Polski Rejestr Statków

INFORMATIVE PUBLICATION NO. 5/I

GUIDELINES FOR THE PERFORMANCE OF PERIODICAL CLASSIFICATION SURVEYS OF ELECTRICAL EXPLOSION-PROOF EQUIPMENT ONBOARD SHIPS IN OPERATION OTHER THAN TANKERS AND ON TANKERS

2016

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GDAŃSK

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This Publication replaces the Publication No. 5/I – *Guidelines for the performance of periodical classification surveys of electrical explosion-proof equipment onboard ships in operation– 2005*.

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1 PURPOSE OF GUIDELINES

The requirements contained in Chapters 1 to 4 apply to ships other than tankers. The requirements contained in Chapter 5 are recommendations (instructions) and concern tankers (additional marks of class defined in the Rules for Sea-going Ships Part VIII, paragraph 22.5).

The purpose of the guidelines is to present general principles, the observance of which will enable achievement and maintaining efficient explosion-proof protection of equipment in operation.

Electrical equipment of explosion-proof type shows performance and operational safety properties in potentially explosive atmospheres. The performance or functional properties may be relatively easily verified. Explosion-proof properties, and in particular their loss in normal operational conditions, may have no effect on the performance characteristics of the equipment. Therefore the equipment of explosion-proof type requires special approach both at its design and installing, acceptance and in operation as well, to ensure its safe operation.

The purpose of the guidelines is to present general principles, the observation of which will ensure appropriate safety level at designing, acceptance and operation of electrical equipment and systems of explosion-proof type onboard ships surveyed by PRS.

2 DOCUMENTATION OF EXPLOSION-PROOF EQUIPMENT

It is recommended that the documentation for installation of explosion-proof equipment should be prepared in the form of a separate set.

2.1 Documentation types

Each floating unit shall be provided with appropriate documentation for explosion-proof equipment containing:

– technical documentation;
– operational documentation.

2.2 Technical documentation

The technical documentation shall contain:

– operation and maintenance documentation supplied by Manufacturer;
– certificates.

2.2.1 Operation and maintenance documentation

The operation and maintenance documentation to be supplied by the Manufacturer shall contain:

– technical particulars, to include information necessary for proper installation and operation of the equipment;
– necessary electrical diagrams;
– equipment drawings necessary for installation and proper operation thereof.

2.2.2 Certificates

Certificates defining the kind of explosion-proof construction are supplied by the Manufacturer. They shall confirm explosion-proof construction, on the basis of certificate of approval of explosion-proof properties issued by notified certification body from European Union[1] or from a non-EU country, whose documents are accepted by PRS[2].

Moreover, besides individual certificates issued for particular intrinsically-safe devices and related associated equipment, the Manufacturer shall issue a certificate for intrinsically-safe circuit, together with the protocol for analysis of selection conditions for potential hazard of particular circuit elements: intrinsically-safe device, connecting cable, associated device.

1 The list of notified certification bodies is presented on the following website of European Union: http://europa.eu.int/comm/enterprise/atex/nb/nblist.htm

2 Documents of bodies from outside of European Union may be accepted, in agreement with PRS Head Office, provided it has been reliably confirmed that the body is accredited by the government of the country where operates the body's head office.

2.3 Operational Documentation

The operational documentation shall contain:

– Plan of a ship or a part thereof with marked rooms and zones where explosion hazard exists, defining the kind of hazard. It is recommended that Fire Protection Plan (see 4.3.2.3 of the *Rules for the Classification and Construction of Sea-going Ships, Part I – Classification Regulations*) should be used for this purpose;
– Technical delivery-acceptance protocol for equipment and systems, issued by a fitter and approved by PRS Surveyor, after installation onboard;
– Guidelines (instructions) for operation and carrying out overhauls and repairs;
– Record sheet or book with entries on the equipment operation, carried out maintenance, repairs, tests and measurements, found damages, observations from audits, etc.;
– List and stock of required spare parts.

3 CLASSIFICATION SURVEYS

3.1 General

During classification survey of a ship, condition of electrical appliances of explosion-proof type and their systems shall be checked within the scope of:

– technical documentation and validity of records;
– proper operation of equipment and systems;
– occurrence of possible external damages of installed equipment;
– changes to electrical equipment introduced from the last survey.

3.2 Survey Principles

During survey, the below principles shall be taken:

– the user carries out current onboard inspections of electrical equipment and systems of explosion-proof type to maintain them in proper and operative condition, in accordance with Manufacturer's recommendations and the recommendations resulting from IEC 60079-17 Standard;
– the user maintains currently record of explosion-proof type equipment and systems installed onboard, together with documents confirming their explosion-proof properties (also after carried out repair) and operational manuals;
– each repair or overhaul of explosion-proof type equipment and systems are performed by competent persons, and a record of these activities is maintained onboard ship.

During the survey, the user shall, at the request of PRS Surveyor carrying out the ship survey:

– submit appropriate documents, which can be the basis to confirm that equipment and systems are currently kept in proper condition and maintain required explosion-proof properties and that performed changes or repairs have not reduced required explosion-proof properties;
– open designated explosion-proof type appliances for internal inspection.

3.3 Class Renewal Survey

During the class renewal survey, detailed inspection in accordance with IEC 60079-14 Standard shall be carried out.

3.3.1 Electrical Equipment and Systems in Explosion-Hazardous Zones

The following shall be checked during the survey:

– technical documentation and validity of records;
– maintenance of equipment in operational readiness on the basis of entries in reports of periodical control carried out in accordance with IEC 60079-14 Standard;

It shall be taken as a principle that:

– damaged cables shall be completely replaced with new ones without using additional connections;
– cables shall be properly secured against mechanical damage;
– spark-proof circuits cables shall be located a minimum 50 mm off the non-spark-proof circuit cables;
– surveyed equipment shall have no visible damages;
– parts essential for explosion-proof characteristics may not be painted;
– where potential explosion hazard exists, only the equipment of appropriate explosion-proof type required by PRS shall be installed.

3.3.2 Electrical Equipment and Systems in Battery Rooms

The following shall be checked during the survey:

– technical documentation and validity of records;
– the condition of ventilator drive, together with control device in accordance with 3.3.1, for artificial ventilation;
– the operation of ventilator drive together with an interlocking device, for artificial ventilation, which permits charging batteries only when battery room ventilation operates;
– any external damages to electrical equipment;
– arrangement and condition of ventilation openings ensuring free flow of air around batteries.

3.4 Survey for Class Confirmation

Survey for Class Confirmation shall include close-up examination of explosion-proof type electrical equipment and systems in accordance with IEC 60079-14 Standard.

3.4.1 Electrical Equipment and Systems in Explosion Hazardous Zones

The following shall be surveyed:

– technical documentation and validity of records;
– maintenance of equipment in operational readiness on the basis of reports of periodical control carried out in accordance with IEC 60079-14 Standard.

During the inspection made at random, checks and operation tests shall be performed of required interlocking devices in electrical equipment in association with ventilation systems, in particular interlocks of cargo pumps and pump room lighting, remote disconnection of engines, pumps, ventilators and other electrical equipment.

During all surveys, the equipment shall be checked for external damage. Where any damage or faults have been found, their removal shall be requested.

3.4.2 Electrical Equipment and Systems in Battery Rooms – Intermediate Survey

During Intermediate Surveys, random inspection of items referred to in 3.3.2 shall be carried out.

4 ADDITIONAL INFORMATION

Electrical equipment of explosion-proof type installed onboard in explosion-hazardous rooms and spaces shall be operated, maintained and repaired in accordance with general operation principles of shipboard electrical equipment, considering particularly heavy marine operation conditions, and also taking into account their special explosion-proof construction. Manufacturer's operational requirements relevant for the given item of equipment shall be taken into account and strictly observed. Direct user of the equipment, so the designated ship's personnel, is responsible for proper operation and service of the equipment.

Any overhauls and repairs to explosion-proof electrical equipment shall be performed exclusively by persons having appropriate authorizations.

It shall be noted that **no changes and modifications in spark-proof circuits are permitted without obtaining prior written acceptance of PRS**. The change or modification which has been accepted shall be documented on respective diagrams and accepted by PRS Surveyor after it has been physically executed. Onboard repair of any spark-proof equipment is not permitted. The equipment to be repaired shall

be sent to the manufacturer or to the service firm authorized by the manufacturer. The only permitted repair is the exchange of fuses, using exclusively the fuses permitted by the equipment manufacturer. Therefore, a supply of proper fuses, generally bought at the equipment manufacturer, shall be maintained onboard. It shall be noted that fuses having the same current rating can differ by time-current characteristics.

Note:

Intrinsically safe device installed in non-spark-proof circuit losses its intrinsical safety properties and may not then be fitted in the spark-proof circuit.

It shall be taken as a rule that explosion-proof equipment shall be installed onboard according to one certification system. Several not fully compatible certification systems exist worldwide, therefore application onboard a ship electrical system certified according to the same selected system is reasonable.

In the area of European Union, requirements according to ATEX 100a Directive are applicable. The directive provisions are implemented in Poland by the Regulation of the Minister of Economy, Labour and Social Policy of 28 July 2003 on principal requirements for security equipment and systems intended for use in explosion-hazardous spaces (Journal of Laws No. 143 item 1393).

ATEX 100a Directive does not obligatorily apply to sea-going ships, however, its scope of application is to the satisfaction of Classification Society. All the (notified) attestation laboratories in European Union shall operate in accordance with ATEX 100a Directive, then it is reasonable that the same method should be applied in relation to sea-going ships.

5 RECOMMENDATIONS (GUIDELINES) ON SURVEYS OF SYSTEMS ON TANKERS (ADDITIONAL MARKS IN SHIP'S CLASS DEFINED IN THE MOR VIII RULES ITEM 22.5)

5.1 List of organizations having authorization for issuing certificates to the equipment intended for use in explosion-hazardous zones is available at webpage www.iecex.com/bodies.html .

5.2 The electrical equipment installed in explosion hazardous areas shall:

– have Ex certificate for Zone 2 (or 0 or 1).
– have a manufacturer's conformity declaration, stating that the equipment is suitable for installation in hazardous zone, declaring conformity with specified standard/standards, such as IEC 60079-11,
– be of a type designed to prevent spark and arcs and unacceptable surface temperatures during its normal operation,
– having enclosure of at least IP55 and acceptable surface temperature.

Simple apparatus (such as thermocouples, photocells, junction boxes), as defined in the above mentioned Standard do not require any of the evidence given above.

5.3 Examples of modifications in explosion-proof equipment: additional holes drilled in an Ex-d enclosure, gaskets fitted to enclosures not certified together with them.

5.4 Cable glands and plugs for Ex-d and Ex-e enclosures are marked as same Ex type as the enclosure, unless certified for use of different type. For Ex-d enclosures, the gas group shall also be stated on the gland. If this information is not readable on the equipment, it will normally be considered as not suitable for explosion-hazardous areas. For Zone 1, glands with rubber seal can only be used for enclosure with internal volume less than 2 litres and gas group IIA & IIB.

5.5 Flame paths on Ex-d enclosures can be protected by**:** suitable non-hardening grease, gaskets, if the equipment has been certified with gaskets, one layer of soft tape, but not for gas group IIC, Maker's recommended items.

Cable glands shall be also of Ex-d type.

5.6 The hazardous area end of spare cables / cores shall be connected to earth or spare terminals suitable for the zone. Insulation by tape alone is not permitted on spare cable / cable pairs. Cables containing intrinsically safe circuits shall be marked to identify them as being part of IS circuit.

5.7 Sealing of gas-tight cable penetrations separating hazardous and non-hazardous area shall be satisfactory.

5.8 It shall be checked whether earthing of cable braiding or other metallic coverings have been applied. Power and lighting circuits shall be earthed in both ends. Single core cables above 20 A shall be earthed in one end only, preferable in hazardous area.

5.9 For spaces protected by over-pressure, provision of alarms activated (or any other actions initiated) upon the loss of pressure are to be verified according to approved drawings. These may be automatic or manual disconnections depending on the type of Ex protection used. Alarms are to be given at a permanently manned station.

5.10 Records of surveys and amendments introduced to them shall be verified every 12 months.

5.11 It shall be verified that:
- cables are properly fixed and mechanically protected and that the type of cable is appropriate for the explosion-hazardous area (screened or armoured) or has been installed in a pipe;
- there is no damage to cables. There shall normally be no cable joints in hazardous areas, but for repairs this may be single agreed with PRS Head Office (e.g. for approval of cable joints). Cable joints are not accepted in Zone 0.

5.12 It shall be verified that there is no undue accumulation of dust and dirt in explosion-hazardous zones.

5.13 It shall be verified that:
- earth fault monitoring devices are in normal operation and there is no active alarm due to abnormal low level of insulation resistance or high level of leakage current;
- all items of electrical equipment are able to read minimum 1 MΩ of insulation resistance and that earthing and bonding are made with proper resistance to earth.

5.14 It shall be verified that:
- explosion-proof type cable and standard type cable are not laid in the same cable bunch or pipe unless provided with an earthed metal partition;
- Ex-ia circuits and Ex-ib circuits are not run in the same cable;
- terminals for explosion-proof type cable circuits and terminals for standard type cable circuits are separated by a physical distance of 50 mm or a separating panel. Circuits terminals shall be appropriately marked.

5.15 It shall be verified that condensate drainage of cable pipes is arranged and located at the lowest part of the pipe. For spaces in which ventilation is required it shall be verified that appropriate ventilation capacity is ensured. Ventilation failure shall be alarmed.

5.16 It shall be verified that settings of overload protection for Ex-e motors are in accordance with approved drawings.

5.17 It shall be verified that there is no corrosion in Ex equipment – corrosion can cause the equipment to lose its protective function and its watertight integrity.

5.18 It shall be verified that the protective gas pressure and flow for Ex-p equipment is adequate.

5.19 It shall be verified that the resin for Ex-m equipment in the enclosure is not damaged.

5.20 It shall be verified that a suitable safety barrier/isolator is provided for Ex-ia/-ib equipment.

Annex 1

Definitions and Physico-chemical Properties of Readily Flammable Substances

Ignition temperature of readily flammable substance – the lowest temperature at which the liquid or solid body gives off over its surface enough vapour which, when mixed with air (at its normal pressure), can readily ignite.

Explosive limits – The lowest concentration of a flammable gas, vapour, mist, spray and/or dust in air capable of producing an explosion. If the concentration of a flammable volatile substance when mixed with air is too low (lean mixture) or too high (reach mixture), then the explosion will not occur, and there will be respectively no reaction or a slow combustion, so called deflagration (see Fig. 1).

Minimum ignition energy – the smallest amount of energy produced during condenser discharging, which is sufficient to ignite the most combustible explosive mixture of the substance considered. The minimum ignition energy ranges from $20x10^{-6}$ Joule for Hydrogen up to several Joules for some dusts (see Fig. 2).

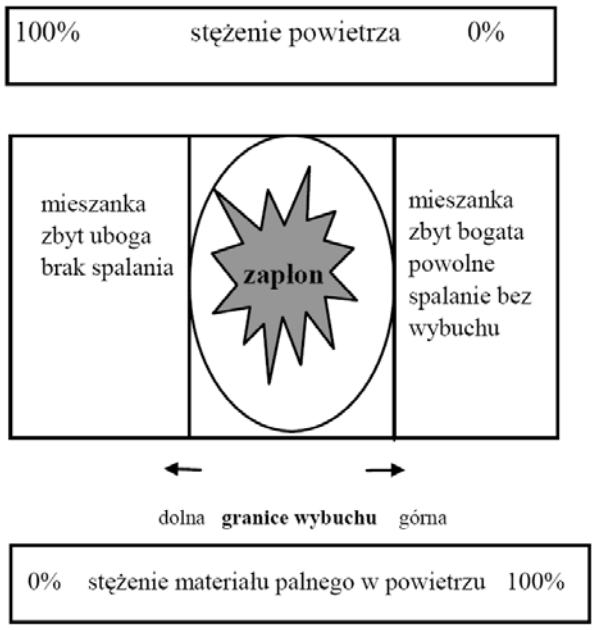


Fig. 1 Explosive limits

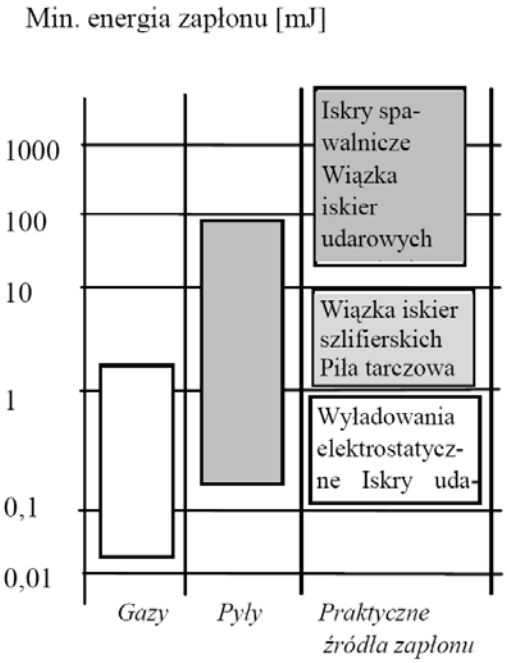


Fig. 2 Minimum ignition energy for gases, dusts and practical ignition sources

Stężenie powietrza – air concentration	Min. energia zapłonu – min. ignition energy [mJ]
Mieszanka zbyt uboga, brak spalania – lean mixture no combustion	Iskry spawalnicze wiązka iskier udarowych – welding sparks, impact spark bundle
Mieszanka zbyt bogata powolne spalanie bez wybuchu – reach mixture, slow combustion without ignition	Wiązka iskier szlifierskich, piła tarczowa – grinding spark bundle, buzz saw
Granice wybuchu – explosive limits	Wyładowania elektrostatyczne iskry udarowej – electrostatic discharges of impact spark
Dolna – lower explosive limit	Gazy – gases
Górna – upper explosive limit	Pyły – dusts
Stężenie materiału palnego w powietrzu – flammable material concentration in air	Praktyczne źródła zapłonu – practical ignition sources

Auto-ignition temperature – the lowest temperature, of e.g. machinery item surface, at which in defined conditions (acc. to IEC 79-4) a flammable substance such as mixture of gases, vapours, sprays, mists and/or dusts with air may ignite.

Table
Explosive properties of selected readily flammable substances

Name of substance	State of aggregation at 20 ºC	Ignition temperature [ºC]	Explosive limits [%]	Auto-ignition temperature [ºC]
Acetone	liquid	-19	2.1-13	540
Ethyl alcohol	liquid	-12	3.3-93	425
Ammonia	gas	Not applicable	15-28	630
Benzene	liquid	-11	1.2-8.0	555
Hydrogen cyanide	liquid	-17.8	5.6-41	538
Decalin	liquid	54-61	0.7-4.9	250-260
Carbon disulfide	liquid	-30	1.0-60	102
Diethyl ether	liquid	-45	1.7-49	160
Phenol	solid	75	0.3-2.4	605
Hydrogen phoshphide	gas	Not applicable	1 - no data	100
Ethylene glycol	liquid	111	3.2-53	410
Hydrazine	liquid	37.8	4.7-100	270
Formic acid	liquid	68.9	18-57	504
Acetic acid	liquid	47	5.3-26	374
Methanol (methyl alcohol)	liquid	11	5.5-44	455
Kerosene	liquid	37.8-88.5		229
Naphthalene	solid	80		526
Nitrobenzene	liquid	88		482
Pyridine	liquid	17	1.7-10.6	482
Hydrogen sulfide	gas	Not applicable	4.3-45	260
Styrene	liquid	31	2,1-13,0	490
Turpentine	liquid	35	0,9-5,9	253.3
Carbon monooxide	gas	Not applicable	1.8-no data	605

Annex 2

Classification of Hazardous Zones

Three explosion-hazardous zones are distinguished, depending on the likelihood of presence there of an explosive mixture. For explosive mixtures made of gases, vapours, mists and sprays, zone 0, zone 1 and zone 2 are distinguished. Irrespectively of that, for explosive mixtures created by dusts, fibres and other solid particles, zones 20, 21 and 22 are distinguished.

In respect of gas mixtures, appropriate zones are defined in accordance with PN-EN 60079-10, PN-EN 1127-1, IEC 60092-502 Standards, to the below criteria:

zone 0: an area in which a hazardous atmosphere is present constantly or for long periods of time;

zone 1: an area in which a hazardous atmosphere may occur at normal operational conditions;

zone 2: an area in which at normal operation a hazardous atmosphere is not likely to occur or occurs rarely and for a short period of time.

For dusts:

zone 20: a place where a hazardous atmosphere formed by dust cloud in air is present continuously or for long periods, or frequently;

zone 21: a place where a hazardous atmosphere formed by dust cloud in air is likely to occur in normal operation, but not frequently

zone 22: a place where a hazardous atmosphere formed by dust cloud in air is not likely to occur in normal operation, and if so then for a short period only

For dusts, the zones include also the places where dusts can accumulate.

The kind of zone depends on the level of emission and ventilation. The zone range depends on the kind of combustible substance, emission and ventilation capacity.

The determination of hazardous zones is a complex process, where in each case all associated factors shall practically be considered.

The table below shows division into hazardous zones and corresponding categories of equipment **group II**, in accordance with valid Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 (see also paragraph 5). The equipment group II is applied to an explosive atmosphere present, inter alia, in sea-going transport, then other than that present in mining industry.

Table
Classification of hazardous zones and of respective equipment group II categories

Zone No.		Equipment category		Definition of presence of explosion hazard acc. to 94/9/EC	Kind of equipment protection acc. to 94/9/EC	Kind of equipment certificate acc. to 94/9/EC
Gases, mists, vapours	Dusts	Gases, mists, vapours [G]	Dusts [D]			
0	20	1G	1D	Continuous, long-standing	Very high level by means of 2 protective measures/against 2 faults	Certificate of conformity or Type-examination certificate; special for zone 0
1	21	2G	2D	Occasional	High level of protection against frequently occuring one disturbance or fault	Certificate of conformity or Type-examination certificate
2	22	3G	3D	Rare or of short duration	Normal level of protection for normal operation	Equipment complying with basic requirements of the above directive.[3]

[3] Equipment certified for zones 0 and 1 may also be used.

Annex 3

Temperature Classes

Readily flammable vapours and gases are divided into temperature classes according to their auto-ignition temperature. The auto-ignition temperature means the lowest surface temperature (e.g. of electrical equipment) at which in favourable conditions an explosion occurs. The greatest temperature of any equipment item surface shall any time be lower than the auto-ignition temperature of an explosive mixture in which such equipment may be found.

Table
Temperature classes acc. to IEC

Temperature class IEC/EN NEC 505-10	Permissible maximum temp. of equipment surface [ºC]	Auto-ignition temperature of readily flammable substances [ºC]	Temperature class NEC 500-3 CEC 18-052
T1	450	> 450	T1
T2	300	> 300 ≤ 450	T2
	280	> 280 ≤ 300	T2A
	260	> 260 ≤ 280	T2B
	230	> 230 ≤ 260	T2C
	215	> 215 ≤ 230	T2D
T3	200	> 200 ≤ 300	T3
	180	> 180 ≤ 200	T3A
	165	> 165 ≤ 180	T3B
	160	> 160 ≤ 165	T3C
T4	135	> 135 ≤ 200	T4
	120	> 120 ≤ 135	T4A
T5	100	> 100 ≤ 135	T5
T6	85	> 85 ≤ 100	T6

Annex 4

Explosion Groups and Temperature Classes

The explosion-proof electrical equipment is divided into 2 groups:
Group I – Electrical equipment for mining industry.
Group II – Electrical equipment for any other hazardous spaces.

Electrical equipment group II is divided into sub-groups IIA, IIB and IIC, depending on the level of hazard of gas or vapour atmosphere. The equipment of group IIC is adequate for use in the most hazardous atmosphere.

Table
Examples of classification of gases and vapours into explosion groups and temperature classes

Group/class	T1	T2	T3	T4	T5	T6
I	Methane					
II A	Acetone	Ethyl alcohol	Petrol	Acet-aldehyde		
	Ethane	I-amyl acetate	Propul-sion oil	Ethyl ether		
	Ethyl acetate	n-butane	Jet fuel			
	Ammonia	N-butyl alcohol	Fuel oils			
	Benzene		n-heksane			
	Acetic acid					
	Carbon monooxide					
	Methane					
	Methanol					
	Propane					
	Toluene					
II B	Town (carbon) gas	Ethylene				
II C	Hydrogen	Acethylene				Carbon disulfide

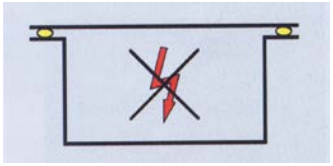
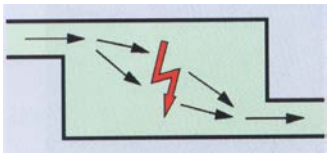
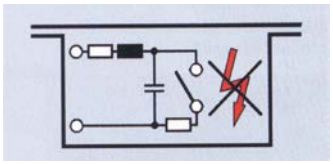
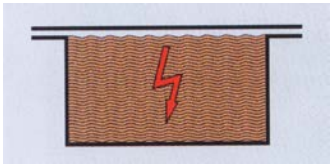
PRS Rules permit only the equipment designed for explosive mixtures included in explosion group at least IIB and temperature class at least T3. In particular cases, for groups and classes higher than provided by the Rules, the requirements of IBC and IDG Codes apply.

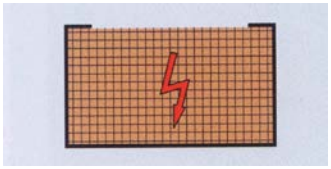
Annex 5

Types of Anti-explosion Protection of Electrical Equipment

In spaces where explosive atmosphere may be present, in spite of using means of initial anti-explosion protection, only an explosion-proof electrical equipment shall be used. The explosion-proof electrical equipment shall be manufactured in accordance with protection generic standards defined in IEC Standards.

Table
Anti-explosion protection of electrical equipment

Type of protection acc. to IEC / EN	Basic principle	Schematic drawing	Main applications
1	2	3	4
Flameproof enclosure **d** IEC 60 079-1 EN 50 018	Parts which can ignite a potentially explosive atmosphere are surrounded by an enclosure which withstands the pressure of an explosive mixture exploding inside the enclosure and prevents the propagation of the explosion to the atmosphere surrounding the enclosure.		Switchgear and control gear and indicating equipment, control systems, motors, transformers, heating equipment, light fittings
Increased safety **e** IEC 60 079-7 EN50019	Additional measures are taken to increase the level of safety, thus preventing the possibility of unacceptably high temperatures and the creation of sparks or electric arcs within the enclosure or on exposed parts of electrical apparatus parts.		Terminal and connection boxes, control boxes for installing Ex-components (which have a different type of protection), squirrel-cage motors, light fittings
Pressurized apparatus **p** IEC 60 079-2 EN 60079-2	The formation of a potentially explosive atmosphere inside a casing is prevented by maintaining a positive internal pressure of inert gas in relation to the surrounding atmosphere and, where necessary, by supplying the inside of the casing with a constant flow of inert gas which acts to dilute any combustible mixtures.		Switchgear and control cabinets, analysers, large motors
Intrinsic safety **i** IEC60079-11 EN 50 020	Apparatus used in a potentially explosive area contain intrinsically safe electric circuits only. An electric circuit is intrinsically safe if no sparks or thermal effects are produced under specified test conditions (which include normal operation and specific fault conditions) which might result in the ignition of a specified potentially explosive atmosphere.		Measurement and control technology, communication technology, sensors, actuators.
Oil immersion **o** IEC 60 079-6 EN 50 015	Electrical apparatus or parts of electrical apparatus are immersed in a protective fluid (such as oil), such that a potentially explosive atmosphere existing over the surface or outside of the apparatus cannot be ignited.		Transformers, starting resistors.

1	2	3	4
Powder filling **q** IEC 60 079-5 EN 50 017	Filling the casing of an electrical apparatus with a fine granular packing material has the effect of making it impossible for an electric arc created in the casing under certain operating conditions to ignite a potentially explosive atmosphere surrounding the casing.		Electronic equipment
Encapsulation **m** IEC60079-18 EN 50 028	Parts which may ignite a potentially explosive atmosphere are embedded in sealing compound such that the potentially explosive atmosphere cannot be ignited.		Switchgear with small capacity, control and signalling units, display units, sensors.
Type of protection **n** IEC60079-15 EN 50 021	Electrical apparatus is not capable of igniting a potentially explosive atmosphere (under normal operation and under defined abnormal operating conditions).	Zone 2 This type of protection includes several methods of ignition protection.	All electrical apparatus for Zone 2, less suitable for switchgear and control gear.

The Rules of Polish Register of Shipping permit the use of only explosion-proof equipment – intrinsically safe (Exi), with flameproof enclosure (Exd), with pressurised enclosure (Exp), of increased safety type (Exe) and specially certified (Exs).

Currently valid standards do not mention Exs type, therefore PRS Head Office may agree to other protection provided by standards referred to in the above table.

Annex 6

Certification and marking

In explosion-hazardous spaces, only the appropriately certified and correctly marked equipment may be used. Onboard ships constructed before 30 June 2003, the equipment marked according to Directive 79/196/EEC is permitted. Onboard ships constructed after 30 June 2003, the equipment marked according to Directive 94/9/EC shall be installed.

Table

Comparison of directives for structures and certification of explosion-proof equipment

EC Directive No.:	79/196/EEC	94/9/EC
1	2	3
Validity	Until 30.06.2003	From 01.03.1996
Scope of application for the equipment in hazardous spaces	– electrical equipment – gases and vapours	– any protective equipment and systems – gases, vapours and dusts
Manufacturer's quality system	Not required	Certificate for quality system issued by a notified body
Certificate of conformity	Certificate of conformity or survey certificate issued by a notified body	Certificate of manufacturer's conformity issued on the basis of type examination
Marking required by directive and standards on the certification plate and/or nominal plate		
Name and designation of manufacturer	Company's name or logo	Company's name or logo
Type designation	Digitals or letters	Digitals or letters
Manufacturer's address	–	Town name
CE marking, No. of examination body (e.g. PTB)	–	CЄ 0102
Examination station, Certificate No. (example)	PTB No. Ex-91.C.1045[1)]	PTB 07 ATEX 2031[1)]
Mark acc. to EC Directive (free trade of products)	[2)] 	[2)] 
Equipment group and category: Mining industry (I) Other hazardous spaces (II)	**I** or **II**	Group **I**: **M1** or **M2** Group **II**: **1 G/D**, **2 G/D**, **3 G/D**
Mark acc. to an EN Standard	**EEx** / **Ex**	**EEx** / **Ex**
Type of protection	**d**, **e**, **q**, ... **ib** or **[ib]**[3)]	**d**, **e**, **q**, ... **ib** or **[ib]**[3)]
Additional classification of group II (only for protection d and i)	**A** or **B** or **C**	**A** or **B** or **C**
Temperature class of Group II	**T1** ... **T6**	**T1** ... **T6**
Symbols of nominal data	**V**, **A**, **W**, **Hz**	**V**, **A**, **W**, **Hz**
Room temperature, if other than -20ºC ... +40ºC, (example)	**Ta** ≤ **50ºC**	**Ta** ≤ **50ºC**

1) Additional markings: **X** – if any additional conditions of use are indicated, etc;
U – for subassemblies of Ex-type;

2) According to a new directive: permanent; acc. to an old directive: not indicated on subassemblies of Ex-type;

3) Intrinsically safe apparatus: **ib** / associated apparatus: **[ib]**

List of amendments valid as of 1 July 2016

Item	*Title/Subject*	*Source*
1	Purpose of guidelines	IACS Rec.35 (Corr.1)
5	General recommendations for manufacture and survey of installations and equipment for hazardous areas on tankers	IACS Rec. No. 120