

Frost protection thermostat

Safety component in technical plants

Frost protection thermostats are used to monitor temperature in ventilation and air-conditioning systems and to prevent frost damage on the heat exchangers. Ideally, they would be “unemployed” for their entire lifetime. But if conditions arise requiring immediate action, these thermostats can prevent massive damage and high repair costs. These thermostats are frequently used not only in the HVAC industry, but also in many other industries such as railway technology and agriculture. Although electronics are increasingly widespread in our era, electromechanical components can not be replaced completely because of safety considerations.



THERMOSTAT OPERATION

Frost protection thermostats are frequently used to monitor temperature on a surface as wide as possible. Therefore it is necessary that the whole capillary is active. The capillary operates according to the steam pressure condensation principle: measurement systems are filled with a gas which changes its state of aggregation from gaseous to liquid within the setpoint range.

This effects a large pressure change in the measurement system. By a membrane or a bellows on the end of the measurement system, the force is transmitted to a switch. The new refrigeration fluid R507A is used in many cases. It has ozone-depleting potential (ODP) of 0 and is free of hydrochlorofluorocarbons (HCFCs) which are, or will soon be, prohibited.

SCOPE

One application is in ventilation and air-conditioning systems. Many safety components like pressure switches, predetermined breaking points, or temperature switches are used to protect the plant. The above mentioned capillary of the frost

protection thermostat is installed directly behind the register of the heat exchangers at air heaters. But the capillary is installed directly in front of the register at air coolers. This capillary should be installed meander-formed and in a regular distance of 50 mm on the total surface to ensure an optimal safety function. Depending on the dimensions of the plant, several areas have to be monitored. If one thermostat is not sufficient, several thermostats can be connected in series. For optimizing the quantity of frost protection thermostats, *JUMO* frostTHERM is available in different capillary lengths. The table on the next page contains an overview for the different capillary and threshold lengths and details for the surface area dimensions, which can be monitored.

Various functions can be executed in case of frost danger: the fan can be switched off and air flaps closed to prevent the entry of cold air. For counteracting a drop in temperature, the airheater valve can be opened and the circulation pump switched on. An optical or acoustical frost alert could be activated at the same time.

The selection of the appropriate option depends on the plant and environmental conditions. The thermostats can be reset automatically as a safety temperature monitor (STW) or manually as a safety temperature monitor (STB).

SAFETY TEMPERATURE MONITOR (STW)

If the temperature on the capillary drops below the selected setpoint, circuit 1-2*1 will be opened and circuit 1-4*2 closed due to a changeover contact. But if the temperature rises to 1.5K +/- 1K above the setpoint, the microswitch will be automatically reset to the initial position. If the measurement systems breaks, i.e. expansion liquid leaks, pressure will drop in the membrane. Therefore circuit 1-2 will be permanently open, circuit 1-4 will be closed.

SAFETY TEMPERATURE LIMITER (STB)

This type of thermostat is automatically latched upon a temperature drop and can only be manually reset when the temperature goes above setpoint. At a break of the measurement system the same actions as for the STW will occur.

CAPILLARY LENGTHS OVERVIEW

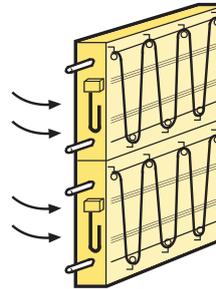
| capillary length | threshold length*3 | surface area*4 |
|------------------|--------------------|---|
| 3 m / 118 in | 150 mm / 5.9 in | ca. 0,13 m ² / 201.5 in ² |
| 6 m / 236 in | 300 mm / 11.8 in | ca. 0,27 m ² / 418.5 in ² |
| 12 m / 472 in | 400 mm / 15.75 | ca. 0,54 m ² / 837 in ² |

*3 length of the capillary where the temperature has to be below setpoint to effect the microswitch. The length does not have to be in a continuous length, it can also be separated on different areas of the whole capillary.

*4 approx. area, which can be monitored for rectangular air ducts at capillary distance of 50 mm

*1 contact 1-2: NC contact

*2 contact 1-4: NO contact



Cross-section:
Frost protection thermostat

DIFFERENT VERSIONS

To accommodate various market requirements, frost protection thermostats are available in several versions:

- "AT" (surface mounting thermostat) for wall- or pipe-mounting
- "DR" (DIN RAIL) for mounting on TH35 rails according to DIN EN 60715 (control cabinets)

If units with smaller dimensions are required, panel-mounting thermostats are also available (e.g. for limited space in refrigeration vehicles). The surface temperature does not always have to be monitored. For many applications it is necessary to monitor the temperature directly in a liquid medium. Therefore frost protection thermostats with 1.8 m. (6 ft.) capillary and cylindrical probe are available to be installed directly in a tank or container. So, the temperature of a point can be monitored.

CONCLUSION

Due to the wide range of versions, frost protection thermostats can be used for various applications. As safety components, these "little helpers" can prevent damage with less effort and minimize high costs and repair time.

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