





# Guidance to Testing and Certification under IECEx

William G Lawrence FM Approvals









- IECEx Equipment Certification overview
- Practical approach to certification
- Process overview









### **IECEx Certificate of Conformity (CoC)**

The main instrument of the IECEx Certified Equipment Scheme is the Certificate of Conformity



Assessment of Product Samples (Type Testing)

IEC/TC 31 Product Standards

IECEx	
Quality	
Assessment Report	
QAR	

Assessment of Manufacturers Quality System

Based on parts of ISO 9001:2008 and ISO/IEC 80079-34:2011

	Î	of Co	nformi	ty
1	NTERNATIONAL ELEC IEC Certification Sche for rules and details of t	TROTECHNICAL me for Explosive / the IECEx Scheme visit www.le	COMMISSIO Atmospheres	DN 3
Certificate No.:	IECEX FMG 09.0010X		Issue No: 6	Certificate history:
Status:	Current		Page 1 of 4	Issue No. 5 (2013-06-27) Issue No. 4 (2012-11-20)
Date of Issue:	2014-01-16			Issue No. 3 (2011-09-29) Issue No. 2 (2010-08-23)
Applicant:	Limitorque, a unit of Flowse 5114 Woodall Road Lynchburg VA 24506 United States of America	rve USA, Inc.		Issue No. 1 (2010-04-13) Issue No. 0 (2010-01-11)
Electrical Apparatus:	Part Turn Electric Valve Act	uator, Series QX		
Optional accessory:	Remote-Mounted Control S	tation, Series CS_		
Type of Protection:	Ex d (or d e) IIC (or IIB) T6	60°C=Ta=+70°C; IP68 / E	d IIB T5 -20°C≤Ta	a≤+60°C; IP68
Marking:	See Schedule - Equipment 1	for marking details of specif	ic parts	
Approved for Issue on beha Certification Body:	If of the IECEx	J. E. Marquedant		
Position:		Manager - Electrica	al Systems	
Signature: (for printed version)				
Date:				
<ol> <li>This certificate and sched</li> <li>This certificate is not trans</li> <li>The Status and authentic</li> </ol>	uie may only be reproduced in fuil. sferable and remains the property of ty of this certificate may be verified	f the issuing body. by visiting the Official IECE	x Website.	
Certificate issued by: FM 1151 Bost Nor United	I Approvals LLC on-Providence Tumpike wood, MA 02062 d States of America	FMA	pprovals <sup>.</sup>	
		Member of th	r FM Global Genae	









### IECEx Certificate of Conformity (CoC) – Online System

	🚨 an IECEx Guest User   ExCB Login
	IECEx Certified Ex Equipment
	IEC System for Certification to Standards relating to Equipment for use in Explosive Atmospheres (IECEx System)
	IECEx CoC Home > Certified Equipment Scheme
COC	IECEx Certified Equipment [PUBLIC AREA]
<pre>&gt; iecex.iec.ch:</pre>	You are welcomed in as an IECEx Guest User and have full access to public information.
Home / Search Certified Service Facilities	IECEx Certification Bodies please login to create or edit certificates [Password Protected] : ExCB Login
Conformity Mark Licenses Certified Persons	Quick access: view certificate Type in CoC ref. number (e.g.: "IECEx BAS 10.0001")
→ View by: "All ExCBs" Certificates	Free text search: Search You can use boolean operators "AND", "OR"
Certificate ref. number	The IECEx Online Certified Equipment Scheme enables:
IECEx Cert. Body (ExCB)	<ul> <li>IECEX Certification Bodies to issue new IECEX Certificates of Conformity "On-line"</li> </ul>
Applicant	<ul> <li>Full Public access to consult, view and print issued IECEx Certificates</li> </ul>
Applicant Location	View Statistical information
Manufacturer location	Export data to an Excel worksheet
Country/Standards/ExCBs	For any questions, please contact Mr. Chris Agius, IECEX Secretary.
Standard used	
ExTRs	
QARs	
» Services:	
Export to MS Excel	
Operational Manual	

All CoCs available on IECEx web site









### **IECEx Certificate of Conformity (CoC) - Online**

				an IECEX GU	est User   ExCB Login
			IECEx Ce	rtified Ex Equipn	nent
			q	uit print print into pdf	
	IECEX CoC Home > Certified Ec	<u>julpment Scheme</u> > Co	ertificate of Conformity		portant information I
	Certificate No.:	IECEX FMG 09.00	10X Issue No.:6	Certificate history: Issue No. 6 (2014-1-16)	^
ecex.lec.ch:	Status:	Current		Issue No. 5 (2013-6-27) Issue No. 4 (2012-11-20) Issue No. 3 (2011-0-29)	
Home / Search	Date of Issue:	2014-01-16	Page 1 of 4	Issue No. 2 (2010-8-23) Issue No. 1 (2010-4-13)	
Certified Service Facilities	Applicant	Limitorque au	unit of Flowserve USA Inc	Issue No. 0 (2010-1-11)	
Conformity Mark Licenses	, dan a	5114 Woodall Road			
Certified Persons		Lynchburg VA 2450 United States of	6 of America		
/lew by:					
"All ExCBs" Certificates					
Certificate ref. number	Electrical Apparatus: Ontional accessory:	Part Turn Electric Remote-Mounted C	Valve Actuator, Series QX		
IECEX Cert. Body (EXCB)	options accessiy.				
Applicant	Type of Protection:	Ex.d (or.d.e) IIC (o	or IIB) T6 -60°C <ta<+70°c: ex.d.="" iib="" ip68="" t<="" td=""><td>5 -20°C<ta<+60°c1 ip68<="" td=""><td></td></ta<+60°c1></td></ta<+70°c:>	5 -20°C <ta<+60°c1 ip68<="" td=""><td></td></ta<+60°c1>	
Applicant Location	.,,,				
Manufacturer location	Marking:	See Schedule - Equ	upment for marking details of specific parts		
Country/Standards/ExCBs	Annraved for Issue on be	shalf of the JECEx	J E Marquedant		
Standard used	Certification Body:				
EXTRs	Position:		Manager - Electrical Systems		
QARs					
Services:					
Export to MS Excel	<ol> <li>This certificate and so</li> <li>This certificate is not to</li> </ol>	nequie may only be repro transferable and remains	oaucea in tull. s the property of the issuing body.		
Operational Manual	3. The Status and authen	ticity of this certificate m	ay be verified by visiting the Official IECEX We	ebsite.	-









### **IECEx Certificate of Conformity (CoC) - Printed**

	×	IECEx of Co	Certific onformit	ate ly
I	NTERNATIONAL ELEC IEC Certification Sche for rules and details of the	TROTECHNICA me for Explosive the IECEx 8cheme visit www	L COMMISSIO Atmospheres	DN ;
Certificate No.:	IECEX FMG 09.0010X		Issue No: 6	Certificate history:
Status:	Current		Page 1 of 4	Issue No. 6 (2014-01-16 Issue No. 5 (2013-06-27
Date of Issue:	2014-01-16			Issue No. 3 (2012-01-20 Issue No. 3 (2011-09-29 Issue No. 2 (2010-08-23
Applicant:	Limitorque, a unit of Flowser 5114 Woodall Road Lynchburg VA 24506 United States of America	ve USA, inc.		Issue No. 2 (2010-06-23) Issue No. 1 (2010-04-13) Issue No. 0 (2010-01-11)
Electrical Apparatus:	Part Turn Electric Valve Actu	lator, Series QX		
Optional accessory:	Remote-Mounted Control St	ation, Series CS_		
Type of Protection:	Ex d (or d e) IIC (or IIB) T6 -	60°C≤Ta≤+70°C; IP68 /	Ex d IIB T5 -20°C≤Ta	a≤+60°C; IP68
Marking:	See Schedule - Equipment f	or marking details of spec	anc parts	
Approved for issue on beha Certification Body:	f of the IECEx	J. E. Marquedant		
Position:		Manager - Electr	cal Systems	
Signature: (for printed version)				
Date:	$\boldsymbol{\mathcal{C}}$			
<ol> <li>This certificate and sched</li> <li>This certificate is not trans</li> <li>The Status and authentici</li> </ol>	ule may only be reproduced in full. ferable and remains the property of ty of this certificate may be verified to	the issuing body. by visiting the Official IEC	Ex Website.	
Certificate issued by: FM 1151 Bost Nor United	l Approvais LLC xn-Providence Tumpike wood, MA 02062 I States of America	< FM /	Approvals <sup>-</sup>	
		Menter d	the PARCEAU Group :	









### **IECEx Certificate of Conformity (CoC)**



FM Approvals







### **IECEx Certificate of Conformity (CoC)**

document issued under IECEx Rules indicating that adequate confidence is provided that a duly identified product is in conformity with a specific standard. The certificate can relate to Ex equipment, an Ex Component or an Ex system

A Unit Verification Certificate is also possible for equipment produced under a single production run









### IECEx Test Report (ExTR)

a document issued by an ExTL that includes a documented record of the obtained test and assessment results for endorsement by an ExCB, associated with the issuing ExTL, demonstrating that the examined product type is in conformity with specified Standards. An ExTR may cover complete or partial testing to the relevant Standard









### **IECEx Quality Assessment Report (QAR)**

a document that presents the results of an on-site assessment of a manufacturer's quality management system by an ExCB, to the requirements of the IECEx Certified Equipment Scheme









### **IECEx Certification Body (ExCB)**

a body which has been accepted according to these Rules and which issues IECEx Certificates of Conformity, IECEx Quality Assessment Reports and also endorses IECEx Test Reports

An Up-To-Date list of ExCBs can be found at www.iecex.com









### **IECEx Testing Laboratory (ExTL)**

testing laboratory which is accepted according to these Rules and which is either <u>integral</u> <u>with</u>, or under the complete control of, or belongs to or works under a written agreement with at least one Ex Certification Body

Most of the current ExTLs in the Equipment Certification Scheme are integrated with an ExCB.









### **Realistic Approach to Certification**

### Certification is a verification of a compliant design, it is NOT intended to be the initial determination of compliance

If the assessment / testing by the ExTL is the initial determination of conformity, there is a very high likelihood of non-conformances and test failures

Conformity has to be one of the integral elements of the design process. It cannot be addressed at the end of the design process without significant delay and cost









### **Application process for equipment certification**



## The application is lodged with an ExCB in a participating country

• The required assessment and testing is conducted by an ExTL under the supervision of the Ex CB

•An ExTR is prepared by the ExTL for endorsement by the ExCB

•National Differences may be included in the ExTR

• If a CoC is to be issued, a QAR must be in place at the manufacturing facility and include the applicable concepts.

•If QAR is not in place, ExCB will arrange preparation









### **Application document**



### There is no IECEx Scheme defined application form

Required information is:

Request for CoC or ExTR preparation
Details of product and manufacturing location
Details on Quality Management System (is QAR in place?)
List of applied standards

#### However, most ExCBs use a defined form

It must be clear EXACTLY what is to be certified / tested and for what ratings









### **Application preparation questions**



- Are you confident the equipment complies with the applicable Ex standards?
- Do you have a Quality Management System in place that complies with ISO/IEC 80079-34 for the Protection Concepts employed?
- Does the equipment documentation (Schedule Drawings) comply with IECEx OD-017?
- Is the ExTR to be used to support national certification in specific countries? Which ones?





**FM** Approvals





### **FM Approvals Application Form**



#### APPLICATION / REQUEST FOR QUOTE FORM EQUIPMENT FOR HAZARDOUS LOCATIONS / EXPLOSIVE ATMOSPHERES



Company	Name:								_				7
Company	Address	c –											
													$\neg$
Country:							Postal	Code:					
Main Telep	ohone:						Main F	ax:					$\neg$
Website:							•						
Contact Na	ame:												
Direct Tele	phone:						E-mail	:				-	$\neg$
Status:	Manufa	octurer		Design	Control	(	Other:	Provid	e Co	omment, if Othe			
2 Manufa	cturing	cite(c):	(if di	fferent	from or	addit	ional to	the anni	ican	t lise senarat	a cheets (:	as necessary)	
Company	Name:	5.10(5).	in an			uuun		the uppi		. ose separat	- sincers p	15 110005500.51	
Company	Address												$\neg$
													-
Country:							Postal	Code:	Г				$\neg$
Main Teler	hone:						Main F	ax:	$\vdash$				$\neg$
Website:													$\neg$
QA Contac	t Name												$\neg$
Direct Tele	phone:						E-mail						$\neg$
Direct read	priorite.												
3. Invoicir	ng to: (if	f differer	nt fro	m or a	dditiona	al to th	ne applio	ant)					
Company	Name:	_											_
Company	Address	c –											
Country:							Postal	Code:					
Main Telep	phone:						Main F	ax:					
Website:													
Contact Na	ame:												
Direct Tele	ephone:						E-mail	:					
4 FM App	rovals	Certifica	tion	s Requ	ired <sup>.</sup>								
United Sta	tes 🛛 d	omplete Se	ction II	Car	nada 🔤	Complete	Section III	ATE)	(	Complete Section IV	IECEx	Complete Section	V
5. Type of	Certific	ate:								_			
Product					Compo	nent [				System			
6. Type of	Applic	ation:											_
New Produ	uct	Sup	oplen	nent to	Existing		Quality A	ssurance	e: IS	O 9001 📋 ATE	X QAN 📋	IECEx QAR	-1
Certificate		Pro	duct	Certific	cate 🔛		NO. OF EI	mployees	at	Site to be Audite	a:		
7. Equipm	ent Des	cription											
Type (Mod	lel) Refe	rence ar	nd Na	ame:									
Description	n:												
		DOSES ON		Custon						Project ID & Issue		-	
Enguiry Ref	INC PURI	Gaca ON	MA	Receive	d Date			Date to En	gine	er	Nominate	d Engineer	$\neg$
	E	mail: <u>app</u>	ovals	@fmgiob	al.com or	atex@	ofmapprov	als.com		Website: www.fm	approvals.con	<u>n</u>	
1151 Boston-P	rovidence 1	pke, Norwo	od, MA	02062 U	JSA 1WI	ndsor Dia	als, Windsor	Berkshire, U	JK. SL	4 1RS 743 Reynol	Is Road, W. Gi	ocester, RI 02814 U	SA
	02 4300 F	1 (1) /81	102.9		11-44	+ (u) 1/:		e. •••• (u) 1:	, 33 8	oo 700 1. <del>•</del> 1 (1) 40	- 307 5000 P	1 (1) 401 508 624	
EIN EIECTICAL	Applicatio	n rom_u	JT (De	G(13)			Pa	gen					







### **FM Approvals Application Form**



FM Approvals







### **FM Approvals Application Form**





#### Section V: Product Details for IECEx Certification

(Complete In as much detail as possible or for assistance in completing this form contact FM Approvals)

1. Equipment Protection	Mining	Ma	Mb	
Level (EPL):	Surface Gas/Vapour:	Ga	Gb Gc	
	Surface Dust	Da	Db Dc	

2. Target Standards Markings For Gas/Vapour (e.g., Ex de IIB T4):	
3. Target Standard Marking For Dust (e.g., Ex tb IIIC T135°C):	
4. Target IP Classification (if required, e.g., IP66):	
5. Ambient Temperature Range for the Product.	
Unless otherwise stated, the standard range -20°C to +40°C will be assumed.	°C≤Ta≤ °C

Comment:

6. Standards to be used for Certification (If known, otherwise FM Approvals to complete based on Identified markings above):









### **FM Approvals Application Form**









### **Application Processing**



### • Application review by ExCB

- If the ratings being sought are unclear or if the Schedule Drawings are incomplete, additional time and effort will be spent to resolve these issues
- Preparation of quotation by ExCB
- Acceptance of quotation by applicant









### **Typical Problems Encountered During Application Review**



**FM** Approvals

- Product cannot comply with claimed standards.
  - High-Voltage motor for "i"
  - Switching contacts for "e"
  - Printed Circuit Assembly (no enclosure) for "d"
- Temperature class is not realistic
  - T6 {85° surface temperature} with Tamb = 100 °C
  - T6 with a Pi of 6 watts for "i"
- Applicant does not have design control
  - Critical information not included in Schedule Drawings as the applicant doesn't have access to it
  - The Schedule Drawings, documenting the explosion safety aspects of the equipment, need to be prepared in accordance with IECEx / OD017, or the ExTL will have insufficient information to complete the assessment and testing







### After acceptance of quotation



• ExCB instructs ExTL on assessment and testing program to be conducted

•Design assessment commences

•Preparation of test plan

Determination of exact test samples







### **Typical Problems Encountered During Design Assessment**



**FM** Approvals

- Inadequate spacings for "i"
- Component ratings inadequate for "i"
  - Protective components require derating
- Inadequate service temperature range for nonmetallic materials
- Flamepath dimensions for "d" greater than permitted
- Threaded entries not ISO 965 metric or NPT
- External earth corrosion issues
  - Connection of a copper conductor to aluminium enclosure requires other metals for intermediate parts

These are all examples of a situation where no prior determination of compliance has been made.







### Testing



- If off-site (other than at ExTL facility) is necessary, OD-024 applies
  - Off-Site / Witness Testing Agreement required
  - Site assessment required based on ISO 17025
  - Generally requires ExTL / ExCB witness
  - Can be used for long-term tests
  - Can be used for partially witnessed tests
  - Remote witnessing permitted in some cases
- ExCB / ExTL will provide notification of test failures
  - Prompt resolution of test failures is critical









### **Typical Problems Encountered During Testing**



- Structural degradation of plastic enclosures during thermal endurance
- Use of non-UV resistant materials for enclosures
- · Cemented joints for "d", leakage
- Impact failures of glass or aged plastics
- IP test failures, usually after aging

These are all examples of a situation where no prior determination of compliance has been made.









### **Completion and Issue of the ExTR**



• When all tests are completed with satisfactory results and the Schedule Drawings are complete, the ExTR will be endorsed and issued by the ExCB

• In some cases, only an ExTR is completed when the intent is to use that ExTR to obtain national certification in specific countries. In this case, it is critical that the "National Differences" for that country have been addressed in the ExTR.







### **Typical Problems Encountered During Issue of ExTR**



**FM** Approvals

- Failure to provide final marking drawings
  - Ratings may have changed
  - IECEx Certificate number or mark to be integrated
- Failure to finalize instruction materials in compliance with Clause 30 of 60079-0







### ExTR can also be used to support national certification





#### CERTIFICATE OF COMPLIANCE

FM Approvals 1151 Boston Providence Tumpike P.O. Box 9102 Nerwood, MA 02062 USA T: 781 762 4400 P: 781-762-9275 www.fmapprovals.com

HAZARDO US LOCATIO N ELECTRICAL EQUIPMENT PER CANADIAN REQUIREMENTS

This certificate is issued for the following equipment:

VIZabodet/Kahle, Galetel (Waleh/galeta), Cells and ex. with standard 45232. Rete Communication. (5 / ), II, III / 1 / A2002FG (14 - 2520-001-07 Maximum Entity Farameters: See control drawing 2520-001-07 a - listice (s. p. A). (a - unber for the nearbidity (leg., 1 = 0, 1g. 2 = 0.01g.) = 0.00(g). (b) - entrole for the nearbidity (leg., 1 = 0, 1g. 2 = 0.01g.) = 0.00(g). gity - listices and/or numbers (Specials, cpip, applied software) (e.g., CEVI). Options: R5455 Data Communication (Instead of R5222), TTY Data Communication with 10 gab.ad.pd. (mainter R5455 Data Communication (Instead of R5222), TTY Data Communication with 10 gab.ad.pd. (mainter R5455 Data Communication (Instead of R5222), TTY Data Communication with 10 gab.ad.pd. (mainter)

CR425 Dala Communication (Instead of R5222), TTY Data Communication with 10 epikoulput (Instead of R5222), R5422 Data Communication (Instead of R5222), Juncton Box Type YA508.5-X, terminal YAC016-X000C, F.CA, terminal YAC016-X000C, F.CA, terminal YAC016-X000C, F.CA, terminal YAC016-X000C, P.CA, terminal YAC016-X000C, P.CA, terminal YAC016-X000C, P.CA, terminal YAC016-X000C, P.CA, terminal YAC016-X000C, termina

Equipment Ratings:

Intrinsically safe for Class I, II, III, Division 1, Groups A, B, C, D, E, F and G; Class I, Zone 1 Ex. Ip IIC, T4 for hazardous locations for indoor only use.

FM Approved for:

FM Seprerak HLC 6/07

Sartorius Lab Instruments GmbH & Co. KG Goettingen, Germany

To verify the availability of the Approved product, please refer to www.approvalguide.com

Sossoore Page if of it

Certificate for Canada









### **Completion and Issue of the IECEx CoC**



• When the ExTR is issued and a valid QAR is in place, the CoC can be issued by the ExCB







### **Typical Problems Encountered During Issue of CoC**



- There is no QAR in place at the manufacturing facility
- The QAR is beyond the validity period
- The QAR in place does not support all of the Protection Concepts employed in the ExTR
  - The QAR summary shown on the IECEx web site shows the audited site and details the Protection Concepts









### **IECEx Certificate of Conformity (CoC)**





I	NTERNATIONAL ELE IEC Certification Sci for rules and details	CTROTECHNICAL neme for Explosive A of the IECEX Scheme visit www.lec	COMMISSI Atmospheres	DN I
Certificate No.:	IECEX FMG 09.0010X		Issue No: 6	Certificate history: Issue No. 6 (2014-01-16
Status:	Current		Page 1 of 4	Issue No. 5 (2013-06-27 Issue No. 4 (2012-11-20
Date of Issue: Applicant:	2014-01-16 Limitorque, a unit of Flow	serve USA, Inc.		Issue No. 3 (2011-09-29 Issue No. 2 (2010-08-23 Issue No. 1 (2010-04-13
	5114 Woodall Road Lynchburg VA 24506 United States of America			Issue No. 0 (2010-01-11
Electrical Apparatus:	Part Turn Electric Valve A	ctuator, Series QX		
Optional accessory:	Remote-Mounted Control	Station, Series CS_		
Type of Protection:	Ex d (or d e) IIC (or IIB) T	6 -60°C≤Ta≤+70°C; IP68 / Ex	d IIB T5 -20°C≤Ta	a≊+60*C; IP68
Marking:	See Schedule - Equipmer	nt for marking details of specif	c parts	
Approved for issue on beha Certification Body: Position:	f of the IECEx	J. E. Marquedant Manager - Electrica	il Systems	
Signature: (for printed version)				
Date:				
1. This certificate and scheo 2. This certificate is not tran 3. The Status and authentic	lule may only be reproduced in fu sferable and remains the property ty of this certificate may be verifie	II. r of the issuing body. rd by visiting the Official IECE)	r Website.	
Certificate issued by: Fi 1151 Bost	Approvals LLC			
No	wood, MA 02062 d States of America		provals	
		Manhor of the	EM Global Group	









### **IECEx Certification - Formula for Success**

 Integrate conformity aspects into the design process

 Conduct the assessment and testing, to the extent possible, prior to application for certification

• Review the Schedule Drawings against IECEx OD-017 for completeness









## Thank you

## William G Lawrence FM Approvals