THE ROAD TO COMMON ASSESSMENT METHODS
FOR DISTRIBUTION NETWORK EQUIPMENT

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ABSTRACT
When utilities resort to external service providers for conformity assessment of distribution electrical network equipment, most of their needs are basically the same, but have been shaped into requirements by various historic and organisational reasons. Whilst the underlying conformity assessment needs are similar, the form of the corresponding requirements may differ.

This paper aims to assert the basic needs of users with a uniform vocabulary in order to encourage establishment and acceptance of harmonised assessment schemes, and should reduce costs and delays for both manufacturers and users. Harmonisation should help users share information and improve assessment methods. A good example for further development of these proposals is the assessment of Ring Main Units (RMUs).

INTRODUCTION
According to IEC 17000, conformity assessment* is “the demonstration that specified requirements relating to a product […] are fulfilled”. There are many ways to achieve this, but some are more credible than others. This is why customers tend to express their preferences by means of specific requirements regarding conformity assessment.

It is important to avoid confusing technical requirements (concerning the product itself, as stated in the specification) with requirements regarding conformity assessment (conditions on which a proof of conformity may be accepted by the customer).

This paper deals with harmonisation of users’ requirements regarding conformity assessment, that should encourage stakeholders (manufacturers, laboratories, certification bodies, and so on) to apply the same methods (e.g. accreditation), and would open the way for improving the overall efficiency of assessment schemes.

Furthermore, the main technical characteristics required for distribution equipment are often similar for many utilities, so that manufacturers tend to make equipment which covers a range of specifications (e.g. medium voltage RMUs).

If the approach each utility takes to check conformity were similar, synergies could be reached, ultimately with one utility assessment of conformity being sufficient to allow another utility to purchase the same product with minimal additional testing and verification.

The authors** of this paper set out to:
- Assert the basic common needs of the utilities;
- Encourage uniform vocabulary to express these needs;
- Encourage the establishment and acceptance of harmonised assessment schemes that facilitate sharing of conformity information between users, and reduce cost and time devoted to conformity assessment.

*Underlined words refer to standardised definitions, which may cause confusion.

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VARIOUS ASSESSMENT SCHEMES

The four Components of Conformity Assessment
One should keep in mind that conformity assessment (CA) is made of four distinct components (see IEC Guide 67):
CA = Selection + Determination + Review + Attestation

This paper is not the right place to explore each component in detail, but it should be made clear that:
- Testing (that is one means for determination) is not a conformity assessment on its own;
- Making selection of objects to be tested and of tests to be carried out, is an important part of assessment;
- Review of the whole bunch of test results (including close examination of the validity of test conditions) is the key step of assessment (since test results are almost never “black or white”);
- The word attestation is due to a precise definition (IEC 17000): it is the “issue of a statement, based on a decision following review, that fulfilment of specified requirements has been demonstrated”. An attestation is called a declaration when issued by a manufacturer, and a certification when issued by a third party. No special term exists for second-party attestation;
- What comes out of conformity assessment is a decision about conformity of a product.
The many ways to implement assessment

In practice, there are several ways to implement conformity assessment which are called schemes. A conformity assessment scheme is a set of “rules, procedures and management for [assessing products] to which the same specified requirements […] apply” (see 2.7 and 2.8 of IEC 17000). Several schemes may exist for a given kind of product such as distribution electrical equipment. The differences lie in the:
- Way to involve various stakeholders;
- Scope covered by the scheme;
- Internal rules and scheme procedures.

The Three Different Categories of Assessment

It is useful to classify the various assessment schemes into a limited number of categories. Since the most important criteria is the responsibility of the final conformity decision, we stick to IEC categories, based on the kind of body that is responsible for this final decision:
- The provider of the product that issues a supplier’s declaration of conformity (see IEC 17050);
- The user of the product. Since no special standardised wording exists: users refer to various terms such as “notice, acceptance, qualification, authorisation, ability…”. Some also refer to the word “certificate”, but this is unfortunate because words based on the terms declaration and certification should be restricted to the cases above and below respectively. There should be a standard term used when a conformity decision has been taken by the user;
- A third party that may be a product certification body operating according to IEC Guide 65 = EN 45011.

These categories do not take into account the place where tests are performed (manufacturers laboratories, independent test houses…). They only refer to the final assessor, assuming tests are performed under its responsibility (either by its own laboratory, or by a subcontractor laboratory). The above emphasises the attestation step of the assessment process. It contrasts with the habit of focussing attention on testing (that is the determination step) and underestimating the largest part of responsibility that lies in the other steps of assessment (selection, review and decision).

Let’s compare two examples:

- Case #1: a user makes a conformity decision, based on a test report issued by a third-party laboratory at the request of the manufacturer.
  - The test report covers only one of four steps from the assessment process. Selection is carried out by the manufacturer before placing the order for testing. The review and decision steps are carried out by the user (including review of the testing conditions, that can be ambiguous, as the user may not have witnessed the tests).
  - From a procurement process, this comes within the scope of second-party assessment, and the user bears the largest part of responsibility.

- Case #2: the manufacturer issues a supplier’s declaration of conformity, based on a test report issued either by a third party laboratory at the request of the manufacturer, or by the manufacturer’s laboratory.
  - It is clear that the manufacturer is responsible for the four steps of the assessment process (wherever tests may have been performed, since they have been carried out under its responsibility anyway). From the user’s point of view, the assessment is fully outsourced.

In the chapters below, this paper will keep the point of view of the final user, and it will focus on the requirements that applies in the cases of first-party (supplier) and third-party assessments. Other situations exist, but this paper does not deal with them.

Initial Assessment and Continual Assessment

The purpose of initial assessment is to prove product design compliance with specified requirements. On this occasion, tests are carried out on “one or more items representative of production” and are called type tests (IEV 151-16-16). After which, the purpose of continual assessment is to make sure that the manufacture of mass-produced items, preserves the characteristics of the original design. From a user’s point of view, both initial and continual assessments are complementary. Optimisation of the overall assessment schemes is achieved by means of balancing efforts between these two forms of assessment. Neglecting one of them in favour of the other, should be a mistake.

Continual assessment, that is the “systematic iteration of conformity assessment activities as a basis for maintaining the validity of the statement of conformity”, is called surveillance according to ISO/IEC 17000. Surveillance may include activities such as testing, auditing and monitoring of operational failure rates of the network (both means for the determination):
- When testing is “made on each individual item during or after manufacture”, it is called routine test (IEV 151-16-17).
  - When it is carried out on “one or more sample items [selected on a random basis] intended to provide information on the [whole] population” of manufactured items, it is called sampling tests (IEV 151-16-20). In some cases, sampling tests are the repetition of a selection of the most pertinent type tests. Since conformity assessment is at stake, the sample is normally taken from the factory and not from the network, in order to avoid influence of wear;
- Auditing of the manufacturing quality procedure is intended to gain reassurance that relevant measures are taken to keep the manufactured item in line with the initial design.
  - From a user’s point of view, routine tests, sampling tests, and factory audits, are complementary. The overall efficiency of surveillance, rests on the optimised combination of the three of them.
From a user’s point of view, continual assessment is extremely important, since it deals with conformity of actually delivered items. Drives for cost reduction cause manufacturers to reduce margins in designing components: endurance tests carried out on prototypes may show good results whilst the normal production may show failures in a short or long term. Utilities almost always operate surveillance on their own which allows them to take advantage of their operating feedback to help focus factory audits and sampling tests.

USER NEEDS FOR EXTERNAL ASSESSMENTS

Facing the many ways to implement an assessment scheme, each user tends to specify its own requirements according to its own situation. Such variations in conformity assessment requirements, may well be justified, and this paper does not stipulate that all utilities should have the same requirements. Conformity assessment is related to the management of the risk of purchasing products that do not fully comply with the technical specification. Risk management depends on:
- The impact of the failure that may result from a non-conformity;
- How the user estimates the risk, taking into account knowledge of the market (suppliers, testing laboratories, etc…) and other possible means to temper that risk (insurance, increased warranty period, liability contracting based on operational failure rates, etc…).

However, there are also situations where discrepancies arise due to non consistent vocabulary, lack of information, or historic reasons, whilst the underlying needs remain the same. Especially when utilities decide it is appropriate to delegate responsibility of the conformity assessment to an external body (having the whole process done by this body, either first or third-party), we believe that most of their needs are the same. It is the purpose of this chapter to start from these fundamental needs, and propose for each one what we feel to be the best solution.

Amongst the several solutions to satisfy conformity assessment, we believe the best method is that which can satisfy the largest number of users simultaneously. For this reason, the solution we propose are based on IEC standards and/or international recognition. There is opportunity to improve harmonisation of assessment schemes.

As a result, we recommend to refer to supplier’s declaration of conformity (IEC 17050) when assessment is entrusted to the first party, and to resort to certification bodies (IEC Guide 65 = EN 45011), when it is entrusted to a third party.

THIRD-PARTY ASSESSMENT

Fundamental needs of the users regarding third party assessment are competence, impartiality, flexibility, harmonisation, transparency and control. Confidence will result from the addition of all these features.

Competence

Competence must be demonstrated simultaneously for the given product, specification, technical feature, related tests. Accreditation is a recognition of competence. It is recommended to request for accreditation of the laboratory (according ISO/IEC 17025) and accreditation of the certification body (according to IEC Guide 65 = EN 45011). Moreover, it is important to check that the accreditation scope covers the assessed product and that the issued documents (test reports and conformity certificates) bear the logo of the accreditation body (which is the only way to make sure that the provided service has been carried out according to accredited procedures).

When choosing a certification body, preference should be given to those bodies which operate laboratories integrated to their structure, and/or base their competence on personnel having actual current testing experience. Working with laboratories is a powerful means to keep competence up to date.

An additional way to have competence recognised is a Mutual Recognition Agreement and peer assessment (see harmonisation below).

Impartiality

Complying with ISO/IEC Guide =EN 45011 is a guaranty of impartiality. According to 45011, a certification body shall “have a documented structure which […] shall enable the participation of all parties significantly concerned in the development of policies and principles regarding the content and functioning of the certification system”. A certification body whose structure is made of representatives of each party is a good way to have the three parties involved and be equally influential. It is better if representatives of the three parties are involved at all the levels of the structure, from management level to operating level.

Flexibility

Flexibility means that the certification scheme must fit the specific needs of this market segment we are dealing with. Some of these needs may be fulfilled by means of structural arrangements including the:
- Restriction in the scope of certification to the type of product (not including surveillance process);
- Restriction in the scope of certification to a part of the specification (not necessarily including all tests), as far as specifications remain consistent. On that purpose, certification bodies should refer to harmonised technical rules regarding indivisible groups of tests;
- Taking into account results of tests carried out in the manufacturer’s lab. This can be solved by means of Witnessed or Supervised Manufacturer’s Testing schemes based on IECEE concepts as described in OD-CD2029 and 2030.
Other specific needs are related to the competence resources that are available within the body are the ability to:
- Cope with a possible failure of the product under test (through analysis of the consequences of the failure correction on the other characteristics of the product cause of the failure, and choice of tests to be repeated, not requesting for complete repetition if not necessary from a technical point of view);
- Certify a range of products, not repeating all the tests on all the versions if not necessary;
- Update a certificate following a change in product design or manufacturing, or after a certain time span (for instance 5 years) to cover all minor changes that may have occurred to the product over this period.

**Harmonisation**

Certification schemes of the different certification bodies should be harmonised (at least within the European market) so that a user can rely, without any doubt, on any certificate either coming from its own country, or another. Peer assessment and Mutual Recognition Agreement (MRA) are powerful drivers towards harmonisation. Attention should be paid that a MRA, if any, is based on actual technical cooperation and not only on formal procedures.

**Transparency**

Procedures that are applied by the certification body must be clearly explained somewhere: either on the web site of the body, or by means of a mutual recognition agreement between several bodies placing common procedures on a web site following the same format, for example.

In the case of a manufacturer’s testing scheme, it should clear whether tests are witnessed (WMT according to IECCE OD-CD2029) or supervised (SMT according to IECCE OD-CD2030). If SMT is applied, some of the manufacturer’s tests are witnessed by the certification body, and others are not. Minimum requirements for implementation of supervision should be published and something like a witnessing rate for instance could help users to be confident.

As far as witnessing of manufacturer’s tests is implemented, information about the minimum criteria (regarding independence, competence, technical background…) for the qualification of Testing Observers should be available (including their curriculum vitae for instance).

**Control**

The certification body has to be controlled, not only by an accreditation body (that is once a year), but also by peer bodies (within the frame of a Mutual Recognition Agreement), and by users themselves (thanks to a structure integrating representatives of each parties at each level of operation of the body).

**FIRST-PARTY (SUPPLIER) ASSESSMENT**

Except for impartiality (that may not be requested from the first party), expected features remain the same: competence, flexibility, harmonisation, transparency and control.

Competence will depend on the accreditation of testing laboratories only, since IEC 17050 is not a standard reference for accreditation. Flexibility is obviously easier to achieve when no third party is involved. Conversely, excessive flexibility should not impair transparency or harmonisation. For instance, it should be clear whether old tests reports are accepted or not, and if yes, up to what age?

Transparency may be achieved by means of supporting documentation (see IEC 17050-2) provided with the supplier’s declaration. But the scope of IEC 17050-2 is so broad that it deserves additional requirements, built around the specific purpose of network equipment. Some users already request tests reports be appended to the declaration, as well as a kind of check list to make sure that all important points have been reviewed.

Harmonisation of users’ requirements about supporting documentation should help suppliers who have to establish documentation for several users. Supporting documentation is also useful for control purposes since it can be checked afterwards by the user on a random basis within the frame of a surveillance scheme.

**PROSPECTS**

The advantages in harmonisation of assessment requirements are twofold: sharing of information between users, and improvement of assessment methods.

Using common concepts and vocabulary to state requirements, and resorting to the same kind of external bodies that operate mutually recognised assessment schemes, are big steps towards one user relying on the qualifications of another. It is obvious that mutual recognition of product qualifications among users is only possible if technical specifications are similar. But some parts of an assessment may be shared, even if differences exist between two product specifications: core designs of products are often the same, most specifications refer to the same IEC tests, results of a factory audit are not dependant on a specific product, and even results of sampling tests may provide information about the manufacturer’s ability to keep manufacturing process under control whatever the specific product may be.

A RMU is a good example of a standard product to start thinking about common assessment among users.

Moreover, even if few tests have to be repeated in some cases, having the same assessment requirements (regarding accreditation or supporting documentation, for instance), is a strong factor in favour of an overall improvement of assessment schemes.