductivity than glycerin, the function of the diaphragm failure warning device can be carried out by a conductivity probe with evaluation relay which is integrated in the drain socket of the separating chamber. The reaction time of the probe after a diaphragm failure depends on the miscibility of the glycerin and the liquid to be metered and on the difference in density. For constructional reasons, graphite might separate from the cast of the separating chamber system. Also other impurities in the glycerin might cause interference of the diaphragm failure probe. Cleaning the probe and exchanging the glycerin help to eliminate this problem in most cases.

Troubleshooting

NATURE OF PROBLEM	POSSIBLE CAUSE	RECOMMENDED ACTION
Pump not delivering or output too low.	No chemical to be metered available.	Refill tank.
	No or not enough sealing liquid (glycerin) in the supply bin.	Refill glycerin until thedegassing valve is covered.
	Air in the hydraulic piston diaphragm system.	Venty system, press down the degassing valve ball andpossibly also the relief valve rod, thus activating the pressure relief valve.
	Suction line too long, too small (dia.) or suction lift too high (relief valve does not open at 0.7 bar).	Install pump closer to the chemical tank or retrofit suction air chamber.
	Stroke length or frequency incorrectly set.	Check pump.
	Valves dirty.	Clean and check valve seats.
Metering pump not reaching required operating pressure.	Setting of pressure limiting valve too low	Pressurize pressure limiting valve, using a pressure gauge to check the pressure in order not to overload the pump.
Pump gear or motor failure.		See special operating and maintenance instructions for the relevant metering pump.