

## Steam traps for demanding applications

Modern industrial valves have to satisfy many requirements in daily operation. Generally they must, as far as possible, be maintenance-free and resistant to fouling; installation and commissioning should be easy, and operation must be reliable. These basic prerequisites are already met by many units today. In the face of changing operational parameters, however, many self-acting units hit their limitations. Either they are not at all suitable for flexible use or they display functional deficits when the conditions vary. Operational reliability is a sensitive issue, particularly for condensate discharge at steam-driven heat exchangers under strongly fluctuating operating conditions. By exchanging the drain valve for a combined pump trap, proper drainage may be ensured under all operational circumstances. As a welcome effect, perfect product quality and reliable operation are guaranteed.

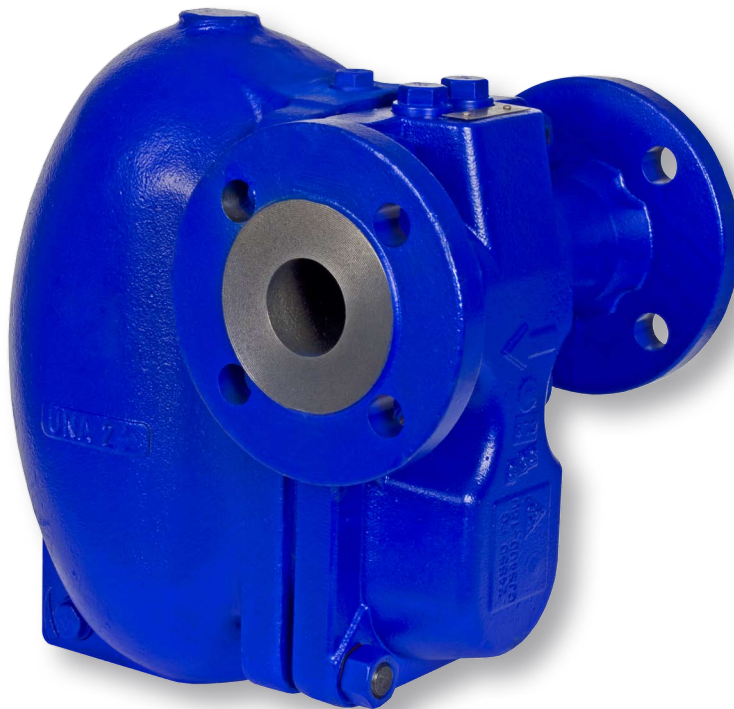


Figure 1  
GESTRA pump trap UNA 25-PK

### Challenging pressure differential

With heat exchangers controlled on the steam side, the required heating power is achieved by having the control valve vary the flowrate of the incoming steam. In the partial- and reduced-load range, the control valve must throttle the steam flow strongly, in order to adapt to the low energy demand. This causes a considerable pressure drop at the control valve; the pressure within the heat exchanger, which lies before the steam trap, may be considerably lower than the steam pressure available upstream of the control valve. In extreme cases, the pressure on the heating steam side inside the heat exchanger is not just lower than the pressure after the steam trap, but also lower than normal atmospheric pressure. In particular, this occurs when the required temperature of the medium to be heated lies below 100 °C. A vacuum is created in the heat exchanger. Conventional steam traps are no longer able to keep the heat exchanger free of condensate under such challenging pressure conditions. This results in a banking-up of condensate: the condensate remains in the heat exchanger and partially covers the heating surface.

Depending on the configuration and operational mode, various problems are encountered. Load changes cannot be balanced out quickly enough, because the condensate covering the heating surfaces prevents the necessary transfer of heat. To make matters worse, there is also backflow from the condensate system, filling up the heat exchanger with more condensate. If the condensate downstream of the steam trap must be lifted to a higher level (see Figure 2) or if there is an increased pressure in the condensate system, there is further banking-up of condensate. In most cases, this leads to the dreaded thermal waterhammer. If the control

valve opens again in response to the demand for more heating power, steam flows into the heating area. The pressure increases. If this steam now mixes with the condensate remaining in the heating chamber or in the pipes, enormous pressure loads arise. Sooner or later, they will damage the heat exchanger, piping, gaskets and valves.

## Risk of damage frequently neglected

In various branches of industry, there are many installations in which such problems with condensate discharge are inevitably encountered whenever load regulation is performed at the heat exchangers. A classic example is found in the chemical industry with the stills for removing unwanted constituents, e.g. alcohols, from a mother liquor. But plate or tube-bundle heat exchangers for heating service water or process water, or for discharging condensate from an air-conditioning plant, are also amongst the risky situa-

tions. Frequently, the serious consequences of load-dependent control are not considered in the design phase. Malfunctions and potential damage only become evident later during everyday operation, or after procedures or process parameters have been changed.

## Suitable for all load cases

Using a new generation of extremely compact pump traps ensures an optimum discharge of condensate that is reliable for all load cases. These devices unite a drain function with a demand-dependent pump function.

In comparison to normal float traps, they have two additional connections – for the motive steam and for a vent line – as well as integrated solenoid valves and non-return elements.

In addition to a time-proven rolling ball regulator, there is a mechanism which automatically injects high-pressure steam into the body when the pressure is too low. Thanks to

this motive steam, the condensate is actively transported into the condensate system. If the pressure in the heat exchanger is sufficiently high, the rolling ball regulator acts as a conventional float trap without employing any additional motive steam.

The UNA 25-PK unit made by GESTRA is available in the nominal size DN40 (1½") for hot condensate flowrates of over 2,000 kg/h. Three other versions round off this series, providing optimum solutions to fit every requirement of condensate discharge:

- ▶ UNA 2x with a rolling ball closing mechanism for normal condensate discharge
- ▶ UNA 2x max with a ball segment closing mechanism for large condensate flowrates
- ▶ UNA 25-PK as a classic lifter without orifice – for applications in which the back pressure within the condensate system is continuously greater than the pressure upstream of the unit.

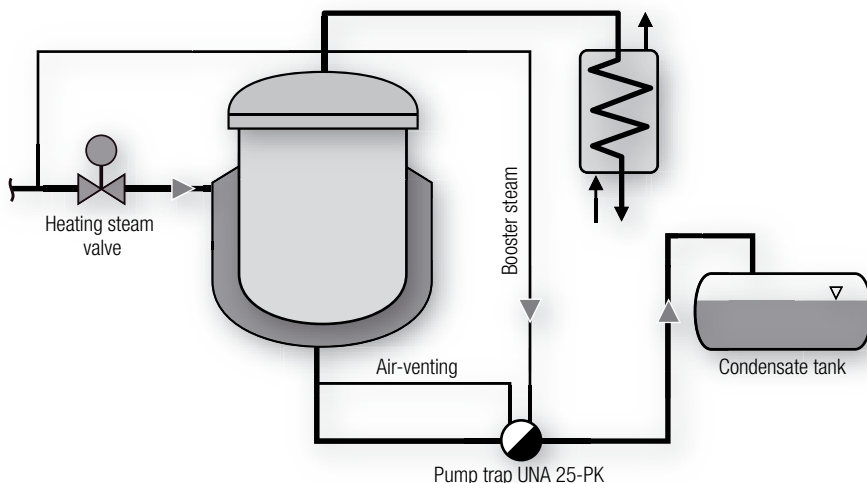


Figure 2

Example for the use of a pump trap: Jacket-heated still (simplified representation)

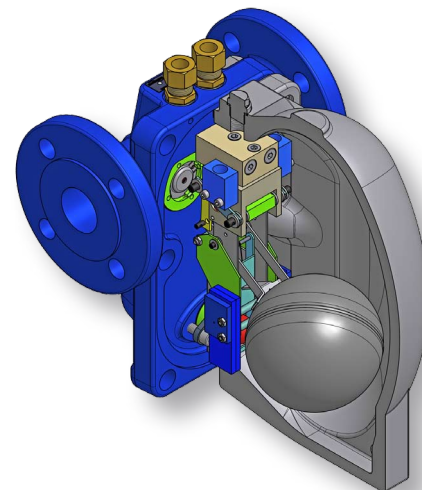


Figure 3

Isometric section of the GESTRA pump trap UNA 25-PK

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