



TECHNICAL SPECIFICATION

Explosive atmospheres – Part 43: Equipment in adverse service conditions

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.260.20

ISBN 978-2-8322-5011-2

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 Environmental conditions affecting the equipment used in explosive atmospheres.....	7
4.1 General.....	7
4.2 Low temperature effects.....	7
4.3 Other environmental effects	8
5 Recommendations for design of equipment	8
5.1 General.....	8
5.2 Atmospheres containing salt and chlorides	9
5.3 Snow conditions.....	9
5.4 Solar Radiation	9
5.5 Mechanical integrity.....	9
5.6 Icing and winterization	10
5.7 Impact of rapid cooling.....	10
6 Impact of low temperatures on types of protection	10
6.1 General.....	10
6.2 Intrinsic safety "i"	10
6.3 Flameproof enclosure "d"	11
6.4 Pressurized enclosure "p"	11
6.5 Liquid immersion "o"	11
7 Selection, installation and use of equipment	11
7.1 Limited functionality	11
7.2 Cables and cable glands.....	11
7.3 Seals and sealing materials	12
8 Maintenance of equipment.....	12
9 Hazardous area classification	12
Annex A (informative) Recommendations on materials.....	13
Annex B (informative) Solar radiation.....	14
B.1 General.....	14
B.2 Temperature gradients.....	14
B.3 Recommendations	14
B.3.1 Cables and glands.....	14
B.3.2 Equipment	14
B.3.3 Protective measures	14
Annex C (informative) Electric motors in low temperatures.....	15
C.1 General.....	15
C.2 Explosion-protection	15
C.3 Factors that may affect design and performance	15
Bibliography.....	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 43: Equipment in adverse service conditions

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 60079-43, which is a technical specification, has been prepared by IEC Technical committee 31: Equipment for explosive atmospheres.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
31/1311/DTS	31/1328A/RVDTS

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60079 series, published under the general title *Explosive atmospheres*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

IEC 60079-0 specifies the requirements for electrical equipment intended for use in explosive atmospheres at standard atmospheric conditions:

- temperature -20 °C to $+60\text{ °C}$;
- pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
- air with normal oxygen content, typically 21 % v/v.

In some cases, other parts of the IEC 60079 series also specify conditions outside the above range, for example in IEC 60079-1.

IEC 60079-0 states the normal ambient temperature range as -20 °C to $+40\text{ °C}$ and states that electrical equipment designed for use in other than this normal ambient temperature range is considered to be special and includes additional marking to communicate this to the user.

IEC 60079-14 includes requirements for users to select and install equipment so that it is suitable for the environmental conditions, but does not provide any specific guidance for installations outside of the standard atmospheric conditions or for other adverse environmental conditions.

Extreme climate conditions in Polar environments are challenging to explosion protection technology and solutions. Conditions such as snow build-up, icing from spray and freezing of precipitation can negatively affect the operation and safety of equipment. Extreme low temperatures and weather conditions make it difficult to process hydrocarbons in open outdoor process areas and it can also be challenging for equipment operation. Measures to deal with these challenges are often called 'winterization'.

This document is a guide for equipment subject to adverse service conditions, for example equipment considered as 'special' in IEC 60079-0. It is applicable to the design, manufacture, installation, inspection and use of such equipment. Annex A gives recommendations on materials and Annex C gives information on electric motors in low temperatures. It is possible that some details in this technical specification will be relocated to relevant parts of the IEC 60079 series at the next edition of each of those relevant parts as guidance material.

This technical specification does not at this time address other environmental conditions such as high temperatures, which will be explored further at a later date.

EXPLOSIVE ATMOSPHERES –

Part 43: Equipment in adverse service conditions

1 Scope

This part of IEC 60079, which is a Technical Specification, provides guidance for equipment for use in explosive atmospheres in environments which may include ambient temperatures below –20 °C, and additional adverse conditions, including maritime applications.

The purpose of this document is to provide recommendations to be considered for the design, manufacture and use of equipment. It is intended that this document be used for equipment operating within the environmental range specified on the certificate for the equipment.

NOTE For detailed classification of climate conditions refer to IEC 60721 series and IEC 60068-1.

This document is intended to be used in conjunction with the IEC 60079 series and the ISO/IEC 80079 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60034-5, *Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification*

IEC 60068 (all parts), *Environmental testing*

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

IEC 60079-11, *Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"*

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

IEC 60079-17, *Explosive atmospheres - Part 17: Electrical installations inspection and maintenance*

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

IEC 60721-1, *Classification of environmental conditions - Part 1: Environmental parameters and their severities*

IEC 60721-2-1, *Classification of environmental conditions - Part 2-1: Environmental conditions appearing in nature - Temperature and humidity*

IEC TR 60721-4 (all parts), *Classification of environmental conditions*