
**Električne naprave za potencialno eksplozivne atmosfere - Polnjenje s
peskom "q"**

Electrical apparatus for potentially explosive atmospheres - Powder filling "q"

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Descriptors: Electrical apparatus, potentially explosive atmosphere, explosive atmosphere, explosion proofing, specific requirement, powder filling "q"

English version

**Electrical apparatus for potentially explosive atmospheres
Powder filling "q"**

Matériel électrique pour atmosphères
explosibles
Remplissage pulvérulent "q"

Elektrische Betriebsmittel für
explosionsgefährdete Bereiche
Sandkapselung "q"

This European Standard was approved by CENELEC on 1998-08-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by Technical Committee CENELEC TC31, Electrical apparatus for explosive atmospheres - General Requirements.

It consists of the text of EN 50017:1994 and a draft amendment to this second edition which was submitted to the unique acceptance procedure and received a positive vote. The second edition and the amendment have been combined to form an "editorial" third edition which was approved by CENELEC on 1998-08-01.

This European Standard was prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and supports the essential health and safety requirements of EC Directive 94/9/EC.

This European Standard is to be read in conjunction with EN 50014:1997 Electrical Apparatus for potentially explosive atmospheres – General requirements, and with the European Standards for the specific types of protection listed in the scope of EN 50014:1997. This European Standard should not be considered in conjunction with any editions of these standards and their amendments published before 1997.

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) 1999-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) -

Annexes designated "normative" are part of the body of the standard.
In this standard Annex A is normative.

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CONTENTS

	Page
Foreword	2
1 Scope	4
2 Normative references	4
3 Definitions	5
4 Enclosure	5
5 Requirements for filling material	6
6 Distances	7
7 Use of materials	8
8 Cable entries and bushings	8
9 Energy storing devices	8
10 Temperature limitations	9
11 Fault conditions	9
12 Type verifications and tests	11
13 Routine verifications and tests	13
14 Marking	14
15 Instructions	14
ANNEX A (normative): Test arrangement for the electrical strength test of the filling material	15

1 Scope

1.1 This European Standard contains the specific requirements for the construction, testing and marking of electrical apparatus, parts of electrical apparatus and Ex components in the type of protection powder filling 'q', intended for use in potentially explosive atmospheres of gas, vapour and mist.

Potentially explosive atmospheres include the presence of combustible dusts.

This European Standard covers only Category 2G and Category M2.

NOTE: Powder-filled electrical apparatus and Ex Components may contain electronic circuits, transformers, protection fuses, relays, intrinsically safe electrical apparatus, associated electrical apparatus, switches, etc.

1.2 This European Standard supplements EN 50014, insofar as it applies to powder-filled electrical apparatus.

1.3 This European Standard applies only to electrical apparatus, parts of electrical apparatus and Ex components with

- a rated supply voltage less than or equal to 1000 V;
- a rated current less than or equal to 16 A;
- a rated power less than or equal to 1000 VA.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50014	Electrical apparatus for potentially explosive atmospheres General requirements
EN 50019	Electrical apparatus for potentially explosive atmospheres Increased safety 'e'
EN 50020	Electrical apparatus for potentially explosive atmospheres Intrinsic safety 'i'
EN 60127	Miniature fuses (IEC 60127 series)
EN 60269	Low-voltage fuses (IEC 60269 series)
EN 60529	Degrees of protection provided by enclosures (IP Code) (IEC 60529: 1989)

IEC 60707	1981	Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source.
ISO 565	1990	Test sieves Metal wire cloth, perforated metal plate and electro formed sheet Nominal size of openings
ISO 1210	1982	Plastics - Determination of flammability characteristics of plastics in the form of small specimens in contact with a small flame

3 Definitions

The following definitions in EN 50014:1997 apply to this Standard: 3.27, 3.29, 3.31.

The following definitions specific to type of protection powder filling 'q' are applicable in this European Standard; they supplement the definitions which are given in EN 50014.

3.1 powder filling 'q': A type of protection in which the parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material to prevent the ignition of an external explosive atmosphere.

NOTE: The type of protection may not prevent the surrounding explosive atmosphere from penetrating into the apparatus and Ex components and being ignited by the circuits. However, due to the small free volumes in the filling material and due to the quenching of a flame which may propagate through the paths in the filling material, an external explosion is prevented.

3.2 filling material: Quartz or glass particles.

3.3 creepage distance: The shortest distance between two conducting parts along the surface of the insulating parts.

3.4 working voltage: Highest r.m.s. value of the a.c. or d.c. voltage which may occur (locally) across any insulation at rated supply voltage, transients being disregarded, in open circuit conditions or under normal operating conditions.

4 Enclosure

4.1 Mechanical strength

The apparatus, part of electrical apparatus and Ex components protected by powder filling 'q' shall comply with the high impact energy requirements of 23.4.3 of EN 50014 and shall meet the pressure test requirements specified in clause 12 and 13 of this standard.

Apparatus or Ex components intended to be mounted inside another enclosure which complies with the requirements for enclosures defined in EN 50014 including the requirements in 23.4.3 are only required to meet the pressure test requirements specified in clause 12 and 13 of this standard. This apparatus shall be marked with the symbol "X" according to 27.2. (9) of EN 50014 if not an Ex component.

4.2 Degree of protection of the enclosure

The enclosure of the powder-filled apparatus, powder-filled part of the apparatus or powder-filled Ex component in its normal service condition, i.e. with all openings closed as in normal use, shall comply at least with the degree of protection IP 54 as defined in EN 60529. If the degree of protection is IP 55 or higher, the enclosure shall be provided with a breathing device. The enclosure with the breathing device in place shall comply with the degree of protection IP 54 according to EN 60529.

Enclosures of powder-filled apparatus or powder-filled parts of apparatus intended for use only in clean, dry rooms, shall comply at least with degree of protection IP 43 as defined in EN 60529. These enclosures shall be marked with the symbol "X".

When the enclosures of powder-filled apparatus, powder-filled parts of apparatus or powder-filled Ex components, are intended to be mounted inside another enclosure complying with EN 50014, this outer enclosure shall have a degree of protection of at least IP 54. The IP code of the inner enclosure does not need to be stated.

The maximum gap of an enclosure shall be at least 0,1 mm smaller than the smallest dimension of the actual filling material not exceeding 0,9 mm, so that no filling material can escape.

4.3 Filling

Filling shall be carried out so as not to leave any voids within the filling material (e.g. by shaking down). The free space within powder-filled electrical apparatus, parts of electrical apparatus or Ex components shall be completely filled with filling material (see also 6.2).

4.4 Means of closing

Enclosures of powder-filled apparatus, powder-filled parts of apparatus or powder-filled Ex components shall be factory-sealed and shall not be capable of being opened without destroying the enclosure or the means of closing. Filling openings shall be closed in the same way.

NOTE: Suitable assembly techniques are e.g. welding, soldering, cemented joints, rivets, cementing of screws.

5 Requirements for filling material

5.1 The documents presented by the manufacturer and verified by the testing station in accordance with 23.2 of EN 50014 shall describe precisely the filling material as well as the filling process and the measures taken to ensure proper filling.

5.1.1 The description shall include:

- name and address of the manufacturer of the filling material;
- exact and complete reference of the filling material;
- size of granules (see 5.1.2).

5.1.2 Size of granules

The size of granules shall lie within the following sieve limits according to ISO 565:

- upper limit: metal wire cloth or perforated metal plate with nominal size of opening of 1 mm;
- lower limit: metal wire cloth with nominal size of opening of 0,5 mm.

5.1.3 Only quartz or solid glass particles are allowed.

5.1.4 The testing station is not required to verify compliance of the filling material with 5.1.1, 5.1.2 and 5.1.3.

5.2 The filling material shall be subjected to an electric strength test defined in clause 12 and 13. The leakage current through the filling material shall not exceed 10^{-6} A.

6 Distances

6.1 Except where specified otherwise in this standard the minimum distance through the filling material between electrically conducting parts of the apparatus and insulated components on the one hand, and the inner surface of the enclosure on the other hand shall comply with Table 1. This does not apply for conductors used for external connections which penetrate the wall of the enclosure. Such conductors shall comply with 6.3.

Table 1 : Distances inside the filling material

Working voltage U a.c. r.m.s. or d.c.	Minimum distance
V	mm
$U \leq 275$	5
$275 < U \leq 420$	6
$420 < U \leq 550$	8
$550 < U \leq 750$	10
$750 < U \leq 1000$	14
$1000 < U \leq 3000$	36
$3000 < U \leq 6000$	60
$6000 < U \leq 10000$	100

Fault conditions according to clause 11 shall be considered when determining the maximum voltage a.c. r.m.s. or d.c.

6.2 If electrical apparatus contain components which have an enclosed free volume not filled with the filling material (e.g. a relay), the following requirements apply:

- If the enclosed free volume of the component is less than 3 cm^3 , the minimum distance through filling material between the component wall and the inner surface of the enclosure shall comply with table 1.