Top 10 common mistakes when building a panel for Zone 2/22 Cat 3 (EPL Gc)
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### Background: Panels for Zone 2/22

One of the most popular methods of assembling an electrical control panel for use in a Zone 2 hazardous area is to make the control panel and its components “non-incendive” or “non-sparking”. The equipment, in normal operation, has no active ignition sources such as sparking electrical contacts or hot surfaces. The design requirements for this type of equipment are typically laid out in two European or International standards in the 60079 series:

EN / IEC 60079-0 – General Requirements and
EN / IEC 60079-15 – Type of protection “n”

There are other methods of protection for Zone 2, such as purge and pressurization type “pz” (EN / IEC 60079-2), restricted breathing enclosure “nR” (also covered by EN 60079-15) or any of the other Zone 1 types of protection. Non-sparking, Type “nA” is perhaps the most common, and is the subject of this article, which aims to guide the reader through the 10 most common pitfalls or mistakes encountered when equipment is assembled.

### What does the legislation say?

Equipment for use in Explosive Atmospheres in Europe must comply with the requirements of the ATEX Directive 94/9/EC. Manufacturers of electrical equipment intended for use in Zone 2/22 (ATEX Category 3) do not need to undertake the EC Type-examination certification route that is required for equipment for Category 1 & 2 electrical equipment and therefore do not need to use a notified body. Instead, compliance is achieved by “self-declaring” that the equipment is compliant with the Essential Health and Safety Requirements of the ATEX Directive, and then controlling production under “Internal Control of Production” as described under Annex VIII of the Directive.

Note: Non-electrical equipment rules are slightly different and do not form part of this white paper.

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### Zones

IEC 60079-14 identifies the Zones:

**Zone 0**
Place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently.

**Zone 1**
Place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.

**Zone 2**
Place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

**Zone 20**
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.

**Zone 21**
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur, occasionally, in normal operation.

**Zone 22**
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
IECEx

Under the IECEx Certified Equipment Scheme, equipment is subjected to independent testing and assessment by Test Laboratories and Certification Bodies recognized by the IECEx scheme and its management committee. All equipment certified under the IECEx scheme is subjected to independent testing and assessment. There is no self-declaration as exists under ATEX, regardless of the intended zone of use. Under IECEx, manufacturing must be controlled under a quality management system that has been audited to the IECEx scheme requirements and the manufacturer must hold a Quality Assessment Report issued by an IECEx Certification Body or unit verification.

Within Europe, many manufacturers prefer to obtain some form of third party testing and assessment of their product, and many of the testing and certification bodies (who may also be Notified Bodies!) issue what are commonly termed “Type Examination Certificates”. This can be a rather confusing situation, but has come about because the directive prohibits notified bodies from issuing EC Type Examination certificates for electrical equipment (or non-electrical equipment) for category 3. There are some exceptions, where equipment has parts used in several different zones, and for Unit Verifications, but in general, third party certification of category 3 equipment has evolved into the “Type Examination”, although it is stressed that adopting such an assessment route is purely voluntary by the manufacture.

Top 10 Common Mistakes

1) “Making the equipment ‘ATEX compliant’ requires buying ATEX components, surely?”

There are many aspects to specifying a panel for a hazardous location that can be easily overlooked. Before starting the design and specifying the components to be used, make sure you know the specifics of the hazardous area where the panel will be eventually located.

Some vital questions to answer before starting include:

a) What is the hazard and is there anything else that could affect the local conditions?

b) Aside from the explosion hazard, what other hazards or aggressive substances might exist in the installation? Aggressively corrosive chemicals or contamination from dust and dirt may affect how the explosion protection measures employed perform over time. It is a requirement of the
ATEX directive that such considerations are taken into account in the design of equipment for its adequate performance throughout its anticipated lifetime.

c) What is the Gas Group or Dust Group? Equipment protected for dust explosion hazards may not be suitable for gas explosion hazards, make sure the components meet or exceed the minimum requirements of the installation site.

d) What is the ambient temperature range? Make sure that the ambient temperature range of the installation site is known so that it can be certain that the selected components are used within their certified range, and take into account the effect of local heat generation. (Internal temperature rise see point 4)

e) What certification scheme will be acceptable for the end user? Not all end users will be happy with self-declaration, despite the fact that it is permitted under the ATEX directive.

2) “I thought I could put a panel together just by gathering together parts that are certified. Do I need to read the standards?”

Considering the somewhat obscure nature of many of the requirements of 60079 series of standards, and the expense of buying them in the first place, it is not surprising that many manufacturers try to make their way through the minefield of making equipment for use in explosive atmospheres without a thorough understanding of the standards’ requirements and those of the ATEX directive itself. There is really no substitute for a thorough understanding, and indeed not being fully aware of the requirements can lead to the manufacture of equipment that is potentially dangerous, and the possible loss of life and property should there be a catastrophic failure when the equipment is installed.

The standards themselves are not free. However, there is much valuable guidance information freely available directly from the EU website, including the ATEX Directive, a comprehensive guidance document, other guides on CE Marking in general, and the text and guides for any other Directives, such as EMC and R&TTE that may be applicable.

Bear in mind also, that although the Low Voltage Directive specifically excludes equipment used in Explosive Atmospheres, the manufacturer must still, as a requirement of the ATEX directive, manufacture equipment that is electrically safe, and should follow whatever electrical safety standard is applicable to their equipment, if it were to be used in a non-hazardous area.
3) “I’ve used an enclosure that states it is IP rated. Isn’t this enough?”

Many standard industrial IP rated enclosures are available on the market. When it comes to enclosures for equipment in hazardous areas, there are several other requirements the panel builder must be aware of, as detailed in the General Requirements 60079-0:

The enclosure must meet some minimum strength requirements for impact.

Non-metallic parts such as plastics used in the enclosure, viewing windows, or elastomeric materials used in seals and gaskets, must stand up to accelerated aging tests against heat, humidity, cold and UV radiation.

The IP rating must be valid after the aging tests and impact tests have been performed, and where an enclosure must be dust tight, the dust ingress tests are performed with the enclosure under slight vacuum.

A standard “IP Rated” enclosure might not meet all these requirements.

So, it is highly recommended that the panel builder choose an enclosure that has already been tested and certified as meeting the enclosure requirements of the General Requirements standard (60079-0). A way of achieving this would be to use an enclosure that has been component certified under the “Increased Safety” standard, EN 60079-7. Although this is a standard used for Category 2 applications (Zone 1), the enclosure will meet the minimum requirements for strength and IP rating. IP54 is needed as a minimum for both Ex e and Ex nA enclosures containing bare live parts, although, the enclosure should also be fit for its intended use, and may require a higher IP rating, such as IP 56 or IP 65, depending on the application. Of course, there are enclosures on the market that are self-declared by their manufacturer as meeting the requirements for Category 3, and these would also be potentially suitable (but see point 9 below).

4) “All my equipment is rated for the maximum ambient temperature”

Understanding the temperatures that equipment can be used in is one of the most confusing topics for any one assembling several different certified parts. A piece of equipment certified for use in a hazardous area will have a range of temperatures specified through which it is safe for use, with a default range of -20°C to +40°C being applied where no other range is specified. Confusion arises when a piece of equipment is installed within an enclosure, and therefore operated in a local ambient temperature that will be above the ambient temperature outside the enclosure, caused by the self-heating of the internal components.
Such a temperature rise is difficult to calculate and is typically determined by test, with the enclosure operated at full rated load (between 90% and 110% of the rated voltage of the electrical equipment that gives the maximum surface temperature). A correction is made linearly for the difference between the ambient temperature during test and the required maximum.

As an example, if the equipment installed within a panel has a maximum ambient temperature limit of +60°C, and the temperature rise inside the enclosure is 10°C, the maximum ambient temperature outside the enclosure must not exceed 50°C for the certification of the internal components to remain valid.

Some tricks can be employed to help manage the situation where some components have a lower ambient limit than others. Since heat rises, it is typically hotter at the top of an enclosure than at the bottom, so items with a lower ambient range could be placed at the bottom of the enclosure.

5) “I didn’t check all the conditions of use for the components”

Very often, some conditions of use will be noted in the documentation of parts used within the panel. It is vital that all of these conditions are understood and any measures that they require must be implemented. One common requirement is the provision of the suppression of over-voltage transients on the supply connections of equipment. This can be achieved by the use of dedicated transient voltage suppressors or by the use of an approver power supply unit to supply the power to the internal components.

Make sure that all the conditions of use (indicated by an X on the certificate number) are checked and do not preclude the use of the item you are intending to use.

6) “I’ve used some American equipment that is certified for Class I Division 2, isn’t that OK?”

Simply put NO. While equipment used in hazardous locations in different parts of the world will have been designed to prevent explosions in the hazardous area, the standards used may vary in the detail of their requirements, and so caution must be exercised when using parts certified to standards other than the EN or IEC 60079 series. The requirements for impact resistance, ingress protection and the like may be very different or may not even be specified for equipment certified to standards used in other countries.
7) “Some of the certificates for components are to old standards, is that OK?”

In Europe, as part of the general CE marking requirements, a manufacturer must provide their equipment with an EC Declaration of Conformity. This document (which is prepared by the manufacturer under his own responsibility) details the directives that the equipment complies with, together with the standards used to justify that compliance. These standards must always be those that were harmonised at the time the equipment was put onto the market. The manufacturer may declare compliance with a later version of the standard (say EN 60079-0:2012) than the version that is listed on his EC Type or Type examination certificate (which may list EN 50014:1998) provided they have done their own documented analysis of any changes to the standard affecting their product and is satisfied that the product is compliant with the new version. So, any piece of equipment currently on the market and marked as complying with the ATEX directive, should be compliant with the latest standards and therefore it should be acceptable to use. But, it is worth querying with the manufacturer whether his component is built to the latest standards, should there be any doubt, or in the situation where the part being used was manufactured before what is now the latest version of the standard came into force.

The standards for old Type N equipment, pre-dating the ATEX directive, and the dedicated Type “n” standard EN 50021 have several less severe requirements than are required now, and so any equipment found on the market to these out-dated standards will almost certainly not be acceptable for use in a new installation.

8) “Can I use IECEx certified parts in a panel self-declared under ATEX?”

Generally, the answer should be “yes”, provided that the standards listed on the IECEx Certificate of Conformity are of the same edition as their corresponding European version. Unlike ATEX, there is no requirement for manufacturers to keep their products compliant to the latest standards under the IECEx Scheme when the standards are updated, so careful examination of the certificate is needed.

Note: Always cross check with national Essential Health & Safety Requirements

9) “Can I use ATEX Category 3 parts in an IECEx Certified Panel?”

The answer is almost certainly “no”. All equipment certified under IECEx requires testing and assessment by testing and certification bodies recognized by the scheme, together with manufacturing controlled by an audited quality management system. These are not mandatory for ATEX Category 3 equipment, and therefore the strict controls required by IECEx cannot be guaranteed to be met.
for equipment that is self-declared, or even equipment that has been independently tested and certified, but is not manufactured under the required audited quality management system.

10) “I want 3rd party certification but the test house wants to test everything!”

Testing and certification companies that are accredited, for example, in the way that Intertek in the UK is accredited by UKAS, the United Kingdom Accreditation Service, must maintain a high level of diligence in ensuring that the products that they test and certify meet the requirements that they are certified to. For equipment that is also certified by other accredited test houses and laboratories, such diligence is relatively easy to prove.

However, where a piece of equipment is to be used where its manufacturer has (and quite rightly, as permitted by the directive) self-declared compliance, the test house will not have the required level of proof of compliance, and therefore may choose to perform some additional tests themselves, or may veto the use of that particular component altogether. The diagram below highlights the conformity assessment types you will encounter.
How Intertek can help

Our Credentials
Intertek has one of the largest and most experienced hazardous location teams available at multiple locations world-wide. Our expertise is backed by a number of accreditations and recognitions including:

- OSHA recognized Nationally Recognized Testing Laboratory (NRTL) for Hazardous Location Divisional Listing
- Standards Council of Canada accredited Certification Body (CB) and Testing Organization (TO)
- United States Coast Guard recognised test lab
- Notified Body and UKAS Accredited for the ATEX Directive, 94/9/EC.
- IECEx Certification Body (CB) and Test Laboratory (TL)
- Full HazLoc Training including an Accredited CompEx Training Centre
- Site Safety Services (Risk Assessment, Area Classification and Inspection)
- Specialist in Oil Tools, Rigs and Skids.

Certification
We certify products for compliance to National and International published standards which satisfy the applicable requirements of the National Electrical Code (NEC) in the U.S., the Canadian Electrical Code (CEC) in Canada, IECEx and the European Union’s ATEX Directive. Some of the standards we test to include those of ANSI, UL, IEC, CSA, MIL Specs, FM, and CENELEC and CEN.

Design Reviews
Intertek offers free 2 hour design reviews from both our Leatherhead and Chester offices. We can also do this via telephone conference or Skype/WebEx meetings.

For full design reviews or meeting at clients premises, please speak to your account representative.

Intertek offers a ‘Review and Lodge’ service of technical files. This includes providing a GAP analysis report against the technical file and issuing a Certificate of Assessment and Lodging acknowledgment letter.
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Training

Intertek is an ATEX Notified Body, DSEAR/ ATEX implementation specialist with dedicated Hazardous Locations Training Centres. We have dedicated CompEx licensed facilities in the UK (Chester & Grangemouth) as well as the capabilities to offer training and competency assessment globally on client sites. We offer both open and bespoke training, and through our unique systems can ‘tie in’ with a company’s management systems to ensure that all staff are verified and attributed as competent and ‘remain’ competent through regular updates and refresher training.

Mobile CompEx

Designed for use outside of the United Kingdom, Intertek is the first CompEx centre to offer the scheme to a global market through their mobile CompEx Assessment Rigs. Based closely on our principal centres in the UK our mobile rigs are transported via bespoke “flight” cases and assembled at a suitable location on or near your site. For more information on Intertek’s training services for hazardous location staff, or to begin your project right away,

Call: +44 (0)1244 882590
Email: training.uk@intertek.com
or visit: www.intertek.com/hazloc

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