

BS EN 60079-19:2011+A1:2015



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Explosive atmospheres

Part 19: Equipment repair, overhaul
and reclamation

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National foreword

This British Standard is the UK implementation of EN 60079-19:2011+A1:2015. It is identical to IEC 60079-19:2010, incorporating amendment 1:2015. It supersedes BS EN 60079-19:2011 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

The UK participation in its preparation was entrusted by Technical Committee EXL/31, Equipment for explosive atmospheres, to Subcommittee EXL/31/3, Codes of practice.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2015

ISBN 978 0 580 83993 1

ICS 29.260.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2011.

Amendments/corrigenda issued since publication

Date	Text affected
30 June 2015	Implementation of IEC amendment 1:2015 with CENELEC endorsement A1:2015

**Explosive atmospheres -
Part 19: Equipment repair, overhaul and reclamation
(IEC 60079-19:2010)**

Atmosphères explosives -
Partie 19: Réparation, révision et remise
en état de l'appareil
(CEI 60079-19:2010)

Explosionsgefährdete Bereiche -
Teil 19: Gerätereparatur, Überholung und
Regenerierung
(IEC 60079-19:2010)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 31J/180/FDIS, future edition 3 of IEC 60079-19, prepared by SC 31J, Classification of hazardous areas and installation requirements, of IEC TC 31, Equipment for explosive atmospheres, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60079-19 on 2011-01-01.

This European Standard supersedes EN 60079-19:2007.

The significant technical changes with respect to EN 60079-19:2007 are as follows:

- inclusion of specific Group I requirements;
- inclusion of offshore requirements.

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The following dates were fixed:

- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2011-10-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2014-01-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60079-19:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60034 series	NOTE	Harmonized in EN 60034 series (partially modified).
IEC 60079-11	NOTE	Harmonized as EN 60079-11.
IEC 60364 series	NOTE	Harmonized as HD 60364 (partially modified).
ISO 9000	NOTE	Harmonized as EN ISO 9000.
ISO 9001	NOTE	Harmonized as EN ISO 9001.

Foreword to amendment A1

The text of document 31J/249/FDIS, future IEC 60079-19:2010/A1, prepared by SC 31J "Classification of hazardous areas and installation requirements" of IEC/TC 31 "Explosive atmospheres" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60079-19:2011/A1:2015.

The following dates are fixed:

- latest date by which the document has to be (dop) 2016-01-23
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2018-04-23
standards conflicting with the
document have to be withdrawn

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079	series	Explosive atmospheres	EN 60079	series
IEC 60079-0	-	Explosive atmospheres - Part 0: Equipment - General requirements	EN 60079-0	-
IEC 60079-1	-	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"	EN 60079-1	-
IEC 60079-2	-	Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"	EN 60079-2	-
IEC 60079-7	-	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"	EN 60079-7	-
IEC 60079-7	1990 ¹⁾	Electrical apparatus for explosive gas atmospheres - Part 7: Increased safety "e"	-	-
IEC 60079-7	2001	Electrical apparatus for explosive gas atmospheres - Part 7: Increased safety "e"	EN 60079-7	2003 ²⁾
IEC 60079-14	-	Explosive atmospheres - Part 14: Electrical installations design, selection and erection	EN 60079-14	-
IEC 60079-15	2005	Electrical apparatus for explosive gas atmospheres - Part 15: Construction, test and marking of type of protection "n" electrical apparatus	EN 60079-15	2005 ³⁾
IEC 60079-15	2010	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"	EN 60079-15	2010

¹⁾ Superseded by IEC 60079-7:2001, which is also superseded by IEC 60079-7:2006.

²⁾ Superseded by EN 60079-7:2007 (IEC 60079-7:2006).

³⁾ Superseded by EN 60079-15:2010 (IEC 60079-15:2010).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079-19	-	Explosive atmospheres - Part 19: Equipment repair, overhaul and reclamation	EN 60079-19	-
IEC 60079-26	-	Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga	EN 60079-26	-
IEC 60085	-	Electrical insulation - Thermal evaluation and designation	EN 60085	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 61241	series	Electrical apparatus for use in the presence of combustible dust	EN 61241	series
IEC 61241-0	-	Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements	EN 61241-1	-
IEC 61241-4	-	Electrical apparatus for use in the presence of combustible dust - Part 4: Type of protection 'pD'	EN 61241-4	-
ISO 4526	-	Metallic coatings - Electroplated coatings of nickel for engineering purposes	EN ISO 4526	-
ISO 6158	-	Metallic coatings - Electrodeposited coatings of chromium for engineering purposes	EN ISO 6158	-

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CONTENTS

INTRODUCTION	12
1 Scope	13
2 Normative references	13
3 Terms and definitions	14
4 General	16
4.1 General principles	16
4.2 Statutory requirements for repair facility	17
4.3 Instructions for the user	17
4.3.1 Certificates and documents	17
4.3.2 Records and work instructions	17
4.3.3 Re-installation of repaired equipment	17
4.3.4 Repair facilities	17
4.4 Instructions for the repair facility	17
4.4.1 Repair and overhaul	17
4.4.2 Reclamations	22
4.4.3 Alterations and modifications	24
4.4.4 Temporary repairs	24
4.4.5 Rotating machinery	25
4.4.6 Inverters	25
5 Additional requirements for the repair and overhaul of equipment with type of protection "d" (flameproof)	26
5.1 Application	26
5.2 Repair and overhaul	26
5.2.1 Enclosures	26
5.2.2 Cable and conduit entries	27
5.2.3 Terminations	27
5.2.4 Insulation	27
5.2.5 Internal connections	27
5.2.6 Windings	27
5.2.7 Auxiliary equipment	29
5.2.8 Light-transmitting parts	29
5.2.9 Encapsulated parts	29
5.2.10 Batteries	29
5.2.11 Lamps	29
5.2.12 Lampholders	30
5.2.13 Ballasts	30
5.2.14 Breathing devices	30
5.3 Reclamation	30
5.3.1 General	30
5.3.2 Enclosures	30
5.3.3 Sleeving	31
5.3.4 Shafts and housings	31
5.3.5 Sleeve bearings	31
5.3.6 Rotors and stators	31
5.4 Alterations and modifications	32

5.4.1	Enclosures	32
5.4.2	Cable or conduit entries	32
5.4.3	Terminations	32
5.4.4	Windings	32
5.4.5	Auxiliary equipment	32
6	Additional requirements for the repair and overhaul of equipment with type of protection "i" (intrinsic safety)	32
6.1	Application	32
6.2	Repair and overhaul	33
6.2.1	Enclosures	33
6.2.2	Cable glands	33
6.2.3	Terminations	33
6.2.4	Soldered connections	33
6.2.5	Fuses	34
6.2.6	Relays	34
6.2.7	Shunt diode safety barriers and galvanic isolators	34
6.2.8	Printed circuit boards	34
6.2.9	Optocouplers and piezoelectric components	34
6.2.10	Electrical components	35
6.2.11	Batteries	35
6.2.12	Internal wiring	35
6.2.13	Transformers	35
6.2.14	Encapsulated components	35
6.2.15	Non-electrical parts	36
6.2.16	Testing	36
6.3	Reclamation	36
6.4	Modifications	36
7	Additional requirements for the repair and overhaul of equipment with type of protection "p" (pressurized)	36
7.1	Application	36
7.2	Repair and overhaul	36
7.2.1	Enclosures	36
7.2.2	Cable and conduit entries	37
7.2.3	Terminations	37
7.2.4	Insulation	37
7.2.5	Internal connections	37
7.2.6	Windings	37
7.2.7	Auxiliary devices	39
7.2.8	Light-transmitting parts	39
7.2.9	Encapsulated parts	39
7.2.10	Batteries	39
7.2.11	Lamps	39
7.2.12	Lampholders	39
7.2.13	Ballasts	40
7.3	Reclamation	40
7.3.1	General	40
7.3.2	Enclosures	40
7.3.3	Shafts and housings	40
7.3.4	Sleeve bearings	40

7.3.5	Rotors and stators	40
7.4	Alterations and modifications	41
7.4.1	Enclosures	41
7.4.2	Cable and conduit entries	41
7.4.3	Terminations	41
7.4.4	Windings	41
7.4.5	Auxiliary equipment	41
8	Additional requirements for the repair and overhaul of equipment with type of protection "e" (increased safety)	41
8.1	Application	41
8.2	Repair and overhaul	42
8.2.1	Enclosures	42
8.2.2	Cable or conduit entries	42
8.2.3	Terminations	42
8.2.4	Insulation	42
8.2.5	Internal connections	42
8.2.6	Windings	43
8.2.7	Light-transmitting parts	46
8.2.8	Encapsulated parts	46
8.2.9	Batteries	46
8.2.10	Lamps	46
8.2.11	Lampholders	46
8.2.12	Ballasts	46
8.2.13	Breathing devices	47
8.3	Reclamation	47
8.3.1	Enclosures	47
8.3.2	Sleeve bearings	47
8.3.3	Rotors and stators	47
8.4	Modifications	48
8.4.1	Enclosures	48
8.4.2	Cable and conduit entries	48
8.4.3	Terminations	48
8.4.4	Windings	48
8.4.5	Auxiliary equipment	48
9	Additional requirements for the repair and overhaul of equipment with type of protection "n"	48
9.1	Application	48
9.2	Repair and overhaul	48
9.2.1	Enclosures	48
9.2.2	Cable and conduit entries	49
9.2.3	Terminations	49
9.2.4	Insulation	49
9.2.5	Internal connections	49
9.2.6	Windings	49
9.2.7	Light-transmitting parts	53
9.2.8	Encapsulated parts	53
9.2.9	Batteries	53
9.2.10	Lamps	53
9.2.11	Lamp holders	53

9.2.12	Ballasts	53
9.2.13	Enclosed break devices	53
9.2.14	Breathing devices	54
9.3	Reclamation	54
9.3.1	General	54
9.3.2	Enclosures	54
9.3.3	Joints	54
9.3.4	Shafts and housings	54
9.3.5	Sleeve bearings	54
9.3.6	Rotors and stators	54
9.4	Alterations and modifications	55
9.4.1	Enclosures	55
9.4.2	Cable and conduit entries	55
9.4.3	Terminations	55
9.4.4	Windings	55
9.4.5	Auxiliary equipment	55
10	Additional requirements for the repair and overhaul of equipment covered by IEC 60079-26	55
11	Additional requirements for the repair and overhaul of equipment with type of protection Group III 't' (formerly known as 'tD' or DIP)	55
11.1	Application	55
11.2	Repair and overhaul	56
11.2.1	Enclosures	56
11.2.2	Cable and conduit entries	56
11.2.3	Terminations	56
11.2.4	Insulation	57
11.2.5	Internal connections	57
11.2.6	Windings	57
11.2.7	Light-transmitting parts	59
11.2.8	Batteries	59
11.2.9	Lamps	59
11.2.10	Lamp holders	59
11.2.11	Ballasts	59
11.2.12	Breathing devices	59
11.3	Reclamation	60
11.3.1	Enclosures	60
11.3.2	Joints	60
11.3.3	Shafts and housings	60
11.3.4	Sleeve bearings	60
11.3.5	Rotors and stators	60
11.4	Alterations and modifications	60
11.4.1	Enclosures	60
11.4.2	Cable and conduit entries	60
11.4.3	Windings	61
11.4.4	Auxiliary equipment	61
12	Additional requirements for the repair and overhaul of equipment with type of protection pressurization 'pD'	61
12.1	Application	61
12.2	Repair and overhaul	61

12.3 Reclamation	61
12.4 Modifications	61
Annex A (normative) Identification of repaired equipment by marking.....	62
Annex B (normative) Knowledge, skills and competencies of “responsible persons” and “operatives”	64
Annex C (normative) Requirements for measurements in flameproof equipment during overhaul, repair and reclamation (including guidance on tolerances).....	66
Annex D (informative).....	69
Bibliography.....	70
Figure C.1 – Determination of maximum gap of reclaimed parts	68
Table C.1 – Determination of maximum gap of reclaimed parts	66

INTRODUCTION

When electrical equipment is installed in areas where dangerous concentrations and quantities of flammable gases, vapours, mists or dusts may be present in the atmosphere, protective measures are to be applied to reduce the likelihood of explosion due to ignition by arcs, sparks or hot surfaces produced either in normal operation or under specified fault conditions.

This part of IEC 60079 is supplementary to other relevant IEC standards, for example IEC 60364 series, as regards installation requirements, and also refers to IEC 60079 series and its appropriate parts for the design requirements of suitable electrical equipment.

Clause 4 of this part of IEC 60079 contains general requirements for the repair and overhaul of equipment and should be read in conjunction with the other relevant clauses of this standard dealing with the detailed requirements for individual types of protection.

In cases where protected equipment incorporates more than one type of protection, reference should be made to all clauses involved.

This part not only gives guidance on the practical means of maintaining the electrical safety and performance requirements of repaired equipment, but also defines procedures for maintaining, after repair, overhaul or reclamation, compliance of the equipment with the provisions of the certificate of conformity or with the provisions of the appropriate explosion protection standard where a certificate is not available.

The nature of the explosion protection offered by each type of protection varies according to its unique features. Reference should be made to the appropriate standard(s) for details.

Users will utilize the most appropriate repair facilities for any particular item of equipment, whether they be the facilities of the manufacturer or a suitably competent and equipped repairer (see Note).

This part recognizes the necessity of a required level of competence for the repair, overhaul and reclamation of the equipment. Some manufacturers may recommend that the equipment be repaired only by them.

In the case of the repair, overhaul or reclamation of equipment which has been the subject of design certification, it may be necessary to clarify the position of the continued conformity of the equipment with the certificate.

NOTE Whilst some manufacturers recommend that certain equipment be returned to them for repair or reclamation, there are also competent independent repair organizations who have the facilities to carry out repair work on equipment employing some or all of the types of protection covered by IEC 60079 series. For repaired equipment to retain the integrity of the type(s) of protection employed in its design and construction, detailed knowledge of the original manufacturer's design (which may only be obtainable from design and manufacturing drawings) and any certificate documentation may be necessary. Where equipment is not being returned to the original manufacturer for repair or reclamation, the use of repair organizations that are recommended by the original manufacturer should be considered.

EXPLOSIVE ATMOSPHERES –

Part 19: Equipment repair, overhaul and reclamation

1 Scope

This part of IEC 60079

- gives instructions, principally of a technical nature, on the repair, overhaul, reclamation and modification of equipment designed for use in explosive atmospheres;
- is not applicable to maintenance, other than when repair and overhaul cannot be disassociated from maintenance, neither does it give advice on cable entry systems which may require a renewal when the equipment is re-installed;
- is not applicable to type of protection “m”, “o” and “q”;
- assumes that good engineering practices are adopted throughout.

NOTE Much of the content of this standard is concerned with the repair and overhaul of electrical machines. This is not because they are the most important items of explosion-protected equipment, but rather because they are often major items of repairable capital equipment in which, whatever type of protection is involved, sufficient commonality of construction exists as to make possible more detailed instructions for their repair, overhaul, reclamation or modification.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures “d”*

IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosure “p”*

IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety “e”*

Ⓐ IEC 60079-7:1990, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety “e”*

IEC 60079-7:2001, *Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety “e”* Ⓐ

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

Ⓐ IEC 60079-15:2005, *Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection “n” electrical apparatus*

IEC 60079-15:2010, *Explosive atmospheres – Part 15: Equipment protection by type of protection “n”* Ⓐ

IEC 60079-19, *Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation*

IEC 60079-26, *Explosive atmospheres – Part 26: Equipment with equipment protection level (EPL) Ga*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61241 (all parts), *Electrical apparatus for use in the presence of combustible dust*

IEC 61241-0, *Electrical apparatus for use in the presence of combustible dust – Part 0: General requirements*

IEC 61241-4, *Electrical apparatus for use in the presence of combustible dust – Part 4: Type of protection “pD”*

ISO 4526, *Metallic coatings – Electroplated coatings of nickel for engineering purposes*

ISO 6158, *Metallic coatings – Electrodeposited coatings of chromium for engineering purposes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0 and the following apply.

NOTE Additional definitions applicable to explosive atmospheres can be found in IEC 60050-426.

3.1

serviceable condition

condition which permits a replacement or reclaimed component part to be used without prejudice to the performance or explosion protection aspects of the equipment, with due regard to the requirements of the certificate documentation as applicable, in which such a component part is used

3.2

repair

action to restore faulty equipment to its fully serviceable condition complying with the relevant standard

NOTE The relevant standard means the standard to which the equipment was originally designed.

3.3

overhaul

action to restore to a fully serviceable condition equipment which has been in use or in storage for a period of time but which is not faulty

3.4

maintenance

routine actions taken to preserve the fully serviceable condition of the installed equipment (see Clause 1)

3.5

component part

an indivisible item

NOTE The assembly of such items may form equipment.

3.6

reclamation

means of repair involving, for example, the removal or addition of material to reclaim component parts which have sustained damage, in order to restore such parts to a serviceable condition in accordance with the relevant standard

NOTE The relevant standard means the standard to which the individual parts were originally manufactured.

3.7
modification

change to the design of the equipment which affects material, fit, form or function

NOTE As the certificate describes specific construction of the equipment, a modification of the equipment would no longer comply with the construction described in the certificate documentation.

3.8
manufacturer

maker of the equipment (who may also be the supplier, the importer or the agent) in whose name usually the certificate, where appropriate, of the equipment was registered

3.9
alteration

change to a product that results in an alternative construction that is described in the certificate documentation

3.10
user

user of the equipment

3.11
repair facility

facility providing a service that consists of repairs, overhauls, or reclamations of explosion-protected equipment who may be the manufacturer, the user or a third party (repair agency)

3.12
certificate

document that assures the conformity of a product, process, system, person, or organization with specified requirements

NOTE The certificate may be either the supplier's declaration of conformity or the purchaser's recognition of conformity or certification (as a result of action by a third party) as defined in ISO/IEC 17000.

3.13
certificate references

a certificate reference number may refer to a single design or a range of equipment of similar design

3.14
symbol "X"

symbol used to denote specific conditions of use

NOTE The symbol "X" is used to provide a means of identifying that essential information for the installation, use, and maintenance of the equipment is contained within the certificate. Therefore, the certificate documents should be studied before such equipment is installed, repaired, overhauled, reclaimed, altered or modified.

3.15
copy winding

process by which a winding is totally or partially replaced by another, the characteristics and properties of which are at least as good as those of the original

3.16
flameproof enclosure "d"

enclosure in which parts which can ignite an explosive atmosphere are placed and which can withstand the pressure developed during an internal explosion of an explosive mixture and which prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure

3.17

type of protection “i”

type of protection based on the restriction of electrical energy within apparatus and of interconnecting wiring exposed to the potentially explosive gas atmosphere to a level below that which can cause ignition by either sparking or heating effects

3.18

type of protection “p”

technique of guarding against the ingress of the external atmosphere into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere

3.19

type of protection “e”

type of protection applied to electrical apparatus in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks in normal service or under specified abnormal conditions

3.20

type of protection “n”

type of protection applied to the electrical equipment such that, in normal operation and in certain specified regular expected occurrences, it is not capable of igniting the surrounding explosive gas atmosphere

3.21

type of protection “tD” or Group III “t”

type of protection for explosive dust atmospheres where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures

3.22

type of protection “pD”

technique of applying a protective gas to an enclosure in order to prevent the formation of an explosive dust atmosphere inside the enclosure by maintaining an overpressure against the surrounding atmosphere

4 General

4.1 General principles

This clause covers those aspects of repair, overhaul, reclamation, alteration, and modification which are common to all explosion-protected equipment. Subsequent clauses provide instructions for the additional requirements relevant to specific types of protection. When equipment incorporates more than one type of protection, reference shall be made to the appropriate clauses.

NOTE 1 Additional requirements for types of protection “m”, “o” and “q” have not been defined.

Assuming that repairs and overhauls are carried out using good engineering practices, then repairs and overhauls impacting the type of protection shall be presumed as being in conformity with the certificate when manufacturer's parts or parts specified in 4.4.1 are used and repairs or alterations are carried out specifically as detailed in this standard, the certificate documentation under 4.4.1.5, and when performed by competent persons as provided in 4.4.1.3.

In circumstances where the relevant documentation in accordance with 4.4.1.5.1 is not available, then the repair or overhaul shall be carried out on the equipment in accordance with this standard and other relevant standard(s). The steps taken to obtain the relevant documentation shall be recorded in the repair facility records (see 4.4.1.5.3).

If the equipment has been modified, it shall comply with the requirements of 4.4.3 where a new certificate is required to be prepared or the equipment is no longer suitable for use in a hazardous area.

NOTE 2 In some countries, legal requirements do not permit repair without relevant documentation to Group I equipment unless subjected to complete retesting and a new certificate issued.

If other repair or alteration techniques are used which are not in accordance with this standard, then it will be necessary to ascertain, from the manufacturers, and/or the certification authority, the suitability of the equipment for continued use in an explosive atmosphere.

NOTE 3 Repair of equipment which has no marking plate should be avoided.

4.2 Statutory requirements for repair facility

The repair facility, which may be the manufacturer, user or a third party repair, shall be aware of any specific requirements in relevant national legislation which may govern the repair or overhaul operation.

4.3 Instructions for the user

4.3.1 Certificates and documents

The equipment design certificate and other related documents (see 4.4.1.5) should have been obtained as part of the original purchase contract.

4.3.2 Records and work instructions

The relevant documentation (4.3.1), along with the records of any repairs, overhauls, alterations or modifications, should be kept by the user and made available to the repairer.

NOTE 1 The documentation and records are normally retained in the users verification dossier for the lifetime of the equipment.

NOTE 2 It will be in the interests of the user that the repairer is notified, whenever possible, of the fault and/or nature of the work to be done and any special application information, e.g. a motor supplied by an inverter.

Special requirements stipulated in the user's specifications, and which are supplementary to the various standards, e.g. enhanced ingress protection, specific environmental conditions etc., should be brought to the attention of the repairer.

4.3.3 Re-installation of repaired equipment

Re-installation of repaired equipment is in accordance with IEC 60079-14.

NOTE Before the repaired equipment is re-commissioned, cable/conduit entry systems should be checked to ensure that they are undamaged and are appropriate to the equipment type of protection.

4.3.4 Repair facilities

It is the responsibility of the user to ascertain that the repair facility concerned can demonstrate compliance with the relevant stipulations of this standard.

4.4 Instructions for the repair facility

4.4.1 Repair and overhaul

4.4.1.1 General

Repair facilities shall operate a Quality Management System.

NOTE Overhaul of explosion-protected equipment involves special techniques. The Quality Management System should include documented procedures to ensure work is performed within an agreed refurbishment quality programme. For additional information, see ISO 9001.

The repair facility shall appoint a person ('responsible person') with the required competency (see Annex B), within the management organization, to accept responsibility and authority for ensuring that the overhauled/repaired equipment complies with the certification status agreed with the user. The person so appointed shall have a working knowledge of the appropriate explosion protection standards and an understanding of this standard.

The repair facility must have adequate repair and overhaul facilities as well as the appropriate equipment necessary and trained Operatives with the required competency (see Annex B) and authority to carry out the activities, taking into account the specific type of protection.

The repair facility shall conduct an assessment of the status of the equipment to be repaired, agree with the user the expected certification status of the equipment after repair and the scope of work to be done. This should include the justification for omission of any tests mentioned within this document that the user could reasonably assume to be included. The assessment shall be documented and shall address the relevant clauses of the appropriate equipment standard and this standard and be included in the job report to the user. Such assessments shall be conducted by the responsible person (supported by appropriate Operatives). The responsible person shall only conduct assessments with the explosion protection techniques for which they have demonstrated his competence.

The repair facility shall include additional procedures and systems to carry out overhaul/repair work at sites external to the repair facility, where appropriate.

4.4.1.2 Certificates and standards

The repairer's attention is directed to the need to be informed of, and to comply with, the relevant explosion-protection standards and certificates, including any specific conditions of use, applicable to the equipment to be repaired or overhauled.

4.4.1.3 Competency

All personnel directly concerned with the repair and/or overhaul of the equipment shall be competent or supervised by a competent person. The competencies may be specific to the type of work.

Training and competency assessments are specified in Annex B.

Appropriate training and assessment shall be undertaken from time to time at intervals depending on the frequency of utilization of the technique or skill and change of standards or regulations. The interval should normally not exceed three years.

4.4.1.4 Repair of components

When a component of complete equipment is taken off site for repair, such as a rotor of a rotating machine, and it is impracticable to carry out certain tests, the repairer shall document the details and communicate them to the user before starting the repair.

NOTE In some countries, legal consequences may depend upon the extent to which the carrying out or not of certain actions or tests is practicable.

4.4.1.5 Documentation

4.4.1.5.1 General

The repair facility shall seek to obtain all necessary information/data from the user or manufacturer for the repair and/or overhaul of the equipment. This may include information

relating to previous repairs, overhauls or modifications. The repair facility shall also have available and refer to the relevant explosion-protection standard.

NOTE As from the fourth edition of IEC 60079-0, manufacturers are required to prepare instructions including repair.

The data necessary for the repair and/or overhaul includes, but is not limited to, details of the:

- technical specification;
- drawings;
- type(s) of explosion-protection;
- operating conditions (such as environment, supply (inverter), lubricants, duty, etc.)
- dismantling and assembly instructions;
- certificate documentation with certificate limitations (specific conditions of use), where specified;
- marking (including Ex marking);
- recommended methods of installation/operation/maintenance/repair/overhaul for the equipment;
- list of spare parts;
- summary of previous history of the repaired product including information as gathered under 4.3.2.

The information may be subject to amendments.

The repair facility shall maintain copies of any relevant explosion-protection standards with which repaired/overhauled equipment is claimed to comply.

4.4.1.5.2 Job report to the user

At the completion of the work, job reports shall be submitted to the user (see 4.3.2), for inclusion in the user's verification dossier, containing, at least, the following:

- details of fault(s) detected;
- full details of repair and overhaul;
- list of replaced or reclaimed parts;
- results of all checks and tests (in sufficient detail to be useful if required by the next repairer, see 4.3.2);
- a comparison of the results against the criteria that have been used to determine compliance;
- copy of the user contract or order;
- a recapitulation of the marking applied in accordance with Annex A.

The job reports of repairs/overhauls shall be retained for a period of time as agreed with the user. Retained information shall be adequately controlled to ensure correct retrieval.

For repairs undertaken without documentation in accordance with 4.4.1.5.1, the following shall be included in the repair report:

- a statement that the repair is in accordance with the manufacturer's instructions or applicable requirements of the Ex standard for the particular type of protection against which the equipment was originally manufactured;
- a statement that the repairer has insufficient evidence of full compliance with the certificate documents;

- a statement that any specific conditions of use have not been identified or considered in the repair or overhaul.

4.4.1.5.3 Repair facility records

The following records shall be retained by the repair facility:

- current and past copies of relevant technical standards in addition to the explosion protection standards;
- certification of Facility Quality Standard including:
 - details of Repair provider's Quality Assessment Scheme;
 - test instrument calibration;
 - competency and training records of personnel;
 - purchasing control system;
 - customer complaints system;
 - internal and, where appropriate, external audit documentation;
 - management review;
 - process control procedures;
 - register of manufacturer's drawings.
- job records including:
 - the steps taken to obtain the certificate documentation;
 - mechanical inspection record for compliance with relevant standards;
 - defect identification;
 - electrical test records before and after repair including traceability of instruments used and pass/fail criteria;
 - attestation of conformity for replacement components;
 - recovery procedure for repaired components;
 - record of any assessments by the responsible person along with the justification for decisions taken;
 - record of mechanical inspection during assembly and upon completion;
 - record of work undertaken by the repair facility;
 - record of any replacement parts manufactured by the repairer.

The record of the reclamation of repaired components (4.4.2.2.2) shall, at least, identify the following:

- a) identification of the component part;
- b) name of the organization carrying out the reclamation;
- c) a detailed justification for the work carried out;
- d) various options considered (e.g., welding, metal spraying);
- e) technical parameters, e.g., bond strength;
- f) the reasons for selecting the chosen technique;
- g) consumables used and method of storage;
- h) base material;
- i) reclamation process manufacturers' instructions considered;
- j) procedure utilized;
- k) identity and competency of the operator;

- l) inspection procedure used, e.g., ultra-sonic, dye-penetration, X-ray;
- m) maintenance and calibration details of automatic systems;
- n) detail of any dimensions which differ from those in relevant certificate documents or the original dimensions of the component part;
- o) drawing showing reclamation details including material removed and replaced;
- p) date of reclamation.

These records shall be retained for a period of at least ten years or as agreed with the user.

4.4.1.6 Spare parts

4.4.1.6.1 General

It is preferable to obtain new parts from the manufacturer, and the repairer shall ensure that only appropriate spare parts are used in the repair or overhaul of certified equipment. Depending on the nature of the equipment, these spare parts may be identified by the manufacturer, the equipment standard or the relevant certificate documentation.

Where components cannot be supplied by the original manufacturer, where the full specification for the component is available, and where the repairer's quality scheme permits, the repairer may manufacture replacement component parts. Records of such replacement shall be retained and provided to the user.

4.4.1.6.2 Fasteners

Where replacement bolts are used, they shall be the same type, diameter, pitch and length and at least the same tensile strength as specified for the original equipment.

Washers, plain or lock, shall not be placed under bolt heads, screw heads or nuts unless they are specified in the original certificate documentation or in the type of protection standard to which the equipment was manufactured.

4.4.1.6.3 Sealed parts

Parts, which are required by the equipment specification and certificate documents to be sealed, shall be replaced only by the particular spare part(s) detailed in the parts list.

NOTE Devices incorporated in equipment to indicate interference by third parties (e.g., security seals) as distinct from those required in the certificate documentation, are not intended to fall within the scope of this subclause.

4.4.1.7 Identification of repaired equipment

The equipment shall be marked to identify the repair or overhaul and the repairer's identity. The marking for the repaired equipment is given in Annex A.

Marking may be provided on a separate label. It may be necessary to amend or remove or supplement the label in certain circumstances as follows.

- a) If after repair, overhaul, or alteration, the equipment still complies with the restrictions imposed by this standard and the type of protection standards to which it was manufactured, but does not necessarily comply with the certificate documentation, the label should not normally be removed and the repair symbol "R" shall be written within an inverted triangle (see Annex A).
- b) If after repair, overhaul, alteration, or modification, the equipment is changed such that it no longer conforms with the type of protection standards or certificate documentation, the "Ex" marking and the mark of the certificate issuer on the certification label shall be removed unless a supplementary certificate has been obtained.