WHITE PAPER

SENSE-WARE
THE FLAME DETECTOR COMPANY

Avoidance of water trapping in flame detectors

Abstract

Flame detectors are safety equipment. Downtime because of faults should be avoided. In outdoor applications regularly temperature differences occur. Flame detector housings may then suffer from damaged seals and moisture trapping, which could cause electronics faults. These faults may be avoided with help of mounting a pressure compensating element. In this document is explained how pressure compensating elements work and is discussed if they are indeed a solution to the water trapping problem.

Problem Statement

Pressure differences occur when a sealed housing is exposed to rapid, extreme or recurring changes in ambient temperature conditions. Changes in temperature, because of changing weather conditions can cause a pressure difference between the inside and the outside of a sealed housing.

A rapid decrease in temperature, for example, can create a vacuum inside the housing. If this pressure difference is not compensated, the vacuum causes stress on the housing seal. This may cause seals to fail, allowing moisture trapping inside the housing. This trapped moisture again, may cause faults in the electronics of a flame detector. This may also cause downtime, something, which should be avoided for safety equipment.

Background

In this section the working of pressure compensating elements and the importance of their use are discussed.

Synonyms

There are several synonyms for pressure compensating elements. The most common are: Breather, PCE, Protective Vent, Pressure Balance Element, Pressure Equalizing Element and Pressure Compensating Drainage Element.

Principle of operation

For a housing without pressure compensation, the interaction of temperatures with the influence of water and moisture may result in moisture being sucked into the housing through the seal. This may cause a seal to fail and that Ingress protection (IP) protection is no longer guaranteed. Pressure differences should be avoided and to prevent pressure differences, high humidity and condensation of water in the housing, constant balancing of pressure and exchange of air is needed.

There is a simple solution to this potential problem; pressure compensating elements prevent the formation of condensation in the housing and damage of the seal, by preventing differences in pressure (due to temperature differences). They therewith guarantee a trouble-free operation.

The pressure compensating element used in our flame detector housing is water-tight but air-transmitting, because of a hydrophobic- and air transmissive membrane. The fact that the membrane is air transmitting, means that a temperature difference between the interior and the outside of the housing does not result in a pressure difference and without a pressure difference over the seal, there is no air flow. The membrane is well-protected against puncture by for example screw drivers, used during commissioning of the flame detector.

References

1. Protective Vents - Pressure Video (2014) Gore®, https://youtu.be/x832kshrYio
2. https://www.gore.com/products/gore-protective-vents-for-lighting-housings
3. https://en.wikipedia.org/wiki/Hydrophobic_effect

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Features of the pressure compensating element:

- Dustproof and waterproof (Ingress Protection: IP66) maintained regardless temperature differences between of the air in the housing and the ambient temperature
- The pressure compensating element has a the simple structure is compact and can easily be mounted in our flame detector
- Pressure compensating elements permit compensation of pressure differences, arising from temperature changes, between the interior air and the surrounding air
- The pressure compensating element contains a hydrophobic- and air-transmissive membrane, to avoid that water molecules from the ambient can enter the housing
- The pre-assembled elements are due to their structure, insensitive to mechanical disturbances
- The pressure compensating element is designed in a way, that the hydrophobic foil is not reachable from outside with tools, like screwdrivers or wrenches
- No maintenance is required

Conclusion

Water trapping in a flame detector housing is a potential source of downtime and damage, because of faults in the electronics. These faults can be avoided with help of a pressure compensating element. Therefore Sense-WARE supplies its flame detectors including a pressure compensating element.