

Why Use Limit Devices in Temperature Control Applications?



Limit devices provide vital protection for temperature controlled process systems, ensuring product quality and the safety of both the workforce and the plant itself.

This paper takes a closer look at why limit devices are required, describes how they work and explains why they reduce risk, providing a useful summary to anyone who is considering specification of limit devices.

What Are The Dangers with Temperature Control Systems?

Failure to manage temperature can result in equipment damage and serious safety issues, such as fires caused by extreme temperatures that have not been identified and prevented by the system. Without the use of a limit device every temperature control application carries these risks and the greater the size of the application and its process substances/materials, the greater the risk.

Some industries and applications are strictly regulated to reduce such risk. For example, the operation of ovens and kilns in the USA is regulated by the NFPA (National Fire Protection Association). NFPA 86, the Standard for Ovens and Furnaces, was drawn up to minimize fire and explosion hazards in ovens and furnaces which are used for commercial and industrial processing of materials, and requires a limit device to be used.



Requirements made by NFPA 86 include the safe design, installation, operation, inspection, testing and maintenance of Class A, B, C, and D ovens, dryers, and furnaces, thermal oxidizers, and any other heated enclosure used for processing of materials and related equipment. Provisions are also provided for furnace heating systems, safety equipment and application, and fire protection.

How Does a Limit Device Work?

Limit devices are used in process control applications where independent limit switching for over or under temperature is required. Typical use occurs where there is a safety or quality requirement to protect a product or appliance from damage caused by excessive temperatures.

Limit devices have both a high and a low temperature cut off,

so if the pre-set temperature limit is exceeded then the system is swiftly shut down. Limit devices can typically be used with a thermocouple sensor or RTD (resistance temperature detector) and provide relay outputs for alarms. A limit controller is often used in conjunction with a loop control system, in which temperature measurements of the process material are used to dictate adjustments to the input temperature.

Why Do Limit Devices Reduce Risk?

One major reason why limit devices significantly improve safety is that if limits are exceeded supply to the system is switched to a failsafe mode. A fixed setpoint is programmed on the limit device; this means that as soon as the required temperature is reached a signal is sent to make the process safe, for example this may be isolating power to the heaters





or switch on forced cooling. Importantly, when a process value either exceeds or falls below a pre-set limit level, it has to be manually reset before the process can continue. The fact that manual resetting is required is a key factor in reducing risk as it encourages safe conditions to be manually checked before reset of the limit device can occur.

Typical Applications and Industry Standards for Limit Devices

As mentioned above, limit controllers are a powerful tool in many applications and standards such as NFPA 86 now specify the installation of these devices. Another organisation that has standardized the use of limit controllers is FM Global, a US mutual insurance company with offices worldwide that specializes in loss prevention services primarily to large corporations throughout the world.

FM Global's 3545 standard, "sets performance requirements for temperature limit and supervisory switches used as safety devices in industrial heating control systems. They are intended to operate electrical switching devices in order to initiate a safety shutdown or initiate an alarm under abnormal conditions. Process temperature controllers and/or recorders can also be approved if they are provided with limit and/or supervisory functions."

Similarly in Europe there is a European standard, EN14597, which applies to "electrical or non-electrical temperature control devices which are used to control temperatures within heat generating systems by controlling the supply of energy and to limiting devices which ensure that the temperature in heat generating systems will not exceed a predefined limit."



Summary

In protecting plant profitability and employee safety, together with raising overall performance by enabling businesses to meet new standards, limit devices should be considered an essential process tool for any temperature control application.

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