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Understanding ‘U’ and ‘X’ Certification and why it is important for end users and panel builders in compliance with EN & IEC 60079 standards – Bob Johnson – President Source IEx

One of the biggest issues that we get asked here on almost a daily basis is the topic of ‘X’ and ‘U’ certified equipment being sold and used by US companies who are supplying Ex equipment for international projects in what does it mean, how does it affect me and my scope of supply and why is this an issue that I need to be aware of.

First off let’s review the definition of **equipment** per 60079-0 General Requirements:

3.25 equipment (for explosive atmospheres)

general term including apparatus, fittings, devices, components, and the like used as a part of, or in connection with, an electrical installation in an explosive atmosphere

3.8.2 Equipment Certificate

A certificate prepared for equipment other than an Ex Component. Such equipment may include Ex components, but additional evaluation is always required as part of their incorporation into equipment.

3.53 symbol “X”

symbol used to denote specific conditions of use

NOTE The symbol “X” is used to provide a means of identifying that essential information for the installation, use, and maintenance of the equipment is contained within the certificate.

Now the definition of **component** per 60079-0 General Requirements:

3.28 Ex Component

part of electrical equipment or a module, marked with the symbol “U”, which is not intended to be used alone and requires additional consideration when incorporated into electrical equipment or systems for use in explosive atmospheres

3.8.1 Ex Component Certificate

A certificate prepared for an Ex Component.

3.52 symbol “U”

symbol used to denote an Ex Component

NOTE The symbol “U” is used to identify that the equipment is incomplete and is not suitable for installation without further evaluation.

So, let's take a look at a real world application involving an Ex 'd' flameproof enclosure as an example:

An Ex-"d" empty enclosure was certified as category 2 (Zone 1) piece of equipment under the ATEX Directive (or certified Zone 1 Gb under the IECEx certification) with a "special condition of use", describing how to drill the holes for cable entry devices by a European Notified Body or IECEx Certifying Body. During the EC type examination (or IECEx Test Report) the manufacturer showed the Notified Body an assembled enclosure. But the manufacturer sold the enclosures without assembling them with the holes already drilled.

Problem 1:

This product is a component because part of the production process of assembling has to be covered by the quality assessment of the manufacturer and must not be part of the installation. If the manufacturer allows machining works (e.g. drilling holes) done by the user, he is nevertheless responsible for the final product. Normally this machining work is part of the quality assessment done by a Notified Body or Ex Certifying Body. In case of drilling holes into an Ex 'd' Enclosure this assessment for the machining work would be necessary but is not done by the user.

Solution: Do not drill and tap entries in the field once it leaves the factory. Obviously, this scenario is always preferred and in most cases, the manufacturers will always insist on supplying a product with entries as specified.

Problem 2:

Once the enclosure has arrived and additional entries are required. How can I address this?

Solution: Not necessarily an easy solution. Generally, the enclosure would have to be returned to the manufacturer to allow them to modify the enclosure with additional entries which entails time and money. In some cases, manufacturers have associated quality assessed modification centers that can in fact follow the manufacturer's guidelines and quality modules and do the proper modifications at a local site. However, just having a 'panel shop' drill and tap entries is not acceptable. Alternatively, before purchasing an Ex d enclosure, have additional entries drilled and tapped and plugged with an acceptable, certified Ex d plug to allow additional modifications in the field as required.

Problem 3:

The manufacturer has supplied an Ex 'd' enclosure with all of the entries properly drilled and tapped but it has no internal components inside and only has a 'U' certificate. Per 60079-14 the following passage is relevant:

14.1 General

Only Ex "d" equipment having a complete certificate shall be installed.

Ex “d” enclosures and components having only a component certificate, i.e. marked with a “U”, shall not be installed in the hazardous area unless as part of an assembly of components (now being referred to as equipment), when the components in the equipment are permitted by a full Ex certificate which may contain an “X” and the equipment label carries full Ex marking including temperature class.

So now we see that under the installation requirements under 60079-14 that Ex d enclosures (and other Ex protection concepts such as Ex ‘e’, Ex ‘p’, Ex ‘nR’, etc.) before being installed must have a complete (assembly) certificate to be installed.

The issue is twofold with regards to empty Ex ‘d’ enclosures being populated with internal components and supplied as an assembly. First, part of the testing of Ex ‘d’ enclosures under 60079-1 is the concept of flame transmission and pressure tests. By placing components in a certain location inside the enclosure or by placing less or more than what is allowed under the testing that was done by the NB or Ex test lab, it can change the explosive pressure profile inside the enclosure. Secondly, the addition of heat producing components inside of an Ex d enclosure will determine the temperature identification code (T-code) of the overall enclosure which is unknown by either the manufacturer or the testing authority.

Solution: Again, not an easy fix once the enclosure is out of the hands of the manufacturer. Some manufacturers have agreements in place with either third parties to assemble and have undergone quality audits as per the manufacture in question and have typically been also been vetted by a third party as part of the quality process. In this case, the third party would assemble the components, do a temperature rise calculation and supply this information back to the manufacturer for verification and approval and an assembly label provided.

So this begs the question... Why then do manufactures of Ex ‘d’ enclosures even promote and sell their products with only a ‘U’ certificate if they know it will not be possible to install it unless it has an assembly certificate? In some cases, they are providing an empty enclosure to a secondary manufacturer who will install other components inside the enclosure, have it third party tested, and affix their own certification label to the product. In other cases, they may be supplying to a third party who is authorized to do assembly work on empty ‘U’ component enclosures as noted previously. And in some cases, the manufacturer or their representatives do not fully understand that in many cases, the client is not aware of the requirements of 60079-14 and make the assumption that their client will in turn have their enclosure certified by another third party at a later date after additional modifications are done to the enclosure.

Problem 4:

An Ex ‘e’ enclosure has been supplied complete with Ex ‘e’ U’ component certified terminals and the certificate has an ‘X’ certificate.

Solution: This is not a problem. Remember that an ‘X’ designation denotes a condition for safe use of the product in question. This information is always located within the certificate of the product and will give specific instruction on the safe use of the product in question. For example, in the case of the enclosure referenced above, the enclosure may be manufactured out of glass reinforced polyester material in which the condition for safe use may be to

periodically wipe down the enclosure with a damp cloth in order to remove a buildup of dust that could create a static hazard.

Why then do manufacturers of Ex 'd' enclosures even sell their products with only a 'U' certificate if they know it will not be possible to install it unless it has an assembly certificate?

So to summarize some key points here:

- 'U' certified products are components and not assemblies. Per 60079-14, equipment that is considered to be an assembly must have an assembly certification and cannot be put into use as a component certified piece of equipment without further evaluation/testing.
- 'X' certified products have a condition for safe use. These can be used safely in hazardous locations but the specific conditions must be followed in order to be safely used.

Hopefully, this information is useful and certainly important to remember when specifying and using Ex equipment.