**INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC) SCHEME FOR CERTIFICATION TO STANDARDS RELATING TO EQUIPMENT FOR EXPLOSIVE ATMOSPHERES
(IECEx SCHEME)**

Title: Report from ExMC Working Group 2 - TGDs

To: Members of the IECEx Management Committee, ExMC

INTRODUCTION

This document provides a report prepared by ***ExMC Working Group 2 – TGDs*** and is issued for discussion during the ExMC Meeting to be held in Shanghai. The Draft TGDs are attached as Annexes.

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IECEx ExMC WG 2: Technical Guidance Documents

Report from Ian Cleare, WG 2 Convenor

1. Task

The task of WG2 is to review the Technical Guidance Documents used in the assessment of ExTLs and ExCBs in the light of the use of these documents over the past 10 years and to propose revisions where appropriate. It is also necessary to update the documents in line with the updating of the standards to which they relate.

2. Working Group Members

The following people have participated in the work of WG2:
Dave Adams, CSA; Chris Agius, IECEx; Ian Cleare, Buxton Technology; Alain Czyz, Ineris; Jim Munro, Jim Munro Intl Compliance; Allan Ogden, Hawke International; Theo Pijpker, KEMA; John Richman, EEMUA; Ron Sinclair, Baseefa

3. Work Schedule

August 2004	Initial report to ExMC setting out proposed approach to the task (ExMC/208/R)
October 2004	Proposal accepted by ExMC (ExMC/217A/RM: 6.2)
December 2004	First draft of TGD Framework document
July 2005	Collated WG 2 comments on draft Framework document
August 2005	Report to ExMC with updated Framework proposal (ExMC/274/R)
October 2005	Proposal accepted by ExMC, work tasks taken on by WG 2 members (ExMC/302/RM)
January 2006	First draft TGD in new format produced for WG comment
June 2006	Report to ExMC with current drafts of TGDs for ExTAG, Assessors and ExMC comment.

4. Current Position

Starting from the framework agreed at the 2005 ExMC meeting, the following TGDs have been drafted in the revised format:

Standard	Doc.Ref.	Comments
IEC 60079-0: 2004 General Requirements	IECEx TGD 60079-0 2004 (Section 1 - Personnel) V0.doc	Section 1, Personnel only. Sections 2 & 3 to be completed
IEC 60079-1: 2006 Ex d	IECEx TGD 60079-1 2006 V0.doc	All Sections. Revised introductory pages
IEC 60079-7: 2006 Ex e	IECEx TGD 60079-7 2006 V0.doc	All contained in Section 1
IEC 60079-11: Ed.5 Ex i	IECEx TGD 60079-11 Ed-5 V0.doc	Different formats for each Section

OD/005: 2003 Quality system requirements	IECEx TGD OD-005 2003 V0-1.doc	All Sections

The drafts have yet to be reviewed by WG 2.

5. Findings from the drafting process

In preparing the drafts a number of issues have been raised:

a) The introductory pages could be improved. The draft for Ex d could act as a template.

b) The splitting of the TGD into the three sections – Personnel, Systems and Equipment – has provided the ability to adopt different approaches for each of the sections – as in the Ex i draft – but some difficulties have been encountered.

c) Different approaches have been taken to the way in which the assessment points are expressed. A common method of expression is required, either:

- Open questions "How do you…" "Why is it…";
- Closed question "Do you …" "Is there…" Answer "Yes/No"; or
- Statements as prompts for the assessor.

The method selected could depend upon the way in which the TGDs are to be used, for example as a guide to assessment by IECEx assessors, as a self-assessment tool by ExCBs and ExTLs or as a training aid by personnel.

d) By addressing each clause of a standard, a large number of assessment points is created. Depending upon the use to which the TGDs are being put, it could be advantageous to limit the number of points to those that are crucial to an understanding of the philosophy and application of the particular standard.

e) The question has arisen as to whether a different set of TGDs is required for the assessment of ExCBs as distinct from ExTLs. Clearly the ExCBs would not have any test equipment or test procedures but they would need to have a full understanding of the standards. They would also need to be able to specify the tests and examinations to be carried out by the ExTLs and to understand and verify the reported results.

f) A lot of work is involved in drafting the TGDs and they need to be kept up to date as the standards evolve. Consideration needs to be given to ways in which the work can be minimised and to share it amongst a greater number of people.

6. Recommendations for further work

The following recommendations are made:

a) The current drafts should be submitted to ExTAG, the IECEx Assessors and ExMC for their comments and guidance on how to complete the task.

b) Each ExCB and ExTL should be asked to nominate an expert in each topic for which there is a TGD so that they can provide an input to the drafting and maintenance process. Where an ExCB and ExTL are combined in one organisation, only one expert for each topic would be needed.

c) WG 2 should plan to complete its work on the initial five TGDs by mid 2007.

d) ExMC should decide upon which other TGDs are required and ask WG 2 to plan for their completion by mid 2008.

e) The membership of WG 2 should be increased both to provide more effort on the work and to bring in expertise in the topics to be included under d) .

7. Thanks

I would like to thank the members of WG 2 who have managed to find the time in their busy schedules to undertake a great deal of work in the drafting of the TGDs. I would also like to place on record our gratitude for the pioneering work carried out by EEMUA on the first set of TGDs under the leadership of Peter Bennett.

Ian Cleare

30 June 2006

ExMC/208/R – 16/08/04 – Report from WG 2 Convenor re proposed task of WG 2

ExMC/217A/RM – February 2005 Minutes of Brdo Meeting 13, 14 October 2004

6.2 WG2 Development of Technical Guidance Documents – Report on progress

Document noted

• ExMC/208/R - Report from WG2 Convener, Mr Ian Cleare

In noting the appointment of Mr Cleare as the new convenor, the meeting agreed to extend their thanks to Mr Peter Bennett for his work as the former Convenor of ExMC Working Group 2. His involvement from the early days of the scheme has been much appreciated. Also the ExMC extends its thanks to EEMUA, Engineering Equipment and Materials Users Association, for their continued stewardship of Working Group 2.

The Chairman commented on the importance of these documents in ensuring a common and thorough assessment of ExTLs with the Secretary commenting that current Standards such ISO/IEC 17025 are extremely generic in nature and cannot be applied on their own without a set of credible technical requirements. The Secretary also advised that applicant ExTLs are now being asked to complete these as a self check prior to an on site assessment, during which they are then reviewed by the assessment team.

Mr Cleare then commented that if the work on TGDs was to progress further, more members were needed for participation on the WG. The following members volunteered and were accepted by the meeting:

Mr Jim Munro (Chairman TC31)
Mr Dave Adams (CA),
Mr Alain Czyz (FR),
Mr Alan Ogden (GB)

Mr Cleare presented his report with the US seeking clarification over:

• The involvement of EEMUA in the process and how are costs dealt with?

• What is the reason for not having a TGD for Part 0, General Requirements?

Mr Cleare informed the meeting that Engineering Equipment and Materials Users Association (EEMUA) is an industry association for the oil and gas industries to promote confidence in the use of Standards and Processes by the industry. Mr Cleare further advised that the work done is relying on voluntary efforts.

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Concerning Part 0, Mr Cleare informed the meeting that to date the approach has been to include the general requirements within the TGD for the particular protection technique.

In noting Mr Cleare's explanations, CA commented that the control of TGDs must be by the Secretariat, perhaps by way of some joint venture. The ExMC Secretary advised that while this may not have been formalised, this has been the practise to date.

The meeting also agreed to make TGDs available to National Accreditation Bodies as part of the IEC/ILAC co-operation**.**

ExMC/274/R August 2005 – Report from WG 2 Convenor – Proposed TGD structure.

ExMC/302/RM February 2006 – Minutes of Buxton meeting 6, 7 October 2005

7.2 WG2 Development of Technical Guidance Documents – Report on progress from Mr Ian Cleare

Document noted
ExMC/274/R - Report from WG2 Convener, Mr Ian Cleare

In introducing this item the Chairman called on Mr Cleare, Convener of the TGD Working Group, WG2, to present his report.

Mr Ian Cleare gave a brief background to the introduction of TGDs commenting that they are a significant tool for the gaining of confidence in the scheme by IECEx Members and Stakeholders.

Mr Cleare further reported that apart from a tool for assessors, the TGDs have also been found to be most useful for Bodies (ExTLs) when preparing for an assessment. He continued that in looking to the future, it might assist if the information gathered in the TGDs be divided into 3 parts

1) Personal Competence
2) Systems
3) Equipment

Mr Cleare noted that using a clause-by-clause approach to the Standard was most efficient and appropriate. He advised, that the revised TGD should be recording evidence rather than asking if it exists, e.g. change the questioning from “do you have a procedure?” to “what is the procedure?” After further discussion Mr Cleare sought the meeting’s acceptance to allow the WG to go forward with the proposed approaches.

Before closing the discussion the Chairman posed the question as to whether the TGDs should have some reference link to the ISO/IEC 17025 document? Mr Cleare advised that this is the philosophy behind the proposed review.

In conclusion, the meeting agreed to the following:

a) Agreement of the approaches outlined by Mr Cleare
b) Preparation of a TGD covering General Requirements

The following members to assist in the preparation of TGDs
Ex ‘d’ - Dave Adams and Theo Pijpker
Ex ‘i’ - Jim Munro
Ex ‘e’ - Baseefa
Quality Assurance TGD - Ian ClearеAnnex A

Annex A

IECEx

Body Assessed: **Assessor:** **Date:**

Standard IEC 60079-0:2004 - General Requirements	**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06

Section 1: Personnel

		Evidence from body under assessment	**Comments by IECEx Assessor**
Clause 2.0 - Normative references			
How do you gain access to controlled copies of all standards listed?			
How are latest editions identified and obtained?			
Clause 4.0 – Apparatus grouping and temperature classification			
4.1	**Apparatus grouping**		
	What are the current groups for electrical equipment in hazardous atmospheres?		
	What gas is equipment for use in mines certified for?		
	How is equipment certified for mining applications identified in its marking if gases other than firedamp are present?		
4.2	**Group II**		
	What protection concepts of Group II electrical equipment have sub divisions?		
4.2.1	**Group II Subdivisions**		
	How are the subdivisions identified		
	What are the two methods used for sub division of gases?		
	How are the tests conducted to give these sub divisions?		
4.2.2	**Group II – Surface temperature marking**		

Body Assessed: **Assessor:** **Date:**

Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	What types of electrical equipment do not have to be marked with a Surface temperature mark?		
	What type of protection requires the Surface temperature to be stated for inside the enclosure?		
4.2.3	**Apparatus for a particular explosive atmosphere**		
	How is it indicated that a particular piece of equipment is only suitable for use with a particular explosive atmosphere?		
	Where should these indications be marked and recorded?		
Clause 5.0 – Temperatures			
5.1	**Environmental influences**		
5.1.1	**Ambient temperature**		
	What is the standard ambient temperature range for electrical equipment in hazardous atmospheres?		
	Where the ambient temperature is outside this range, what three methods can be used to indicate that the equipment may be used outside these temperatures?		
	Under what circumstances an X condition would be used?		
5.1.2	**External source of heating or cooling**		
	How do you establish if equipment may be fitted to a heated or cooled process or pipeline?		

Body Assessed: **Assessor:** **Date:**

Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	What are the effects on equipment that may be attached to a heated or cooled process or pipe line in respect to ambient operating temperature?		
	How is this external heat source indicated on the equipment?		
5.2	**Service temperature**		
	What is service temperature?		
	What factors need to be taken in to account when establishing the service temperature of a piece of electrical equipment?		
5.3	**Maximum surface temperature**		
5.3.1	**Determination of maximum surface temperature**		
	What factors should be applied when determining the maximum surface temperature?		
5.3.2	**Limitation of maximum surface temperature**		
5.3.2.1	**Group I electrical apparatus**		
	For Group I electrical equipment what are the two conditions of the coal dust that need to be considered when establishing the maximum surface temperature?		
5.3.2.2	**Group II electrical apparatus**		
	What are the three methods for Group II electrical equipment that can be used to show the maximum surface temperature of the equipment?		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
5.4	**Surface temperature and ignition temperature**		
	What do you understand by the term surface temperature?		
	How does this term relate to the ignition temperature of a gas?		
5.5	**Small components**		
	How would you assess small components?		
	What are the criteria for doing an assessment, rather than a test on a small component?		
	If a small component has a surface area smaller than 10cm2. What temperature can the component reach Temperature Class T5?		
	Why is the temperature of small components allowed to vary from that off the assigned equipment T class?		
	How would this information be indicated on the certificate?		
	Show me examples of small component that have been certified?		
Clause 6.0 – Requirements for all electrical apparatus			
6.1	**General**		
	How do you ensure that the manufacturer who has applied for a certificate meets the requirement for construction of the equipment in accordance with other applicable safety requirements?		
	Show an example of how this is done.		
6.2	**Mechanical strength of apparatus**		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	How do you establish that the equipment being certified is not protected by guards?		
	What information regarding the use of the product and guarding used to protect the product do you obtain from the manufacturer?		
	How would this information influence your decision on testing requirements?		
	Show an example.		
6.3	**Opening times**		
	What is the purpose of assigning delay before opening times?		
	What types of components inside the equipment may require opening times to be assigned?		
	How would you calculate the opening times associated with the dissipation of a capacitor for example?		
	How would this be indicated on the certificate, test report and equipment?		
	Show an example.		
6.4	**Circulating currents**		
	When considering circulating currents what are the methods of preventing them arising?		
	What protection should be afforded to a bonding conductor to maintain its function?		
	How would this requirement be identified to ensure that it is passed to the customer if necessary?		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	Show an example.		
6.5	**Gasket retention**		
	How do you check compliance with this clause?		
	Show an example.		
Clause 7.0 – Non-metallic enclosures and non-metallic parts of enclosures			
7.1	**General**		
7.1.1	**Applicability**		
	How would you asses if the non-metallic part supplied on the equipment by the manufacturer was a critical to the protection concept in order to asses whether or not to apply this clause?		
	Show evidence where this has been done.		
7.1.2	**Specification of materials**		
	On equipment that you have certified / tested. Show evidence of how the material and manufacturing process has been identified in the test records.		
7.1.3	**Plastic materials**		
	On equipment that you have tested / certified show what data was collected from the manufacturer and how this was recorded.		
7.2	**Thermal endurance**		
	How do you ensure that the non metallic material has a TI as required in this clause?		
	Show an example of how this has been reported in the test report.		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
7.3	**Electrostatic charges on external non-metallic materials of enclosures**		
7.3.1	**Applicability**		
	Show an example where electrostatic charging of non-metallic parts has been considered.		
7.3.2	**Avoidance of build-up of electrostatic charge**		
	What methods have you used to identify the potential risk?		
	For each of the possible methods how is this indicated on the enclosure, certificate and test report?		
7.4	**Threaded holes**		
	What assessments do you make when considering non metallic enclosures with threaded fasteners?		
	Give an example.		
Clause 8.0 – Enclosures containing light metals			
8.1	**Material composition**		
8.1.1	**Group I**		
	Do you have any Group I mining approvals?		
	How do you ensure that the material content requirements for product comply with this clause?		
8.1.2	**Group II**		
	How do you ensure that the material content requirements for product comply with this clause?		
	Show an example of how this is recorded.		
8.2	**Threaded holes**		
	What assessments do you make when considering non-metallic enclosures with threaded fasteners?		
	Show an example.		

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Clause 9.0 – Fasteners			
9.1	**General**		
	What do you understand by the term aid of a tool and what represents a tool?		
	What materials would you consider suitable for the fastenings of a light metal enclosure?		
9.2	**Special fasteners**		
	Under what circumstances would you require special fasteners?		
	How would you indicate the requirement for special fasteners?		
	Show an example.		
9.3	**Holes for special fasteners**		
9.3.1	**Thread engagement**		
	How do you address this clause in the certification documents to ensure that the thread depth is at least equal to the threads diameter?		
	Show an example.		
9.3.2	**Tolerance and clearance**		
	How do you ensure that the relevant tolerances and clearance are met and how is this indicated in the certification documents?		
9.3.3	**Hexagon socket set screws**		
	How do you ensure that the relevant tolerances are met and how is this indicated in the certification documents?		
Clause 10.0 – Interlocking devices			

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	What measures do you take to ensure that where interlocks are fitted that they cannot be fitted?		
	How is this indicated in the certification documents?		
	Show an example.		
Clause 11.0 – Bushings			
How do you ensure that bushings that are fitted to enclosures are secured against turning?			
What tests do you perform on a bushing?			
Clause 12.0 – Materials used for cementing			
How do you ensure that the cementing material has a suitable thermal stability?			
How is this indicated in the certification documents?			
Show an example.			
Clause 13.0 – Ex components			
13.1	**General**		
	What methods do you use to deal with Ex components?		
	How is an Ex component identified in the certification documents?		
	Show an example.		
13.2	**Mounting internal to apparatus**		
	What methods do you employ to consider internal components and how are these identified in the certification documents?		
13.3	**Mounting external to apparatus**		
	What methods do you employ to consider external components and how are these identified in the certification documents?		

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	What methods are used to assess the interface between the external component and the enclosure to ensure the relevant type of protection are complied with?		
Clause 14.0 – Connection facilities and terminal compartments			
14.1	**General**		
	No requirement.		
14.2	**Connection space**		
	How do you ensure that termination compartments are adequately dimensioned?		
14.3	**Type of protection**		
	How is it identified and what types of protection are required for terminal compartments?		
	What methods are used to ensure that the terminal compartment complies with the specific type of protection?		
14.4	**Creepage and clearance**		
	Where creepage and clearance distances are required by the relevant type of protection, what methods do you use to ensure that they comply with the type of protection concerned?		
	How is this identified in the documents issued for the product?		
Clause 15.0 – Connection facilities for earthing or bonding conductors			
15.1	**Internal**		
	When an internal connection facility is provided how is this identified in the documentation?		

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15.2	**External**		
	When an external connection facility is provided how is this identified in the documentation?		
15.3	**Apparatus not requiring earthing**		
	If the equipment does not require an earth, how is it identified in the documentation?		
15.4	**Size of conductor connection**		
	What methods are employed to ensure the size of the equipotential bonding connection complies with the requirements of Table 5?.		
	How is this identified in the documents?		
	Show an example.		
15.5	**Protection against corrosion**		
	How do you identified in the documentation when protective measures are required to prevent corrosion?		
15.6	**Secureness**		
	What methods do you use to ensure that the connection facilities provide a secure connection to the cable terminations?		
	Where tests in accordance with Clause 26.12 are required, how is this identified to the ExTL?		
	Show an example.		

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Clause 16.0 – Entries into enclosures			
16.1	**General**		
	No requirement.		
16.2	**Identification of entries**		
	How are entries in the enclosures checked to ensure that they comply with the documentation supplied by the manufacturer?		
	What form of identification is required to be supplied by the manufacturer to the customer and how is this checked?		
16.3	**Cable glands**		
	Where the enclosures are to be fitted with cable glands how is it identified that the requirements for the particular type of protection are ensured e.g. when glands are fitted to an enclosure complying with IEC 60079-7 Increased Safety requiring a minimum rating of IP 54 is maintained?		
	How are these requirements identified in the documentation?		
16.4	**Blanking elements**		
	Where blanking elements are to be certified as apparatus to be used with any enclosure how do you ensure that the relevant type of protection for the enclosure can be maintained?		
	How is this identified in the documentation?		
	Where a blanking element forms part of the enclosure how is this identified in the documentation?		

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	Show an example of each of the above.		
16.5	**Conductor temperature**		
	What methods are employed to establish the temperatures of the conductors under rated conditions at the entry point and branching point conductors?		
	Where the entry point or branching point are greater than the figures specified how is this identified in the documentation and on the equipment?		
	Show an example.		
Clause 17.0 – Supplementary requirements for rotating electrical machines			
17.1	**Fans and fan hoods**		
	Where motors have external cooling fans how is it identified in the documentation that it shall be fitted with a fan hood?		
	What methods are used to ensure that they comply with the requirements of Clauses 17.2 – 17.5?		
	Show an example.		
17.2	**Ventilation opening for external fans**		
	What methods are employed to show that the ventilation openings of the fan hoods provide IP 20 on the inlet side and IP 10 on the outlet side.		
	Where orientation of the motor can affect these IP requirements how is it identified in the documentation?		

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	What is the maximum dimension of foreign objects for Group I rotating electrical machines for which IP 10 is considered adequate?		
17.3	**Construction and mounting of the ventilating systems**		
	How do you notify the ExTL when tests in accordance with Clauses 26.4.2 are required?		
	What information does the ExTL provide to show compliance with this clause?		
	Show an example.		
17.4	**Clearances for the ventilation systems**		
	What methods are used to show compliance with this clause?		
	How is the information identified in the documentation?		
17.5	**Materials for external fans and fan hoods**		
	What information is provided by the manufacturer to comply with the requirement of this clause?		
	How is this information identified in the documentation?		
	Where tests in accordance with Clause 26.13 are required to establish surface resistance how is this identified to the ExTL?		
17.6	**Equipotential bonding conductors**		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	Where equipotential bonding conductors are required how is the cross sectional area and construction of the conductor identified in the documentation?		
Clause 18.0 – Supplementary requirements for switchgear			
18.1	**Flammable dielectric**		
	Why should switchgear not have contacts immersed in flammable dielectrics?		
18.2	**Disconnectors**		
	How do you check compliance with the requirements of this clause?		
	How is this identified in the documentation?		
18.3	**Group I – Provisions for locking**		
	For Group I switchgear with local resetting device, how do you ensure that the cover is secured by special fasteners?		
	How is this documented?		
18.4	**Doors and covers**		
	What forms of interlocks shall be incorporated to prevent access to the interior of an enclosure?		
	What methods are used to check that the interlocks provide the necessary protection?		
	Where the enclosure is marked what form of words are employed and how is this checked?		
	Show an example.		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
Clause 19.0 – Supplementary requirements for fuses			
How do you ensure that replacement of fuses cannot be done before the supply is disconnected?			
Where the apparatus is marked what form of words is used?			
How is this identified in the documentation?			
Show an example.			
Clause 20.0 – Supplementary requirements for plugs and sockets			
20.1	**Interlocking**		
	Where plugs and sockets are not interlocked mechanically, what tests are performed to ensure that the contacts cannot be separated when the contacts are energised, or energised when the plug and socket are separated?		
	Where the above cannot be complied how is the product marked and how is this identified in the documentation?		
	Show an example.		
	Where the plug and socket are rated 10 Amps and the voltage does not exceed 250V a.c. or 60V d.c. compliance can be achieved by meeting the alternative requirements given in this clause, what tests are conducted and how is this identified in the documentation?		
	The plug and socket shall remain flameproof during the arc quenching period, what tests are performed to ensure this requirement?		

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Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	Where the contacts remain energised after separation and are required to be protected according to one of the types of protection, how is this identified in the documentation?		
20.2	**Energised plugs**		
	How do you ensure that this requirement regarding plugs remaining energised is checked?		
Clause 21.0 – Supplementary requirements for luminaries			
21.1	**General**		
	Where light transmitting covers are fitted how are the required tests identified to the ExTL?		
	What information is provided by the ExTL and how is this assessed?		
	How is this information incorporated into the documentation?		
21.2	**Covers**		
	What tests are performed to ensure that covers are interlocked and disconnect of all poles at the beginning of opening?		
	Where interlocks are not fitted what marking is required and how is this identified in the documentation?		
	Show an example of both.		
	Where parts of the enclosure remain energised after opening what requirements are necessary to ensure that the energised parts are protected?		
	How is this identified in the documentation?		

Body Assessed: **Assessor:** **Date:**

Standard IEC 60079-0:2004 - General Requirements			**Doc.No.** TGD-60079-0 **Version:** Draft 4 **Date:** 03/01/06
	What marking is required?		
21.3	**Special lamps**		
	What types of lamps are not permitted in hazardous areas?		
Clause 22.0 – Supplementary requirements for caplights and handlights			
22.1	**Group I Caplights and handlights**		
	Do you have a copy of IEC 62013-1 for Group I caplights and handlights?		
	How do you ensure that this standard is current?		
22.2	**Group II Caplights and handlights**		
	What tests are performed on the caplight and handlight to ensure that the electrolyte does not leak?		
	How are these tests identified to the ExTL?		
	Where the caplight or handlight are supplied with electric cables what additional tests are required?		
	How is the cable information identified in the documentation?		
Clause 23.0 – Apparatus incorporating cells and batteries			
23.1	**Batteries**		
	How do you ensure that batteries are formed only from series connected cells?		
23.2	**Cell types**		
	What information is provided by the manufacturer regarding the cell type?		

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	How is this information documented?		
	Show an example.		
23.3	**Cells in a battery**		
	What information is provided by the manufacturer, how is this checked to ensure that the cells meet the requirement of this clause?		
23.4	**Ratings of batteries**		
	How are the ratings of batteries identified such that they are operated within their defined limits?		
	How is this information documented?		
23.5	**Mixture of cells**		
	What checks are made to ensure the primary and secondary cells are not mixed?		
23.6	**Interchangeability**		
	How is compliance ensured with this clause and how is it identified in the documentation?		
23.7	**Charging of primary batteries**		
	Where primary batteries are fitted, how is it ensured that they are not recharged?		
	Where an enclosure contains primary batteries and a separate voltage source, how is it ensured that interconnection of the two is not possible?		
	How is this identified in the documentation?		
23.8	**Leakage**		

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	When cells are fitted in an enclosure, how is it established that if leakage of electrolyte occurs it will not affect the type of protection or components?		
	How is this documented?		
23.9	**Connections**		
	For connection facilities how are the manufacturers recommended connection methods transmitted to the user?		
23.10	**Orientation**		
	Where orientation of the equipment is important how is this information documented and how is the enclosure marked?		
	Show an example.		
23.11	**Replacement of cells and batteries**		
	How is it ensured that for the replacement of the cells or batteries the information supplied by the manufacturer is incorporated in the documentation?		
	What information is provided inside the enclosure?		
Clause 24.0 – Documentation			
When an application is received, how is the supporting documentation recorded?			
Having checked the documentation how are any required changes identified and transmitted to the customer?			
When the modified documentation is received from the customer how is this recorded?			

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When the documentation is finalised what information is transcribed onto the certification documents?			
Show an example.			
Clause 25.0 – Compliance of prototype or sample with documents			
When a sample is requested how is this information transmitted to the customer?			
Where the sample requires special preparation how is this transmitted to the customer e.g. reduced wall thickness or flamepaths for a flameproof enclosure?			
What checks are done on the sample to ensure that it complies with the documentation?			
How is this information recorded?			
How is the sample controlled?			
How is the sample identified in the documentation?			
Show examples.			
Clause 26.0 – Type tests			
26.1	**General**		
	How is the ExTL selected?		
	How is it known that the ExTL can conduct all the required tests?		
	How is the ExTL notified of the required tests and assessments to be conducted on the equipment?		
	What documentation is received from the ExTL following testing and assessment?		
	How is this documentation assessed?		
26.2	**Test configuration**		
	For each of the necessary tests from this and other relevant protection concepts how is the test configuration identified?		

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26.3	**Tests in explosive test mixtures**		
	How is it established that the test gas meets the necessary standards for purity?		
26.4	**Tests of enclosures**		
26.4.1	**Order of tests**		
26.4.1.1	**Metallic enclosures, metallic parts of enclosures and glass of parts of enclosures**		
	How are the requirements for this clause identified i.e. the impact energy, drop test, IP test, additional tests and specific tests related to the type of protection?		
	When would a drop test be required?		
	How are the test requirements identified to the ExTL?		
26.4.1.2	**Non-metallic enclosures or non-metallic parts of enclosures**		
	How are the thermal endurance requirements established for non-metallic enclosures?		
	How is this identified to the ExTL?		
	Why are thermal endurance tests conducted on non-metallic enclosures?		
26.4.1.2.1	**Group I electrical apparatus**		
	What additional tests are required for non-metallic enclosures, other than thermal endurance tests, for Group I equipment?		

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	How are these tests identified to the ExTL?		
26.4.1.2.2	**Group II electrical apparatus**		
	What information is passed to the customer to enable a decision on whether 4 or 2 samples shall be subjected to the thermal endurance test?		
	Show an example.		
26.4.2	**Resistance to impact**		
	Under what circumstances would the reduced level of impact be applied to an enclosure?		
	How would this be identified in the documentation?		
	Under what circumstances would you conduct an impact test at the lower specified ambient temperature?		
	When testing non-metallic enclosures what are the temperatures at which the impact tests would be conducted?		
26.4.3	**Drop test**		
	When would a drop test be considered?		
	How is this information transmitted to the ExTL?		
26.4.4	**Acceptance criteria**		
	What level of damage would you consider Is not acceptable?		
	How is the information on the testing conducted by the ExTL received by the ExCB?		
26.4.5	**Degree of protection (IP) by enclosures**		
26.4.5.1	**Test procedure**		

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	What protection concepts require an IP rating to be established?		
	Where testing is established, how is this information transmitted to the ExTL?		
	How is the information provided by the ExTL incorporated into the documentation?		
	How is the IP rating identified within the documentation and on the product?		
	Show an example.		
26.4.5.2	**Acceptance criteria**		
	Where the manufacturer has stated a higher IP rating than required by the product standard how is this information passed to the ExTL?		
	How is the information provided by the ExTL assessed and incorporated into the documentation?		
26.5	**Thermal tests**		
26.5.1	**Temperature measurement**		
	Why is the temperature measurement test different for Group I and Group II equipment?		
	How is the requirement for the temperature measurement established?		
	How is this data transmitted to the ExTL?		
	Where the equipment is tested in a particular position how is this information identified in the documentation?		
	Under what protection concept would you the internal hottest point of the equipment be considered?		

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	How are the results provided from the ExTL incorporated into the documentation?		
26.5.2	**Thermal shock test**		
	When are thermal shock tests required?		
	How is this information transmitted to the ExTL?		
26.5.3	**Small component ignition test**		
26.5.3.1	**General**		
	Under what circumstances would you conduct a small component ignition test?		
	Where a small component is used how would the requirement for this test be transmitted to the ExTL?		
26.5.3.2	**Procedure**		
	How is it ensured that the ExTL carries out the test in accordance with this clause?		
26.5.3.3	**Acceptance criteria**		
	How is the information provided by the ExTL assessed and incorporated into the documentation?		
26.6	**Torque tests for bushings**		
26.6.1	**Test procedure**		
	How do you establish whether a bushing is subject to a torque during connection of disconnection of the conductors?		
	Where a bushing is subject to torque how is the requirement for torque test transmitted to the ExTL?		
26.6.2	**Acceptance criteria**		

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	How are the results of the test provided by the ExTL incorporated into the documentation?		
26.7	**Non-metallic enclosures or non-metallic parts of enclosures**		
26.7.1	**General**		
	How is it established which tests from Clauses 26.8 to 26.15 are applicable to non-metallic enclosures or non-metallic parts of enclosures?		
	Where tests are established how is this information transmitted to the ExTL?		
26.7.2	**Temperatures during tests**		
	Where temperatures tests have been conducted what are the maximum upper surface temperatures increased by and what are the minimum surface temperatures reduced by?		
26.8	**Thermal endurance to heat**		
	For thermal endurance to heat what are the limits in temperature where the 4 week period is replaced by 2 weeks and the 2 weeks at various temperatures and humidity?		
26.9	**Thermal endurance to cold**		
	How are the temperatures for thermal endurance to cold transmitted to the ExTL?		
26.10	**Resistance to light**		

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26.10.1	**Applicability**		
	How is it established that the resistance to light test is necessary for the type of equipment?		
	Where the test is deemed necessary, how is this information passed to the ExTL?		
	Under what circumstances would the resistance to light test only be applied to luminaires?		
26.10.2	**Test procedure**		
	How is the request for samples transmitted to the customer?		
	How is it ensured that ExTL has capability to carry out this test in accordance with this test procedure?		
26.10.3	**Acceptance criteria**		
	How is the information provided by the ExTL assessed and incorporated into the documentation?		
	In the event of non-compliance how is the information transmitted to the customer?		
26.11	**Resistance to chemical agents for Group I electrical apparatus**		
	What are the requirements for non-metallic enclosures for Group I in respect to resistance to chemicals?		
	Where this test is considered relevant, how is this information transmitted to ExTL?		

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	In the event of non-compliance with the test, what additional marking can be applied to the documents and how is this identified in the document?		
26.12	**Earth continuity**		
	Why is this earth continuity test conducted?		
	How is the resistance between the earth plates measured?		
	How are the results incorporated into the documents?		
	What is the maximum resistance between the earth plates?		
26.13	**Surface resistance test of parts of enclosures of non-metallic materials**		
	How is this test identified to the ExTL?		
	What is the reason for this test?		
	How are the results from the ExTL assessed and incorporated into the documentation?		
	How is the surface resistance calculated?		
26.14	**Charging tests**		
26.14.1	**Introduction**		
	Where the test is considered necessary how is the manufacturer informed as to the requirements for the sample?		
	Where the part is not available what is the area of the flat sample of the material upon which the test can be performed?		
	What is the purpose of this test?		

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	How is the test identified to the ExTL?		
	How is it ensured that the ExTL can conduct this test?		
26.14.2	**Principle of the test**		
	No requirement.		
26.14.3	**Samples and apparatus**		
	How is it ensured the ExTL has the relevant apparatus to conduct the test?		
26.14.4	**Ambient conditions**		
	What are the ambient conditions under which this test should be conducted?		
26.14.5	**Conditioning**		
	Why is the test piece cleaned?		
26.14.6	**Determination of most efficient charging method**		
	How is it determined which method is chosen?		
26.14.6.1	**Method A rubbing with a pure polyamide cloth (Figure 6)**		
	No requirement.		
26.14.6.2	**Method B rubbing with a cotton cloth**		
	No requirement.		
26.14.6.3	**Method C charging by influence with a d.c. high-voltage power supply (Figure 8)**		
	No requirement.		
26.14.7	**Assessment of discharge**		

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	How are the results of the test conducted by the ExTL assessed and incorporated in the documents?		
	Show an example of any of the above.		
26.15	**Measurement of capacitance**		
	What is the purpose of this test?		
	How is the requirements of this test to be conducted to the ExTL?		
26.15.1	**Test procedure**		
	How is it ensured that the ExTL has the capability to carry out these tests?		
26.15.2	**Acceptance Criteria**		
	How is the data provided by the ExTL and the outcome of the test incorporated into the documentation?		
Clause 27.0 – Routine verification and tests			
Under what circumstances would routine verification tests be necessary?			
How would the manufacturer be advised of these requirements?			
How are the incorporated in the documentation?			
Clause 28.0 – Manufacturers responsibility			
28.1	**Certificate**		
	As an ExCB how is the certificate for the equipment created?		
	What checks are made to ensure the details are correct?		

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	Prior to issue of the certificate to the manufacturer what other actions are necessary to be considered?		
28.2	**Responsibility for marking**		
	How is the manufacturer advised of his responsibility for compliance of the product with the certificate?		
	How is the marking provided by the manufacturer assessed for correctness?		
Clause 29.0 – Marking			
29.1	**Location**		
	How do you ensure that equipment is marked legibly and in the correct location?		
29.2	**General**		
	Where multiple protection concepts are used what is the form of the marking e.g. increased safety enclosure combined with flameproof switches fitted internally?		
	Where equipment meets two separate protection concepts e.g. a flameproof cable gland which also meets increased safety requirements, how would this product be marked?		
	When equipment has associated apparatus suitable for use in a hazardous area. what symbol is used to identify the associated apparatus?		
29.3	**Different types of protection**		

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	Where more than one type of protection is used on the equipment, what is the order for the symbols of the types of protection to be applied?		
29.4	**Order of marking**		
	No requirement.		
29.5	**Ex components**		
	How is it ensured that the marking of Ex components complies with this clause?		
	What is the symbol that applies to all Ex components?		
	Why are Ex components not marked with a temperature class?		
	Show an example.		
29.6	**Small apparatus and Ex components**		
	Under what circumstances would the requirements for marking of small equipment and Ex components apply?		
	What information should appear on small equipment or Ex components?		
29.7	**Extremely small apparatus and Ex components**		
	What is the requirement for marking this type of equipment?		
29.8	**Warning markings**		
	Under what circumstances are warning markings applied to electrical equipment?		
	Where warning markings cannot be applied what other methods can be used?		

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29.9	**Cells and batteries**		
	How do you ensure that cells and batteries are effectively marked?		
29.10	**Examples of marking**		
	No requirement.		
Clause 30.0 – Instructions			
30.1	**General**		
	How is it ensured that the instructions provided with the equipment comply with the requirements?		
	How is this identified in the documentation?		
30.2	**Cells and batteries**		
	No requirement.		
Annex A – Ex cable glands			
A.1	**General**		
	What protection concepts have additional requirements for cable glands?		
	How is this identified?		
A.2	**Constructional requirements**		
A.2.1	**Cable sealing**		
	What are the sealing methods that can be employed in respect to a cable gland sealing on a cable?		
	Where composite sealing rings are employed, what precautions should be taken regarding the materials?		
	Where other protection concepts are identified, how is this integrated with the general requirements?		

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A.2.2	**Materials**		
A.2.2.1	**Exposed parts**		
	Where plastic glands, or non-metallic materials, are employed in the external parts of cable glands, what tests are applied to the non-metallic materials?		
	Where tests are identified how is this transmitted to the ExTL?		
A.2.2.2	**Elastomeric sealing rings**		
	How are the requirements of resistance to ageing assessed?		
	What information does the manufacturer supply?		
	Show an example.		
A.2.2.3	**Filling compounds**		
	What information is provided by the manufacturer?		
	How is this incorporated into the documentation?		
A.2.3	**Clamping**		
A.2.3.1	**General**		
	Why do cable glands have to provide clamping of the cable?		
A.2.3.2	**Group II cable glands**		
	Where cable glands are supplied without a clamping device, how are they identified if they do not pass the required pull test?		
A.2.4	**Lead-in of cable**		
A.2.4.1	**Sharp edges**		
	Why should cable glands not have sharp edges?		
A.2.4.2	**Point of entry**		
	No requirement.		

Body Assessed: **Assessor:** **Date:**

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A.2.5	**Release by a tool**		
	How is this requirement assessed?		
A.2.6	**Fixing**		
	What tests are employed to ensure that the cable gland can be adequately fixed to an enclosure?		
A.2.7	**Degree of protection**		
	How can it be ensured when a cable gland has an IP rating that when fitted to the enclosure the interface between the two pieces of equipment will maintain the IP rating of the enclosure?		
	How is this indicated in the documentation?		
A.3	**Type tests**		
A.3.1	**Tests of clamping of non-armoured and braided cables**		
	What do you understand by the term braided cables?		
	What is the braid of the cable used for?		
A.3.1.1	**Cable glands with clamping by the sealing ring**		
	Where an application is received for the certification of cable glands that incorporates a range of sizes e.g. an M20 and M25 size etc., how many samples would be requested?		
	Why are the clamping tests where sealing rings are concerned performed on metallic mandrels?		

Body Assessed: **Assessor:** **Date:**

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	Where this type of cable gland is required to be certified, how are the sealing tests identified to ExTL?		
	What is the load applied to the mandrel when the smallest diameter mandrel in the range specified by the manufacturer is fitted?		
A.3.1.2	**Cable glands with clamping by filling compound**		
	Where compound filling is used for the clamping tests, how is it ensured that where braided cables are used, braid is not retained by the compound?		
A.3.1.3	**Cable glands with clamping by means of a clamping device**		
	Where clamping devices are applied and the clamping devices are capable of clamping a range of cables, how is it ensured that the loads applied comply in both the minimum and maximum size cases?		
A.3.1.4	**Tensile test**		
	How is it ensured that ExTL conducting this test has the relevant equipment to meet this requirement?		
	What information is provided by the ExTL and how is it incorporated into the documentation?		
A3.1.5	**Mechanical strength**		

Body Assessed: **Assessor:** **Date:**

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A.3.2	**Tests of clamping of armoured cables**		
A.3.2.1	**Tests of clamping where the armourings are clamped by a device within the gland**		
A.3.2.1.1	**Tensile test**		
A.3.2.1.2	**Mechanical strength**		
A.3.2.2	**Test of clamping where the armourings are not clamped by a device within the gland**		
A.3.3	**Ageing test for material used for elastomeric sealing rings**		
A.3.4	**Type test for resistance to impact**		
A.3.5	**Test for degree of protection (IP) of cable glands**		
A.4	**Marking**		
A.4.1	**Marking of cable glands**		

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A.4.2	**Marking of cable – sealing rings**		
Annex B – Requirements for Ex components			

Annex B

IECEx
Technical Guidance Document (TGD)

based on

IEC 60079-1, 6th edition (2006)
Flameproof enclosure “d”

Body assessed:
<Name>
IECEx contact person: <name>
<Address>
<Place>
<Country>

Assessment date(s):
<ddmmyyyy>

Audit team members:
<Name 1> - Lead assessor
<Name 2>
<Name 3>

Document history:

Revision level:	Changes:	Issued by:	Approved by ExMC in:
V1.0	Initial release	KEMA/CSA	<month, year>

Purposes of this TGD:

- This TGD has been prepared to assist both the body under assessment as preparation for the audit as well as the audit team during the assessment.
- It is assumed that the body under assessment has sufficient knowledge of the type of protection concerned. This is based on the evidence provided together with the formal application as ExCB or ExTL. During the actual audit the audit team will collect sufficient evidence to support this assumption.
- It is also assumed that if an ExCB or ExTL meets the requirements of this TGD, the ExCB or ExTL is also capable of meeting the requirements of older editions of standard IEC 60079-1.
- The TGD does not cover all requirements of IEC 60079-1, it focuses on the most important clauses of the standard regarding available personal knowledge and expertise, procedures and the equipment used.
- The focus of this TGD is on those parts of a product assessment and testing that are not (clearly) identified in the IEC standard. Many “how to …?” questions and answers can be asked by for example junior (non-qualified) employees of an ExCB or ExTL. The answers of senior (qualified) employees will be based on the available knowledge and experience of those senior employees. It is unfortunately not uncommon to get different answers to the same question, even within the same ExCB or ExTL. The aim of this TGD is therefore not only to make sure that the requirements of IEC 60079-1 are understood and used for assessment and testing as written in the IEC standard, but also to identify the most critical usually non-written interpretations on the standard as used in every day practice by the ExCB or ExTL. The audit team will compare the interpretations of the ExCB or ExTL under assessment with the commonly used interpretations of other ExCBs and ExTLs within the IECEx Scheme and will provide comments if necessary.

Final goal:

In principle, all ExCBs and ExTLs should use the IEC standards in the same way. Using the input of all ExCBs or ExTLs under assessment, the IECEx Assessors together with IECEx TAG would be able to generate guidance documents for all types of protection.

How to fill out this TGD?
This TGD is split in 3 sections as follows:

Section 1 – Personnel:
To identify the knowledge level of the ExCBs or ExTLs employees regarding the written and non-written requirements and interpretations of IEC 60079-1.

For Section 1, “Evidence” column, please refer to training records, personal knowledge evidence files, regular internal meetings, participations in (inter)national Ex d working groups, maintenance teams, etc. as far as available / applicable.

Section 2 – Procedures:
To identify the procedures used for carrying out the tasks related to IEC 60079-1 (assessment and testing) and to collect evidence that these procedures are known, understood and used

For Section 2, “Evidence” column, please refer to any written documents (procedures, instructions, manuals, etc) as far as available / applicable.

Section 3 – Equipment:
To identify all equipment used for testing of Ex d equipment, the calibration status, method and interval, availability of the equipment and its condition and maintenance cycle.

For Section 3, “Evidence” column, please refer to the applicable equipment identification number, calibration certificate and calibration report, as far as available. For non-calibrated measuring equipment, please refer to the applicable procedure for periodic checking of the equipment.

Help needed?
In case of any questions: please contact the IECEx Secretariat for assistance.

Personnel involved in Ex d assessments and testing:

Name	Function	Qualified (Y/N)	Experience (Years)	Interviewed by audit team (Y/N)

Remarks to above table:

- <any remarks by the ExCB / ExTL or audit team>

Section 1 - Personnel

1	Scope		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Is it known which requirements of this standard conflict with the requirements of IEC 60079-0?		

2	Normative references		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Are the standards listed known in general and applied where applicable? More specific, are the following standards understood in detail and applied where applicable: • IEC 60034-1 • IEC 60112 • IEC 60529 • ISO 965-1 • ISO 965-3 • ISO 2738 • ISO 4003 • ANSI/ASME B1.20.1? Are the IECEx ExTAG (draft) decisions known, understood and applied where applicable? Is OD017, especially chapter 4.2, known and applied to the drawings and other documents that describe the construction of the flameproof enclosure?		

3	Terms and definitions		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Are all of the terms and definitions understood in detail and applied in correct manner?		

4	Apparatus grouping and temperature classification		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

5	Flameproof joints
5.1	General requirements

	Requirement / interpretation:	Evidence:	Comments by IECEx audit team:
	How is it determined whether or not a coating material adversely affects the flameproof properties of a joint? How is it determined whether a corrosion inhibiting grease is suitable to be applied to joint surfaces before assembly? How is it determined whether electroplating meets the requirements of the standard?		
5.2	**Non-threaded joints**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
5.2.1	Width of joints (*L*)		
	How are the joints identified? How is it determined whether the width of joints meet the requirements of table 1 or 2?		
5.2.2	Gap (*l*)		
	How is it determined whether the gap meets the requirements of table 1 or 2? Is ISO 31-0 known and applied to determine the maximum gap? Is ISO 468 known and applied to determine the average surface roughness (R_a) of a joint?		
5.2.3	Spigot joints		
	No specific knowledge required	-	-
5.2.4	Holes in joint surfaces		
	No specific knowledge required	-	-
5.2.5	Conical joints		
	No specific knowledge required	-	-
5.2.6	Joints with partial cylindrical surfaces (not permitted for Group IIC)		
	No specific knowledge required	-	-
5.2.7	Flanged joints for acetylene atmospheres		
	No specific knowledge required	-	-
5.2.8	Serrated joints		
	How is the maximum gap required by table 1 and 2 determined for a serrated joint (i.e., how is the equivalent minimum width of joint L determined?		
5.3	**Threaded joints**		

	Requirement / interpretation:	Evidence:	Comments by IECEx audit team:
	Are all the terms and constructional requirements mentioned in Tables 3 and 4 understood in detail? The thread pitch must be ≥ 0,7 mm; is there a maximum pitch?		
5.4	**Gaskets (including O-rings)**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	How is it determined whether the minimum width of a cylindrical (part of a spigot) joint is maintained after compression? How is it determined whether a sealing gasket of "a non-flammable compressible material with a metallic sheath" is indeed non-flammable?		
5.5	**Apparatus using capillaries**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

6	**Cemented joints**		
6.1	**General**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which upper and lower temperatures are used for the endurance to heat and to cold tests of IEC 60079-0? How many samples are subjected to these tests?		
6.2	**Mechanical strength**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	How is it determined whether the mechanical strength of the cemented joint depends upon the adhesion of the cement alone? Which arrangements would be considered acceptable constructions? Using 15.1.3 for the overpressure test on the cemented joint: which test method is used (static or dynamic) and at what		

	temperature is the test conducted? What is the test time? What is the test pressure?		
6.3	**Width of cemented joints**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	How is the shortest path through a cemented joint verified?		

7	**Operating rods**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
7.1	No specific knowledge required	-	-
7.2	How is it determined whether diametrical clearances are liable to be enlarged as a result of wear in normal service?		

8	**Shafts and bearings**		
8.1	**Joints of shafts**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
8.1.1	Cylindrical joints		
	No specific knowledge required	-	-
8.1.2	Labyrinth joints		
	No specific knowledge required	-	-
8.1.3	Joints with floating glands		
	How is the maximum degree of float determined in practice? How is it determined whether the device intended to prevent rotation of the gland is suitable for its purpose?		
8.2	**Bearings**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
8.2.1	Sleeve bearings		
	Which metals are considered non-sparking?		
8.2.2	Rolling-element bearings		
	Is, for the calculation of *m* and *k*, the method laid down in the (draft) interpretation sheet 31/626/DC to IEC 60079-1 known and applied?		

9	**Light transmitting parts**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	How is it verified whether precautions, taken to avoid internal mechanical stress due to mounting of light-transmitting		

	parts, are sufficient?		

10	**Breathing and draining devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Following explosion tests, how is it determined whether there is permanent distortion or damage which would impair the flame-arresting properties of the device?		
10.1	**Openings for breathing or draining**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
10.2	**Composition limits**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
10.3	**Dimensions**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
10.4	**Elements with measurable paths**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
10.5	**Elements with non-measurable paths**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	**-**	**-**
10.6	**Removable devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
10.7	**Mounting arrangements of the elements**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
10.8	**Mechanical strength**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

10.9	**Breathing and draining devices when used as Ex components**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
10.9.1	Mounting arrangements of the elements and components		
	No specific knowledge required	-	-
10.9.2	Type tests for breathing and draining devices used as Ex components		
	No specific knowledge required	-	-
10.9.2.1	Test of the ability of the breathing and draining device to withstand pressure		
	What is the test time for the		

	overpressure test? Following overpressure tests, how is it determined whether there is permanent deformation or damage affecting the type of protection?		
10.9.2.2	Thermal tests		
	Following thermal tests, how is it determined whether there is permanent distortion or damage which would impair the flame-arresting properties of the device?		
10.9.2.3	Test for non-transmission of an internal ignition		
	No specific knowledge required	-	-
10.9.3	Ex component certificate		
	No specific knowledge required	-	-

11	**Fasteners, associated holes and blanking elements**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
11.1	When is a fastener considered to be accessible from the outside? When not?		
11.2	No specific knowledge required	-	-
11.3	No specific knowledge required	-	-
11.4	What is considered to be another equally effective method for attaching studs to the enclosure?		
11.5	Is the use of glue considered as an equally effective method to make fasteners non-detachable from the enclosure? If yes, what are the requirements for the glue?		
11.6	No specific knowledge required	-	-
11.7	How is it determined whether at least one full thread remains free at the base of the hole?		
11.8	No specific knowledge required	-	-
11.9	No specific knowledge required	-	-
11.10	What is considered to be an equally effective method for securing and releasing threaded doors or covers?		

12	**Materials and mechanical strength of enclosures – Materials inside the enclosures**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**

12.1	No specific knowledge required	-	-
12.2	No specific knowledge required	-	-
12.3	No specific knowledge required	-	-
12.4	How is the quality of cast iron verified?		
12.5	No specific knowledge required	-	-
12.6	How is the CTI verified?		
12.7	What is considered as a zinc alloy?		

13	**Entries for flameproof enclosures**		
13.1	**Cable glands**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
13.2	**Conduit sealing devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
13.2.1	No specific knowledge required	-	-
13.2.2	What dimension is taken as the size of the conduit: the inner or outer diameter?		
13.3	**Plugs and sockets and cable couplers**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
13.4	**Bushings**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	**-**	**-**

14	**Verification and tests**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

15	**Type tests**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	The enclosure can be tested with all enclosed apparatus in place, empty, or using equivalent models. How is the configuration which will give the most severe conditions (for development of explosion pressures) determined?		
15.1	**Tests of ability of the enclosure to withstand pressure**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
15.1.1	General		
	Following the tests of 15.1.2 and 15.1.3, how is determined whether there is permanent		

	distortion or damage which would affect the type of protection, or the joints have been enlarged?		
15.1.2	Determination of explosion pressure (reference pressure)		
	For equipment that involve simple internal geometry: What is considered as simple internal geometry? Which criteria are used to determine whether the test may be conducted at room ambient or must be conducted at the min. ambient temperature (if < -20 C)?		
15.1.2.1	What criteria are used to determine the locations of the ignition sources and pressure transducers?		
15.1.2.2	No specific knowledge required	-	-
15.1.2.3	What is meant by “the pressure values obtained deviate *from one to another* by a factor of ≥ 1,5”?		
15.1.2.4	No specific knowledge required	-	-
15.1.3	Overpressure test		
	What is considered as an insignificantly decrease of the tensile and yield strength properties of the material at low temperature?		
15.2	**Test for non-transmission of an internal ignition**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-
15.4	**Tests of flameproof enclosures with breathing and draining devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
15.4.1	Tests of ability of the enclosure to withstand pressure		
	No specific knowledge required	-	-
15.4.2	Thermal tests		
	How is the position of the ignition source determined in order to give the most unfavourable thermal results?		
15.4.3	Test for non-transmission of an internal ignition		
	How is it determined whether “a high peak explosion pressure and rate of rise of pressure at the face of the device” is likely to occur? For enclosures with more than one identical devices: how is it determined which device will give the most unfavourable results?		

16	Routine tests		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

17	Switchgear for Group I		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

18	Lampholders and lamp caps		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

19	Non-metallic enclosures and non-metallic parts of enclosures		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
19.3.1	Tests for flameproofness		
	For bushings common to two adjacent enclosures: how is it determined which enclosure gives the worst conditions for the test?		
19.3.2	Is the last paragraph of this clause understood in detail?		

20	Marking		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

Annex A	Crimped ribbon elements and multiple screen elements of breathing and draining devices		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

Annex B	Elements with non-measurable paths of breathing and draining devices		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No additional specific knowledge required other than specified in clause 2 of this TGD	-	-

Annex C	Flameproof entry devices		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

Annex D	Empty flameproof enclosures as Ex components		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

Annex E	Cells and batteries used in flameproof “d” enclosures		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific knowledge required	-	-

Section 2 - Procedures

1	Scope		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

2	Normative references		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedures assure that employees have access to the listed standards and are informed about any (upcoming) changes to these standards? Which procedures assure that employees have access to IECEx (draft) ExTAG decisions? Which procedures assure that the drawings and other documents that describe the construction of the flameproof enclosure are verified for compliance with OD017, especially chapter 4.2?		

3	Terms and definitions		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

4	Apparatus grouping and temperature classification		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

5	Flameproof joints		
5.1	General requirements		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedures assure a uniform approach regarding: - a coating material that shall not adversely affect the flameproof properties of a joint, - the suitability of a corrosion inhibiting grease applied to joint surfaces before		

	assembly, - electroplating meets the requirements of the standard?		
5.2	**Non-threaded joints**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
5.2.1	Width of joints (*L*)		
	Which procedure assures that all joints are identified and that the width of joints is verified for compliance with the requirements of table 1 or 2?		
5.2.2	Gap (*l*)		
	Which procedure assures that the gap is verified for compliance with the requirements of table 1 or 2? Which procedure assures that ISO 31-0 is applied to determine the maximum gap? Which procedure assures that ISO 468 is applied to determine the average surface roughness (R_a) of a joint?		
5.2.3	Spigot joints		
	No specific procedures required	-	-
5.2.4	Holes in joint surfaces		
	No specific procedures required	-	-
5.2.5	Conical joints		
	No specific procedures required	-	-
5.2.6	Joints with partial cylindrical surfaces (not permitted for Group IIC)		
	No specific procedures required	-	-
5.2.7	Flanged joints for acetylene atmospheres		
	No specific procedures required	-	-
5.2.8	Serrated joints		
	No specific procedures required	-	-
5.3	**Threaded joints**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
5.4	**Gaskets (including O-rings)**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedure assures that the minimum width of a cylindrical (part of a spigot) joint is determined correctly after compression? Which procedure assures a		

	uniform approach regarding the determination of a sealing gasket of a non-flammable compressible metal with a metallic sheath is indeed non-flammable?		
5.5	**Apparatus using capillaries**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

6	**Cemented joints**		
6.1	**General**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedure assures a uniform approach regarding the temperatures taken for the endurance to heat and to cold tests of IEC 60079-0 and the number of samples that are subjected to these tests?		
6.2	**Mechanical strength**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedure assures a uniform approach regarding the arrangements that are considered acceptable in the construction and that it is verified that the mechanical strength of the assembly with the cemented joint does not depend upon the adhesion of the cement alone? Using 15.1.3 for the overpressure test on the cemented joint: which procedure specifies the test method to be used (static or dynamic) and prescribes the temperature at which the test is conducted and the test time and pressure to be taken?		
6.3	**Width of cemented joints**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedure prescribes how to determine the shortest path through a cemented joint?		

7	**Operating rods**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**

7.1	No specific procedures required	-	-
7.2	Which procedure assures a uniform approach regarding the determination that diametrical clearances are liable to be enlarged as a result of wear in normal service?		

8	**Shafts and bearings**		
8.1	**Joints of shafts**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
8.1.1	Cylindrical joints		
	No specific procedures required	-	-
8.1.2	Labyrinth joints		
	No specific procedures required	-	-
8.1.3	Joints with floating glands		
	Which procedure is used to determine the maximum degree of float? Which procedure assures a uniform approach regarding the suitability of the device that is intended to prevent rotation of the gland?		
8.2	**Bearings**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
8.2.1	Sleeve bearings		
	Which procedure assures a uniform approach regarding which metals are to be considered as non-sparking?		
8.2.2	Rolling-element bearings		
	Which procedure assures the application of the method laid down in the (draft) interpretation sheet 31/626/DC to IEC 60079-1 regarding the calculation of *m* and *k*?		

9	**Light transmitting parts**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedure assures a uniform approach regarding the evaluation of the precautions taken to avoid internal mechanical stress due to mounting of light-transmitting parts?		

10	**Breathing and draining devices**

	Requirement / interpretation:	Evidence:	Comments by IECEx audit team:
	Which procedure assures a uniform approach regarding the determination whether, following the explosion tests, there is no permanent distortion or damage which would impair the flame-arresting properties of the device?		
10.1	**Openings for breathing or draining**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
10.2	**Composition limits**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
10.3	**Dimensions**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
10.4	**Elements with measurable paths**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
10.5	**Elements with non-measurable paths**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	**-**	**-**
10.6	**Removable devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
10.7	**Mounting arrangements of the elements**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
10.8	**Mechanical strength**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

10.9	**Breathing and draining devices when used as Ex components**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
10.9.1	Mounting arrangements of the elements and components		
	No specific procedures required	-	-
10.9.2	Type tests for breathing and draining devices used as Ex components		
	No specific procedures required	-	-
10.9.2.1	Test of the ability of the breathing and draining device to withstand pressure		
	Which procedure assures a uniform approach regarding		

	the test time and dp/dt for the overpressure test? Which procedure is followed to determine that following the overpressure test there is no permanent deformation or damage affecting the type of protection?		
10.9.2.2	Thermal tests		
	Which procedure is followed to determine that following the thermal tests the device shows no evidence of thermal or mechanical damage or deformation which could affect its flame-arresting properties?		
10.9.2.3	Test for non-transmission of an internal ignition		
	No specific procedures required	-	-
10.9.3	Ex component certificate		
	No specific procedures required	-	-

11	**Fasteners, associated holes and blanking elements**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
11.1	Which procedure is followed to determine whether a fastener is considered to be accessible from the outside?		
11.2	No specific procedures required	-	-
11.3	No specific procedures required	-	-
11.4	Which procedure assures a uniform approach regarding the application of another equally effective method for attaching studs to the enclosure?		
11.5	Which procedure assures a uniform approach regarding the use of an equally effective method to make fasteners non-detachable from the enclosure?		
11.6	No specific procedures required	-	-
11.7	Which procedure is followed to determine whether at least one full thread remains free at the base of the hole?		
11.8	No specific procedures required	-	-
11.9	No specific procedures required	-	-
11.10	Which procedure assures a uniform approach regarding the use of an equally effective method for securing and		

	releasing threaded doors or covers?		

12	Materials and mechanical strength of enclosures – Materials inside the enclosures		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
12.1	No specific procedures required	-	-
12.2	No specific procedures required	-	-
12.3	No specific procedures required	-	-
12.4	Which procedure is followed to verify the quality of cast iron?		
12.5	No specific procedures required	-	-
12.6	Which procedure is followed to verify the CTI?		
12.7	Which procedure assures a uniform approach regarding the definition of a zinc alloy?		

13	Entries for flameproof enclosures		
13.1	Cable glands		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
13.2	Conduit sealing devices		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
13.2.1	No specific procedures required	-	-
13.2.2	No specific procedures required	-	-
13.3	Plugs and sockets and cable couplers		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
13.4	Bushings		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	**-**	**-**

14	Verification and tests		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

15	Type tests		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	Which procedure assures that the correct situation is determined that gives the most severe condition for explosion pressure development?		
15.1	Tests of ability of the enclosure to withstand pressure		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**

15.1.1	General		
	Which procedure is followed to determine whether, following the tests of 15.1.2 and 15.1.3, there is deformation or damage affecting the type of protection, or joints have been enlarged?		
15.1.2	Determination of explosion pressure (reference pressure)		
	Which procedure assures a uniform approach regarding the judgement that equipment has a simple internal geometry? Which criteria are laid down to determine whether the test may be conducted at room ambient or must be conducted at the min. ambient temperature (if < -20 C)?		
15.1.2.1	Which procedure is followed and what criteria are used to determine the locations of the ignition sources and the pressure transducers?		
15.1.2.2	No specific procedures required	-	-
15.1.2.3	No specific procedures required		
15.1.2.4	No specific procedures required	-	-
15.1.3	Overpressure test		
	What procedure is followed and what are the criteria to judge that the decrease of the tensile and yield strength properties of the material at low temperature is insignificant?		
15.2	**Test for non-transmission of an internal ignition**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-
15.4	**Tests of flameproof enclosures with breathing and draining devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
15.4.1	Tests of ability of the enclosure to withstand pressure		
	No specific procedures required	-	-
15.4.2	Thermal tests		
	Which procedure is followed to assure that the position of the ignition source gives the most unfavourable thermal results?		
15.4.3	Test for non-transmission of an internal ignition		
	Which procedure is followed to determine whether “a high peak explosion pressure and rate of rise of pressure at the face of the device” is likely to occur? For enclosures with more than		

	one identical device: which procedure is followed to determine the device that will give the most unfavourable results?		

16	**Routine tests**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	**-**	**-**

17	**Switchgear for Group I**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

18	**Lamp holders and lamp caps**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

19	**Non-metallic enclosures and non-metallic parts of enclosures**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
19.3.1	Tests for flameproofness		
	For bushings common to two adjacent enclosures: which procedure is followed to determine which enclosure gives the worst conditions for the test?		
19.3.2	No specific procedures required		

20	**Marking**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

Annex A	**Crimped ribbon elements and multiple screen elements of breathing and draining devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

Annex B	**Elements with non-measurable paths of breathing and draining devices**		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No additional specific procedures required other than specified in the standards listed in clause 2 of this TGD	-	-

Annex C	Flameproof entry devices		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

Annex D	Empty flameproof enclosures as Ex components		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

Annex E	Cells and batteries used in flameproof “d” enclosures		
	Requirement / interpretation:	**Evidence:**	**Comments by IECEx audit team:**
	No specific procedures required	-	-

Section 3 - Equipment

1	Scope		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required	-	-

2	Normative references		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required	-	-

3	Terms and definitions		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required	-	-

4	Apparatus grouping and temperature classification		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required	-	-

5	Flameproof joints		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	Which measuring instruments are used to verify joint specifications? Is the following determined and available for each instrument: • calibration status • calibration method • calibrated measuring range(s) • accredited calibration report		

6	Cemented joints		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	Which instrument is used to verify the shortest path through a cemented joint?		

7	Operating rods		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No other instruments, other than those specified in clause 5, are required.		

8	Shafts and bearings		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No other instruments, other than those specified in clause 5, are required.		

9	Light transmitting parts		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required	-	-

10	Breathing and draining devices		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
10.3 10.4	Which instruments are used to verify the dimensions of the device, its component parts and any measurable paths of the element?		
10.9	Is the component test rig shown in Fig. 21 available?		

11	Fasteners, associated holes and blanking elements		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
11.6 11.7	No other instruments, other than those specified in clause 5, are required.		

12	Materials and mechanical strength of enclosures – Materials inside the enclosures		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required.	-	-

13	Entries for flameproof enclosures		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No other instruments, other than those specified in clause 5, are required.		

14	Verification and tests		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required.	**-**	**-**

15	Type tests		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
15.1 15.2	Which measuring instruments are used to verify joint		

15.4	are used to verify joint specifications? Is the following determined and available for each instrument: • calibration status • calibration method • calibrated measuring range(s) • accredited calibration report In addition, is the following available: • Low pass filter with 3 dB point at 5 kHz • Standard test gases with known and verified (ISO 17025) quality: o Methane o Propane o Ethylene o Acetylene o Hydrogen o H_2/CH_4 (85/15) o Air with 20,9% O_2 • Calibrated gas analyzing system • Calibrated pressure measuring system • Test facilities for testing at low ambient (< -20 C) • Calibrated overpressure test setup, suitable for use at low ambient (< -20 C)		

16	**Routine tests**		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	Calibrated equipment to be used by the manufacturer	-	-

17	**Switchgear for Group I**		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No specific Ex d measuring equipment needed. For the verification of Ex e clearances and creepage distances, measuring instruments as listed in the TGD for IEC 60079-7 shall be used. For verification of the degree of		

	protection of minimum IP 20, test fingers according to IEC 60529 shall be available.		

18	Lamp holders and lamp caps		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
18.2	Which instruments are used to verify the dimensions of the lamp holders and lamp caps as stated in Fa6 of IEC 60061?		

19	Non-metallic enclosures and non-metallic parts of enclosures		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
19.2.1	Which instruments and/or methods are used to verify the resistance to tracking and the creepage distances as required by IEC 60079-7?		
19.3.2	Which test setup / instruments are available to conduct the flammability test of IEC 60695-11-10 (Method V-0)?		

20	Marking		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required.	-	-

Annex A	Crimped ribbon elements and multiple screen elements of breathing and draining devices		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No equipment required.	-	-

Annex B	Elements with non-measurable paths of breathing and draining devices		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	Which instruments and test setup is used to determine: • The max. bubble test pore size according to ISO 4003 • The density according to ISO 2738 • The determination of open porosity and/or fluid permeability according to ISO		

	2738 and ISO 4022		

Annex C	Flameproof entry devices		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
C.3.1.1 C.3.1.2 C.3.1.3 C.3.2.1 C.3.2.2 C.3.2.3 C.3.3.1 C.3.4.1 C.3.4.2	Which mild steel mandrels are available? Which calibrated torque wrench is used? Is a hydraulic testing device as illustrated in Fig. C.1 available?		

Annex D	Empty flameproof enclosures as Ex components		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
	No additional equipment, other than those specified elsewhere in this TGD, is required.	-	-

Annex E	Cells and batteries used in flameproof “d” enclosures		
	Requirement / interpretation:	**Equipment:**	**Comments by IECEx audit team:**
E.4.1.1	Which instruments and test setup is used to determine the external surface temperature of the cell or battery? To determine the maximum discharge current?		

Annex C

Technical Guidance Document
No. TGD-60079-7-4th Edition: Version Draft 1: 2006/04/07

IEC 60079-7: 2006

Electrical apparatus for explosive gas atmospheres Part 7: Increased Safety “e”

Technical Guidance Document
No. TGD-60079-7- 4th Edition: Version Draft 1: 2006/04/07
Title: Electrical apparatus for explosive gas atmospheres Part 7: Increased Safety "e"

Documentation Control

Version No.	Date	Changes	Prepared by	Approved by
Draft 1				

Notes on use of Technical Guidance Documents

TGDs are primarily intended for use by ExTLs and ExCBs when preparing for assessments. They will provide completed TGDs to the IECEx assessment team prior to the assessment. The assessors will review the completed TGDs and formulate their assessment plan based on the information provided. During the assessment, the assessors will record their findings on the TGDs such that their conclusions regarding the compliance of the body with the IECEx requirements are substantiated. It is also possible that bodies may wish to use the TGDs for their own self-assessment as part of their on-going self-monitoring. Use by accreditation body assessors is also to be encouraged, provided that the TGDs are not used out of context.

The TGD checklist is structured against the technical requirements of the relevant standard. Each paragraph has a question/activity reflecting the requirement. Against each question evidence is provided to demonstrate that:–

- the requirement has been properly understood;
- the way in which conformity with the requirement is to be evaluated is properly documented;
- the conformity evaluation is being implemented effectively in accordance with the documented procedure;

Space is provided for the assessor's findings to be recorded together with any comments on the evidence provided.

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Introduction

Standard No.: IEC 60079-0: 2004

Title: Electrical apparatus for explosive gas atmospheres Part 0: General requirements

Protection philosophy
The requirements can be applied to equipment which does not have an ignition source in normal operation and is so designed that particular measures, as specified in the standard, are applied to ensure that arcs, sparks and hot surfaces are not likely to occur in normal operation and under defined adverse operating conditions.

Temperature control is relevant in both meeting the Temperature Class limitations under the defined normal and adverse conditions and in ensuring a reasonable life for insulating materials and components.

Typical applications
Induction Motors
Luminaires
Solenoid Valves
Batteries
Junction Boxes
Heating Resistors (other than Trace Heating)
Transformers

Personnel interviewed (or see Appendix)

Name	Job title	Abbreviation used in following tables

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
1	**Scope**		
	Is the interaction with IEC 60079-0 fully understood, including how potential conflicts are resolved?		
	Note: For the purposes of completing this document, it is assumed that the TGD for IEC 60079-0 has also been completed. Therefore matters which are adequately dealt with in that document are not repeated here		
2	**Normative References**		
3	**Definitions**		
4	**Constructional Requirements for all electrical apparatus**		
4.1	**General**		
	Is the interaction between clauses 4 and 5 understood?		
4.2	**Electrical Connections**		
4.2.1	**General**		
	Are possible means to avoid loosening of terminations understood?		
4.2.2	**Field Wiring Connections**		
	How does the 45K rise permitted in the test of 4.2.2.2 relate to the performance of terminals in general purpose junction boxes?		
	Can suitable means for preventing lug rotation be described? (4.2.2.4)		
	Can a method of providing mechanical support to a soldered joint be described? (4.2.2.5)		
4.2.3	**Factory Connections**		
	Is the difference between factory and field connections understood?		
	Can the philosophy behind the requirements for pluggable connections be described?		
4.3 **4.4**	**Clearances** **Creepage Distances**		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Can the significance of conductor size for clearance and creepage distance on terminal insulation be explained? Why might this lead to an "X" condition on the final equipment?		
	Can working voltage be related to rated voltage?		
	Why is CTI not relevant below 10V?		
	Are the various diagrams of Figure 1 understood?		
	Why should the presence of ribs or grooves allow a different material group ?		
4.5	**Solid Electrical Insulating Materials**		
	What evidence is sought to demonstrate compliance with 4.5.2 (a) regarding temperature withstand?		
4.6	**Windings**		
	For round winding wires, how is the evidence of grade and compliance obtained?		
	How is the impregnation process defined (interaction between type examination and QA phases)?		
	Is there an understanding of how the different impregnation processes achieve homogeneity and avoidance of voids?		
4.7	**Temperature Limitations**		
	This standard uses Zone A and Zone B, as defined in IEC 60034-1, in a way not intended by that standard. Is there a clear understanding of the implications of the difference?		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Is there an understanding of the "time" factor in determining temperature by the resistance method? Is there a procedure for dealing with this?		
	Is there an understanding of the effect of a "stuck" a.c. solenoid and how this should be dealt with when testing?		
	Is there suitable equipment for measuring change of resistance?		
	Can thermocouples be placed on "live" metal?		
4.8	**Wiring Internal to Apparatus**		
	Can suitable forms of protection be described?		
4.9	**Degrees of Protection provided by Enclosures**		
	Is the role of drain holes understood?		
	Are the "pass" criteria in IEC 60079-0 understood in the context of Ex e?		
4.10	**Fasteners**		
5	**Supplementary Requirements for Specific Electrical Apparatus**		
5.1	**General**		
5.2	**Rotating Electrical Machines**		
5.2.1	**Degrees of Protection provided by Machine Enclosures**		
	Is the exception to 4.9 understood?		
5.2.2	**Internal Fans**		
	Are the requirements of IEC 60079-0 understood in this context?		
5.2.3	**Minimum Radial Airgap**		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Can the effects of the various tolerances and eccentricities in machine build-up be related to establishing the minimum airgap by calculation?		
	How is the process for "measurement after erection" defined (interaction between type examination and QA phases)?		
5.2.4	**Machines with Cage Rotors**		
	What is meant by "airgap sparking" and what is its cause?		
	Is "wye(star)-delta" starting a suitable method of reducing the starting current to 300%?		
	What operating disturbance in use may cause similar problems to a full current start, but is the responsibility of the user?		
	What is meant by the term "end packet"?		
	What might cause parts such as centring rings to attain a temperature greater than the rotor cage during stall conditions?		
	Why is minimum ambient temperature important when testing a motor protected by winding temperature sensors and when might it be necessary to artificially simulate the minimum ambient condition?		
	5.2.4.5 refers to testing with the "converter specification" rather than the specific converter. What parts of the specification are relevant and how can this be simulated?		
5.2.5	**Winding Requirements**		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Can the difference between VPI and Resin-Rich impregnation systems be described?		
5.2.6	**Stator Winding Terminals**		
	What is likely to be the controlling aspect of "limiting temperature" in this clause?		
	How should this clause be applied when t_E is not determined?		
5.2.7	**Stator Winding Insulation Systems**		
	What types of high voltage discharge are likely to be an ignition source?		
5.2.8	**Bearing Seals and Shaft Seals**		
	How are bearing clearances determined for sliding element bearings?		
5.3	**Luminaires**		
5.3.1	**Light Source**		
	Why is the pin material specified for bi-pin tubes but not mono-pin tubes?		
	Why is pre-heating of bi-pin tubes prohibited?		
5.3.2	**Minimum Distance between Lamp and Protective Cover**		
5.3.3	**Lampholders and Lamp Caps**		
	Are facilities available for performing the relevant flameproof tests?		
	Are there facilities for measuring contact force?		
5.3.4	**Surface Temperature of Lamps**		
	Are facilities available for performing the "in-gas" temperature tests?		
5.3.5	**Temperature of Lamp Caps**		
	Are facilities available to measure temperatures directly on "live" parts?		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
5.3.6	**Limiting Temperatures**		
	Why can temperatures increase as lamps age?		
5.3.7	**Luminaires for Tubular Bi-pin Lamps**		
	Are mechanisms for taking into account mechanical tolerances understood?		
	Are the requirements for contact independence and support understood?		
	Can the insertion and removal torques be measured?		
	Is the assessment for non-defeat of the isolating switch understood?		
5.4	**Caplights and Handlights**		
	Can the purpose of the spring-loaded lampholder be described?		
5.5	**Measuring Instruments and Transformers**		
	What is the source of the value I_{SC}?		
5.6	**Transformers other than Instrument Transformers**		
5.7	**Batteries**		
5.7.1	**Batteries over 25Ah**		
	In the absence of Examples 2 and 3 from Figure 1, which example is normally appropriate for measuring creepage distance?		
	How is IP23 assessed against the technical documentation?		
	How may minimum and maximum electrolyte levels be indicated?		
5.7.2	**Batteries up to 25Ah**		
	Why should it be desirable to encapsulate cells?		
	Can examples be given of sealed valve-regulated and sealed gas-tight cells?		
	How may cells behave if subject to reverse charging?		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Why are Ex i and Ex d components prohibited from being in the same enclosure as most batteries?		
5.8	**General Purpose Connection and Junction Boxes**		
5.9	**Resistance Heaters (other than Trace Heaters)**		
	What is meant by "the temperature self-limiting characteristic" of a heating device?		
5.10	**Other Electrical Apparatus**		
	How may this clause be used?		
	How is "risk assessment" compatible with the concept of conformity assessment?		
6	**Type Verifications and Tests**		
6.1	**Dielectric Strength**		
	What is the maximum capability of the laboratory?		
	If this does not reach 23kV, how are requirements above the laboratory's capability met?		
6.2	**Rotating Electrical Machines**		
	Can the criteria for a partially wound stator pack be explained?		
	What is the system for providing the explosive gas atmosphere?		
	What is the system for providing the high voltage for the three minute test?		
	What is the system for creating the impulse voltage and are there any limitations?		
	What is the maximum power supply available for the stall tests?		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Is there an appreciation of, and appropriate action to mitigate, the dangers from an explosion in a complete machine?		
6.3	**Luminaires for Mains Supply**		
	Are test lamp caps and torque measuring equipment available?		
	Are suitable diodes available to perform the rectification test?		
	Can the sulphur dioxide test be performed or are arrangements in place to allow the test to be performed elsewhere?		
	Is a vibration facility available?		
	How is current disruption observed during the vibration test?		
6.4	**Measuring Instruments and Instrument Transformers**		
	Is the temperature rise with I_{th} determined by calculation or by test?		
	How is the dynamic test current I_{dyn} generated?		
6.5	**Transformers other than Instrument Transformers**		
6.6	**Secondary Batteries**		
	Can the insulation resistance be measured?		
	How is the maximum level of electrolyte determined?		
	Can the shock test be performed? Is there a weight limitation?		
	How is the battery capacity determined?		
	Can Method 1 or Method 2 be used for the ventilation test? How is hydrogen concentration measured?		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
6.7	**General Purpose and Connection Boxes**		
	Is a low voltage, high current power supply available? What are its limits?		
	How are high currents measured?		
	What may be the effect of wrongly determining the worst case terminal?		
6.8	**Resistance Heating Devices and resistance Heating Units**		
	Is there a capability to perform the insulation resistance tests in water?		
	Can the cold start test be performed?		
6.9	**Terminal Insulating Material Tests**		
	Can the pulling force be applied steadily and measured?		
7	**Routine Verifications and Routine Tests**		
	Is there a procedure to ensure that the manufacturer is aware of the specific tests to be performed?		
8	**Ex Component Certificates**		
9	**Marking and Instructions**		
Annex A	**Cage Motors – Methods of Test and of Calculation**		
	What are the arrangements for full load running of the motor?		
	How are the full load rotor temperatures measured?		
	What are the arrangements for the stall test?		
	Are the calculations for performing a stall test at reduced voltage fully understood?		

Section 1: Personnel			
Standard	**IEC 60079-7:2006** **Increased Safety "e"**		**Doc.No.** TGD-60079-7 **Version: D**raft1 **Date:** 2006/04/07
Clause	**Requirement**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
	Is the thermocouple logging equipment for the stall test capable of producing a continuous trace or are discrete points measured at sufficient frequency to ensure that the true shape of the curve can be determined? How many traces can be logged simultaneously?		
	Is the importance of understanding the shape of the rotor stall thermocouple traces understood?		
Annex B	**Type Tests for Resistance Heating Devices and Units**		
	Are there appropriate jigs for the crush and bending tests?		
Annex C	**(Informative)**		
Annex D	**(Informative)**		
Annex E	**(Informative)**		
Annex F	**(Informative)**		
Annex G	**(Informative)**		
Annex H	**Test Procedure for T8, T10 and T12 Lamps**		
	Is equipment available to perform the asymmetric pulse test?		
	Is equipment available to perform the asymmetric power test?		
	Is there an understanding of how the high cathode temperatures occur and how they may create a danger?		

Section 2: Systems			
Standard	**IEC 60079-0:2003** **General requirements**		**Doc.No.** TGD-60079-0 **Version: D**raft 3 **Date:** 24/10/05
Clause	**Requirement**	**Evidence**	**Comments**

Section 3: Equipment			
Standard	**IEC 60079-0:2003** **General requirements**		**Doc.No.** TGD-60079-0 **Version: D**raft 3 **Date:** 24//10/05
Clause	**Requirement**	**Evidence**	**Comments**

Annex D

Technical Guidance Document
No. IEC.79-11: Revision 5 Draft 1: 30/06/2006

IEC 60079-11 5th Edition

Intrinsic Safety "i"

Documentation Control

Version No.	Date	Changes	Prepared by	Approved by
0	Sept 1997	EEMUA: The Engineering Equipment and Materials Users Association		IEC EX Management Group
1	Jan 1998	EEMUA ADDRESS and Phone/Fax Nos. Changed. Minor editorial changes		
2	June 1999	EEMUA New phone Fax Nos. The Engineering Equipment and Materials Users Association 45 Beech St, LONDON, EC2Y 8AD e-mail: jrichman@eemua.co.uk Phone: +44 (0)20 7628 7878 Fax.:+44 (0)20 7628 7862		
3	Jan 2002	Minor editing.		
4	Oct 2002	Alignment with updated		

		standard.		
5		Rewritten in new format and based on FDIS for Edition 5	JCM	

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- the way in which conformity with the requirement is to be evaluated is properly documented;
- the conformity evaluation is being implemented effectively in accordance with the documented procedure;

Space is provided for the assessor's findings to be recorded together with any comments on the evidence provided.

This TGD has the following sections:

1. Personnel – this is intended to test the laboratory personnel's knowledge of Ex i, including the new requirements introduced by Edition 5 of the standard.
2. Systems – this is provided for the laboratory to document all its procedures and guidance material that it uses for Ex i assessment and testing.
3. Equipment – this section should provide a consolidated list of all equipment used for Ex I assessment and testing. It should include the specifications of the equipment and calibration status. Where it is intended to sub-contract any tests this should be clearly stated.

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position to identify the need for improvements based on studying the completed TGDs submitted by the assessors.

Introduction

Standard No.: IEC 60079-11: 1999

Title: Electrical apparatus for explosive gas atmospheres Part 11: Intrinsic Safety

Protection philosophy
The intrinsic safety (IS) concept uses intrinsically safe circuits in any spark or thermal effect produced under specified conditions, which may include normal operation and fault conditions, are not capable of causing ignition of a given explosive gas atmosphere.

Part, but not all, of the general requirements, IEC 60079-0 which must also met by apparatus required to comply with this standard

Typical applications
Typical applications included instrumentation, communication devices and gas monitors apparatus intended for use in explosive gas atmospheres.

Personnel interviewed (or see Appendix)

Name	Job title	Abbreviation used in following tables

Other personnel deemed competent (or see Appendix)

Name	Job title	Abbreviation used in following tables

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
3	**Terms and definitions** The following key definitions		
3.1.1	**Intrinsic safety 'i'**		
3.1.4	**Intrinsically safe circuit**		
3.1.3	**Intrinsically safe apparatus**		
3.1.2	**Associated apparatus**		
3.1.5	**Simple apparatus**		
3.6	**Entity concept**		
3.7.2	**Fault**		
3.7.1	**Countable fault**		
3.7.3	**Non-countable fault**		
3.11.1	**Infallible component or infallible assembly of components**		
3.11.2	**Infallible connections**		
3.11.3	**Infallible separation or insulation**		
4	**Grouping and classification of IS and associated apparatus** How are apparatus groupings and surface temperature requirements of 60079-0 applied?		
5 **5.1**	**Levels of protection** Relationship between type of operation (including faults) and factors of safety for:		
5.2	**Level of protection "ia"**		
5.3	**Level of protection "ib"**		
5.4	**Level of protection ic**		
5.5	**Spark ignition compliance** When assessment should be used and when spark ignition should/must be used?.		
	What guidance material is used to assist staff in assessment of circuits?		
5.6	**Thermal ignition compliance**		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
5.6.1	**General** Is there an understanding of the relative merits of the three approaches of: • measurement of temperature, • assessment of temperature and • testing for thermal ignition?		
	What guidance material is available to assist staff make thermal assessments?		
5.6.2	**Temperature of small components** Requirements for acceptability of small components whose temperature exceeds that permitted for temperature classification, using: • Small component ignition test to 26.3.3 of 60079-0, • Group I test, • Group II T4 & Group I – tables 2a and 2b, • Group II T5, and • Not invalidating protection.		
5.6.3	**Wiring within apparatus** Options of: • Maximum permissible current to maximum wire temperature, and • Table 3		
5.6.4	**Tracks on printed circuit boards** Application of Table 4.		
5.7	**Simple Apparatus** What are examples of simple apparatus?		
6	**Apparatus construction**		
6.1	**Enclosures** Typical IP classification that might be required for Group I and Group II and when pollution degree affects this.		
6.2	**Facilities for connection of external circuits**		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
6.2.1	**Terminals** Application of the following: • Table 5 • Separation by distance • Separation by enclosures • Separation by partitions • Distance between IS & Non-IS • Distance between IS		
6.2.2	**Plugs and sockets** Requirements regarding interchangeability of plugs and sockets		
6.2.3	**Determination of Lo/Ro for resistance limited power source** When Lo/Ro is calculated and how that calculation is done.		
6.2.4	**Permanently connected cable** When a pull test should be applied.		
6.3	**Separation distances** Application for either: • 6.3.1 to 6.3.13,or • Annex F		
	Note: This is large and complex section. Only some requirements are covered by this TGD.		
6.3.1	**Separation of conductive parts** Separation of conductive parts between: • IS and NonIS • Different IS • Circuit and earthed of isolated metal parts. Other factors that apply (movement, tolerances) Separation distances that comply with values in 6.1.1 or 6.1.2 are not subject to fault		
6.3.1.1	**Distance according to Table 6** Requirements applied for distances less than in the table for • "ia" and "ib" • "ic"		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
6.3.1.2	**Distance according to Annex F** Requirements are applied for distances less than in the table for • "ia" and "ib" • "ic"		
6.3.2	**Voltage between conductive parts** How voltage determined: • For circuits which are galvanically separated within apparatus • Between parts of a circuit		
6.3.3	**Clearance**		
6.3.4	**Separation distance through casting compound** • Casting compound requirements • Failure of encapsulated component used according to 7.1 and with internal clearances and distances through encapsulant is a single countable fault		
6.3.5	**Separation distances through solid insulation** Shall have dielectric strength conforming to 6.3.12 when separation distance according to Table 5 or Annex F.		
6.3.6	**Composite separations**		
6.3.7	**Creepage distances** Application of column 7 of Table 5 applies and the CTI.		
	Is CTI tested (by which lab?) or assessed?		
6.3.8	**Distance under coating** The concept of a conformal coating (eg not a solder mask alone).		
6.3.9	**Requirements for assembled circuit boards** Requirements for creepage and clearance distance understood when applied to PCBs, eg:		
6.3.10	**Separation by earth screens**		
6.3.11	**Internal wiring**		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
6.3.12	**Dielectric strength requirement** Is the dielectric strength test applied?		
6.3.13	**Relays** • For coil connected to IS circuit, contacts not exceed manufacturer's rating and not switch more than 5 A rms or 250V rms or 100 VA; • Barrier separation for IS/NonIS circuits; • Use of Annex F		
6.4	**Protection against polarity reversal** Need to prevent polarity reversal, eg by use of single diode		
6.5	**Earth conductor, connectors and terminals** Earthing requirements such as: • Cross sectional area such to carry maximum current • For "ia" connector at least 3 independent connections • For "ib" at least 2 independent connections • Terminal requirements to ensure effective contact		
6.6	**Encapsulation** Requirements for encapsulating compound, process and assessment, such as: • Temperature rating • CTI • Tests of 10.6.1 • Adherent • Specification • Free of voids • Parts protruding from encapsulant		
7	**Components on which IS depends**		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
7.1	**Ratings of components** • For "ia" and "ib" under normal and fault conditions, 2/3 maximum current, voltage, and power taking into account mounting and temperature range • For "ic" under normal operation, maximum current & voltage, and 2/3 power		
7.2	**Connectors for internal connections, plug-in cards and components** • Interchangeability not possible unless safe • Failure to open circuit countable fault • Where protection depends, connector to 6.5		
7.3	**Fuses** • 1.7 I_n assumed to flow continuously • Characteristic to protect component • Capacity not less than maximum prospective current of current in which installed		
7.4	**Primary and secondary cells and batteries** • Type from which no spillage of electrolyte or enclosed • Build up of hydrogen from charging • Current limiting devices when used and replaced explosive atmosphere • Current limiting devices when used and but not replaced explosive atmosphere		
7.5	**Semiconductors**		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
7.5.1	**Transient effects** • For associated apparatus peak ac voltage and maximum dc voltage divided by infallible series resistance. • Ignored for IS apparatus		
7.5.2	**Shunt voltage current limiters** Semiconductors carry without short circuit 1.5 times current if failed to short circuit.		
7.5.3	**Series current limiters** • 3 blocking diodes for "ia" • Semiconductors and controllable semiconductors series on for "ib" or "ic" unless power limitation only		
7.6	**Failure of components, connections and separations** For component rated to 7.1 • For "ia" & "ib" a countable fault • For "ic" not considered to fail		
	Failure modes to be considered for components not rated, subsequent faults, resistor fault values, semiconductors including ICs, connections, creepage & clearance, capacitance, inductors, wiring and PCB tracks.		
	Spark test apparatus: • Not a countable fault • Not inserted in infallible connections unless exposed and not protected to IP20		
7.7	**Piezo-electric devices** Tested to 10.7		
7.8	**Electrochemical cells for the detection of gases** Addition for spark ignition but not thermal assessment		
8	**Infallible components, infallible assemblies or components and infallible connections on which intrinsic safety depends** For "ic"?		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
8.1	**Mains transformers** • Considered not failing to short circuit between windings • Minimum requirements for screens		
8.1.1	**Protective measures** Protected by fuse or circuit breaker		
8.1.2	**Transformer construction** • Type 1 or Type 2 construction • Minimum thickness/diameter of foil or wire screens • Number of earths for screens • Transformer windings impregnated or encapsulated		
8.1.3	**Transformer type tests** • Safe isolation under specified fault conditions • Comply with tests to 10.10		
8.2	**Transformers other than mains transformers** Similar requirements to 8.1 but with different fault conditions		
8.3	**Infallible windings** • Damping windings not subject to open-circuit faults under certain conditions • Inductors not considered to fail to a resistance or inductance value than nominal resistance or inductance under certain conditions		
8.4	**Current-limiting resistors** • Type such as film, wire wound or printed covered by coating • Infallible failing only to short-circuit • Rated to 1.5 times		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
8.5	**Blocking capacitors** • Either of 2 series blocking capacitors considered failing to short or open circuit • Capacitance most onerous • Safety factor of 1.5 • High reliability solid dielectric type • Conform to dielectric strength requirements of 6.3.12		
8.6	**Shunt safety assemblies** • Infallible shunt safety assembly of diodes or zener diodes form 2 parallel paths • Considered safety shunt when ensures electrical parameters are controlled to IS values • Considered shunt voltage limiter is ensures defined voltage level applied to IS circuit		
8.7	**Wiring, printed circuit board tracks, and connections** Above infallible if: • Wires – 2 in parallel or meet other requirements • PCBs – 2 tracks or other requirements • Connections – 2 in parallel, wire through board or meet requirement for surface mount connection to 60079-7, or internal connector with independent connecting elements		
8.8 **8.8.1**	**Galvanically separating components** Infallible isolating component conforming to following not fail to short-circuit		
8.8.2	**Isolating components between IS and non-IS circuits** • Apply Table 5 except inside • Protection to ensure ratings • Meet dielectric strength requirements		

Section 1: Personnel			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Understanding Shown of the Following Requirements**	**Evidence from body under assessment**	**Comments by IECEx Assessor**
8.8.3	**Isolating components between IS circuits** • Rating according to 7.1 • Meet dielectric strength requirements		
9	**Diode safety barriers** • Test transient faults to 10.8 • For is routine tests if only 2 diodes • "ic" barrier – 1 diode • Correct mounting obvious • Earth connection at last 4 mm • Protection against access		
9.1	**General**		
9.2	**Construction**		
10	**Type verification and type tests** See Section 3		
11	**Routine tests**		
12	**Marking**		
12.1	• **General** • To 60079-0 • IP if meeting 6.1.2 a) • "ic" if appropriate • X if appropriate		
12.2	**Marking of connection facilities** • To be clearly marked • If colour use light blue		
12.3	**Warning markings** To be shown where required		
13	**Documentation** Some requirements include: • Electrical parameters for entity apparatus • Special requirements for installation • Maximum Um		

Section 2: Systems			
Standard	**IEC 60079-11** **Intrinsic Safety "i"**		**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Procedure Number	**Title**	**Clause(s) covered**	**Assessor Comments**

Section 3: Equipment				
Standard	**IEC 60079-11** **Intrinsic Safety "i"**			**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Equipment**	**Specification**	**Calibration due date**	**Comments by IECEx Assessor**
5.6	Equipment for measuring track widths, distances, clearances etc:			
	Microscope/magnifier with scale			
	Profile projector			
	Vernier callipers			
	Micrometers			
	Other			
5.6.1	Small component ignition test apparatus of 60079-0			
6.1, 7.4.8, 7.6	Degree of Protection for at least IP 20, 30 and 54			
6.3.7, 6.6	CTI Test to IEC 60112			
10.1 **Annex B** **Annex E**	Spark test apparatus to Annex B			
	Equipment associated with above:			
	95 mH inductor			
	Device for preparing tungsten wires			
	Gas mixing and measurement equipment			
	Components for simulating external parameters:			
	Low inductance capacitors			
	Air-cored inductors			
	Other			
	For transient energy test:			
	Current clamp probe			
	High speed storage oscilloscope			

Section 3: Equipment				
Standard	**IEC 60079-11** **Intrinsic Safety "i"**			**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Equipment**	**Specification**	**Calibration due date**	**Comments by IECEx Assessor**
	Other equipment such as:			
	AC and DC power supplies			
	Apparatus to measure voltage and current			
	Inductance/capacitance bridge			
	Other spark test apparatus (eg for higher currents)			
10.2 **5.6**	Temperature tests, including temperature measurement of small components:			
	Recording apparatus			
	Thermocouples – normal and fine wire			
	Resistance bridge (for change in resistance)			
	Infrared device			
	Other			
10.3 **6.3.12**	Dielectric strength test			
10.4	Determination of parameters of loosely specified components			
10.5 **7.4.2** **7.4.3** **7.4.4**	Tests for cells and batteries:			
	Short circuit apparatus (as specified 10.5.1)			
	Apparatus to measure voltage and current			
	Equipment for battery container pressure test:			
	Means to apply pressure			
	Pressure gauge			
	Internal resistance of cell or battery			

Section 3: Equipment				
Standard	**IEC 60079-11** **Intrinsic Safety "i"**			**Doc.No.** IEC.79-11 **Version:** 5 draft **Date:** 30/06/2006
Clause	**Equipment**	**Specification**	**Calibration due date**	**Comments by IECEx Assessor**
10.6	Mechanical tests			
10.6.1 **6.6** **7.3**	Casting compound:			
	6 mm diameter flat ended rod			
	Means to apply 30 N			
	Means to measure time			
	Impact test of Annex C of 60079-0	To be shown in TGD for 60079-0		
10.6.2	Sealing of components before encapsulation:			
	Means control sample temperature to (25±2) ^{o}C and water to (50±2) ^{o}C			
10.6.3	Partitions	*TGD Note: See 10.6.1*		
10.7 **7.7**	Test for apparatus containing piezoelectric devices			
	Apparatus to measure capacitance and voltage			
	Impact test of Annex C of 60079-0	*TGD Note: To be shown in TGD for 60079-0*		
10.8 **9.1**	Type tests for diode safety barriers and safety shunts			
	Test apparatus to deliver rectangular current pulses			
10.9 **6.2.4**	Cable pull test			
	Apparatus to apply 30 N tensile force			
10.10 **8.1.3**	Transformer tests			
	Dielectric strength test	*TGD Note: See 10.3*		
	Means to control input voltage			

Annex E

Technical Guidance Document
No. TGD-OD/005: Version Draft ~~1~~2:
~~06~~04/~~01~~04/2006

IECEx OD/005: Version 2: 2003

IECEx Quality System Requirements for Manufacturers

Note

This Technical Guidance Document addresses only the requirements relating to Ex products as specified in OD/005. It does not cover the clauses of ISO 9001:2000 for which no additional information is given in OD/005. It is assumed that the competence of the body and its staff to conduct assessments and audits to ISO 9001:2000 has been separately assessed, either by a national accreditation body or as part of the IECEx assessment.

Technical Guidance Document
No. TGD-OD/005: Version Draft ~~1~~2: ~~06~~04/~~01~~04/2006
Title: IECEx Quality System Requirements for Manufacturers

Documentation Control

Version No.	Date	Changes	Prepared by	Approved by
Draft 1	06/01/2006	Initial draft	IMC	
Draft 2	04/04/2006	Further draft including questions	IMC	

Notes on use of Technical Guidance Documents

TGDs are primarily intended for use by ExTLs and ExCBs when preparing for assessments. They will provide completed TGDs to the IECEx assessment team prior to the assessment. The assessors will review the completed TGDs and formulate their assessment plan based on the information provided. During the assessment, the assessors will record their findings on the TGDs such that their conclusions regarding the compliance of the body with the IECEx requirements are substantiated. It is also possible that bodies may wish to use the TGDs for their own self-assessment as part of their on-going self-monitoring. Use by accreditation body assessors is also to be encouraged, provided that the TGDs are not used out of context.

The TGD checklist is structured against the technical requirements of the relevant standard. Each paragraph has a question/activity reflecting the requirement. Against each question evidence is provided to demonstrate that:–

- the requirement has been properly understood;
- the way in which conformity with the requirement is to be evaluated is properly documented;
- the conformity evaluation is being implemented effectively in accordance with the documented procedure;

Space is provided for the assessor's findings to be recorded together with any comments on the evidence provided.

TGDs may be used as checklists when conducting an assessment and as ~~a~~ reporting tools to record the findings. The completed TGDs will form part of the document package retained by the IECEx Secretariat with the other papers from each assessment. Handwritten TGDs are acceptable, provided that they are reasonably legible. There is no expectation that an assessor should devote time to transferring a handwritten TGD to an electronic document.

Assessors are encouraged to make suggestions for the improvement of the TGDs so that they remain a useful tool in the assessment process. Suggestions may be made to the Secretariat or directly to the WG2 Convenor. The Secretariat would also be in a position to identify the need for improvements based on studying the completed TGDs submitted by the assessors.

Introduction

Standard No.: OD/005

Title: IECEx Quality System Requirements for Manufacturers

IECEx Certification Philosophy
The IECEx Scheme has been modelled on the International ISO Type 5 Product Certification System whereby IECEx Certification Bodies (ExCBs) certify a manufacturer's capability to produce products or provide services that comply with the International Standards, listed on the IECEx Certificates. In this sense, while Type Testing of Samples, representative of production, is the vital foundation for IECEx Certification, it is the manufacturer's controls over the on-going production, testing and release of Ex products that provide the confidence in products certified under the IECEx Scheme.

As such, it is the activity of initial assessment and auditing of the Manufacturer's Quality Management System coupled with the on-going surveillance, to ensure compliance with OD 005 and the IECEx Scheme Rules, that provide assurance that Ex products listed on the IECEx Certificates continue to be produced so as to comply with the International Standards listed on the IECEx Certificate.

Protection philosophy
Once a product type has been certified as conforming to the relevant Ex standards, it is vital that all subsequent production items are in conformity with the certified type. OD/005 sets out the characteristics of a manufacturer's quality management system which, if properly applied, will achieve that result. OD/005 uses the requirements of ISO 9001:2000 and explains the critical features which need to be addressed in the manufacture of Ex products.

Key characteristics for the different types of protection are listed in Annex A.

OD/005 assists manufacturers in setting up and maintaining effective quality management systems and also provides for consistency of assessment and auditing by certification bodies.

Typical applications
At present OD/005 applies specifically to ~~electrical~~ equipment for use in potentially explosive gas and vapour atmospheres, although the principles apply also to equipment for use in combustible dust atmospheres.

Personnel interviewed (or see Appendix)

Name	Job title	Abbreviation used in following tables

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
4	**Quality management system requirements**		
4.1	**General requirements** The quality system shall ensure compliance of the product with the type described in the ExTR.		
	What is the purpose of the manufacturer's quality system in the context of OD/005? To what extent can existing certification of the manufacturer's system to ISO 9001 be taken into account? In what ways would an audit of a manufacturer without a certified ISO 9001 system differ from that for a manufacturer with a certified system?		
4.2.3	**Documentation requirements** **Control of documents** a) Equipment documents and manufacturer's documents shall be controlled		
	b) Documented procedures shall ensure that information contained within manufacturer's documents is compatible with equipment documents. The manufacturer shall not initially approve or subsequently amend related drawings unless they are in compliance with the schedule drawings.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	c) The quality system shall ensure that no factor (type, characteristic, position etc.) defined within the ExTR and technical documentation (e.g. schedule drawings) is modified.		
	d) There shall be a documented system that refers all related drawings to the relevant schedule drawings.		
	e) Where there are common schedule drawings associated with more than one ExTR, there shall be a documented system to ensure simultaneous supplementary action in the event of an amendment to such drawings.		
	f) Where a manufacturer also has drawings for products not intended for use in potentially explosive atmospheres then the manufacturer shall have a system that enables both the related drawings and schedule drawings to be clearly identified.		
	g) The manufacturer shall document which ExCB is responsible for ~~the~~ each IECEx CoC		
	h) Where equipment documents or manufacturer's documents are passed to a third party, they shall be provided in a way that is not misleading.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	Why is it necessary to distinguish between schedule drawings and related drawings? *What methods can a manufacturer use to distinguish between schedule drawings and related drawings?*		
4.2.4	**Control of records** It is in the manufacturer's interests to retain adequate quality records to demonstrate conformity of the product.		
	What records should a manufacturer retain and why?		
5 **5.4** **5.4.1**	**Management responsibility** **Planning** **Quality objectives** The quality objectives shall include the manufacturer's commitment for ensuring that appropriate product and its supporting quality system shall comply with the requirements of the IEC Standard, identified in the ExTR and the IECEx Scheme rules, IECEx 02.		
	How should the manufacturer's commitment be expressed?		
5.4.2	**Quality management system planning** The quality system shall ensure that the product conforms to the type described in the ExTR and the technical documentation.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. The quality system documentation shall permit a consistent interpretation of quality programmes, plans, manuals and records.		
	The manufacturer shall facilitate an arrangement whereby the ExCB may audit aspects of the suppliers operations that affect the type of protection.		
	How should the manufacturer determine the level of detail to be given in procedures, instructions and quality plans? *What are the key elements of a quality plan and in what circumstances could it be needed?*		
5.5 **5.5.1**	**Responsibility, authority and communication** **Responsibility and authority** Responsibilities and authority for the following shall be defined:		
	a) the effective co-ordination of activities with respect to products intended for use in potentially explosive atmospheres.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	b) the need to liaise with the ExCB responsible for the issue of the ExTR with respect to any proposed change to the design defined in the ExTR and the technical documentation;		
	c) the need to liaise with the ExCB responsible for the issuing of the IECEx CoC with respect to intended updating of the quality system;		
	d) the authorising of initial approval and changes to related drawings, where appropriate;		
	e) the authorising of concessions (see 8.3)		
	f) informing its customer of any applicable special conditions for safe use and any schedules of limitations.		
	How can the manufacturer assign responsibility and authority for control of product conformity and maintenance of certification? *Which areas of responsibility does the manufacturer need to define in relation to the release of Ex products as IECEx Certified Product?*		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
5.6 **5.6.1**	**Management review** **General** a) the maximum intervals between management reviews should normally be 12 months and shall not exceed 14 months		
	b) top management shall chair the review		
	c) the person(s) responsible for the activities as detailed in 5.5.1 shall participate in the review		
5.6.2	**Review input** The input to the management review shall include the overall effectiveness of the quality management system with respect to product intended for use in potentially explosive atmospheres.		
	People with which job functions would be expected to attend the management review? *What records relating to management reviews should be maintained?*		
6.2	**Human Resources** *How can the manufacturer demonstrate that all people required for the delivery of conforming product are competent for their allotted tasks and are suitably supervised and managed?*		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
7 **7.1**	**Product realization** **Planning of product realization** Planning of product realization: examples are given in annex A.		
	What are the key elements of a product realization plan? How should the contents of Annex A be incorporated in the plan?		
7.2 **7.2.1**	**Customer-related processes** **Determination of requirements related to the product** The manufacturer shall determine the product category and marking required by their customer.		
7.2.2	**Review of requirements related to the product** The review shall ensure that any stated customer requirement is compatible with the ExTR e.g. ambient temperature range.		
	What records of the determination and review of customers' product requirements should the manufacturer maintain?		
7.4 **7.4.1**	**Purchasing** **Purchasing process** a) While manufacture, test and final inspection may be sub-contracted, the responsibility for ensuring conformance with the product covered by the ExTR shall not be sub-contracted.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	b) Suppliers providing a product, process, or service that can affect the product's compliance with the ExTR shall only be selected after an evaluation has demonstrated that they have the capability of ensuring compliance with all specified requirements.		
	c) The evaluation shall be made by one or more of the following methods: • the supplier has third party quality system certification to the appropriate standard and scope issued by an accredited body which can demonstrate that it operates in compliance with ISO/IEC Guide 62. This can be achieved by an accredited certification; • a documented evaluation which provides objective evidence that the supplier can provide product, process or service that are fit for purpose; • a documented site assessment to ensure that all relevant controls are available, documented, understood and effective.		
	d) Suppliers providing calibration services shall be evaluated on their ability to meet stated requirements.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	e) Where the features affecting the type of protection cannot be verified at a later stage e. g. encapsulated intrinsically safe circuits, then the evaluation shall include initial and periodic site assessments at the suppliers premises to ensure relevant controls are available, documented, understood and effective.		
	f) Suppliers not used for a period exceeding one year shall be re-evaluated prior to the placing of the contract.		
	g) Requirements b) and f) are not mandatory for products, processes or services where the manufacturer fully verifies each item for conformance.		
	h) The ongoing ability of the supplier to provide conforming product, process or service shall be reviewed at periods not exceeding one year.		
	What records should the manufacturer maintain to demonstrate that the controls on suppliers are adequate?		
7.4.2	**Purchasing information** a) The purchasing documents shall clearly describe the specific requirements pertaining to subcontracted product set out in ExTR and in the technical documentation (eg for process control, testing or inspection)		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	b) For items where the conformance cannot be verified after manufacture e.g. encapsulated intrinsic safe circuits, the purchasing information shall set out the specific quality procedures, resources and sequence of activities relevant to the particular item.		
	c) The manufacturer shall define the method by which documents e. g. technical specifications, stated in a particular purchase order remain traceable to the order.		
	d) Where the manufacturer does not provide such documents with subsequent orders, then the manufacturer shall have procedures for ensuring that suppliers have current copies of documents and that they remain in good condition.		
	What controls of the purchasing process should the manufacturer provide?		
7.4.3	**Verification of purchased product** a) For purchased products that can compromise the type of protection the manufacturer shall determine and implement verification arrangements which demonstrate the product's compliance with the Standards listed on the ExTR, taking into account the nature of the product and the nature of the supplier.		

Section 1: Personnel			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	b) When deciding what type of verification is required for a particular purchased product, the manufacturer shall consider the nature of the purchased product, the supplier, and how critical it is to the type of protection.		
	c) where the supplier has been evaluated and documented objective evidence has been obtained to demonstrate that the supplier is fully capable of producing and verifying the product or service, no further verification of the product or service is required, if a declaration of conformity according to EN 45014 is supplied with each batch or product;		
	d) where the IECEx CoC specifies routine tests or inspections these shall be carried out on each and every product. They may be carried out by either the supplier or the manufacturer. When carried out by the supplier they shall be specified on the purchasing documents, e.g. by a quality plan, and confirmed by the supplier e. g. declaration of conformity according to EN 45014;		

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Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06/01~~04/04/2006
Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
	e) where verification of a product cannot be carried out after manufacture, e. g. the internal parts of an encapsulated intrinsically safe circuits, then the product shall only be accepted if supplied with a declaration of conformity according to EN 45014. This shall specifically state compliance to the purchase documents, e.g. a quality plan, that lists the factors that together demonstrate conformity of the product		
	f) where sample inspections or tests are permitted they shall be conducted in a manner which demonstrates conformity of the entire batch		
	g) where either the supplier or the manufacturer requires training or specialist skill or knowledge to carry out a verification they shall be documented and training records maintained.		
	h) Where the manufacturer chooses not to carry out inspections and tests at its own premises, then inspections and tests shall be performed on the supplier's premises under the responsibility of the manufacturer		

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	i) Where a supplier provides product with evidence of conformity applicable to use in a potentially explosive atmosphere, (e.g. ExTR or Certificate of Conformity), then further verification is not required unless the manufacturer considers it necessary		
	What steps should be taken to ascertain that the manufacturer is applying the necessary measures to verify the conformity of purchased product?		
7.5 **7.5.1**	**Production and service operations** **Control of production and service provision** The manufacturer shall provide procedures, production equipment, working environments and inspection/testing facilities that together provide assurance with respect to the compliance of the product with the type as described in the ExTR and with the requirements of ExTR		
	What evidence of the planning of service provision should the manufacturer provide?		

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7.5.3	**Identification and traceability** a) The manufacturer shall establish and maintain procedures for product identification during all stages of production, testing, final inspection and placing on the market.		
	b) Traceability is required with respect to the final product and its significant parts		
	What methods of component and product identification could the manufacturer use? What is the purpose of traceability and to what level of detail is it necessary?		
7.5.4	**Customer property** It is the responsibility of the manufacturer to verify the compatibility of customer-supplied product with the requirements of the ExTR		
	What contractual arrangements should the manufacturer have with his customers in order to fulfil his responsibilities regarding conformity of customer-supplied product?		

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7.5.5	**Preservation of product** The manufacturer shall provide its customer with the instructions to enable the safe use of the product. If deemed necessary by the manufacturer, such instructions shall contain special requirements for product maintenance. These may be specified in the ExTR		
	What measures should the manufacturer take to preserve the conformity of the product during manufacture, storage and distribution?		

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7.6	**Control of monitoring and measuring devices** a) Where a calibration certificate does not bear the accreditation logo of a national accreditation authority, each calibration certificate shall include at least the following information: -an unambiguous identification of the item calibrated; -evidence that the measurements are traceable to international or national measurement standards; -the method of calibration; -a statement of compliance with any relevant specification; -the calibration results; -the uncertainty of measurement, where necessary; -the environmental conditions, where relevant; -the date of calibration; -the signature of the person under whose authority the certificate was issued; -the name and address of the issuing organisation and the date of issue of the certificate; -a unique identification of the calibration certificate		

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	b) Where a calibration certificate does not bear the accreditation logo of a national accreditation authority or does not contain the information listed in Clause 7.6a, the manufacturer shall demonstrate a valid relationship to international or national measurement standards by other means (e.g. a documented site assessment)		
	How should a manufacturer demonstrate the traceability of critical measurements?		
8.2 **8.2.1**	**Monitoring** **Customer satisfaction** For the purpose of this Document "customer satisfaction" is in relation to the product's compliance with the requirements of the IEC Standard and ExTR		
	What evidence of the monitoring and follow-up of customer satisfaction should the manufacturer be able to provide?		
8.2.2	**Internal audit** The audit programme shall address the effectiveness of the elements of the quality system as described in this Document to ensure that the products are in conformity with the ExTR. The maximum period between audits should normally be 12 months and shall not exceed 14 months.		

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	What evidence the effective use of the internal audit process should the manufacturer provide?		
8.2.3	**Monitoring and measurement of processes** Where a process can affect the integrity of a type of protection, and where the resulting integrity cannot be verified after manufacture (e. g. the environmental conditions required for curing an encapsulant), that specific process shall be measured or monitored and documentary evidence shall be maintained to demonstrate compliance with required parameters (see also annex A).		
	What documentary evidence of process validation, monitoring and measurement should the manufacturer provide?		
8.2.4	**Monitoring and measurement of product** Where routine tests are required by the IECEx CoC and the equipment documents, then those tests shall be performed as specified with no sampling techniques being permitted. Where practicable, the label bearing the marking data, shall not be affixed until the final inspection and testing has been satisfactorily completed.		

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	To what extent should the conduct of inspection and testing be witnessed during an audit?		
8.3	**Control of nonconforming product** a) The manufacturer shall maintain a system such that in the event of product not complying with the IEC Standard, listed on the ExTR and having been supplied, then the manufacturer's customer can be identified.		
	b) The manufacturer shall take action, appropriate to the degree of risk, where non-conforming product has been supplied to a customer.		
	c) Where unsafe, non-conforming product has been supplied to a customer, the manufacturer shall, in writing, inform its customer and the ExCB responsible for the IECEx Certificate of Conformity		
	d) Where it is not possible to trace unsafe product (e.g. product supplied via a distributor, or for high volume products such as cable glands) then a notice shall be placed in appropriate publications providing recommended action to be taken		

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	e) For all non-conforming product that has been supplied to a customer, the manufacturer shall maintain, for a minimum period of 10 years, records of : 1) serial numbers or identification of products supplied; 2) the customer who received the product; 3) the action taken to inform customers and the relevant notified body in the case of unsafe nonconforming product; 4) the action taken to implement corrective and preventative action.		
	f) Concessions for product that take the product outside the design as defined in the ExTR and technical documentation are not permitted.		
	What evidence of effective corrective and preventative action should the manufacturer provide?		

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Clause	**Requirement**	**Evidence from ExCB or candidate ExCB~~body~~ under assessment**	**Comments by IECEx Assessor**
Annex A	**Information relevant to particular types of protection**		
A.1	**Introduction** This annex provides guidance on those aspects that the quality system needs to address with respect to particular protection types of protection. It does not add to or otherwise change the requirements of this Document.		
~~- - - - -~~	~~- - - - - - - - - - - - - - - - -~~*What measures does the ExCB take to check that the guidance is being followed?* *What justification would be required from the manufacturer if he chose not to follow the guidance?*		
A.2	~~**To be continued**~~**General**		
	What sampling techniques would be regarded as acceptable and in what circumstances?		
A.3	**Ex d – flameproof enclosure**		

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	What inspection and test facilities should the manufacturer have?		
A.4	**Ex i – intrinsic safety**		
	What documented procedures and instructions should the manufacturer provide?		
A.5	**Ex e – increased safety**		
	What inspection and test facilities should the manufacturer have?		
A.6	**Ex p – pressurised apparatus**		
	What inspection and test facilities should the manufacturer have?		
A.7	**Ex m – encapsulation**		
	What inspection and test facilities should the manufacturer have?		
A.8	**Ex o – oil immersion**		
	What inspection and test facilities should the manufacturer have?		
A.9	**Ex q – powder filled**		
	What inspection and test facilities should the manufacturer have?		

Section 2: Systems			
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Clause	**Requirement**	**Evidence**	**Comments**
0	**Audit planning, preparation, execution and reporting** *What are the body's procedures for planning, preparing for, executing and reporting on audits?*		
	What records of the audit process are kept?		
	Where are the records kept?		
	For how long are audit records retained?		
2	**Normative references** *What is the procedure for providing access to controlled copies of all standards listed?*		
4 ~~**4.1**~~	**Quality management system requirements** ~~***General requirements***~~ *How are the ExTRs which are to be included in the scope of the audit identified?*		
	From where are the ExTRs obtained?		
~~**4.2.3**~~	~~***Control of documents***~~ *From where is the technical documentation obtained?*		
5	**Management responsibility** *What guidance is provided to auditors on the appropriate management level and authority for the defined responsibilities?*		

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Clause	**Requirement**	**Evidence**	**Comments**
6	**Resource management** *How are the minimum acceptable resource requirements defined?*		
7	**Product realization** *Where is information relating to the acceptability of calibration laboratory accreditation to be found?*		
	How are the requirements defined for the witnessing/observation of inspections and tests during audits?		
	What instructions are given for conducting product audits?		
8	**Measurement, analysis & improvement** *How are processes which affect conformity defined?*		
	What instructions/guidance are provided on the appropriate corrective and preventative actions and their monitoring?		
~~**7.6**~~	~~**Control of monitoring and measuring devices**~~ ~~Where is information relating to the acceptability of calibration laboratory accreditation to be found?~~		

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Clause	**Requirement**	**Evidence**	**Comments**

Section 3: Equipment			
Standard	**OD/005** **IECEx quality system requirements for manufacturers**		**Doc.No.** TGD-005 **Version: D**raft ~~1~~2 **Date:** ~~06~~04/~~01~~04/2006
Clause	**Requirement**	**Evidence**	**Comments**
	This section is not relevant to OD/005 since any measurements or tests carried out during an audit should make use of the manufacturer's equipment. In circumstances where the audit casts doubt on such equipment, any inspection and/or testing required for the audit should be carried out by an ExTL. **If the body under assessment provides any inspection and/or testing equipment for the use of auditors then evidence of its suitability may be recorded below.** **Auditors may require personal protective equipment according to the hazards likely to be encountered but such safety-related items have generally been beyond the scope of IECEx assessments**		

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