Recommendations for Installation and Monitoring

The trouble-free operation of HERMETIC pumps depends substantially on the manner of the installation and the operating method. The following installation schemes provide information on the installation and protection of HERMETIC pumps in typical applications. For purposes of clarity, the depiction of auxiliary pipes for draining, flushing or heating has been omitted.

In all applications, the focus is directed towards complying with the required **minimum and permissible maximum flow rates** for HERMETIC pumps as well as on sufficient **venting or degassing.** (Impairment of the bearings!) A level sensor (LS^-) as well as a temperature sensor (TS^+) are mandatory for the explosion protection of HERMETIC pumps. In this regard, we recommend using our **electronic monitoring system**. In addition, an ammeter should be permanently installed to monitor the canned motor.

Container with bottom discharge – flooded suction

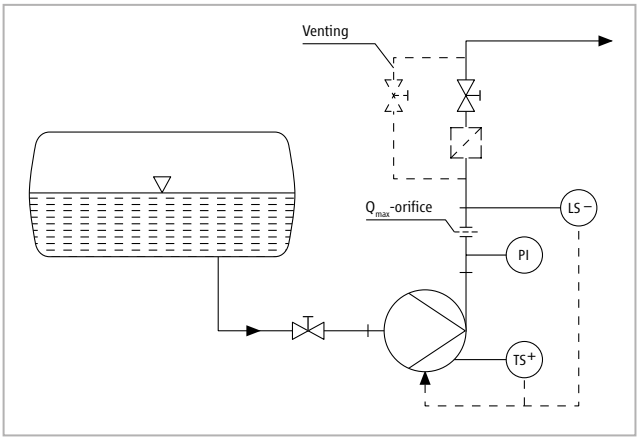

Fig. 1

Observe the minimum flow rate! If necessary, limit the maximum flow rate by an appropriately sized Q_{max}-orifice. Provision must be made for an additional venting possibility, when there is a check valve on the pressure side.

Container with bottom discharge – bypass for a minimum flow rate

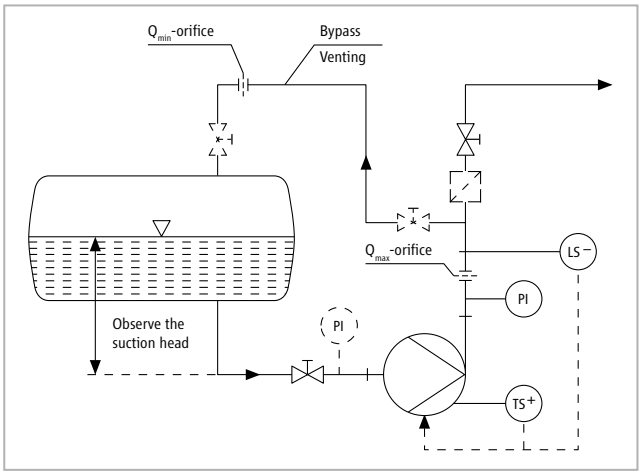

Fig. 2: Installation in fully automatic systems as well as the pumping of liquefied gases (NH_3, Frigen, Chlorine, Phosgene, Vinyl Chloride, etc.)

The bypass serves as a venting pipe whilst the pump is not running and when running, in conjunction with a suitably sized Q_{min}-orifice, to maintain the minimum flow rate. For larger minimum flow rates an automatic recirculation check valve* must be provided, instead of the combination of a Q_{min}-orifice and a check valve. If necessary, limit the maximum flow rate by a Q_{max}-orifice or a flow-control valve (important in pumping liquid gas!).

* The bypass is only opened by the automatic recirculation check valve, if the main flow rate drops below the minimum flow rate. When the pump is not running, the bypass is open.

Notes on pumping liquid gas:

- Open the gate valve in the bypass pipe fully (if necessary, remove the handwheel).
- Place the Q_{min}-orifice as close to the suction tank as possible (to avoid two-phase flow).
- At high vapor pressures: provide a pressure gauge on the suction side to determine the pump's differential pressure.
- To avoid cavitation: observe the minimum suction head!
- Keep the pipe flow resistances as low as possible (C < 1 m/s) on the suction side. As the NPSH value of the pump is increased by an increasing flow rate, the maximum flow rate shall be observed. (cf. HERMETIC Information: NPSH of Pumps and Systems)

Common discharge pipe for several pumps

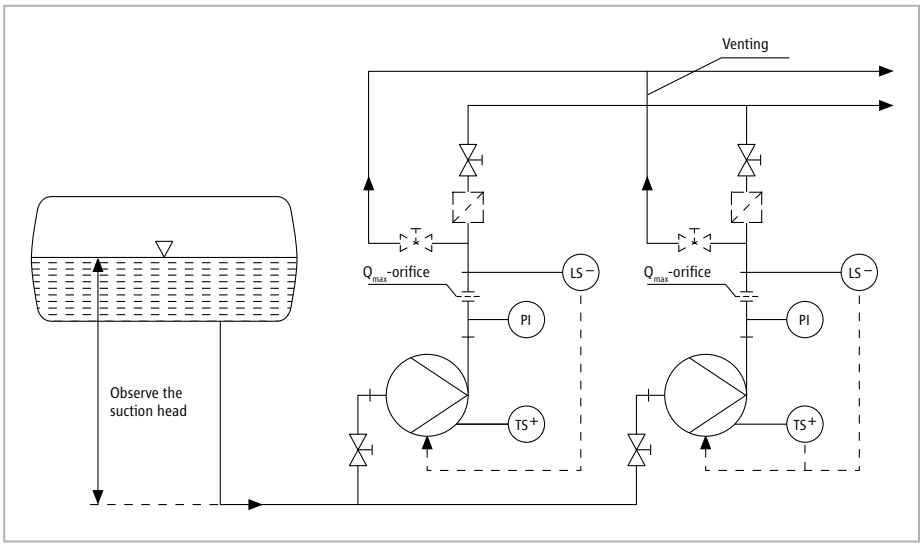

Figure 3: Parallel operation of several HERMETIC pumps. Simultaneously installed standby pump (standby-operating).

Keep the standby pumps ready for operation with the gate valves open, filled with the pumped liquid, if possible.** In order to prevent a backflow through the standby pump, a non-return valve for each pump is necessary. Furthermore, a separate venting possibility must be available.

Exercise caution in the parallel operation of HERMETIC pumps: With a flat characteristic curve, one pump may "overwhelm" another due to slight differential heads (in which event the minimum flow rate is not guaranteed). Rectify by either installing orifices *** or by installing separate bypass pipes (see Fig. 4).

Common discharge pipe for several pumps – bypass pipes for each minimum flow rate

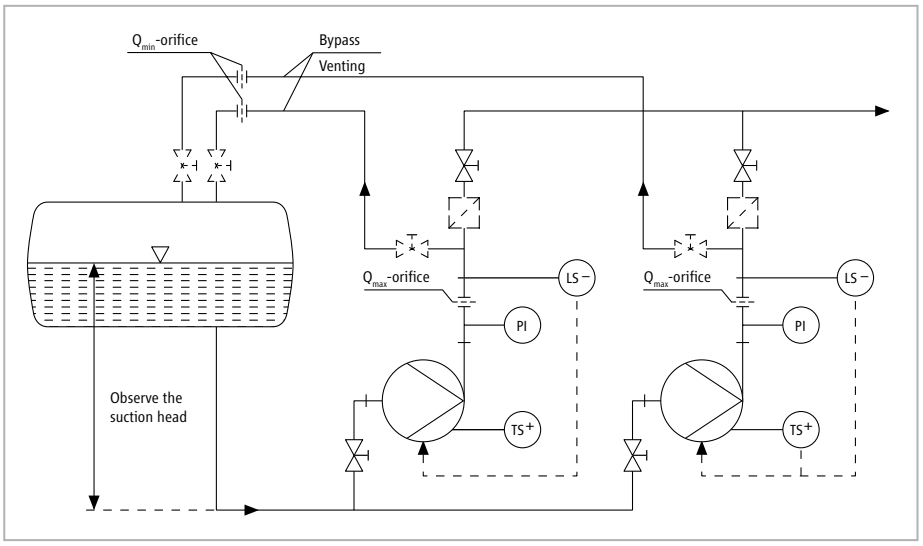

Fig. 4: Automatic operation of several HERMETIC pumps. Pumping liquefied gases. Simultaneously installed standby pump (standby-operating).

For reasons of safety, each pump should be provided with a bypass pipe. This is vital when pumping liquefied gases, so that the gas that forms when the pump not running can be discharged. Moreover, the minimum flow rate of each pump is ensured in this installation, irrespective of the differential head.

Keep the standby pumps ready for operation with the gate valves open, expediently filled with the pumped liquid**. This allows switching from one pump to another, or switching on a second pump, without the additional actuation of the gate valves.

Note on pumping liquid gas:
- If possible, use a separate suction pipe for each pump.
- Apart from this, the notes in respect of Scheme 2 apply.
- The restrictions or parallel operation accords with Scheme 3.

Container with top discharge – suction or siphon operation with a suction container

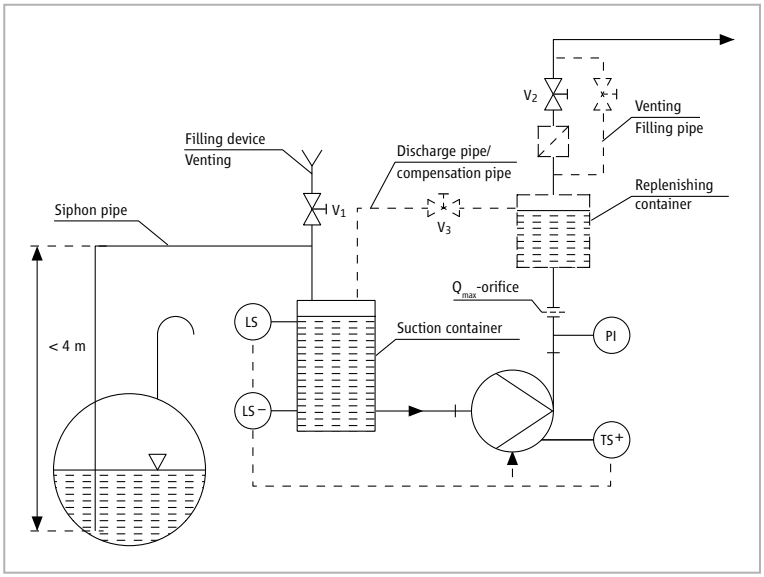

Fig. 5

The following preconditions, amongst others, are required for this installation:
- A vapor pressure of the liquid of less than 0.05 MPa.
- An atmospherically vented container.
- A suction container with two to three times the volume compared to that of the siphon pipe.
- A siphon pipe that is not higher than 4 m.

Before the initial start-up of the pump, the suction container must be filled either by the filling device (V1) or through the discharge pipe. In the latter case, the valve V1 serves as the vent. The pump is enabled in response to the upper level control; it is switched off when the lower level switch is reached.

If there is a check valve on the pressure side, the suction container is refilled through the valve V2 and V1 serves as the vent. If, for technical reasons, the volume of liquid in the discharge pipe is insufficient to fill the suction container, it is advisable to install a replenishing container (with a volume of about half that of the suction container). When switched off, the suction container is filled via the pump, if the gate valve V3 in the pressure-compensation pipe is opened. Before commencing a new draining cycle, V3 must be closed again. To fill the suction container automatically, V3 has expediently been designed as a solenoid valve.

** Not recommended for pumping chlorine.
*** After the installation of the orifices,a steeper characteristic curve is achieved.

Container with top discharge – suction or siphon operation with a vacuum container

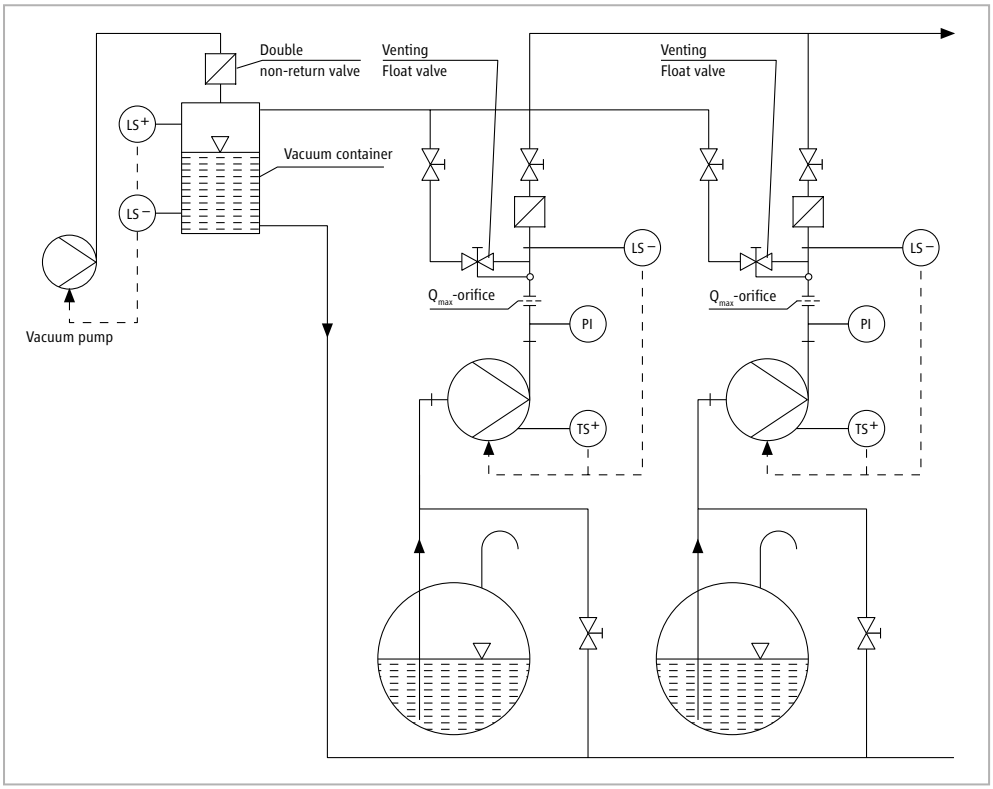

Fig. 6

This installation is recommended for systems with multiple filling stations, whereby all the suction and venting pipes are connected by means of the appropriate valves to a central vacuum container. The installation also allows an automatic suction or siphon operation.

The vacuum pump is switched on and off by two level switches (LS^-) and (LS^+). A dual-action check valve on the container maintains the vacuum, when pump 1 is switched off, and prevents the pumped medium from overflowing into the vacuum pump, should the control system fail. The lower level switch (LS^-) of the vacuum container should be at least 0.3 m above the highest point of the system that is to be vented. In the venting pipe, between the discharge pipe and the vacuum container, a venting valve (float valve) prevents liquid from the pressure side of HERMETIC pump entering the vacuum container.

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