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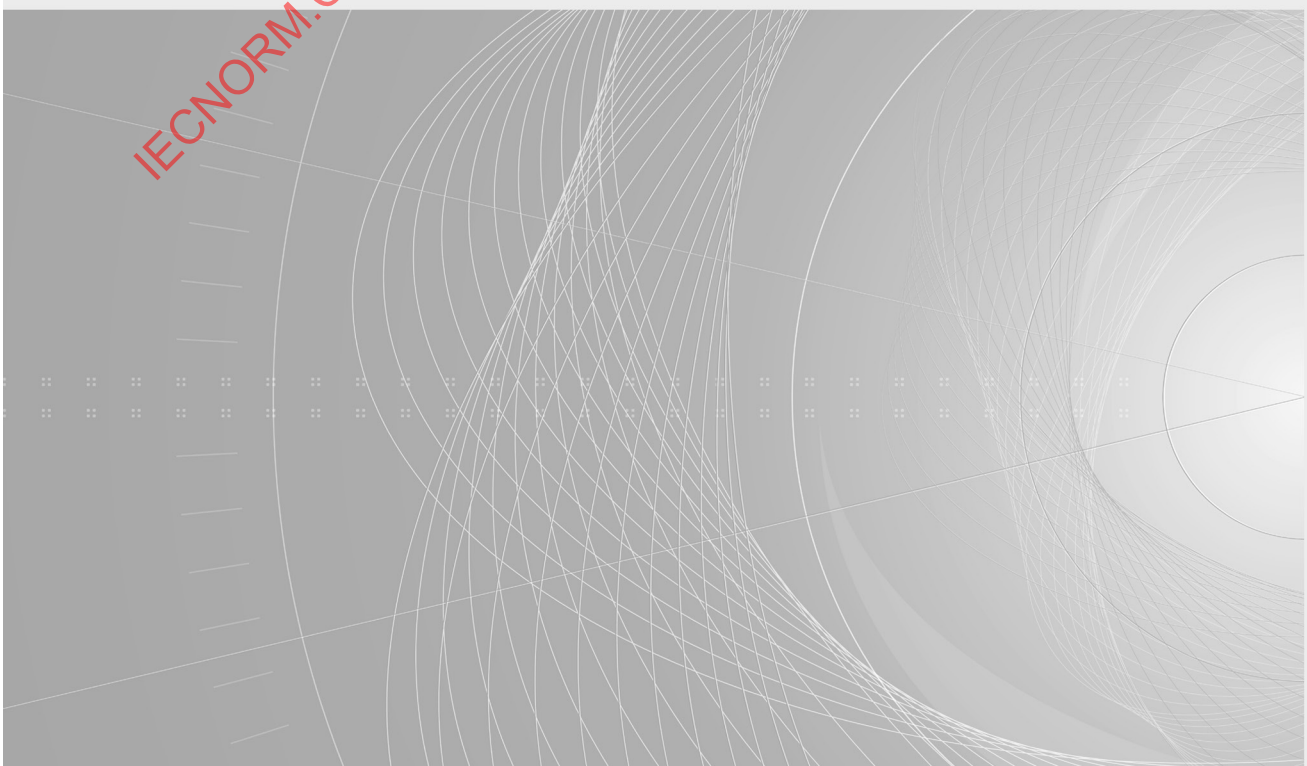
Edition 1.0 2023-11

TECHNICAL SPECIFICATION

Explosive atmospheres –
Part 48: Portable or Personal Electronic Equipment – Guide for the use of equipment without a certificate for use in Hazardous Areas



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EXPLOSIVE ATMOSPHERES –

Part 48: Portable or Personal Electronic Equipment – Guide for the use of equipment without a certificate for use in Hazardous Areas

FOREWORD

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IEC TS 60079-48 has been prepared by subcommittee 31J: Classification of hazardous areas and installation requirements, of IEC technical committee 31: Equipment for explosive atmospheres. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
31J/347/DTS	31J/352/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 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- withdrawn,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.

INTRODUCTION

Suitable portable or personal equipment might not be commercially available with a certificate for use in hazardous areas, but might be needed for operational or health and safety reasons or could commonly be used as personal items. The acceptance of equipment without a certificate for use in hazardous areas would depend on the user organization policies and risk or needs assessment.

This document is intended to assist users in understanding the potential for ignition from such equipment. This guidance could be further limited by regulations in some countries.

This document addresses hazards relevant to portable and personal electronic equipment such as, spark ignition, hot surfaces, mechanically generated sparks, static electricity, radio frequency, ultrasonic energy, and optical radiation.

EXPLOSIVE ATMOSPHERES –

Part 48: Portable or Personal Electronic Equipment – Guide for the use of equipment without a certificate for use in Hazardous Areas

1 Scope

This part of IEC 60079, which is a Technical Specification, provides guidance for an owner or operator for the use of portable or personal electronic equipment to be used in hazardous areas requiring Equipment Protection Level (EPL) Gb, Gc, Db, or Dc that are not otherwise commercially available with a certificate.

NOTE 1 This document is not intended to be used for certification purposes for equipment to be used in hazardous areas.

NOTE 2 Examples of some of these types of equipment are provided in Annex A.

NOTE 3 EPLs are derived from the hazardous area zones based on an additional risk assessment. The default relationship without a risk assessment in IEC 60079-14 is Zone 1 as EPL Gb, Zone 2 as EPL Gc, Zone 21 as EPL Db and Zone 22 as EPL Dc.

This document does not apply to:

- equipment that is electrically connected to fixed equipment or fixed wiring during use in the hazardous area, for example a lead light connected to the premises wiring system by a plug and socket,
- portable or personal equipment with a certificate for use in a hazardous area,
- transportable equipment,
- portable or personal equipment used in Group I applications,
- battery powered tools, such as drills and saws,
- portable or personal equipment used in areas requiring EPL Ga or Da equipment, or,
- medical devices.

NOTE 4 Devices which are implanted in the body are not exposed to atmosphere and are therefore not subject to hazardous area requirements, for example, pacemakers. The risk from other medical devices external to the body is beyond the scope of this document.

This document does not address other considerations involving the use of portable or personal electronic equipment for other aspects of safety, for example, creation of a distraction from important work tasks, radio frequency interference with measurement and control equipment, or medical issues.

This document supplements the guidance in IEC 60079-14 regarding the use of personal or portable equipment without a certificate for use in hazardous areas.

NOTE 5 IEC 60079-14 requires that equipment with a certificate for hazardous areas should be used where possible and equipment without a certificate for hazardous areas should be subject to a risk assessment.

NOTE 6 It is not a requirement of this document that equipment is evaluated for fault conditions since this would be beyond the ability of the end user assessment.

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 undated references the latest edition of the referenced document (including any amendments) applies.

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – Explosive dust atmospheres*

IEC TS 60079-32-1, *Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
battery
one or more cells fitted with devices necessary for use, for example, terminals, marking and protective devices

[SOURCE: IEC 60079-0:2017:3.7.1, modified – removal of Note 1 to entry]

3.2
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, case, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60079-0:2017, 3.7.3, modified – removal of Note 1 to entry]

3.3
certificate
document that conveys the assurance of the conformity of a product, process, system, person, or organization with specified requirements.

Note 1 to entry: The certificate is 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.

[SOURCE: IEC 60079-0:2017, 3.12]

3.4
equipment, personal
equipment intended to be worn by and in contact with a person's body during operation

[SOURCE: IEC 60079-0:2017, 3.31.3]

3.5
equipment, portable
equipment intended to be carried by a person during operation

Note 1 to entry: Portable equipment carried by a person during operation is sometimes referred to as hand-held equipment.

[SOURCE: IEC 60079-0:2017, 3.31.4]

3.6
portable or personal electrical electronic product
PEP
self-contained, low power equipment that can be hand-held or that is further defined by PEP 1 and PEP 2

3.7
PEP 1
electronic equipment intended to be worn by and to be in contact with a person's body that is considered incapable of causing an ignition under normal conditions

Note 1 to entry: Examples of personal equipment include wristwatches.

3.7.1
PEP 1b
PEP 1 electronic equipment which is intended to be used in locations requiring EPL Gb or Db

3.7.2
PEP 1c
PEP 1 electronic equipment which may be used in locations requiring EPL Gc or Dc

3.8
PEP 2c
electronic equipment intended to be carried by a person during its operation that is considered incapable of causing an ignition under normal conditions

Note 1 to entry: Examples of portable equipment include remote controls for hearing aids.

Note 2 to entry: PEP 2c equipment include items that may be restrained on a person by additional means for example, a carrying case.

Note 3 to entry: Portable equipment carried by a person during its operation is sometimes referred to as hand-held equipment.

Note 4 to entry: PEP 2 is not possible for EPL Gb or Db and so the designation PEP 2b is not used.

3.9
safe work procedure
formal process to allow work in a hazardous area under prescribed conditions

Note 1 to entry: The safe work procedure commonly results in a written permit that can be issued to ensure that the work can be carried out safely under the prescribed conditions. This can allow equipment that is not rated for the hazardous area to be used.

Note 2 to entry: Safe work procedure guidelines are provided in IEC 60079-14.

3.10
Equivalent Isotropically Radiated Power
EIRP
product of the power supplied by a radio transmitter to an antenna and the absolute gain of the antenna in a given direction

Note 1 to entry: The gain is produced by an antenna concentrating radiation in a particular direction and is always related to a specified reference antenna.

[SOURCE: IEC 60050-212:2010, 712-02-51]

4 General

Locations containing flammable gases, vapours, or combustible dusts are classified in accordance with IEC 60079-10-1 or IEC 60079-10-2. Portable or personal electronic equipment

having self-contained power supplies could become an ignition source in these hazardous areas.

Testing and assessment of equipment may be conducted by the owner or operator of the facility, or another party accepted by the owner or operator of the facility, who is competent in hazardous area requirements.

Where suitable equipment with a hazardous area certificate is commercially available, it should always be used. This document should not be used as justification for use of equipment without a hazardous area certificate as a matter of preference, for example to support a software function, if the task can be modified such that equipment with a hazardous area certificate could be used. However, in some circumstances, specialty type of equipment or features might not be commercially available. For example, certified cameras are commercially available, however, they might not be capable of performing some specialty functions. In these circumstances, Annex A identifies the typical PEP category that may be used.

Where suitable equipment with a hazardous area certificate is not commercially available, Table 1 provides guidance on the application of portable or electronic equipment without a hazardous area certificate in a specific hazardous area.

NOTE The PEP concepts outlined in this document might not be appropriate for all work activities due to an elevated risk from ignition. For example, draining pipework for maintenance activities in an area requiring EPL Gc could lead to a more onerous safety condition for the period of the activity.

Table 1 – Application of PEP assessed portable or personal electrical equipment

EPL Requirement (Default Zone)	Electrical equipment assessed as meeting PEP 1c requirements	Electrical equipment assessed as meeting PEP 1b requirements	Electrical equipment assessed as meeting PEP 2c requirements
Gc (Zone 2)	No additional control required	No additional control required	No additional control required
Gb (Zone 1)	Control Explosive Atmosphere via safe work procedure	No additional control required	Control Explosive Atmosphere via safe work procedure
Dc (Zone 22)	No additional control required	No additional control required	No additional control required
Db (Zone 21)	Control Explosive Atmosphere via safe work procedure	No additional control required	Control Explosive Atmosphere via safe work procedure
NOTE 1 For areas requiring EPL Ga or Da equipment, additional controls are required which are beyond the scope of this document. NOTE 2 Electrical equipment with a certificate for the EPL they are used in are covered in IEC 60079-14. NOTE 3 Electrical equipment without a certificate for the EPL they are used in and are not PEP assessed are managed under a safe work procedure, see 3.9.			

5 Requirements for PEPs

5.1 General

All PEPs should be suitable for the environment and conditions in which they will be used, for example ambient temperature, and meet all of the following criteria as applicable:

a) Radio frequency energy transmission (EIRP in the range 9 kHz to 60 GHz) shall not exceed the following threshold power limits:

   1) 2 W maximum output for Group IIC.

2) 3,5 W maximum output for Group IIB.

3) 6 W maximum output for Group IIA or Group III.

NOTE These limits are based on the limits established in IEC 60079-0 and simplified for common users.

b) No forced cooling, for example a microprocessor cooling fan.

c) No electrical or mechanical sparking in normal operation.

d) No external surface temperatures exceeding 60 °C in normal operation.

e) No motors unless it is integral to a mobile device for a vibration alert.

f) No ultrasonic energy exceeding 0,1 W per cm sq and 10 MHz.

g) No optical radiation other than a Class 1 source.

NOTE Class 1 in accordance with IEC 60825-1, applicable to laser and LED equipment.

h) No piezoelectric components in electrical equipment likely to be subject to impact or not otherwise protected from impact.

i) No identifiable functions requiring rapid energy release. For example, high energy flash for cameras or supercapacitors.

j) Electrostatic hazard management. For items smaller than 10 000 mm^2 for Groups IIA or IIB, and 2 000 mm^2 for Group IIC, consideration of electrostatic hazards is not needed. See IEC TS 60079-32-1 for additional guidance.

Verification of requirements found in 5.1, 5.2, 5.3 and 5.4 may be based on the manufacturer's declaration or specifications.

Examples of some equipment which can be assigned a PEP 1b / PEP 1c and PEP 2c can be found in Annex A.

5.2 Additional requirements for PEP 1c, EPL Gc and Dc

Personal equipment meeting the general criteria in 5.1 and all of the following additional criteria may be designated as PEP 1c:

a) Powered by a source with a voltage not more than 4,5 VDC and capacity of not more than 350 mAh. With the exception of approved medical equipment, lithium cells should comply with relevant safety standards, for example UL1642 or IEC 62133-2.

b) For other than Group IIIC, exposed terminals (for example battery charging terminals) are either recessed, diode protected, or otherwise guarded to prevent a discharge caused by an accidental shorting of these terminals.

c) For Group IIIC, no exposed terminals (for example battery charging terminals).

NOTE The 4,5 V limitation is from IEC 60079-11 and the capacity limitation is based upon typical smartwatch battery specifications.

5.3 Additional requirements for PEP 1b, EPL Gb and Db

Personal or portable equipment meeting the general criteria in 5.1 and 5.2 and all of the following additional requirements for EPL Gb and Db, PEP 1b equipment:

a) No exposed terminals.

b) No light alloy construction. Materials used in the construction of enclosures should not contain, by mass, more than 7,5 % in total of magnesium, titanium and zirconium.

c) Maximum total rechargeable battery capacity of 150 mAh.

d) Maximum total non-rechargeable battery capacity of 300 mAh.

5.4 Additional requirements for PEP 2c, EPL Gc and Dc

Personal or portable equipment meeting the general criteria in 5.1 and all of the following additional criteria may be designated as PEP 2c:

a) Passes the drop test specified in Clause 7 or an equivalent test.

b) No external electrical connections or wired accessories are used in the hazardous area.

c) Exposed terminals (for example battery charging terminals) are either recessed or diode protected to prevent a discharge caused by an accidental shorting of these terminals.

d) Does not have a power on-off switch with contacts that directly interrupt battery current.

NOTE 1 An on-off switch that interrupts battery current is not acceptable for PEP 2 because the switch could cause an ignition-capable arc. If the switch operator is not a maintained position device and requires the same action for on and off, then it is likely to be an electronic switch. Generally electronic equipment use the electronic circuit type of switch.

e) For electronic components that are integrated into fabrics, these should be assessed to be resistant to damage that could lead to an ignition source based on applicable durability measures.

EXAMPLE Wearable technologies that may be formed into clothing, shoe inserts, or items such as glove components.

NOTE 2 Durability factors could take many forms depending on the item under consideration. For example, durability of soft fabrics could include wear or tear resistance. For a shoe insert, it could be wear and load cycle factors, or for a glove, it could be other impact during a fall or to another surface in use.

6 Administrative controls

6.1 General

A process of administrative control and training should be in place to ensure that portable or personal electrical equipment do not present an unacceptable possibility of ignition when used in hazardous areas.

A policy should be implemented detailing which portable or personal electronic equipment is permitted, and which items are not permitted without further evaluation according to this document and a risk assessment where required. Where the policy identifies that items should be further evaluated, then a register of suitable devices should be maintained by responsible persons as suitable for use, including any restrictions on use (for example, an electrical equipment case).

PEP evaluations and development of policies should include a person who is competent in hazardous area requirements.

The availability of suitable equipment with a hazardous area certificate should be checked periodically. A plan should be established to reduce the use of PEP equipment where applicable.

Prior to entry into the hazardous area, all PEPs should be checked to be free of visible damage and functioning normally. Any PEPs which are damaged or functioning abnormally should be removed from service.

PEP Equipment should be taken out of the hazardous area when the person leaves the hazardous area.

Battery replacement or charging of PEP equipment in a hazardous area should not be permitted.

6.2 Additional requirements for PEP 2c

The owner or operator of the hazardous area should establish a process of inspection including a follow up verification schedule in which a person who is competent in hazardous area requirements establishes that electrical equipment can continue to be accepted as PEP 2c.

A register of equipment which is assessed as PEP 2c should be maintained. Any restrictions on use, such as requirements for a protective case, should be documented.

The use of PEP 2c equipment may depend upon the application of a suitable safe work procedure. For example, use of a gas detector.

7 Drop test

A representative sample of the equipment, in the form in which it is intended to be used, is dropped onto a horizontal concrete surface from a height of 2 meters. The test is repeated with the device being dropped in four orientations that are considered most likely to cause a failure. The device is not to be repaired between tests.

At the conclusion of the testing:

a) the integrity of the enclosure should not have been compromised,

b) the cell or battery should not have fallen out or become disconnected, and

c) the device should continue to operate as intended.

NOTE 1 Battery dislodgement can be indicated by the unit powering down.

NOTE 2 Repair does not include actions that could be taken by the user to return the equipment to its normal operating condition, without the use of tools. For example, reattaching an external cover that has become partially dislodged and is visible during normal use.

NOTE 3 Examples of failed integrity is a cracked casing, partial or total opening of some part with electrical components or connection, LCD with permanent damage, etc.

If the equipment is intended to be used only while in a case and the case affords protection to the battery, then the drop test is done with the electrical equipment in its case. If the electrical equipment is intended to be or could be used after the electrical equipment is removed from its case, then the drop test is performed with the electrical equipment removed from its case.

Annex A
(informative)

Examples of equipment which could be assigned a PEP

Table A.1 shows the potential suitability of selected examples of portable and personal electrical equipment for use in a hazardous area. This list is not intended to be a comprehensive list of potential PEP equipment.

Table A.1 – Possible PEP assignment

Equipment Type	Potential PEP assignment where suitable certified equipment is not available
Analytical test equipment:	
• Analog electrical multi-meter • Resistance tester	safe work procedure required
• Digital multi-meter • pH/ORP meter • Ultrasonic gauges • Vibration monitors	PEP 2c possible
Barcode Scanner	PEP 2c possible
Calculator	PEP 2c possible
Camera:	
• Digital; digital zoom, solid state storage	PEP 2c possible
• Digital; with electro mechanically driven zoom, or media drive	safe work procedure required – motors
Cell phone/tablet	PEP 2c possible
Flashlight	PEP 2c possible
Global Positioning Satellite Receivers:	
• GPS portable/personal	PEP 2c possible
Passive RFID Tag	Not required to be PEP assessed
Gas detector	PEP 2c possible
Hearing aid:	
• In ear or over ear	PEP 1b possible
• Some parts not in contact with skin.	PEP 2c possible
Battery Powered RFID/Secure ID card	PEP 2c possible
Smart Card	Acceptable because no power source
Smart Key	Acceptable because no power source
Key fobs (Remote control):	
• IR type • Radio types	PEP 2c possible
Garage Door Opener Remote	PEP 2c possible
Implanted medical devices:	
• Pace maker	Acceptable because not exposed to atmosphere
• Defibrillator	Acceptable because not exposed to atmosphere
External Medical Devices:	
• Insulin pump	PEP 2c possible

Equipment Type	Potential PEP assignment where suitable certified equipment is not available
Pagers:	
• Standard • Smart type, 2 way	PEP 2c possible
• **Personal Digital Assistant:**	
• PDAs with auxiliary connections • PDAs with no auxiliary connections	safe work procedure required due to wired accessories PEP 2c possible
Power Tools:	
• Battery powered	safe work procedure required due to known ignition sources – motor brushes and switches
Two-way radios	PEP 2c possible
Respirator	PEP 2c possible
Satellite phone	PEP 2c possible
Wristwatch:	
• Standard • Smart/fitness watch, with or without GPS	PEP 1b possible PEP 1c possible
Digital Recorder	PEP 2c possible
Electrically Heated Clothing	PEP 2c possible