

INTERNATIONAL IECEx CERTIFICATION SCHEME

'IECEX 2007 Update of New Initiatives and Compliance Tools for the Oil and Gas Industry'

Lead Author

Mr. Chris Agius – Secretary IECEx
IECEX Secretariat Office,
286 Sussex Street, Sydney,
NSW Australia www.iecex.com

Co-author

Dr Uwe Klausmeyer – IECEx Chairman
PTB
Braunschweig
Germany

Abstract - This paper provides a brief update of changes and new initiatives within the International IECEx Certification Scheme, especially in relation to extension of the IECEx certification activities beyond Ex products and into the area of Ex related services. Changes and new initiatives in response to industry needs as such IECEx is rapidly being regarded as an essential Compliance tool for the International Ex industries.

This paper will also see how IECEx is continuing along its path working towards its Vision to be

"The Global Centre of Excellence in the Ex field"

Index Terms

IEC – International Electrotechnical Commission

IECEX – Conformity Assessment Scheme of the IEC for Certification to Standards relating to equipment for use in explosive atmospheres

ISO/IEC – Joint publications of the International Organisation for Standardisation (ISO) and IEC

QMS – Quality Management System

I. INTRODUCTION

It has long been accepted that to ensure safety in "Hazardous Areas" (areas where a concentration of gases/vapors or mists and or combustible dust exist in quantities that may create an explosive mixture with air) the following broad areas must be properly addressed.

- a) Area classification
- b) Equipment Selection
- c) Equipment installation
- d) Maintenance, repair and overhaul of Equipment

Each of the above 4 items must be addressed separately. Decisions taken on each of these stages should be recorded and documented to provide a "rationale" to decisions taken as well as acting as a reference for any future changes in installation design or changes to the processes themselves.

While it is very easy to demonstrate the importance and criticality of the four areas a) to d) the past has seen more attention given to b) *Equipment Selection* and less to the others. As Ex installations become larger, more complex and greater in number, industries have been paying greater attention to details surrounding items a), c) and d) than they did in the past.

The differing national and regional approaches to both Ex Design and Test Standards and Ex equipment compliance testing and verification caused problems for both manufacturers and end-users. For manufacturers there were differing design standards and then the duplication of Ex testing and Certification/Approvals all adding undue cost and delays in accessing markets while for end-users the duplication of testing and certification meant delays in accessing new and innovative products and in some instances being denied access to such new Ex equipment due to limited sales of specialized equipment not being able to justify the costs and time taken for repeat testing and certification.

While Regional systems such as the ATEX Directive have enabled improvements in this area within Europe, a more global approach was needed which saw the development of the International IECEx Scheme, driven by the Ex industry in need of removing the wasteful duplication of testing and assessment costs and processes when accessing multiple markets worldwide.

While industry have long been convinced of the benefits of a single set of International Standards for the Ex field all the work and effort to develop and maintain a suite of International Ex Standards is of limited value when the testing and assessment practices differ between test house and countries. As such industry invested time and effort in developing a single approach to testing and certification of Ex equipment, now known as the "IECEX way" of Ex Certification.

While almost all National and Regional Ex approval and certification systems have been developed by Regulatory and Governments, IECEx stands out as the single global Ex Certification system developed by the very Industries it serves. By Industries we mean Ex experts from manufacturers, end-users and regulators with the aim of Standardising the approach to Ex testing and certification at a level that provides for international confidence in both the processes used and the competence of the Bodies performing this task.

II. CONFORMITY ASSESSMENT

The term “Conformity Assessment” is an excellent label for activities associated with determining whether defined requirements have been met. This term is clearly defined in ISO/IEC 17000 [1] as

ISO/IEC 17000 Extract:-

2.1

conformity assessment

demonstration that **specified requirements** (3.1) relating to a **product** (3.3), process, system, person or body are fulfilled

NOTE 1 The subject field of conformity assessment includes activities defined elsewhere in this International Standard, such as **testing** (4.2), **inspection** (4.3) and **certification** (5.5), as well as the **accreditation** (5.6) of **conformity assessment bodies** (2.5).

NOTE 2 The expression “object of conformity assessment” or “object” is used in this International Standard to encompass any particular material, product, installation, process, system, person or body to which conformity assessment is applied. A service is covered by the definition of a product (see Note 1 to 3.3).

From the Note 1 we see that Conformity Assessment includes activities such as:

- Testing
- Inspection
- Certification
- accreditation

with “the object of conformity” encompassing:

- materials
- products
- installation
- process
- system
- person
- body

The International Standardisation process provide industries with a number of tools to assist in developing and maintaining effective conformity assessment systems. Some of the more well know standards and guides include:

- **ISO/IEC 17025** *General requirements for the competence of testing and calibration laboratories*
- **ISO/IEC Guide 65** *General requirements for bodies operating product certification systems*
- **ISO/IEC Guide 62** *General requirements for bodies operating assessment and certification/registration of quality systems*
- **ISO/IEC Guide 67** *Conformity assessment — Fundamentals of product*

These international standards are prepared and maintained via the International Committee on Conformity Assessment known as CASCO which is a cooperation between ISO and IEC which sees these Standards and Guides carry dual ISO and IEC Logos. Further information on the work of CASCO can be found by visiting the ISO or IEC websites at www.iso.org or www.iec.ch respectively.

Before proceeding lets take a moment to properly understand what is meant by the more common Conformity Assessment activities of “testing” and “certification”.

Testing

In referring to ISO/IEC 17000 [1] we note clause 4.2

ISO/IEC 17000 Extract:-

4.2

testing

determination of one or more characteristics of an object of conformity assessment, according to a **procedure** (3.2)

NOTE “Testing” typically applies to materials, products or processes.

Traditionally in the Ex field, “testing” was long regarded as the determination of a physical quantity by measurement or application of a process, e.g. measurement of Flamepaths of an Ex d enclosure, testing to determine reference pressures and so on, whereas the inspection of a product for workmanship, compliance of labeling requirements were previously not regarded as a testing function, rather more of an inspection activity and best left to the certification body rather than test laboratory.

Introduction of ISO/IEC 17025 which replaced ISO/IEC Guide 25 did provide some correction by broadening the definition of “testing” and then in more recent times, introduction of ISO/IEC 17000 to provide further clarity.

What is the significance of this delineation between physical testing and examination/inspection? Well consider for a moment the approach to be taken by a testing laboratory or Certification Body when evaluating Ex equipment protected by Intrinsic Safety for compliance with IEC 10079-11 [2], where the majority of evaluation is by circuit analysis, determination of component ratings and referring to reference curves. Is this activity testing or assessment?

Believe it or not this relatively straightforward issue has caused many problems among Laboratory accreditors and continues to do so.

There are still some laboratory accreditation bodies that consider assessment of IS equipment and systems as an activity outside the scope of a laboratory’s accreditation. Further, despite international cooperation among laboratory accreditors there still exists differences of opinions and different approaches suggesting that results from assessments such as IS assessments cannot be included within the body of an accredited test report! Which raises the question **do all laboratory accreditation bodies check the competence of Testing Staff to conduct IS assessments?** A question that IECEx continues to seek an answer. For assessments of Laboratories by IECEx, operating under the IECEx Scheme, this is clearly the case

This is by no means a criticism of the laboratory accreditation system but rather a clarification that while at

the base structure level, accreditation bodies use the same International Standard, ISO/IEC 17025, the application of this generic Standard to specialised fields like Ex can differ greatly. The IECEx assessment process for the evaluation and acceptance of Ex Testing Laboratories does take into account the existence of national accreditation providing there is evidence that IECEx technical requirements have been addressed. To further facilitate this IECEx continues to invest in regular meetings and dialogue with ILAC (the International Laboratory Accreditation Cooperation) through the IEC/ILAC Technical Panel, in a bid to prevent duplication of assessments between IECEx and ILAC member accreditors. The major difference between assessments of Ex Test Laboratories by the IECEx Scheme and those conducted by national accreditors, is that IECEx takes a holistic approach by assessing a Testing Laboratory for the ability to conduct testing and assessment to the full Standard as opposed to accreditation that normally looks at accrediting to conduct a particular test. To assist the IECEx process, the Scheme maintain a suite of IECEx Technical Guidance Documents (TGDs) [3] that serve as a “check list” for IECEx assessment Teams when assessing Ex Test Laboratories. Some accreditation bodies are now even using these TGDs as internal guidance for their accreditation assessments.

For the IECEx Scheme, the activity of testing is very clear, it includes all aspects of the physical testing and evaluation of samples that represent production, including where necessary, assessment, circuit analysis and visual checking/inspection. To ensure this approach is common across all IECEx Test Houses, IECEx maintain a library of Standard Test Report Forms, known as “ExTR Blank Forms”. While mainly for use by IECEx Test Labs, manufacturers are finding value in using these as internal report forms as part of design reviews and preparation for compliance testing.

Certification

Having looked at testing now lets direct our attention to “Certification” with a look at the definition in ISO/IEC 17000, [1] Clause 5.5.

ISO/IEC 17000 Extract:

5.5

certification

third-party **attestation** (5.2) related to products, processes, systems or persons

NOTE 1 Certification of a management system is sometimes also called registration.

NOTE 2 Certification is applicable to all objects of conformity assessment except for **conformity assessment bodies** (2.5) themselves, to which **accreditation** (5.6) is applicable

For completeness let us also look at the definition of the word “attestation”

ISO/IEC 17000 Extract:

5.2

attestation

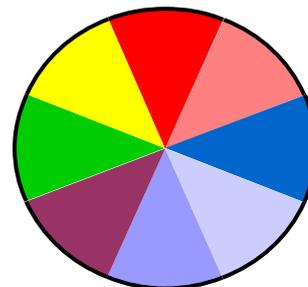
issue of a statement, based on a decision following **review** (5.1), that fulfillment of **specified requirements** (3.1) has been demonstrated

NOTE 1 The resulting statement, referred to in this International Standard as a “statement of conformity”, conveys the assurance that the specified requirements have been fulfilled. Such an assurance does not, of itself, afford contractual or other legal guarantees.

NOTE 2 First-party and third-party attestation activities are distinguished by the terms 5.4 to 5.6. For second-party attestation, no special term is available.

These definitions provide us with much wider scope and application than that previously used or envisaged within the Ex field. For instance, while the scope for certification has long been regarded as confined to tangible products, e.g. the motor, luminaries, enclosures etc wider use of the activities that underpin certification are now envisaged. Looking back at the four key areas that must be addressed to ensure safety in Ex related installations we can see that while equipment itself plays an important key role in managing Ex safety, equal if not greater attention must also be applied to “Services” relating to these installations. A view put forward by both Ex equipment end users of the oil and gas industries along with regulators, especially Coal Mining Regulators which has led IECEx to extend its Single International System for the testing and certification of Equipment to that of Services, with Ex Repair and Overhaul Services the prime target.

In taking a holistic view of an Ex related installation, for example an oil refinery, we note a number of elements, referred to as “Technical Compliance Elements” in figure 1. for which those responsible for such installations seek some measure of confidence that Standards and Specifications have been and continue to be met:



- Elec Product Manufacture
- Elec Product Repair
- Mech Product Manufacture
- Mech Product Repair
- Installation
- Inspection
- Area Classification
- Personnel Competency

Figure 1 Technical Compliance Elements for a typical Ex Installation

III. CERTIFICATE OF CONFORMITY AND TEST REPORT – THE MESSAGES THEY CONVEY

A look at the terms “Testing” and “Certification” would not be complete without spending a moment to understand the message, meaning and standing of the outputs to the two processes, i.e. the Test Report and the Certificate of Conformity. The following provides a summarized collection of key aspects associated with both a Test Report and Certificate of Conformity as instruments used in the general application of Conformity Assessment as reflected in the ISO/IEC Conformity Assessment Standards and Guides,

Test Report	
Message	The message conveyed by a test report to the reader, is that the sample(s) specified were subjected to test/assessment and the results of those tests/assessments recorded therein. There is no warranty or assurance concerning the future supply of samples and products.
Limit on its life	As a test report is a record of results taken at a given time the test report itself does not generally have an expiry date or limit to the life of the test report. However, bodies and organizations wishing to use a test report generated many years ago may need to answer some important questions such as:- <ul style="list-style-type: none"> • Changes to standards or specifications between now and when the test were conducted? • Any changes to testing practices? • Confidence that the samples tested previously still represent samples produced today?
Coverage	Only the samples subjected to the test and assessments. No assurance of units produced after testing.
Ownership	Test reports remain the property of the legal entity that entered into contract with the Test Laboratory, generally the manufacturer.

Table 1 Key aspects associated with the issuing of a Test report

Certificate of Conformity	
Message	The message conveyed by a Certificate of Conformity is that the Certification Body attests that the manufacturer or service provider have adequate systems in place that provide the necessary confidence that products and services produced/provided will continue to comply with the Standards or Specifications listed on the Certificate of Conformity. Hence on-going assurance.
Limit on its life	Yes. This limit may be stated on the certificate itself or in the Certification Procedures. For IECEx Certificates of Conformity, the rules clearly require on-going surveillance of the manufacturer or service provider in order to demonstrate continued compliance. To deal with the life of the certificate, rather than specify a date of expiry, the IECEx uses the electronic “On-Line” system with each certificate being identified with its “Status” as <ul style="list-style-type: none"> • Current • Suspended • Cancelled <p>There is a fourth Status this being “Draft” which is the stage at which the IECEx Certification Body is preparing the certificate ready for formal issue. At this status, the certificate cannot be viewed by the public.</p>
Coverage	All production products falling under the scope of the Certificate, thereby providing assurance that products produced in production continue to comply with the Standards and Specifications listed on the Certificate of Conformity.
Ownership	At all times, it is the Certification body that remains the owner of the Certificate of Conformity, with the manufacturer or service provider regarded as a “Holder” of the certificate. In this sense the certificate can be suspended or cancelled by the Certification Body where requirements of the certification scheme have not be met.

Table 2 Key aspects associated with the issuing of a Certificate of Conformity

IV. THE INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

The International Electrotechnical Commission (IEC) is the international organisation responsible for Standardisation in the electrical and electronic fields.

Founded in 1906, IEC was formed as a result of the resolution of the Chamber of Government Delegates at the International Electrical Congress of St Louis, USA, in September 1904.

The object of the Commission is to promote international cooperation on all questions of standardisation and related matters in the fields of electrical and electronic engineering and thus promote international understanding.

In addition to the preparation of International Standards, the IEC facilitates the operation of Conformity Assessment Schemes through the IEC Board on Conformity Assessment (IEC CAB)

2006 saw the IEC celebrate 100 years of operation with its 100 year General Meeting being held in Berlin. A dedication to the success and accomplishments of the IEC and its worldwide family of experts have been collated on the IEC Website, www.iec.ch

V. IECEX SCHEME OVERVIEW

The IECEX is a single global certification Framework based on the International Electrotechnical Commission's international standards. It caters for countries whose national standards are either identical to those of the IEC or else very close to IEC standards. The IECEX is global in concept and practice, reduces trade barriers caused by different conformity assessment criteria in various countries, and helps industry to serve multiple markets.

The aim of the IECEX Scheme and its Programs is to ease international trade of Explosion Protected Equipment (termed Ex equipment) by eliminating the need for duplication of testing and certification, while preserving safety. IECEX operates as an International Certification System covering products and services associated with the Ex industries.

Ex equipment is found in many areas such as:

- Automotive refueling stations or petrol stations
- Oil refineries, rigs and processing plants
- Oil and gas tankers, drilling ships and FPSO (Floating Production Storage Offloading vessels)
- Chemical processing plants
- Printing industries, paper and textiles
- Hospital operating theatres
- Aircraft refueling and hangars
- Surface coating industries
- Underground coal mines
- Sewerage treatment plants
- Gas pipelines and distribution centres
- Grain handling and storage and processing (flour-milling industry)
- Woodworking areas
- Sugar refineries
- Light metal working, where metal dust and fine particles can appear.

The IECEX Scheme comprises the following two Global Certification Programs:

- The IECEX Certified Equipment Program
- The IECEX Certified Service Facilities Program

The IECEX Certified Equipment Program (Rules of Procedure – IECEX 02 [4]):-

This IECEX Program is an International Certification Scheme covering product that meets the requirements of International Standards, e.g. IEC Standards prepared by IEC TC 31.

The IECEX Certified Equipment Program provides both:

a) A single International Certificate of Conformity that requires manufacturers to successfully complete:-

- Testing and Assessment of samples for compliance with Standards
- Assessment and auditing of manufacturers premises
- On-going surveillance audits of manufacturers premises

or

b) A “fast-track” process for countries where regulations still require the issuing of national Ex Certificates or approval. This is achieved by way of global acceptance of IECEX equipment Test and Assessment Reports.

Certificates issued by the IECEX Certified Equipment Program are issued as “Electronic Certificates” and are live on the IECEX Website. This enables full public access for viewing and printing. Visit the IECEX “On-Line Certificate” System

The IECEX Certified Service Facilities Program (Rules of Procedure – IECEX 03 [5]):-

This IECEX Program is an International Certification Scheme that covers the assessment and the on-site audit of organizations that provide a Repair and Overhaul service to the Ex industry.

Due to the very high capital investment made by industry in Ex equipment, it is usually much more economical to repair and overhaul equipment rather than to replace it with new. This also has obvious environmental benefits.

The challenge for industry is to ensure that all the very unique Ex safety features, included in the design and manufacturing of Ex equipment, are not compromised during the repair process.

Ex Repair and Overhaul Facilities and Workshops, certified under the IECEX Certified Service Facilities Program, provide industry with the assurance that repairs and overhaul to Ex equipment will be undertaken according to the strict requirements of IECEX Scheme to the International Standard IEC 60079-19 [6]

Like the IECEX Certified Equipment Program, only “Electronic Certificates” are issued via the “On-Line” system thereby giving industry full access to both the viewing and printing of certificates thereby providing industry with an instant check of any claims for IECEX certification by distributors or manufacturers. In fact, while in past years the IECEX Secretariat received regular requests from industry to confirm or not that an attached document is a true IECEX Certificate, since introduction of the Electronic “On-Line” system such requests have almost disappeared as industry have learnt that they can check this themselves

live, on any Computer with access to the IECEX Internet site.

VI. THE IECEX “BLUE PRINT”

Successful organisations and companies operate to a defined foundation and philosophy. IECEX is no different and from the early days of its development when considering industry’s call for a single international system for certifying Ex equipment, the IECEX Blue Print has been followed serving as the foundation upon which IECEX is built. In short this Blue Print requires that:

IECEX Blue Print	
Item	IECEX Deliverable
IECEX operates as a System No 5 Certification Scheme, now defined in ISO/IEC Guide 67	IECEX Rules of Procedure require that when issuing an IECEX Certificate the following must be successfully achieved: <ul style="list-style-type: none"> • Type Testing of samples • On-site assessment of quality system • On-going surveillance
All Test Labs and Certification Bodies undergo a common and centralized assessment process	Required by IECEX Rules of Procedure and Operational Documents
Assessment and surveillance of IECEX ExTLs and ExCBs must not add a further layer bureaucracy to national accreditation	IECEX Rules and Operational Procedures provide for the use of national accreditation systems as part of the evidence gathering exercise during assessments.
Consistent format of reporting by ExTLs	IECEX Maintain a suite of Standardised IECEX Test Report Blank Forms that must be used.
The IECEX Scheme must be responsive to the industry it serves	IECEX operates under a membership based arrangement whereby each country holds one vote and voice irrespective of the number of ExTLs or ExCBs operating. Plus IECEX Rules require the National Committee to be representative of the industry.
Maintain International Confidence of the IECEX system	The IECEX Constitutional rules require that the Management Committee (all countries are members) meet at least once per year providing direction to a centralized Technical Secretariat. All rules and procedures subject to on-going review and refinement.
Operate as efficiently as possible to contain costs while maintaining technical and operational integrity	IECEX continues to develop ways for streamlining processes but will not compromise on integrity. Eg increased use of the Internet tools.
Be non-discriminatory	IECEX Basic Rules IECEX 01

IECEX Blue Print	
Item	IECEX Deliverable
and open for use by industries in any country	[7], provide for openness, noting that even countries that are not members of the IECEX Management Committee use IECEX certification.

This Blue Print has served the IECEX Scheme, its members and the industries very well in providing the industry with the world’s first true “On-Line” Internet Certification system. Included in the suite of IECEX Rules of Procedures and Operational Documents is Operational Document OD 011 Part 1 [8] which acts as a user guide for industry in understanding, accessing and using the IECEX “On-Line” Certificate of Conformity System. This along with other IECEX Operational Documents are available directly to the industry free of charge at http://www.iecex.com/operational_manuals.htm



Figure 2 Copy of IECEX Home page at www.iecex.com

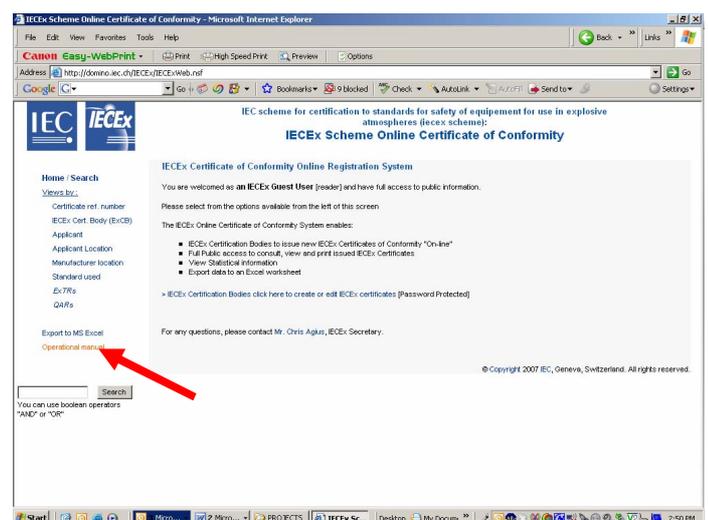


Figure 3 Copy of IECEX “On-Line” Certificate of Conformity Opening Page at:- <http://domino.iec.ch/IECEX/IECEXWeb.nsf>

VII. THE IECEX “ON-LINE” CERTIFICATE OF CONFORMITY SYSTEM

Under the IECEX Scheme paper original certificates do not exist. Rather IECEX ExCBs, through individual password protocols enter the on-line system based at the IEC Central Office in Geneva and create a new certificate, in draft form and then once all certification stages have been completed, according to IECEX Operational Document OD 009 and the IECEX Scheme Rules of Procedures, IECEX 02, the ExCB re-enters the password protected area and changes the status of the certificate from “DRAFT” to “CURRENT” at the instant that this change has been saved, by the ExCB, the certificate then can be accessed by the public area of the IECEX Internet site where industry can view, download and print copies of the certificate.

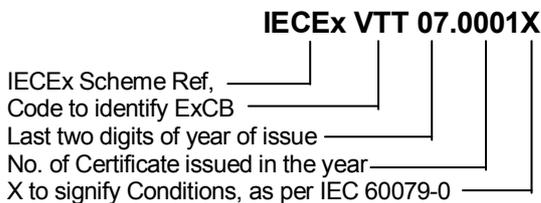
One important point to note is that when downloaded or printing a copy of the certificate, the person in possession of the copy are in fact in possession of an uncontrolled copy with the onus on them to check the IECEX On-Line website for any future verification to the status of the certificate. This clear disclaimer is included at the bottom of page 1 of the certificate.

Further guidance to the industry is available in the explanation section of the IECEX website and Operational Document OD 011 Part 1, as mentioned earlier.

During the later part of 2006 a series of upgrades were developed to further enhance the practical application of the IECEX On-Line system with these including

- Greater transparency of changes to certificates by inclusion of separate Issues of Certificates as individual items including a history block to track certificate changes
- Improved search functions including introduction an active search facility.
- Enhanced registration systems for the registering of IECEX Test reports and Quality Assessment Reports.
- Enhanced statistical reporting

An important point to note is the IECEX Numbering system which while complying with the Marking requirements of IEC 60079-0 [9] General requirements, includes a format that readily identifies that the certification reference Number is related to an IECEX certificate. The following example of a recently issued certificate reference number best demonstrates this



On-Line Registration of Issued IECEX Test Reports and Quality Audit Reports

In addition to the “On-Line” availability of the master IECEX Certificate of Conformity, the system further provides for the official Registration of IECEX Test Reports and IECEX Quality Audit Reports through a linked

database system allowing the cross linkage between the Certificate and the supporting Test Reports and Quality Audit Report.

Using the above IECEX Certificate reference example, we see that when displaying this certificate, the bottom of page 2 shows the references for both the IECEX product Test Reports and the Quality Assessment Report both of which provide a hyperlink to a summary page for each which acts as a formal registration and notification that a complete test report and the quality Audit report have been issued to the client manufacturer

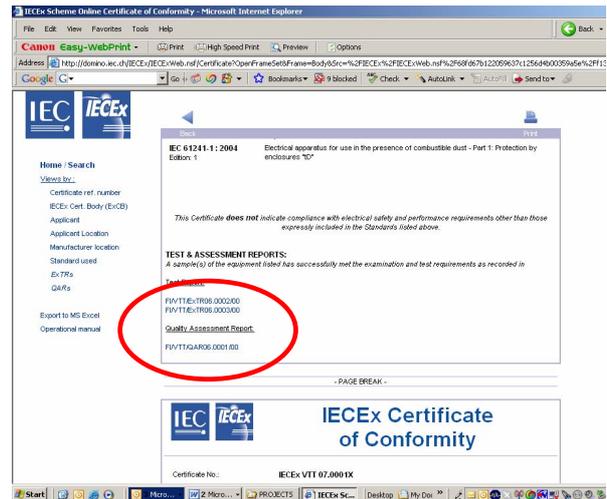


Figure 4 Extract from IECEX Certificate IECEX VTT 07.0001X

By selecting these links we are then shown the registration details of the ExTR or QAR. The following extract is such an example

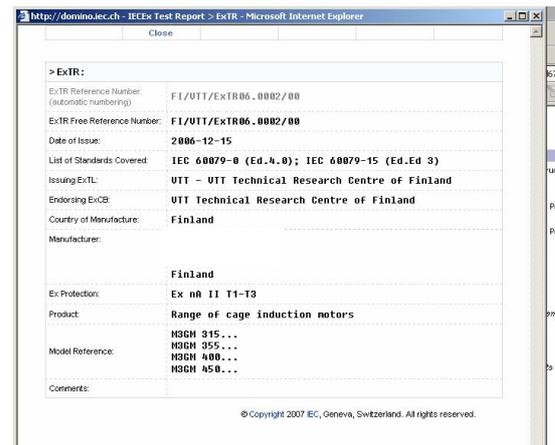


Figure 5 Extract of the On-Line registration details of an issued IECEX Test Report

While we can appreciate the value in having access to the IECEX Certificate live and on line, what is the value in having access to summary details of issued Test Reports?

From Item III earlier in this paper we have understood that a test report contains confidential information which is

the propriety of the manufacturer or organization that entered into contract with the Test laboratory. So why have a registration system for Test reports and for that matter Quality Audit reports?

Industry and the IECEx Management Committee are well aware that an IECEx certificate alone may not gain direct market entry in all situations, therefore the IECEx Scheme provides a "Fast Track" system to the achievement of multiple national certification/approval through the recognition of IECEx Test and Assessment results. Thereby enabling Certification Body located in Country B to accept the testing and assessment conducted by Certification Body located in country A, i.e. no repeat testing or assessment.

To assist with this Fast Track process the formal registration of IECEx Test Reports and Quality Audit Reports enables all Certification Bodies and Regulators worldwide to instantly check and confirm the existence of these reports, along with the ability to check essential information such as:

- ExTR or QAR system generated Registration number
- Provision for the Test Lab to insert their internal file reference for traceability
- The manufacturer
- Product covered
- Standards applied
- The Test and Certification involved
- Any special comments or notes.

In fact, under newly agreed rules, the issuing of an IECEx Test Report (ExTR) or Quality Audit Report (QAR) is not complete unless it has been formally registered on the IECEx Website.

Apart from providing essential information, the act of registering the ExTR or QAR is in itself a **Declaration by the IECEx Certification Body that they have confirmed that all IECEx Scheme rules and procedures have been followed** in the development and issuing of the referenced ExTR and QAR.

VIII. IECEx CERTIFIED EQUIPMENT PROGRAM – UPDATE

The IECEx Certified Equipment Program is one of two Programs operating under the scope of the IECEx Scheme, the other is the:

IECEx Certified Service Facilities Program

As the name implies the Certified Equipment Program covers Ex equipment and provides for the formal registration of test and assessment reports and the issuing of an On Line certificate as detailed in VII above. Certification of Ex product was where IECEx began and the introduction of the Certified Service Facilities Program saw the need to re-present certification of equipment as an individual program. Full details of the Rules and Procedures are detailed in IECEx publication IECEx 02, freely available for download from www.iecex.com/rules.htm

While there is now a general awareness of the IECEx Certified Equipment Program, the Rules of Procedures, IECEx 02 [4] have been revised to reflect the separation of programs but also to clarify some important elements and introduce changes resulting from industry feedback.

Some of the more notable changes to the IECEx Certified Equipment Program include

- a) Removal of the previous restriction in scope to just electrical Ex equipment. The IECEx Certified Equipment Program can be used for non-electrical or mechanical Ex equipment;
- b) Formal introduction of the use of Operational Documents and improved document control systems;
- c) Clarification that an IECEx Certificate of Conformity can be issued to the latest edition of a Standard or one edition prior. However, an IECEx Test Report can be issued to either a current or any superseded version of a Standard;
- d) Introduction of new Clause 9.8 *Certification procedure for licensed equipment*, to clarify the process of dealing with equipment sold under a different legal entity to that of the manufacturer
- e) Others, including refinement of the IECEx Quality system assessment process of Ex manufacturers

Of all the changes introduced recently, the most significant by far is the move to also cover Mechanical Ex equipment thereby providing a complete certification system both electrical and non electrical equipment come together.

This is most significant given the work of both ISO and IEC to address the shortcoming that International Standards to date do not cover Mechanical Ex equipment.

As an update, industry would be aware of the latest developments which provide an agreement between ISO and IEC to form a joint Technical Committee known as SC 31M which will report to IEC TC 31 but with ISO providing the technical secretariat for this new SC 31M. The concept being that standards produced by SC 31M will be jointly labeled as ISO/IEC Standards.

An IECEx Mark of Conformity

A further major enhancement has been work on an IECEx Conformity Mark, with the IECEx Management Committee reaching final agreement on the following key documentation:-

- IECEx Conformity Regulations, IECEx 04
- OD 022 – *Rules and Procedures for the granting of Licenses to issue and use the IECEx Conformity Mark*
- OD 023 – *Terms and Conditions for use of the IECEx Conformity Mark*

With this work completed by IECEx these are now to be submitted for final approval at the IEC Executive management Level along with the final Mark design.

This Mark of Conformity will enable industry to use this on Ex products, their packaging as well as promotional and Stationery items as a means of demonstrating that the product is covered by an IECEx Certificate, which in terms assists end users and inspection authorities to quickly recognize IECEx certification.

The International Ex industry has long been calling for a

Global Mark of conformity and has perceived with the work and effort to bring this to fruition.

IX. IECEx CERTIFIED SERVICE FACILITY PROGRAM – NEW INITIATIVE

While certification of new Ex equipment is covered by the IECEx Certified Equipment Program, as detailed in IECEx 02 [4], the IECEx Certified Service Facilities Program provides a single international scheme for the assessment and certification of Ex related service facilities that have an impact on the on-going compliance of Ex equipment with Ex safety standards.

Industry have long been concerned with the on-going compliance of Ex equipment following repair, overhauls or even minor modifications that are permissible within certification.

Manufacturers producing new Ex equipment in accordance with their Ex Equipment Certification regime, cannot be held responsible for the actions or in actions taken during Ex repair and overhaul.

The IECEx Certified Service Facilities Program provides Ex equipment users, regulators and the community with the confidence that Ex safety is maintained when Ex equipment is repaired, overhauled or modified by an IECEx Certified Service Facility in accordance with this Scheme.

Ex Service Facilities that achieve IECEx Certification are required to demonstrate compliance with stringent IECEx requirements including:

1. Operational procedures and repair techniques meet IECEx Technical requirements encompassing IEC 60079-19 [6]
2. Possess and maintain in operating condition necessary facilities and equipment including test equipment and traceability of measurements
3. IECEx quality system requirements, based on ISO 9001 [10] [ISO 9001 certification is **NOT** a pre-requisite to seeking IECEx Certification]
4. Competent personnel with current competencies related to Ex equipment Standards, repair techniques and certification requirements
5. Others necessary for proper servicing of Ex equipment

Before looking too close at this new Program, let's first be clear what is meant by a Service Facility. Clause 3.5 of IECEx 03 [5], provides the following definition

IECEx 03 Extract

3.5

Service facility

an organization situated at a stated location or stated locations, that carries out or controls such stages in the repair, overhaul and or modification, as defined in IEC 60079-19, of an Ex product. At the same time the knowledge on accepts responsibility for continued compliance of the product with the relevant requirements and undertakes all obligations in that connection. This definition includes Manufacturers of Ex equipment that offers a repair and overhaul service as well as equipment users with their own repair service facility and includes reclamation.

Choice of the term “Service Facility” assists in clarifying that a repair organization can be covered for repair

activities carried out within their own Repair Workshop or on-site as is most often the case.

Work in the development of the new IECEx Certified Service Facility Program has been closely paralleled with the excellent work of IEC SC31J in their revision of IEC 60079-19 [6] in particular the Maintenance Team led by Mr. Colin Hendersen.

The timing in publication of the revised edition of IEC 60079-19 [6] has been most useful as this co-incides with the roll-out of the IECEx Certified Services Facility Scheme.

Coverage of the changes to this revised edition of IEC 60079-19 [6] would in itself be the subject for a separate paper, however the first point is to note the tremendous work accomplished in this revision which can be considered a major revision to the previous edition which acted more as a guide rather than a Standard for industry. Some of the more significant changes now included in IEC 60079-19 [6] include:

- Removal of the exemption to covering equipment for mines
- additional requirements for repair and overhaul of equipment with type of protection ‘tD’ and ‘pD’ for combustible dusts are included;
- Inclusion of requirements for knowledge, skills and competencies of “Responsible Persons” and “Operatives”
- Inclusion of requirements for measurements in flameproof equipment during overhaul, repair and reclamation (including guidance on tolerances)
- Improved clarification over documentation requirements

All in all some 20 additional pages of requirements and information have been added to this 2nd edition of the Standard.

So while we now have a credible and comprehensive Standard to guide industry in the Repair and Overhaul process it is fair to ask the following the questions

Why do we need a certification system for Repairers?

If so why have an international certification system?

These are very valid questions and like all of IECEx programs and activities there must be a demonstrated need from industry in order to gain IEC support.

So for the first question, why a certification system? We note from the introduction that the publication of a standard does not ensure standardization on its own. The publishing of a standard provides the industry with an agreed technical specification. The way in which this “agreed Specification” is applied determines the level of standardization, so all the excellent work of the IEC SC 31J experts can be in vein if Ex repairers apply this new edition of the Standard separately and in their own manner.

So perhaps the answer to the first question is a question itself, “How do Ex equipment owners ensure that a Repair Facility is conducting their operations in accordance with IEC 60079-19 [6], especially in such a competitive environment? Of course, the Equipment owners themselves could carry out a second party assessment of the Repair Facility but does the equipment owner have:

- The resources to undertake such assessments and monitoring of repairers?
- The technical knowledge and understanding for such a task?

- The desire to do so, in the knowledge that they then carry all associated liabilities.

For example, IEC 60079-19 [6] have strict requirements for the replacement of components associated with Ex equipment protected by the protection technique Intrinsic Safety.

IEC 60079-19 2nd Edition Extract

6.2.10 Electrical components

When replacing components such as resistors, transistors, zener diodes, etc., these may normally be replaced with items purchased from any source which are identical replacements. In exceptional circumstances, however, some manufacturers use a “select on test” procedure for some components. Where this is done, the documentation supplied with the equipment shall indicate that either replacements be obtained from the equipment manufacturer or selected by the method he recommends.

The above is just a small example of the technical elements that must be addressed when undertaking repairs and overhauls of Ex equipment. Of course others include the re-winding of Ex motors and the special requirements applicable to the windings associated with Ex e motors, given the nature of the Ex e concept.

Ex equipment owners are not alone in benefiting from a certification system covering Repair and Overhaul facilities. Manufacturers themselves see benefits in using Certification of Ex Repair activities for compliance to IEC 60079-19 [6] as a technical requirement for Repair Workshops seeking to gain acceptance as a Manufacturer’s authorized service agent. The area of Ex Motor repair and Overhaul is certainly one such area thereby enabling the Ex motor manufacturer to seek comfort in the knowledge that their agents are covered by independent certification for compliance to IEC 60079-19 [6]. An approach some well known Ex Motor manufacturers are already taking.

Having established a need for an independent certification scheme covering repair facilities to IEC 60079-19 [6], why then is there interest in an International system such as IECEx? While the benefit of an international system such as IECEx for certification of Ex equipment has obvious International Trade benefits, how can a similar approach benefit the Ex Repair industry?

In noting the long standing IECEx Blue Print (Item VI above) centering on a “single assessment and certification process adopted worldwide” extension of this approach to the Ex repair industry provides the following benefits:

- A single certification process applied worldwide;
- Cost savings by preventing development and maintenance of multiple systems at national levels;
- Extension of the well known “On-Line” Certificate of Conformity System;
- System managed and maintained by the industry it is set up to serve.



Figure 6 Overview of the IECEx Certified Service Facility Certification Program

IECEx Process Summary - To summarise, under the IECEx Certified Service Facility Program we note the following items:

- **Assessment Report** ⇒ Demonstrates that Repairer complies with IEC 60079-19 [6]
- **Facilities Audit Report (FAR)** ⇒ Verify QMS meets IECEx Requirements (OD 014) [11]
- **IECEx Certificate of Conformity (CoC)** ⇒ Demonstrates Capability of the Repairer to consistently comply

The Program is served by the following set of Rules and Operational Documents:

- **IECEx 03 – Rules of Procedures**
- **OD 013 – Operations Manual applicable to IECEx Certification Bodies, (ExCBs)**
- **OD 014 – Quality System Requirements**
- **OD 015 – Technical Specification**
- **OD 016 – Assessment procedures for acceptance of IECEx Certification Bodies**

Development of this Program has highlighted the need to consider a consistent process for the determination of assessing the competencies of personnel involved in the repair and assessment of repaired equipment. A question also raised during the work associated with the revision of the first edition of IEC 60079-19 [6].

X. IECEx LATEST WORK – CERTIFICATION OF PERSONS

Early discussions within the IECEx management committee (ExMC) has identified a need to consider expansion of the IECEx Scheme to cover the assessment and eventual certification of persons as meeting competency requirements, established by the industry. To initiate this work ExMC have constituted new Working Group WG 12 with AU providing the Convener, Mr. Ralph Wigg with experts from AU, CA, CN, CH, DE, FR, GB, NL, US participating in this work.

While early days yet, WG12 have made significant progress with a comprehensive report on progress presented to the IECEx 2006 Shanghai Management Meeting.

A further meeting of WG12 is set down for Paris in June 2007.

During the IECEx Management Committee discussions on the WG12 report, in Shanghai, 2006 a few key principles were noted.

- IECEx as a scheme should not be involved in delivering commercial training, in similar manner as IECEx does not manufacturer equipment;
- Such a program would comply with the requirements of ISO/IEC 17024 [12];
- The principles of the IECEx Blue Print be maintained.

While there is further work required of WG12 the demand by end users is acting as a significant driving force with comments such as "...as managers of Ex installations we are not aware of the competency level of suppliers of services, especially repair and overhaul...."

XI. CONCLUDING COMMENTS – INTEGRATION INTO QUALITY MANAGEMENT SYSTEMS

In the early development days of IECEx, the driving need pushing IECEx forward was

“the need to facilitate international trade of Ex equipment while maintaining an appropriate level of safety”

With IECEx, through its Certified Equipment program, having achieved this, we see a new emerging driver

“The need to demonstrate credible conformance to specified requirements”

With many companies and organizations, worldwide, now well entrenched with the disciplines of Quality Management Systems meeting the base line requirements of ISO 9001 [10] there is a greater awareness of the need to monitor suppliers and only accept products and services

that can be demonstrated as meeting “Community Accepted” standards, citing International Standards IEC and ISO as reflecting community accepted practice.

From ISO 9001 [10], Clause 7.4.1 we note the following general requirement applicable to quality management systems

ISO 9001 Extract

7.4 Purchasing

7.4.1 Purchasing process

The organization shall ensure that purchased product conforms to specified purchase requirements. The type and extent of control applied to the supplier and the purchased product shall be dependent upon the effect of the purchased product on subsequent product realization or the final product.

The organization shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements. Criteria for selection, evaluation and re-evaluation shall be established. Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained (see 4.2.4).

In noting some key phrase “...*The organization shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements.*” Ex equipment users, that claim to operate a management system meeting the requirements of “Community Accepted practice” as reflected in ISO 9001 [10], are faced with the choice

1. Assess and monitor their suppliers of Ex equipment and services; or
2. Utilise the Internationally accepted Practise, as reflected in the IECEx Scheme as one of their Conformity Assessment Tools, for demonstrating conformance with International Standards

While option 2. above is by far the simpler and more cost effective option to an organization developing and maintaining its own “Conformity Assessment System”, the organisation does not get off entirely free from effort.

By making use of the IECEx scheme, an organisation would still require to ensure at the least the following:

- Claims of IECEx Certification by equipment manufacturers and service providers are verified
- IECEx Certification scope covers the same scope of products or service presented by the provider
- IECEx Certification is current
- Any additional “customer specific” requirements have been met

The above needs to be included into the organisation's operating procedures to clearly identify:

- When is the verification checks on the above conducted
- By whom
- What records are taken and maintained
- What action to be taken if a satisfactory result

cannot be achieved.

XII. ACKNOWLEDGEMENTS

The IECEx Scheme is the result of much more than a single individual's efforts. The IECEx work current and future success is the result of the many contributions from the World wide network of Ex experts that come together to contribute to the development and operation of the System, its procedures and processes along with the companies that support the involvement of their management and staff.

Many of the industry organizations involved in the development, management and operation of the IECEx Scheme, are now listed as IECEx certificate holders utilizing the very system they have developed.

Concerning the opportunity to present this paper and assistance with its preparation, a special note of thanks goes to:

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- Mr. Michel Lhenry – ABB Entrellec
- Mr. Patrick Leroux – TOTAL
- Dr Uwe Klausmeyer – PTB (IECEX Chairman)

XIII. REFERENCES

Documents referenced in this paper include:

- [1] ISO/IEC 17000: Conformity assessment — Vocabulary and general principles
- [2] IEC 60079-11: Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"
- [3] IECEx Technical Guidance Documents
- [4] IECEx 02: IEC Scheme for Certification to Standards relating to Equipment for use in Explosive Atmospheres
IECEX 02- Equipment Certification Program covering equipment for use in explosive atmospheres – Rules of Procedure
- [5] IECEx 03: IEC Scheme for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEX Scheme) –
IECEX Certified Service Facilities Program covering repair and overhaul of Ex equipment – Rules of Procedure
- [6] IEC 60079-19: Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation
- [7] IECEx 01: IEC Scheme for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEX Scheme) – Basic Rules
- [8] OD 011 Part 1: Guidance on Use of the IECEx Internet based "On-Line" Certificate of Conformity System Part 1: General Information
- [9] IEC 60079 – 0: Electrical apparatus for explosive gas atmospheres – Part 0: General requirements
- [10] ISO 9001: Quality management systems— Requirements
- [11] OD 014: Quality management system requirements for IECEx Service Facilities involved in repair, overhaul and modification of Ex equipment
- [12] ISO/IEC 17024: Conformity assessment— General requirements for bodies operating certification of persons