SLOVENSKI STANDARD
SIST EN 50628:2016

01-oktober-2016

Namestitev električnih inštalacij v podzemnih rudnikih

Erection of electrical installations in underground mines

Errichten elektrischer Anlagen im Bergbau unter Tage

Construction des installations électriques dans les mines souterraines

Ta slovenski standard je istoveten z: **EN 50628:2016**

ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres
73.100.01	Rudarska oprema na splošno	Mining equipment in general

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Erection of electrical installations in underground mines

Construction des installations électriques dans les mines souterraines

Errichten elektrischer Anlagen im Bergbau unter Tage

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European Committee for Electrotechnical Standardization
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European foreword

This document (EN 50628:2016) has been prepared by CLC/TC 31 “Electrical apparatus for potentially explosive atmospheres”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-05-23
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2020-05-23

This document will be read in conjunction with the European Standards for the specific types of protection listed in the EN 60079 series of standards.

This document will also be read in conjunction with EN 1127-2.

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Introduction

When electrical equipment is to be installed in underground workings where an explosive atmosphere is likely to occur, protective measures are applied to avoid the ignition of firedamp either under normal operation of the electrical installation or under fault conditions.

Mines can be either gassy or non-gassy depending upon the mineral/material being extracted and whether or not firedamp can occur in the workings. It is usual practice to consider all coal mines as gassy mines. Non-coal mines can however, also be susceptible to the occurrence of firedamp e.g. if they are mining minerals/materials in the vicinity of oil bearing strata or unworked coal seams which are to be disturbed by the mining process, or are susceptible to outbursts of flammable gas.

Due to the fact that in underground workings firedamp is one of the major mining hazards that is to be considered all pieces of electrical equipment need to be selected with regard to this hazard. If there are other significant explosive atmospheres than firedamp the hazard occurring from these explosive atmospheres needs to be taken into account.

Directive 2014/34/EU extends the definition of potentially explosive atmosphere to include combustible dust as well as firedamp. Extensive research[1)] has shown that the minimum ignition energy (MIE) of coal dust/ air mixture is several hundred times higher than that of a firedamp/ air mixture and that the maximum experimental safe gap (MESG) for coal dust particles is more than double that for firedamp. It is therefore reasonable to assume that equipment, protective systems and components that are designed, constructed and maintained for use in firedamp/ air mixtures are also suitable for use in coal dust/ air mixtures.

Unlike Group II it will be assumed that in Group I industry nearly all underground workings need to be assessed where an explosive atmosphere is likely to occur and classified accordingly as hazardous areas. A zone classification for such underground workings is not possible because the degree of exposure of such an underground working does not depend on local parameters but on time parameters. In accordance with 2014/34/EU (ATEX-Directive) the exposure of the installed equipment may change from normally acceptable firedamp concentration in the mine air (hazardous condition 2; M2 equipment sufficient) to elevated methane concentration (hazardous condition 1; M1 equipment required, M2 equipment to be de-energized) and vice versa.

Areas of a coal mine could be non-hazardous according to national regulations. In such areas equipment that is not ATEX approved may be used, too subject to the risk assessment and specific local rules where national regulations require.

In non-gassy mines it can be possible that in certain regions in the underground workings explosive atmospheres can occur. In these cases national regulations will apply.

In mines where the atmosphere, in addition to firedamp, may contain significant proportions of other flammable gases than firedamp, the installed Group I equipment complies also with the subdivision of Group II corresponding to the other significant flammable gases.

In any underground working, irrespective of the size, there may be numerous sources of ignition apart from those associated with electrical equipment. Precautions will be necessary to ensure safety from other possible ignition sources, but guidance on this aspect is outside the scope of this standard.

Underground mining activities cause other special problems to the electrical installation as well as those arising from firedamp. Rough environmental conditions evoked by climate – temperature and humidity e.g. – rock pressure caused by depth, geometric dimensions of the underground workings, the winning process itself and other similar circumstances require therefore special specifications to the electrical installation in underground mines.

1) Survey on the use of flameproof enclosures in coal dust and methane atmospheres, G. A. Lunn, SM/97/01.

1 Scope

This European Standard specifies the safety requirements for the erection of new electrical installations.

This European Standard is supplementary to other relevant harmonized standards, for example HD 60364 series and the EN 61936 series as regards electrical installation requirements.

This European Standard also refers to EN 60079-0 and its associated standards for the construction, testing and marking requirements of suitable electrical equipment.

EN 60079-14 gives the specific requirements for design, selection and erection of electrical installations in explosive atmospheres.

NOTE EN 60079–14 can apply to electrical installations in mines where explosive gas atmospheres other than firedamp can be formed and to electrical installations in the surface installation of mines.

This European Standard applies to:

a) electrical installation in underground workings of mines;

b) electrical installations and parts of electrical installation above ground, which are directly connected with the underground workings in functional and safety relating matters because of being part of the underground working process:

   These are in particular:

   - safety and monitoring devices relating to the power distribution of the underground workings,
   - communication system of hoisting and inclined haulage plants,
   - intrinsically safe electrical installations of above ground installation being part of underground workings,
   - remote control systems if they shall fulfil increased requirements relating to functional safety,
   - electrical installation and electrical equipment of ventilation systems and shaft casings above ground being endangered by firedamp of the underground ventilation,
   - firedamp drainage systems;

c) electrical installation in underground workings outside mining if it is demanded of the competent national authorities.

National regulations of the mining authority shall remain unaffected.

This standard applies to installations at all voltages mentioned in Clause 10.

Requirements above both columns are requirements for all underground workings.

Gassy mines	**Other mines**
Requirements within left column are requirements for underground workings in the coal mining industry which could be endangered by firedamp.	Requirements within right column are requirements for underground workings of the coal mining industry not likely to be endangered by firedamp and for underground workings of non-coal mining industry.

2 Normative references

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.

HD 631.1 S2, *Electric cables — Accessories — Material characterisation — Part 1: Fingerprinting and type tests for resinous compounds*

EN 50303, *Group I, Category M1 equipment intended to remain functional in atmospheres endangered by firedamp and/or coal dust*

EN 50393, *Test methods and requirements for accessories for use on distribution cables of rated voltage 0,6/1,0 (1,2) kV*

EN 60038, *CENELEC standard voltages (IEC 60038)*

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

EN 60079-1, *Explosive atmospheres — Part 1: Equipment protection by flameproof enclosures "d" (IEC 60079-1)*

EN 60079-7:2007, *Explosive atmospheres - Part 7: Equipment protection by increased safety "e" (IEC 60079-7:2006)*

EN 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres (IEC 60079-10-1)*

EN 60079-10-2, *Explosive atmospheres — Part 10-2: Classification of areas — Explosive dust atmospheres (IEC 60079-10-2)*

EN 60079-11:2012, *Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i" (IEC 60079-11:2011)*

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

EN 60079-25, *Explosive atmospheres - Part 25: Intrinsically safe electrical systems (IEC 60079-25)*

EN 60204-1, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1)*

EN 60296, *Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear (IEC 60296)*

EN 60309-1, *Plugs, socket-outlets and couplers for industrial purposes - Part 1: General requirements (IEC 60309-1)*

EN 60332-1-2, *Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame (IEC 60332-1-2)*

HD 60364-4-41:2007, *Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364-4-41:2005)*

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

EN 60664-1, *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1)*

EN 60836, *Specifications for unused silicone insulating liquids for electrotechnical purposes (IEC 60836)*

EN 60865-1, *Short-circuit currents - Calculation of effects - Part 1: Definitions and calculation methods (IEC 60865-1)*

EN 60909 (all parts), *Short-circuit currents in three-phase a.c systems (IEC 60909 series)*

EN 61099, *Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes (IEC 61099)*

EN 61557-6, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 6: Effectiveness of residual current devices (RCD) in TT, TN and IT systems (IEC 61557-6)*

EN 61557-8, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. — Equipment for testing, measuring or monitoring of protective measures — Part 8: Insulation monitoring devices for IT systems (IEC 61557-8)*

EN 61557-15, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 15: Functional safety requirements for insulation monitoring devices in IT systems and equipment for insulation fault location in IT systems (IEC 61557-15)*

3 Terms and definitions

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

3.1
mining operation / road heading

3.1.1
mining operation

a) in case of longwall mining: the face including the connected workings

Note 1 to entry: Connecting workings are up to 10 m on both sides of the face entrance. The face entrance is the area between the face and the latest complete row of the roof support.

b) in case of other mining methods: the production area including the connected workings

Note 2 to entry: Connecting workings are up to 10 m to the heading face.

Note 3 to entry: In case of greater mining operation areas, e.g. salt industry, the mining authority will decide.

3.1.2
roadheading

parts of the underground workings where road heading activities are taking part up to 50 m far from the roadhead

3.2
electrical installation

3.2.1
electrical power distribution
electrical installation with pieces of equipment used for such purposes as generation, conversion, storing, transmission, distribution or utilization of electric energy for mechanical work, for generation of heat and light or for electrochemical processes

3.2.2
switchgear
switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy

[SOURCE: IEV 441-11-02]

3.2.3
electrical interference
influence of an electric power installation on a communication system or between different communication systems depending on the coupling of capacitive, inductive or ohmic resistance

3.2.4
erection of electrical installation
new installation, redesign, extension, modification or reconstruction of an electrical installation

Note 1 to entry: Replacing of electrical equipment by similar one or reducing the electrical installation is not redesign if the electrical parameters will not change substantially.

3.2.5
electrostatic earthing
electrical equipment which is electrostatically earthed, i.e. for which the leakage resistance against earth is not bigger than a specific value

Note 1 to entry: The leakage resistance against earth should not be bigger than 10^6 Ω or bigger than 10^8 Ω if the capacity is less or equal than 100 pF.

3.2.6
potential equalization in the field of intrinsically safe electrical systems and electric power installations
elimination of potential differences between different protective conductors of electrical power installations and between exposed conductive parts of intrinsically safe electrical systems

3.2.7
protective bonding conductor
protective conductor provided for protective-equipotential-bonding

[SOURCE: IEV 826-13-24]

3.2.8
communication system
installation for transmitting and processing of messages and/or information (e.g. speech, tunes, pictures or characters) including remote control information (e.g. measuring values, messages or instructions)

Note 1 to entry: A communication system consists of broadcasting equipment, wireless or non-wireless transmission path, receive terminal devices and the supplying equipment.

3.2.9
initial inspection
inspection of all electrical apparatus, systems and installations before they are brought into service

[SOURCE: IEV 426-14-06]

3.3
electrical equipment

3.3.1
electrical equipment
item used for such purposes as generation, conversion, transmission, distribution or utilization of electric energy, such as electric machines, transformers, switchgear and controlgear, measuring instruments, protective devices, wiring systems, current-using equipment

[SOURCE: IEV 826-16-01]

3.3.2
mobile electrical equipment
electric equipment which is moved while in operation or which can easily be moved from one place to another while connected to the supply

[SOURCE: IEV 826-16-04]

3.3.3
current using equipment
electric equipment intended to convert electric energy into another form of energy, for example light, heat, mechanical energy

[SOURCE: IEV 826-16-02]

3.3.4
hand-held equipment
electric equipment intended to be held in the hand during normal use

[SOURCE: IEV 826-16-05]

3.3.5
switch
device for changing the electric connections among its terminals

[SOURCE: IEV 151-12-22]

3.3.6
switchgear and controlgear
electric equipment intended to be connected to an electric circuit for the purpose of carrying out one or more of the following functions: protection, control, isolation, switching

Note 1 to entry: The French and English terms can be considered as equivalent in most cases. However the French terms have a broader meaning than the English terms and include for example connecting devices, plugs and sockets outlets, etc. In English, these latter devices are known as accessories.

[SOURCE: IEV 826-16-03]

3.3.7
remote controlled switchgear
switchgear which is intended to switch on or off one or more electrical circuits by external activity, e.g. mechanically, electrically, electro-optically, pneumatically, acoustically, or on a thermal or magnetic way and where it is impossible to do it manually

3.3.8
convertor
set of equipment, static or rotating, to convert one type of electric current to another type different in nature, voltage and/or frequency

[SOURCE: IEV 811-19-01]

3.4
intrinsic safety

3.4.1
intrinsically safe electrical system
assembly of interconnected items of electrical apparatus, described in a descriptive system document, in which the circuits or parts of circuits, intended to be used in an explosive atmosphere, are intrinsically safe circuits

[SOURCE: IEV 426-11-08]

3.4.2
intrinsically safe circuit
circuit in which any spark or any thermal effect produced in the conditions specified in EN 60079-11, including normal operation and specified fault conditions, are not capable of causing ignition of a given explosive gas atmosphere

[SOURCE: IEV 426-11-01]

3.4.3
intrinsically safe electrical apparatus
electrical apparatus in which all the circuits are intrinsically safe circuits

[SOURCE: IEV 426-11-02]

3.4.4
associated apparatus
electrical apparatus which contains both intrinsically safe circuits and non-intrinsically safe circuits and is constructed so that the non-intrinsically safe circuits cannot adversely affect the intrinsically safe circuits

Note 1 to entry: Associated apparatus may be either:

a) electrical apparatus which has another type of protection listed in EN 60079–0 for use in the appropriate gas atmosphere, or

b) electrical apparatus not so protected and which, therefore, shall be not used within an explosive gas atmosphere.

[SOURCE: IEV 426-11-03]

3.4.5
accessory
device supplementing a main device or apparatus, but not forming part of it, that is needed for its operation or to confer on it specific characteristics

[SOURCE: IEV 151-11-24]

3.5
earthing

3.5.1
earthing system
arrangement of connections and devices necessary to earth equipment or a system separately or jointly

[SOURCE: IEV 604-04-02]

3.5.2
power system earthing
functional earthing and protective earthing of a point or points in an electric power system

[SOURCE: IEV 826-13-11]

3.5.3
earth
make an electric connection between a given point in a system or in an installation or in equipment and local earth

Note 1 to entry: The connection to local earth maybe:

- intentional, or
- unintentional or accidental,
- and may be permanent or temporary.

[SOURCE: IEV 826-13-03]

3.5.4
earth-free exposed-conductive-part
exposed-conductive part without any connection to earth or other earth bounded electrical equipment

3.5.5
earth fault
occurrence of an accidental conductive path between a live conductor and the earth

[SOURCE: IEV 826-14-13 modified]

3.5.6
earth fault current
current flowing to earth due to an insulation fault

[SOURCE: IEV 442-01-23]