Installing Ex i apparatus in an Ex e enclosure

Increased Safety Ex e is a type of explosion protection for electrical equipment, in which additional measures are applied to give increased security against the possibility of excessive temperatures, and against the occurrence of arcs and sparks. It is a well established technique suitable for the protection of high voltage and current equipment located in Zones 1 or 2 and is frequently used for switchgear, electric motors and trace heating.

International increased safety standard EN 60079-7 defines the required additional measures which are basically, high quality, secure electrical engineering with defined segregations protected by a robust IP54 enclosure. The enclosure is required to comply with the thermal endurance and impact requirements defined by the IEC Explosive Atmosphere General Requirements, but it is not a requirement to prevent the ingress of a flammable atmosphere, or to contain or prevent an explosion propagating outside of the enclosure.

An Ex e enclosure housing high power electrical equipment is often a convenient place to locate intrinsically safe Ex i apparatus such as controllers and displays. The installation standard IEC 60079-14 defines the required segregations between Ex i apparatus mounted in an Ex e enclosure and the increased safety electrical apparatus. An external warning label on the Ex e enclosure, or an internal IP30 cover for the intrinsically safe apparatus carrying a warning label are also requirements. These warning labels are necessary because intrinsic safety apparatus may be safely maintained live, but except under special conditions in Zone 2, increased safety apparatus may not.

If the intrinsically safe apparatus requires a mounting or viewing aperture in the Ex e enclosure, such as a panel lamp, push button or a display, it is necessary to ensure that the integrity of the Ex e enclosure is maintained after installation of the panel mounting intrinsically safe apparatus. Therefore the intrinsically safe apparatus must also have increased safety Ex e certification, or the parts of the intrinsically safe apparatus on the outside of the Ex e enclosure must provide IP54 ingress protection after thermal endurance and impact testing. This additional protection should be validated by a statement on the intrinsic safety certificate confirming that when installed as recommended by the manufacturer in an Ex e enclosure, the apparatus will not invalidate the ingress protection of the increased safety Ex e enclosure. A non certified, or a conventional intrinsically safe device should therefore not be used for this application.

When designing a new hazardous area instrumentation system employing both intrinsic safety and increased safety protection, it is often convenient to house it in a proprietary enclosure or cubicle. Empty component certified Ex e enclosures are available from multiple manufacturers.

Apparatus with just a component certificate i.e. having a certificate with a “U” suffix should not be installed in a hazardous area without further certification. As explained in installation standard EN IEC 60079-14 ‘Electrical installation design, selection and installation of equipment, including initial inspection’, component certificates are intended as an aid to obtaining a Type Examination Certificate for an assembly of components referred to as an equipment.

A Component Certificate will usually contain a Schedule of Limitations specifying how to safely apply the component. For an empty enclosure this may permit a range of alternative contents, and / or specify the maximum power that may be dissipated within the enclosure and the resulting maximum outside surface temperature.

The technically correct way to obtain the required approval is to apply to a Notified or Approved Body for an assessment leading to the issue of a Type Examination Certificate based on the enclosures Component Certificate. Although often only a paperwork exercise, this can be a time consuming and expensive process, although some certification bodies have special facilities for assessing and certifying a single installation rapidly.

To help overcome this difficulty, some Ex e enclosure manufactures have Type Examination Certificates specifying their enclosure’s Component Certificate, plus a list of certified apparatus that may be safely installed inside the enclosure. Enclosure manufactures call these ‘Umbrella Certificates’, which they regularly update to include frequently installed items such as switches, panel lamps and digital displays. Within specified limits, they allow the construction of one-off Ex e cubicles and enclosures. When completed the enclosure should be fitted with a label showing the umbrella Type Examination Certificate number issued to the enclosure manufacturer specifying the certification code and the maximum service temperature.

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