TEST REPORT

Report Reference No.	XMT0201601061W/ATEX
Applicant:	SHENZHEN CARY TECHNOLOGY CO,.LTD
Address:	Building 1, No.29 Industrial West Zone, Makan Road, Xili, Nanshan, Shenzhen, China
Sample Name:	LED Explosion Flood Luminaire
Model:	KLE1029-300,KLE1029-250,KLE1029-200,KLE1029-180, KLE1029-150,KLE1029-120,KLE1029-100,KLE1029-80, KLE1029-50,KLE1029-30
Test Type:	KLE1029-300
Standard:	EN 60079-0:2012+AC:2014,EN 60079-1:2014, EN 60079-18:2014, BS EN 60079-31:201
Test Period:	Jun.24,2016 to Jun.30,2016
Test Result:	Please refer to next pages
Conclusion:	Based on the performed tests on submitted samples, the results comply with the Equipment for Explosive Atmospheres 2014/34/EU and its subsequent amendments

Tested By: **Reviewed By:**

John Chen - Engineer **Amy Zhang - Lab Manager**

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Address	Building 1, No.29 Industrial West Zone, Makan Road, Xili, Nanshan, Shenzhen, China

Test Item Description	
Product Name :	LED Explosion Flood Luminaire
Standard :	EN 60079-0:2012+AC:2014,EN 60079-1:2014 EN 60079-18:2014, BS EN 60079-31:2014
Marking :	Ⓔx II 2 G Ex emb IIC T6 Gb,Ⓔx II 2 G Ex tb IIIC T80℃ Db IP66
Model/Type Reference :	KLE1029-300,KLE1029-250,KLE1029-200,KLE1029-180, KLE1029-150,KLE1029-120,KLE1029-100,KLE1029-80, KLE1029-50,KLE1029-30
Ratings :	100~277V,30~300W

Test Case Verdicts	
Test case does not apply to the test object :	N(.A.)
Test item does meet the requirement :	P(ass)
Test item does not meet the requirement :	F(ail)

General Remarks

◆ This report shall not be reproduced except in full without the written approval of the testing laboratory.

◆ The test results presented in this report relate only to the item tested.

◆ Clause numbers between brackets refer to clauses in EN 60079-0:2012+AC:2014,EN 60079-18:2014, BS EN 60079-31:2014,EN 60079-1:2014.

◆ "(see remark #)"refers to a remark appended to the report.

◆ "(see Annex #)"refers to an annex appended to the report.

◆ Throughout this report a point is used as the decimal separator.

Copy of Marking Plate

Product Name :
LED Explosion Flood Luminaire

CE

Model : KLE1029-300

Ratings : 300W

SHENZHEN CARY TECHNOLOGY CO,.LTD

Building 1, No.29 Industrial West Zone, Makan Road, Xili, Nanshan,Shenzhen, China

EN 60079-0:2012+AC:2014 Explosive atmospheres Part 0: Equipment — General requirements			
3	Terms and definitions		-
	For the purposes of this document, the following terms and definitions apply.		P
3.1	ambient temperature		-
	temperature of the air or other media, in the immediate vicinity of the equipment or component		P
3.2	area, hazardous		-
	area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical apparatus		P
3.3	area, non-hazardous		-
	area in which an explosive atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus		P
3.4	associated apparatus		-
	electrical apparatus which contains both energy-limited and non-energy-limited circuits and is constructed so that the non-energy-limited circuits cannot adversely affect the energy-limited circuits		P
3.5	cells and batteries		-
3.5.1	battery		-
	assembly of two or more cells electrically connected to each other to increase the voltage or capacity		P
3.5.2	capacity		-
	quantity of electricity or electric charge, which a fully charged battery can deliver under specified conditions		-
3.5.3	cell		-
	assembly of electrodes and electrolyte which constitutes the smallest electrical unit of a battery		P
3.5.4	charging		-
	act of forcing current through a secondary cell or battery in the opposite direction to the normal flow to restore the energy		P
3.5.5	deep discharge		-
	event which reduces a cell voltage below that recommended by the cell or battery manufacturer		P
3.5.6	maximum open-circuit voltage (of a cell or battery)		P

	maximum attainable voltage under normal conditions, that is, from either a new primary cell, or a secondary cell just after a full charge		-
3.5.7	nominal voltage		-
	(of a cell or battery) is that specified by the manufacturer		P
3.5.8	vented cell or battery		-
	secondary cell, or battery, having a cover provided with an opening through which gaseous products may escape		P
3.5.9	primary cell or battery electrochemical system capable of producing electrical energy by chemical reaction		P
3.5.10	reverse charging		-
	act of forcing current through either a primary cell or secondary cell in the same direction as the normal flow, for example, in an expired battery		P
3.5.11	sealed gas-tight cell or battery		-
	cell or battery which remains closed and does not release either gas or liquid when operated within the limits of charge or temperature specified by the manufacturer		P
3.5.12	sealed valve-regulated cell or battery		-
	cell or battery which is closed under normal conditions but which has an arrangement which allows the escape of gas if the internal pressure exceeds a pre-determined value. The cell cannot normally receive an addition to the electrolyte		P
3.5.13	secondary cell or battery		-
	electrically rechargeable electrochemical system capable of storing electrical energy and delivering it by chemical reaction		P
3.5.14	container (battery)		-
	enclosure to contain the battery		P
3.6	bushing		-
	insulating device carrying one or more conductors through an internal or external wall of an enclosure		P
3.7	cable gland		-
	device permitting the introduction of one or more electric and/or fibre optic cables into an electrical equipment so as to maintain the relevant type of protection		P
3.7.1	clamping device		-
	element of a cable gland for preventing tension or torsion in the cable from being transmitted to the connections		P
3.7.2	compression element		-

	element of a cable gland acting on the sealing ring to enable the latter to fulfil its function		P
3.7.3	sealing ring		-
	ring used in a cable gland to ensure the sealing between the cable gland and the cable		P
3.7.4	Ex Equipment cable gland		-
	cable gland tested separately from the equipment enclosure but certified as equipment and which can be fitted to the equipment enclosure during installation.		P
3.7.5	cable transit device		-
	an entry device, intended for one or more cables, with a seal made up of one or more separate elastomeric modules or parts of modules (modular internal seal), which are compressed together when the device is assembled and mounted as intended.		P
3.8	certificate		-
	document that assures the conformity of a product, process, system, person, or organization with specified requirements		P
3.8.1	Ex Component Certificate		-
	a certificate prepared for an Ex Component. See 3.28.		P
3.8.2	Equipment Certificate		-
	A certificate prepared for equipment other than an Ex Component. Such equipment may include Ex Components, but additional evaluation is always required as part of their incorporation into equipment. See 3.7.4, 3.25, 3.27, 3.28, and 3.29.	See 3.7.4, 3.25, 3.27, 3.28, and 3.29.	P
3.9	compound (for encapsulation)		-
	any thermosetting, thermoplastic, epoxy resin or elastomeric materials with or without fillers and/or additives, in their solid state; used for encapsulation		P
3.10	conduit entry		-
	means of introducing a conduit into electrical equipment so as to maintain the relevant type of protection		P
3.11	connection facilities		-
	terminals, screws or other parts, used for the electrical connection of conductors of external circuits		P
3.12	connections, factory		-
	terminations intended for connection during a manufacturing process under controlled conditions		P
3.13	connections, field-wiring		-

	terminations intended for connection by the installer in the field		P
3.14	continuous operating temperature		-
	temperature range which ensures the stability and integrity of the material for the expected life of the equipment, or part, in its intended application		P
3.15	converter (for use with electrical machines)		-
	unit for electronic power conversion, changing one or more electrical characteristics and comprising one or more electronic switching devices and associated components, such as transformers, filters, commutation aids, controls, protections, and auxiliaries, if any		P
3.16	converter, soft-start		-
	converter which limits the input current to the electrical machine during the starting process.		P
3.17	degree of protection of enclosure		-
	numerical classification according to IEC 60529 preceded by the symbol IP applied to the enclosure of electrical equipment to provide		P
3.18	dust		-
	generic term including both combustible dust and combustible flyings		P
3.18.1	combustible dust		-
	finely divided solid particles, 500 μm or less in nominal size, which may be suspended in air, may settle out of the atmosphere under their own weight, may burn or glow in air, and may form explosive mixtures with air at atmospheric pressure and normal temperatures		P
3.18.1.1	conductive dust		-
	NOTE IEC 61241-2-2 contains the test method for determining the electrical resistivity of dusts.		P
3.18.1.2	non-conductive dust		-
	NOTE IEC 61241-2-2 contains the test method for determining the electrical resistivity of dusts.		P
3.18.2	combustible flyings		-
	solid particles, including fibres, greater than 500 μm in nominal size which may be suspended in air and could settle out of the atmosphere under their own weight		P
3.19	dust-tight enclosure		-
	enclosure capable of excluding the ingress of observable dust particle deposits		P
3.20	dust-protected enclosure		-
	enclosure in which the ingress of dust is not totally excluded, but is unlikely to enter in sufficient quantity to interfere with the safe		P

	operation of the equipment and does not accumulate in a position within the enclosure where it is liable to cause an ignition hazar		
3.21	elastomer		-
	a macromolecular material which returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress (IEV 212-04-05)		P
3.22	electrical equipment		-
	items applied as a whole or in part for the utilization of electrical energy		P
3.23	encapsulation process of applying a compound to enclose an electrical device(s) by suitable means		P
3.24	enclosure		-
	all the walls, doors, covers, cable glands, rods, spindles, shafts, etc. which contribute to the type of protection and/or the degree of protection IP of the electrical equipment		P
3.25	equipment (for explosive atmospheres)		-
	general term including apparatus, fittings, devices, components, and the like used as a part of, or in connection with, an electrical installation in an explosive atmosphere		P
3.26	equipment protection level		-
	level of protection assigned to equipment based on its likelihood of becoming a source of ignition and distinguishing the differences between explosive gas atmospheres, explosive dust atmospheres, and the explosive atmospheres in mines susceptible to firedamp		P
3.27	Ex blanking element		-
	threaded blanking element tested separately from the equipment enclosure but having an equipment certificate and which is intended to be fitted to the equipment enclosure without further consideration		P
3.28	Ex Component		-
	part of electrical equipment or a module, marked with the symbol “U”, which is not intended to be used alone and requires additional consideration when incorporated into electrical equipment or systems for use in explosive atmospheres		P
3.29	Ex thread adapter		-
	thread adapter tested separately from the enclosure but having an equipment certificate and which is intended to be fitted to the		P

	equipment enclosure without further consideration		
3.30	explosive atmosphere		-
	mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, dust, fibres, or flyings which, after ignition, permits self-sustaining propagation		P
3.31	explosive dust atmosphere		-
	mixture with air, under atmospheric conditions, of flammable substances in the form of dust, fibres, or flyings which, after ignition, permits self-sustaining propagation		P
3.32	explosive gas atmosphere		-
	mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour, which, after ignition, permits self-sustaining flame propagation		P
3.33	explosive test mixture		-
	specified explosive mixture used for the testing of electrical equipment for explosive gas atmospheres		P
3.34	firedamp		-
	flammable mixture of gases naturally occurring in a mine		P
3.35	free space		-
	intentionally created space surrounding components or space inside components		P
3.36	galvanic isolation		-
	arrangement within equipment which permits the transfer of signals or power between two circuits without any direct electrical connection between the two		P
3.37	ignition temperature of an explosive gas atmosphere		-
	lowest temperature of a heated surface which, under specified conditions according to IEC 60079-20-1, will ignite a flammable substance in the form of a gas or vapour mixture with air		P
3.38	ignition temperature of a dust layer		-
	lowest temperature of a hot surface at which ignition occurs in a dust layer of specified thickness on a hot surface		P
3.39	ignition temperature of a dust cloud		-
	lowest temperature of the hot inner wall of a furnace at which ignition occurs in a dust cloud in air contained therein		P
3.40	limiting temperature		-
	maximum permissible temperature for equipment or parts of equipment equal to the		P

	lower of the two temperatures determined by: a) the danger of ignition of the explosive atmosphere; b) the thermal stability of the materials used		
3.41	malfunction		-
	equipment or components which do not perform their intended function with respect to explosion protection		P
3.42	maximum surface temperature		-
	highest temperature which is attained in service under the most adverse conditions (but within the specified tolerances) by any part or surface of electrical equipment		P
3.43	normal operation		-
	operation of equipment conforming electrically and mechanically with its design specification and used within the limits specified by the manufacturer		P
3.44	level of protection		-
	subdivision of a Type of Protection, correlating with the Equipment Protection Level, that differentiates the likelihood of the equipment becoming a source of ignition		P
3.45	plastic		-
	a material which contains as an essential ingredient a high polymer and which at some stage in its processing into finished products can be shaped by flow		P
3.46	radio frequency		-
	electromagnetic waves from 9 kHz to 60 GHz		P
3.47	rated value		-
	quantity value, assigned generally by the manufacturer, for a specified operating condition of a component, device or apparatus		P
3.48	rating		-
	set of rated values and operating conditions		P
3.49	replaceable battery pack		-
	assembly consisting of one or more interconnected cells, along with any integrated protective components, which form a complete replaceable battery		P
3.50	service temperature		-
	maximum or minimum temperature reached at specific points of the equipment when the equipment is operating at rated conditions, including ambient temperature and any external sources of heating or cooling. See 5.2		P
3.51	spacings, electrical		-
	separation distances between conductive parts at different electrical potentials		P

3.51.1	clearance		-
	shortest distance in air between two conductive parts		P
3.51.2	creepage distance		-
	shortest distance along the surface of a solid insulating material between two conductive parts		P
3.51.3	distance through casting compound		-
	shortest distance through a casting compound between two conductive parts		P
3.51.4	distance through solid insulation		-
	shortest distance between conductive parts along the surface of an insulating medium coveed with insulating coating		P
3.52	symbol “U” symbol used to denote an Ex Component		-
3.53	symbol “X”		P
	symbol used to denote specific conditions of use		-
3.54	termination compartment		P
	separate compartment, or part of a main enclosure, communicating or not with the main enclosure, and containing connection facilities		-
3.55	test, routine		P
	test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria		-
4	Equipment grouping		P
	Electrical equipment for explosive atmospheres is divided into the following groups:		-
4.1	Group I		P
	Electrical equipment of Group I is intended for use in mines susceptible to firedamp.		-
4.2	Group II		P
	Electrical equipment of Group II is intended for use in places with an explosive gas atmosphere other than mines susceptible to firedamp.		-
4.3	Group III		P
	Electrical equipment of Group III is intended for use in places with an explosive dust atmosphere other than mines susceptible to firedamp.Electrical equipment of Group III is subdivided according		-
4.4	Equipment for a particular explosive atmosphere The electrical equipment may be tested for a particular explosive atmosphere. In this case, the information shall be recorded on the certificate and the electrical equipment marked		P

	accordingly.		
5	Temperatures		-
5.1	Environmental influences		P
5.1.1	Ambient temperature		-
	Electrical equipment designed for use in a normal ambient temperature range of –20 °C to +40 °C does not require marking of the ambient temperature range. However, electrical equipment designed for use in other than this normal ambient temperature range is considered to be special. The marking shall then include either the symbol Ta or Tamb together with both the upper and lower ambient temperatures or, if this is impracticable, the symbol “X“shall be used to indicate specific conditions of use that include the upper and lower ambient temperatures. See item e) of 29.3 and Table 1.		P
5.1.2	External source of heating or cooling		-
	Where the electrical equipment is intended to be physically connected to a separate external source of heating or cooling, such as a heated or cooled process vessel or pipeline, the ratings of the external source shall be specified in the certificate and in the manufacturer’s instructions.		P
5.2	Service temperature		-
	Where this standard, or the standard for the specific type of protection, requires the service temperature to be determined at any place in the equipment, the temperature shall be determined for the rating of the electrical equipment when the equipment is subjected to maximum or minimum ambient temperature and, where relevant, the maximum rated external source of heating or cooling. Service temperature testing, when required, shall be in accordance with 26.5.1.		P
5.3	Maximum surface temperature		-
5.3.1	Determination of maximum surface temperature		P
	Maximum surface temperature shall be determined according to 26.5.1 considering the maximum ambient temperature and, where relevant, the maximum rated external source of heating.		-
5.3.2	Limitation of maximum surface temperature		P
5.3.2.1	Group I electrical equipment		-
	For electrical equipment of Group I, the maximum surface temperature shall be specified in relevant documentation according to		P

	Clause 24.		
5.3.2.2	Group II electrical equipment		-
	The maximum surface temperature determined (see 26.5.1) shall not exceed: – the temperature class assigned (see Table 2), or – the maximum surface temperature assigned, or – if appropriate, the ignition temperature of the specific gas for which it is intended.		P
5.3.2.3	Group III electrical equipment		-
5.3.2.3.1	Maximum surface temperature determined without a dust layer		P
	The maximum surface temperature determined (see 26.5.1) shall not exceed the maximum surface temperature assigned.		P
5.3.2.3.2	Maximum surface temperature with respect to dust layers		-
	In addition to the maximum surface temperature required in 5.3.2.3.1, the maximum surface temperature may also be determined for a given depth of layer, TL, of dust surrounding all sides of the equipment, unless otherwise specified in the documentation, and marked with the symbol “X” to indicate this specific condition of use in accordance with item d) of 29.5.		P
5.3.3	Small component temperature for Group I or Group II electrical equipment		-
	NOTE There is both theoretical and practical evidence to show that the smaller the heated surface, the higher the surface temperature required to ignite a given explosive atmosphere.		P
6	Requirements for all electrical equipment		-
6.1	General		-
	Electrical equipment and Ex Components shall a) comply with the requirements of this standard, together with one or more of the specific standards listed in Clause 1, and NOTE 1 These specific standards may vary the requirements of this standard. NOTE 2 All of the requirements for cable glands marked as type of protection “e” are located in IEC 60079-0. b) be constructed in accordance with the applicable safety requirements of the relevant industrial standards		P
6.2	Mechanical strength of equipment		-
	The equipment shall be subjected to the tests of 26.4. Guards relied upon to provide protection		P

	from impact shall be removable only by the use of a tool and shall remain in place for the required impact tests.		
6.3	Opening times		-
	Enclosures which can be opened more quickly than a) any incorporated capacitors, charged by a voltage of 200 V or more, to discharge to a value of residual energy of – 0,2 mJ for electrical equipment of Group I or Group IIA, – 0,06 mJ for electrical equipment of Group IIB, – 0,02 mJ for electrical equipment of Group IIC, including equipment marked Group II only, – 0,2 mJ for electrical equipment of Group III, or double the above energy levels if the charging voltage is less than 200 V, or b) the surface temperature of enclosed hot components reduces to below the assigned maximum surface temperature of the electrical equipment		P
6.4	Circulating currents in enclosures (e.g. of large electrical machines)		-
	Where necessary, precautions shall be taken to guard against any effect due to the presence of circulating currents caused by stray magnetic fields, and the arcs or sparks that may occur as a result of interrupting such currents, or excessive temperatures caused by such currents.		P
6.5	Gasket retention		-
	Where the degree of protection provided by the enclosure depends on a gasketed joint which is intended to be opened for installation or maintenance purposes, gaskets shall be attached or secured to one of the mating faces to prevent loss, damage or incorrect assembly. The gasket material shall not itself adhere to the other joint face. When the joint is opened and re-closed prior to the tests for degree of protection by enclosure, it shall be verified that the gasket material has not adhered to the other joint face. (See 26.4.1.2).		P
6.6	Electromagnetic and ultrasonic energy radiating equipment		-
	The energy levels shall not exceed the values given below.		P
6.6.1	Radio frequency sources		-
	The threshold power of radio frequency (9 kHz		P

	to 60 GHz) for continuous transmissions and for pulsed transmissions whose pulse durations exceed the thermal initiation time shall not exceed the values shown in Table 4. Programmable or software control intended for setting by the user shall not be permitted.		
6.6.2	Lasers or other continuous wave sources		-
	NOTE The values for Ga, Gb, and Gc can be found in IEC 60079-28.		P
6.6.3	Ultrasonic sources		-
	The output parameters from ultrasonic sources of electrical equipment of EPL Ma, Mb, Ga, Gb, Gc, Da, Db, or Dc shall not exceed the following values: • 0,1 W/cm2 and 10 MHz for continuous sources, • average power density 0,1 W/cm2 and 2 mJ/cm2 for pulse sources.		P
7	Non-metallic enclosures and non-metallic parts of enclosures		-
7.1	General		-
7.1.1	Applicability		-
	The requirements given in this clause and in 26.7 shall apply to non-metallic enclosures and non-metallic parts of enclosures, on which the type of protection depends.		P
7.1.2	Specification of materials		-
7.1.2.1	General		-
	The documents according to Clause 24 shall specify the material of the enclosure or part of the enclosure.		P
7.1.2.2	Plastic materials		-
	The specification for plastic materials shall include the following: a) the name or registered trademark of the resin manufacturer or compounder; c) the possible surface treatments, such as varnishes, etc.; d) the temperature index TI, corresponding to the 20 000 h point on the thermal endurance graph without loss of flexural strength exceeding 50 %, determined in accordance with IEC 60216-1 and IEC 60216-2 and based on the flexing property in accordance with ISO 178. If the material does not break in this test before exposure to the heat, the index shall be based on the tensile strength in accordance with ISO 527-2 with test bars of Type 1A or 1B. As an alternative to the TI, the		P

	relative thermal index (RTI – mechanical) may be determined in accordance with ANSI/UL 746B. e) when applicable, data supporting compliance with 7.3 (resistance to ultraviolet light). The source of the test data for these characteristics shall be identified. NOTE It is not a requirement of this standard that conformity to the specification of the plastic material be verified. b) the identifi cation of the material, including its − type designation, − colour, − type and percentage of fi llers and other additives, if used;		
7.1.2.3	Elastomers		-
	The specification for elastomers shall include the following: a) the name or registered trademark of the resin manufacturer or compounder; b) the identifi cation of the material, including its − type designation, − colour, − type and percentage of fi llers and other additives, if used; c) the possible surface treatments, such as varnishes, etc.; d) the continuous operating temperature (COT); e) when applicable, data supporting compliance with 7.3 (resistance to ultraviolet light).		P
7.2	Thermal endurance		-
7.2.1	Tests for thermal endurance		-
	The tests for endurance to heat and to cold shall be conducted in accordance with 26.8 and 26.9.		P
7.2.2	Material selection		-
	The plastic materials shall have a temperature index “TI” or RTI – mechanical (according to 7.1.2) of at least 20 K greater than the maximum service temperature of the enclosure or the part of the enclosure (see 26.5.1).		P
7.2.3	Alternative qualification of elastomeric sealing O-rings		-
	Elastomeric sealing O-rings are normally qualified as a part of the complete equipment enclosure when the ingress protection of the enclosure (IP) is required by the type of protection. Alternatively, a metal enclosure incorporating elastomeric sealing O-rings,		P

	according to ISO 3601-1, used in defined mounting conditions according to ISO 3601-2, is permitted to be evaluated using a test fixture instead of testing the O-ring assembled in the complete equipment enclosure. The test fixture shall replicate the dimensions of the complete equipment enclosure O-ring mounting. The tests shall be conducted according 26.16. The Oring is then mounted in the complete equipment enclosure and subjected to the required IP tests of 26.4.5.		
7.3	Resistance to light		-
	The resistance to light of the enclosures, or parts of enclosures, of non-metallic materials shall be satisfactory (see 26.10). Materials meeting the ultraviolet light exposure requirements (f1) in ANSI/UL 746C are considered satisfactory.		P
7.4	Electrostatic charges on external non-metallic materials		-
7.4.1	Applicability		-
	The requirements of this subclause only apply to external non-metallic materials of electrical equipment.		P
7.4.2	Avoidance of a build-up of electrostatic charge on Group I or Group II electrical equipment		-
	Electrical equipment shall be so designed that under normal conditions of use, maintenance and cleaning, danger of ignition due to electrostatic charges shall be avoided.		P
7.4.3	Avoidance of a build-up of electrostatic charge on equipment for Group III		-
	Painted/coated metal equipment and equipment of plastic material shall be so designed that under normal conditions of use, danger of ignition due to propagating brush discharges is avoided.		P
7.5	Accessible metal parts		-
	Accessible, metal parts with a resistance to earth of more than 109 Ω could be susceptible to electrostatic charges that could become a source of ignition and shall be tested in accordance with the test method in 26.14. If the measured capacitance of each metal part exceeds the value shown in Table 9, the equipment shall be marked “X” in accordance with item e) of 29.3 and the specific condition of use shall specify the value of capacitance determined to allow the user to determine		P

	suitability in the specific application.		
8	Metallic enclosures and metallic parts of enclosures		-
8.1	Material composition		-
	The documents according to Clause 24 shall specify the material of the enclosure or part of the enclosure.		P
8.2	Group I		-
	Materials used in the construction of enclosures of Group I electrical equipment of EPL Ma or Mb shall not contain, by mass, more than • 15 % in total of aluminium, magnesium, titanium and zirconium, and • 7,5 % in total of magnesium, titanium and zirconium.		P
8.3	Group II		-
	Materials used in the construction of enclosures of Group II electrical equipment for the identified equipment protection levels shall not contain, by mass, more than: • for EPL Ga 10 % in total of aluminium, magnesium, titanium and zirconium, and 7,5 % in total of magnesium, titanium and zirconium; • for EPL Gb 7,5 % in total of magnesium, titanium and zirconium; • for EPL Gc no requirements except for fan impellors, fan hoods and ventilating screens, which shall comply with the requirements for EPL Gb		P
8.4	Group III		-
	Materials used in the construction of enclosures of Group III electrical equipment for the identified equipment protection levels shall not contain, by mass, more than: • for EPL Da 7,5 % in total of magnesium, titanium and zirconium; • for EPL Db 7,5 % in total of magnesium, titanium and zirconium; • for EPL Dc no requirements except for fan impellors, fan hoods and ventilating screens, which shall comply with the requirements for EPL Db.		P
9	Fasteners		-
9.1	General		-
	Parts necessary to achieve a specific type of		P

	protection or used to prevent access to uninsulated live parts shall be capable of being released or removed only with the aid of a tool.		
9.2	Special fasteners		-
	When any of the standards for a specific type of protection requires a special fastener, this shall conform to the following: – the thread shall be a metric thread of coarse pitch in accordance with ISO 262, with a tolerance fit of 6g/6H in accordance with ISO 965-1 and ISO 965-3; – the head of the screw or nut shall be in accordance with ISO 4014, ISO 4017, ISO 4032, ISO 4762, ISO 7380, or ISO 14583 and, in the case of hexagon socket set screws, ISO 4026, ISO 4027, ISO 4028 or ISO 4029; Other heads of a screw or nut are permitted if the equipment is marked “X” in accordance with item e) of 29.3 and the specific condition of use shall fully specify the fasteners and indicate that the fasteners shall only be replaced with identical ones; – the holes in the electrical equipment shall comply with the requirements of 9.3.		P
9.3	Holes for special fasteners		-
9.3.1	Thread engagement		-
	Holes for special fasteners, as specified in 9.2, shall be threaded for a distance to accept a thread engagement, h, at least equal to the major diameter of the thread of the fastener (see Figures 1 and 2).		P
9.3.2	Tolerance and clearance		-
	The female thread shall have a tolerance class of 6H in accordance with ISO 965-1 and ISO 965-3, and either a) the hole under the head of the associated fastener shall allow a clearance not greater than that specified for the “medium series: H13” per ISO 273(see Figure 1); or b) the hole under the head (or nut) of an associated reduced shank fastener shall be threaded to enable the fastener to be retained. The dimensions of the threaded hole shall be such that the surrounding surface in contact with the head of such a fastener shall be at least equal to that of a fastener without a reduced shank in a clearance hole (see		P

	Figure 2).		
9.3.3	Hexagon socket set screws		-
	In the case of threaded holes for hexagon socket set screws, the threaded hole shall have a tolerance class of 6H in accordance with ISO 965-1 and ISO 965-3 and the set screw shall not protrude from the threaded hole after tightening. BS EN 60079-0:2012+A11:2013– 51 – IEC 60079-0 © 2011h		P
10	Interlocking devices		-
	Where an interlocking device is used to maintain a specific type of protection, it shall be so constructed that its effectiveness cannot easily be defeated.		P
11	Bushings		-
	Bushings used as connection facilities and which may be subjected to a torque during connection or disconnection, shall be mounted in such a way that all parts are secured against turning.		P
12	Materials used for cementing		-
	The documents, according to Clause 24, shall include a data sheet or statement from the cement manufacturer to show that, the materials used for cementing on which the type of protection depends, have a thermal stability adequate for the minimum and maximum service temperatures to which they shall be subjected.		P
13	Ex Components		-
13.1	General		-
	Ex Components shall comply with the requirements given in Annex B. Examples of Ex Components include: a) an empty enclosure; or b) components or assemblies of components for use with equipment which complies with the requirements of one or more of the types of protection listed in Clause 1.		P
13.2	Mounting		-
	Ex Components may be mounted: a) completely within an equipment enclosure (for example, a type "e" terminal, ammeter, heater or indicator; a type "d" switch component or thermostat, a type “m” switch component or thermostat, a type "i" supply); or b) completely external to the equipment enclosure (for example, a type "e" earth		P

	terminal, a type "i" sensor); or c) partly within and partly external to the equipment enclosure (for example, a type "d" push button switch, a type “t” push button switch, a limit switch or indicating lamp, a type "e" ammeter, a type "i" indicator).		
13.3	Internal mounting		-
	Where the Ex Component is mounted completely within the enclosure, the only parts that shall be tested or assessed are those parts which have not been tested and/or assessed as a separate component (for example, test or assessment of surface temperature, creepage distance and clearance from the component to surrounding conducting parts).		P
13.4	External mounting		-
	Where the Ex Component is mounted external to the enclosure or partly within and partly external to the enclosure, the interface between the Ex Component and the enclosure shall be tested or assessed for compliance with the relevant type of protection and the enclosure tests as specified in 26.4.		P
13.5	Ex Component certificate		-
	As Ex Components are not intended to be used alone and require additional consideration when incorporated into electrical equipment or systems, they do not have “Specific Conditions of Use” along with the associated “X” suffix for the certificate number. Where this standard or one of its sub-parts specify “Specific Conditions of Use” and the associated “X” suffix for the certificate number, a “Schedule of Limitations” for the Ex Component certificate and the associated “U” suffix for the Ex Component certificate number shall be substituted for an Ex Component. See also 28.2.		P
14	Connection facilities and termination compartments		-
14.1	General		-
	Electrical equipment intended for connection to external circuits shall include connection facilities, with the exception of electrical equipment that is manufactured with a cable permanently connected to it.		P
14.2	Termination compartment		-
	Termination compartments and their access openings shall be dimensioned so that the conductors can be readily connected.		P

14.3	Type of protection		-
	Termination compartments shall comply with one of the specific types of protection listed in Clause 1.		P
14.4	Creepage and clearance Termination compartments shall be so designed that after proper connection of the conductors, the creepage distances and the clearances comply with the requirements, if any, of the specific type of protection concerned.		P
15	Connection facilities for earthing or bonding conductors		-
15.1	Equipment requiring earthing		-
15.1.1	Internal		-
	A connection facility for the connection of an earthing conductor shall be provided inside the electrical equipment adjacent to the other connection facilities.		P
15.1.2	External		-
	An additional external connection facility for an equipotential bonding conductor shall be provided for electrical equipment with a metallic enclosure, except for electrical equipment which is designed to be: a) moved when energized and is supplied by a cable incorporating an earthing or equipotential bonding conductor; or b) installed only with wiring systems not requiring an external earth connection, for example, metallic conduit or armoured cable.		P
15.2	Equipment not requiring earthing		-
	Where there is no requirement for earthing or bonding, for example, in some types of electrical equipment having double or reinforced insulation, or for which supplementary earthing is not necessary, an internal or external earthing or bonding facility need not be provided.		P
15.3	Size of conductor connection Protective earthing (PE) conductor connection facilities shall allow for the effective connection of at least one conductor with a cross-sectional area given in Table 10. Protective earthing (PE) conductor connection facilities for electrical machines shall be according to IEC 60034-1.		P
15.4	Protection against corrosion		-
	Connection facilities shall be effectively protected against corrosion. Special precautions shall be taken if one of the parts in contact consists of a material containing light metal, for example, by using an intermediate part made of		P

	steel when making a connection to a material containing light metals.		
15.5	Secureness of electrical connections		-
	Connection facilities shall be designed so that the electrical conductors cannot be readily loosened or twisted. Contact pressure on the electrical connections shall be maintained and not be affected by dimensional changes of insulating materials in service, due to factors such as temperature or humidity. For non-metallic walled enclosures provided with an internal earth continuity plate, the test of 26.12 shall be applied.		P
16	Entries into enclosures		-
16.1	General		-
	Entry into the equipment shall be either by a plain or threaded hole located in • the wall of the enclosure, or • an adaptor plate designed to be fitted in or on the walls of the enclosure.		P
16.2	Identification of entries		-
	The manufacturer shall specify, in the documents submitted according to Clause 24, the entries, their position on the equipment and the number permitted. The thread form (for example, metric or NPT) of threaded entries shall be marked on the equipment or shall appear in the installation instructions (see Clause 30).		P
16.3	Cable glands		-
	Cable glands, when installed in accordance with the instructions required by Clause 30, shall not invalidate the specific characteristics of the type of protection of the electrical equipment on which they are mounted. This shall apply to the whole range of cable dimensions specified by the manufacturer of the cable glands as suitable for use with those glands. Cable glands may form an integral part of the equipment, i.e. one major element or part forms an inseparable part of the enclosure of the equipment. In such cases, the glands shall be tested with the equipment.		P
16.4	Blanking elements		-
	Blanking elements, intended to close unused openings in the enclosure walls of electrical equipment, shall satisfy the requirements of the specific type of protection concerned. The blanking element shall only be removable with the aid of a tool.		P

16.5	Thread adapters		-
	Thread adapters shall satisfy the requirements of the specific type of protection concerned.		P
16.6	Temperature at branching point and entry point		-
	When the temperature under rated conditions is higher than 70 °C at the entry point or 80 °C at the branching point of the conductors, information shall be marked on the equipment exterior to provide guidance to the user on the proper selection of cable and cable gland or conductors in conduit. See Figure 3.		P
16.7	Electrostatic charges of cable sheaths		-
	For the purposes of this standard, the sheaths of cables used for the connection of external circuits are not considered non-metallic enclosures or parts of enclosures as described by Clause 7 and need not be assessed against those requirements.		P
17	Supplementary requirements for rotating machines		-
17.1	Ventilation		-
17.1.1	Ventilation openings		-
	The degree of protection (IP) of ventilation openings shall be at least: – IP20 on the air inlet side, – IP10 on the air outlet side,		P
17.1.2	Materials for external fans		-
	The external fan impellors, fan hoods, and ventilation screens manufactured from non-metallic materials shall comply with Clause 7. For Group II rotating machines, impellors of external fans		P
17.1.3	Cooling fans of rotating machines		-
17.1.3.1	Fans and fan hoods		P
	External cooling fans of rotating machines shall be enclosed by a fan hood and shall meet the requirements of 17.1.3.2 and 17.1.3.3.		-
17.1.3.2	Construction and mounting of the ventilating systems		-
	Fans, fan hoods and ventilation screens shall be constructed to meet the requirements of the resistance to impact test according to 26.4.2 and the acceptance criteria given in 26.4.4.		P
17.1.3.3	Clearances for the ventilating system		-
	Taking into account design tolerances, the clearances in normal operation between the fan impellor and its fan hood, the ventilation screens and their fasteners, shall be at least onehundredth of the maximum diameter of the		P

	fan impellor, except that the clearances need not exceed 5 mm and may be reduced to 1 mm where the opposing parts are manufactured so as to have controlled dimensional concentricity and dimensional stability (e.g. machined parts of cast metal). In no case shall the clearance be less than 1 mm.		
17.1.4	Auxiliary motor cooling fans		-
	Cooling fans that are not mounted on the shaft of the motor to be cooled, and which require a minimum back-pressure in order to not exceed the rating of the fan motor, shall either be tested as part of the motor to be cooled or shall be marked “X” in accordance with item e) of 29.3 and the specific condition of use shall specify the measures to be considered to not exceed the ratings. If limits for back-pressure are specified as such conditions, these limits shall be verified by testing according to 26.15.		P
17.1.5	Ventilating fans		-
	For Group I equipment, the applicable requirements of EN 1710 shall be applied.		P
17.2	Bearings		-
	Lubricants and seals used in bearings shall be suitable for the maximum temperature of the bearings.		P
18	Supplementary requirements for switchgear		-
18.1	Flammable dielectric		P
	Switchgear shall not have contacts immersed in flammable dielectric.		-
18.2	Disconnectors		P
	Where switchgear includes a disconnector, it shall disconnect all poles. The switchgear shall be designed so that either		-
18.3	Group I – Provisions for locking		-
	For Group I switchgear, the operating mechanism of disconnectors shall be capable of being padlocked in the open position. Provision shall be made to enable short-circuit and earth-fault relays, if used, to latch out. If the switchgear has a local resetting device which is accessible from the outside of the enclosure, its access cover shall have a special fastener according to 9.2.	according to 9.2.	P
18.4	Doors and covers		P
	Doors and covers giving access to the interior of enclosures containing remotely operated circuits with switching contacts which can be made or broken by non-manual influences (such		P

	as electrical, mechanical, magnetic, electromagnetic, electro-optical, pneumatic, hydraulic, acoustic or thermal) shall either a) be interlocked with a disconnector which prevents access to the interior, unless it has been operated to disconnect unprotected internal circuits; or b) be marked with the enclosure opening marking of item d) of 29.12.		
19	Supplementary requirements for fuses		-
	Enclosures containing fuses shall either – be interlocked so that insertion or removal of replaceable elements can be carried out only with the supply disconnected and so that the fuses cannot be energized until the enclosure is correctly closed, or – the equipment shall be marked with the enclosure opening marking as required by item d) of 29.12.		P
20	Supplementary requirements for plugs, socket outlets and connectors		-
20.1	General		P
	These requirements for socket outlets shall also be applied to connectors.		-
20.2	Explosive gas atmospheres		P
	It is not necessary for plugs and socket outlets of EPL Gb to comply with the requirements of 20.1 if all of the following conditions are met: – the part which remains energized is a socket outlet; – there is a delay time for the separation of the plug and socket outlet such that the rated current flow ceases so no arc will occur on separation; – the plug and socket outlet remain flameproof in accordance with IEC 60079-1 during the arc-quenching period while opening a circuit of the rated voltage, rated current, and for a.c. circuits, a power factor of 0,4 to 0,5; – the contacts remaining energized after separation are protected according to one of the specific types of protection listed in Clause 1.		-
20.3	Explosive dust atmospheres		P
	The requirements of 20.1 apply in all cases.		-
20.4	Energized plugs		P
	Plugs and components remaining energized when not engaged with a socket outlet are not permitted.		-
21	Supplementary requirements for luminaires		P
21.1	General		-

	The source of light of luminaires shall be protected by a light-transmitting cover that may be provided with an additional guard. Dependent on the size of the openings in a guard, the tests according to 26.4.2, Table 13 are to be applied as follows: • Guard openings greater than 2 500 mm2; tests a) and c) of Table 13. • Guard openings between 625 mm2 and 2 500 mm2; tests a), b) and d) of Table 13. • Guard openings less than 625 mm2; tests a) and b) of Table 13. • No guard; tests a) and c) of Table 13.		P
21.2	Covers for luminaires of EPL Mb, EPL Gb, or EPL Db		-
	Covers giving access to the lampholder and other internal parts of luminaires shall either be		P
22	Supplementary requirements for caplights and handlights		-
22.1	Group I caplights		P
	NOTE The requirements for caplights for use in mines susceptible to firedamp are contained in IEC 62013-1 (to be replaced by IEC 60079-35-1 which is in preparation).		-
22.2	Group II and Group III caplights and handlights		P
	Leakage of the electrolyte shall be prevented in all positions of the equipment.		-
23	Equipment incorporating cells and batteries		P
23.1	General		-
	The requirements in 23.2 to 23.12 shall apply for all cells and batteries incorporated into explosion-protected equipment.		P
23.2	Batteries		-
	Batteries incorporated into explosion-protected equipment shall be formed only from cells connected in series.		P
23.3	Cell types		-
	Only cell types referred to in published IEC cell standards having known characteristics shall be used. Tables 11 and 12 below list cells for which suitable standards either exist or are to be produced.		P
23.4	Cells in a battery		-
	All cells in a battery shall be of the same electrochemical system, cell design and rated capacity and shall be made by the same manufacturer.		P
23.5	Ratings of batteries		-

	All batteries shall be arranged and operated so as to be within the allowable limits defined by the cell or battery manufacturer.		P
23.6	Interchangeability		-
	Primary and secondary cells or batteries shall not be used inside the same equipment enclosure if they are readily interchangeable.		P
23.7	Charging of primary batteries		-
	Primary batteries shall not be re-charged. Where another voltage source exists inside equipment containing primary batteries and there is a possibility of interconnection, precautions shall be taken to prevent charging current passing through them.		P
23.8	Leakage		-
	All cells shall be constructed, or arranged so as to prevent leakage of electrolyte, which would adversely affect the type of protection or components on which safety depends.		P
23.9	Connections		-
	Only the manufacturer's recommended method(s) of making electrical connections to a battery shall be used.		P
23.10	Orientation		-
	Where a battery is mounted inside equipment and the battery orientation is important for safe operation, the correct orientation of the equipment shall be indicated on the outside of the equipment enclosure.		P
23.11	Replacement of cells or batteries		-
	Where it is necessary for the user to replace cells or batteries contained within an enclosure, the relevant parameters to allow correct replacement shall be legibly and durably marked on or inside the enclosure as detailed in 29.14, or detailed in the manufacturer's instructions in accordance with 30.2. That is, either the manufacturer's name and part number, or the electrochemical system, nominal voltage and rated capacity.		P
23.12	Replaceable battery pack		-
	Where it is intended for the user to replace the battery pack, the battery pack shall be legibly and durably marked on the outside of the battery pack as detailed in 29.14.		P
24	Documentation		-
	The manufacturer shall prepare documents that give a full and correct specification of the explosion safety aspects of the electrical		P

	equipment.		
25	Compliance of prototype or sample with documents		-
	The prototypes or samples of the electrical equipment subjected to the type verifications and tests shall comply with the manufacturer's documents referred to in Clause 24.		P
26	Type tests		-
26.1	General		P
	The prototypes or samples shall be tested in accordance with the requirements for type tests of this standard and of the specific standards for the types of protection concerned. However, certain tests judged to be unnecessary, may be omitted from the testing programme. A record shall be made of all tests carried out and of the justification for those omitted.		-
26.2	Test configuration		P
	Each test shall be made in the configuration of the electrical equipment considered to be the most unfavourable.		-
26.3	Tests in explosive test mixtures		P
	Tests in explosive mixtures shall be carried out as specified in relevant standards listed in Clause 1.		-
26.4	Tests of enclosures		P
26.4.1	Order of tests		-
26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures		P
26.4.2	Resistance to impact		-
	The electrical equipment shall be submitted to the effect of a test mass of 1 kg falling vertically from a height h. The height h is specified in Table 13 according to the application of the electrical equipment. The mass shall be fitted with an impact head made of hardened steel in the form of a hemisphere of 25 mm diameter.		P
26.4.3	Drop test		-
	In addition to being submitted to the resistance to impact test in accordance with 26.4.2, hand-held electrical equipment or electrical equipment carried on the person, ready for use, shall be dropped four times from a height of at least 1 m onto a horizontal concrete surface. The position of the sample for the drop test shall be that which is considered to be the most unfavourable.		P
26.4.4	Acceptance criteria		-

	The resistance to impact and drop tests shall not produce damage so as to invalidate the type of protection of the electrical equipment.		P
26.4.5	Degree of protection (IP) by enclosures		-
26.4.5.1	Test procedure		P
	When a degree of protection is required by this standard or by other parts of this series for a specific type of protection, the test procedures shall be in accordance with IEC 60529, except for rotating electrical machines which shall be in accordance with IEC 60034-5.		-
26.4.5.2	Acceptance criteria		P
	For electrical equipment tested in accordance with IEC 60529, the acceptance criteria shall be in accordance with IEC 60529 except where the manufacturer specifies acceptance criteria more onerous than those described in IEC 60529, for example, those in a relevant product standard. In this case, the acceptance criteria of the relevant product standard shall be applied unless it adversely affects explosion protection.		-
26.5	Thermal tests		P
26.5.1	Temperature measurement		-
26.5.1.1	General		P
	For electrical equipment which can normally be used in different positions, the temperature in each position shall be considered. When the temperature is determined for certain positions only, the electrical equipment shall be marked with the symbol “X” to indicate this specific condition of use according to item e) of 29.3.		-
26.5.1.2	Service temperature		P
	The test to determine service temperatures shall be made at the rated voltage of the electrical equipment but without considering malfunctions.		-
26.5.1.3	Maximum surface temperature		P
	The test to determine maximum surface temperature shall be performed under the most adverse ratings with an input voltage between 90 % and 110 % of the rated voltage of the electrical equipment that gives the maximum surface temperature.		-
26.5.2	Thermal shock test		P
	Glass parts of luminaires and windows of electrical equipment shall withstand, without breaking, a thermal shock caused by a jet of water of about 1 mm diameter at a temperature (10 ± 5) °C sprayed on them when they are at		-

	not less than the maximum service temperature.		
26.5.3	Small component ignition test (Group I and Group II)		P
26.5.3.1	Genera		-
	A small component tested to demonstrate that it shall not cause temperature ignition of a flammable mixture in accordance with item a) of 5.3.3, shall be tested in the presence of a specified gas/air mixture as described in 26.5.3.2.		P
26.5.3.2	Procedure		-
	The test shall be carried out with the component either – mounted in the equipment as intended and precautions shall be taken to ensure that the test mixture is in contact with the component, or – mounted in a model which ensures representative results. In this case, such a simulation shall take into account the effect of other parts of the equipment in the vicinity of the component being tested which affect the temperature of the mixture and the flow of the mixture around the component as a result of ventilation and thermal effects.		P
26.5.3.3	Acceptance criteria		-
	The appearance of a cool flame shall be considered as an ignition. Detection of ignition shall either be visual or by measurement of temperature, for example, by a thermocouple.		P
26.6	Torque test for bushings		-
26.6.1	Test procedure		P
	Bushings used for connection facilities and which are subjected to torque during connection or disconnection of conductors shall be tested for resistance to torque.		-
26.6.2	Acceptance criteria		P
	When mounted, neither the stem in the bushing, nor the bushing itself, shall turn when the stem is subjected to a torque.		-
26.7	Non-metallic enclosures or non-metallic parts of enclosures		P
26.7.1	General		-
	In addition to the relevant tests given in 26.1 to 26.6, non-metallic enclosures shall also satisfy the requirements in 26.8 to 26.15, as appropriate. The tests of 26.10 to 26.15 are independent tests performed on separate samples that are not required to be part of the testsequence for tests of enclosures, 26.4. Non-		P

	metallic parts of enclosures shall be tested together with the whole enclosure or with a representative model of the enclosure.		
26.7.2	Test temperatures		-
	When, according to this standard or to the specific standards listed in Clause 1, tests have to be carried out as a function of the permissible upper and lower service temperature, these test temperatures shall be – for the upper temperature, the maximum service temperature (see 5.2) increased by at least 10 K but at most 15 K, – for the lower temperature, the minimum service temperature (see 5.2) reduced by at least 5 K but at most 10 K.		P
26.8	Thermal endurance to heat		-
	The thermal endurance to heat shall be determined by submitting the enclosures or parts of enclosures in non-metallic materials, on which the integrity of the type of protection depends, to tests according to Table 15.		P
26.9	Thermal endurance to cold		-
	The thermal endurance to cold shall be determined by submitting the enclosures and parts of enclosures of non-metallic materials, on which the type of protection depends, to storage for 24 h 02+ in an ambient temperature corresponding to the minimum service temperature reduced according to 26.7.2.		P
26.10	Resistance to light		-
26.10.1	Test procedure		P
	The test shall be made on six test bars of standard size (80 ± 2) mm × (10 ± 0,2) mm × (4 ±0,2) mm according to ISO 179. The test bars shall be made under the same conditions as those used for the manufacture of the enclosure concerned; these conditions are to be stated in the test report of the electrical equipment.		-
26.10.2	Acceptance criteria		P
	The evaluation criterion is the impact bending strength in accordance with ISO 179. The impact bending strength following exposure in the case of an impact on the exposed side shall be at least 50 % of the corresponding value measured on the unexposed test pieces. For materials whose impact bending strength cannot be determined prior to exposure because no		-

	rupture has occurred, not more than three of the exposed test bars shall be allowed to break.		
26.11	Resistance to chemical agents for Group I electrical equipment		P
	The non-metallic enclosures and non-metallic parts of enclosures shall be submitted to tests of resistance to the following chemical agents: – oils and greases; – hydraulic liquids for mining applications.		-
26.12	Earth continuity		P
	The material from which the enclosure is manufactured may be tested as a complete enclosure, part of an enclosure, or as a sample of the material from which the enclosure is made, provided that the relevant critical dimensions of the sample are the same as those of the enclosure.		-
26.13	Surface resistance test of parts of enclosures of non-metallic materials		P
	The surface resistance shall be tested on the parts of enclosures if size permits, or on a test piece comprising a rectangular plate with dimensions in accordance with Figure 5. The test piece shall have an intact clean surface. Two parallel electrodes are painted on the surface, using a conducting paint with a solvent which has no significant effect on the surface resistance.		-
26.14	Measurement of capacitance		P
26.14.1	General		-
	The test shall be carried out on a fully assembled sample of the electrical equipment. The sample need not have been previously subjected to the tests for enclosures. The sample shall be conditioned in a climatic conditioning chamber for at least 1 h at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) % RH. The sample under test shall be placed on an unearthed metal plate that significantly exceeds the area of the test sample. If the sample requires support, it may be held in position with clamps or pliers (preferably made of plastic), but shall not be held by hand. Other electrical equipment shall be kept as far as possible from the test sample. Connection leads shall be as short as possible. The positions of the samples are to be such that the exposed metallic test point being measured is as close as possible to the unearthed metal plate without contacting the plate. However, if		P

	the external metal part is in electrical contact with internal metal parts, it is necessary to measure the capacitance in all orientations of the equipment to ensure that the maximum capacitance has been determined.		
26.14.2	Test procedure		-
	The capacitance between each exposed metallic part on the test sample and the metal plate is to be measured. Connect the negative measurement lead of the capacitance meter to the unearthed metal plate. The positive measurement lead of the capacitance meter should be kept as far as possible from the metal plate.		P
26.15	Verification of ratings of ventilating fans		-
	For Group I equipment, the applicable requirements of EN 1710 shall be applied.		P
26.16	Alternative qualification of elastomeric sealing O-rings		-
	The thickness t0 of the sealing ring is measured at (20 ± 5) °C temperature. The ring is then compressed as intended in the complete equipment enclosure or in the test fixture.		P
27	Routine tests		-
	The manufacturer shall also carry out any routine tests required by any of the standards listed in Clause 1 which were used for the examination and testing of the equipment.		P
28	Manufacturer's responsibility		-
28.1	Conformity with the documentation		P
	The manufacturer shall carry out the verifications or tests necessary to ensure that the electrical equipment produced complies with the documentation.		-
28.2	Certificate		P
	The manufacturer shall prepare, or have prepared, a certificate confirming that the equipment is in conformity with the requirements of this standard along with its other applicable parts and additional standards mentioned in Clause 1. The certificate can relate to Ex equipment or an Ex Component.		-
28.3	Responsibility for marking		P
	By marking the electrical equipment in accordance with Clause 29, the manufacturer attests on his own responsibility that – the electrical equipment has been constructed in accordance with the applicable requirements		-

	of the relevant standards in safety matters, – the routine verifications and routine tests in 28.1 have been successfully completed and that the product complies with the documentation.		
29	Marking		P
29.1	Applicability		-
	It is essential that the system of marking indicated below only be applied to electrical equipment or Ex Components which comply with the applicable standards for the types of protection listed in Clause 1.		P
29.2	Location		-
	The electrical equipment shall be legibly marked on a main part on the exterior of the equipment and shall be visible prior to the installation of the equipment.		P
29.3	General		-
	The marking shall include the following: a)the name and address of the manufacturer; b)the manufacturer's type identifi cation; c) a serial number, except for – connection accessories (cable glands, blanking element, thread adaptor and bushings); – very small electrical equipment on which there is limited space; (The batch number can be considered to be an alternative to the serial number.) d) the name or mark of the certificate issuer and the certificate reference in the following form: the last two figures of the year of the certificate followed by a "." followed by a unique four character reference for the certificate in that year; BS EN 60079-0:2012+A11:2013 – 79 – IEC 60079-0 © 2011 h the name and address of the manufacturer;i the manufacturer's type identifi cation; e) if it is necessary to indicate specific conditions of use, the symbol "X" shall be placed after the certificate reference. An advisory marking may appear on the equipment as an alternative to the requirement for the "X" marking; NOTE 2 The advisory marking may be a specific reference to a specific instruction document containing the detailed information.		P

	NOTE 3 The manufacturer should ensure that the requirements of the specific conditions of use are passed to the purchaser together with any other relevant information. f) the specific Ex marking for explosive gas atmospheres, see 29.4, or for explosive dust atmospheres, see 29.5. The Ex marking for explosive gas atmospheres and explosive dust atmospheres shall be separate and not combined; See 29.13 for an alternative system of marking that permits some elements of the markings described in 29.4 or 29.5 to be combined, resulting in a more concise Ex marking. g) any additional marking prescribed in the specific standards for the types of protection concerned, as in Clause 1.		
29.4	Ex marking for explosive gas atmospheres		-
	The Ex marking shall include the following: a) the symbol Ex, which indicates that the electrical equipment corresponds to one or more of the types of protection which are the subject of the specific standards listed in Clause 1; b) the symbol for each type (or level) of protection used:		P
29.5	Ex marking for explosive dust atmospheres The Ex marking shall include the following: a) the symbol Ex, which indicates that the electrical equipment corresponds to one or more of the types of protection which are the subject of the specific standards listed in Clause 1;		-
29.6	Combined types (or levels) of protection		P
	Where different types (or levels) of protection are employed for different parts of electrical equipment or an Ex Component, the Ex marking shall include the symbols for all of the types (or levels) of protection employed. The symbols for the types of protection shall appear in alphabetical order, with small separating spaces. When associated apparatus is incorporated, the symbols for the type (or level) of protection, including the square brackets as applicable, shall follow those symbols of the type (or level) of protection for the equipment.		-
29.7	Multiple types of protection		P

	Equipment may be designed using multiple types of protection so that it is suitable for installation in different ways, using the appropriate installation requirements for the selected type of protection. For example, equipment which is designed to comply simultaneously with the equipment requirements for Ex i and also with the equipment requirements for Ex de; may be installed, according to the selection of the installer/user.		-
29.8	Ga equipment using two independent Gb types (or levels) of protection		-
	Where two independent types of protection, with EPL Gb, are employed for the same piece of electrical equipment in order to achieve EPL Ga, the Ex marking shall include the symbols for the two types (or levels) of protection employed with the symbols for the types (or levels) of protection joined with a “+”. See IEC 60079-26.		P
29.9	Ex Components		-
	include the following: a)the name and address of the manufacturer; b) the manufacturer's type identification; c) the symbol Ex; d) the symbol for each type (or level) of protection used; e) the symbol of the group of the electrical equipment of the Ex Component; f) the name or mark of the issuer of the certificate, and the number of the certificate; g) the symbol “U”; and NOTE 1 The symbol “X” is not used. h) the additional marking prescribed in the specific standard for the types of protection concerned, as in Clause 1. NOTE 2 Additional marking may be required by the standards for construction of the electrical equipment. i) As much of the remaining marking information per 29.4 or 29.5, as applicable, as can be accommodated.		P
29.10	Small equipment and small Ex Components		-
	On small electrical equipment and on Ex Components where there is limited space, a reduction in the marking is permitted. The following lists the minimum marking that is required on the equipment or Ex Component: a)h the name and address of the manufacturer;i h the name and address of the manufacturer; b) the manufacturer’s type identification. The		P

	type identification is permitted to be abbreviated or omitted if the certificate reference allows identification of the specific type; c) the name or mark of the issuer of the certificate, and the number of the certificate; and d) the symbol “X” or “U” (if appropriate); NOTE The symbols “X” and “U” are never used together. e) As much of the remaining marking information per 29.4 or 29.5, as applicable, as can be accommodated.		
29.11	Extremely small equipment and extremely small Ex Components		-
	In the case of extremely small electrical equipment and extremely small Ex Components where there is no practical space for marking, a marking intended to be linked to the equipment or Ex Component is permitted. This marking shall be identical to the marking of 29.3, 29.4, and 29.5, as applicable, shall appear on a label provided with the equipment or Ex Component for field installation adjacent to the equipment or Ex Component.		P
29.12	Warning markings		-
	Where any of the following warning markings are required on the equipment, the text as described in Table 16, following the word “WARNING,” may be replaced by technically equivalent text. Multiple warnings may be combined into one equivalent warning.		P
29.13	Alternate marking of equipment protection levels (EPLs)		-
	The marking of the equipment protection levels is shown by the use of an upper case letter for the specific explosive atmosphere for which the equipment is suitable and a lower case letter indicating the level. As an alternate to the marking given in 29.4 and 29.5 the ‘M’, ‘G’ and ‘D’ are not used as the specific explosive atmosphere is recognised by the marking of the equipment groups ‘I’ (mining), ‘II’ (gases and vapours) and ‘III’ (combustible dusts) and the lower case letter for the level is added to the type of protection where it does not already exist.	given in 29.4 and 29.5	P
29.14	Cells and batteries		-
	In accordance with 23.11, where it is necessary for the user to replace cells or batteries		P

	contained within an enclosure, the relevant parameters to allow correct replacement shall be legibly and durably marked on or inside the enclosure. Either the manufacturer's name and part number, or the electrochemical system, nominal voltage and rated capacity shall be included.		
29.15	Converter-fed electrical machines		-
	Electrical machines intended to be operated from a converter shall additionally be marked: • "For Converter Supply" • Speed range or frequency range over which the machine is intended to be operated • Minimum switching frequency • Type of torque application, e.g., variable torque, constant torque, constant power; or alternatively the operational torque limits • If applicable – Type identification of specific converter intended • If applicable – Type of converter intended, e.g., Pulse width modulated (PWM)		P

IEC 60079-18:2014
Explosive atmospheres - Part 18: Equipment protection by encapsulation “m”

4	General		-
4.1	Level of protection (equipment protection level (EPL).		-
	Electrical equipment with encapsulation “m” shall be either: a) level of protection “ma” (EPL “Ma, Ga, Da”), b) level of protection “mb” (EPL “Mb, Gb, Db”), or c) level of protection “mc” (EPL “Gc, Dc”). The requirements of this standard apply to all levels of protection for encapsulation “m” unless otherwise stated.		P
4.2	Additional requirements for levels of protection “ma” and “mb”		-
	Components without additional protection shall be used only if they cannot damage the encapsulation mechanically or thermally in the case of any fault conditions specified in this standard. Alternatively, where a fault of an internal component may lead to failure of encapsulation “m” due to increasing temperature, the requirements of 7.9 shall apply.		P
4.3	Additional requirements for level of protection “ma”		-
	The working voltage at any point in the circuit shall not exceed 1 kV.		P
4.4	Rated voltage and prospective short circuit current		-
	The rated voltage and the prospective short circuit current shall be specified such that the limiting temperature is not exceeded for the relevant level of protection “ma”, “mb” or “mc”.		P
5	Requirements for compounds		-
5.1	General		-
	The documentation shall specify the compound(s) used and the processing method(s),including measures to prevent the formation of voids. As a minimum, those properties of the compound(s) on which encapsulation “m” depends shall be provided. NOTE Proper selection of the compound allows for the expansion of components during operation and in the event of allowable faults.		P

5.2	Specification		-
	The specification for the compound shall include the following: a) the name and address of the manufacturer of the compound, b) the exact and complete reference of the compound and if relevant, percentage of fillers and any other additives, the mixture ratios and the type designation, c) if applicable, any treatment of the surface of the compound(s), for example varnishing, d) if applicable, to obtain correct adhesion of the compound to a component, any requirement for pre-treating of the component for example cleaning, etching, e) the dielectric strength in accordance with IEC 60243-1 at the maximum service temperature of the compound determined according to 8.2.2 a) if available; if not available, the requirements of 5.3.2 shall be applied, f) temperature range of the compound(s) (including maximum continuous operating temperature (COT) and minimum continuous operating temperature (COT)), g) in the case of “m” equipment where the compound is part of the external enclosure, the temperature index TI value as defined by IEC 60079-0. As an alternative to the TI, the relative thermal index (RTI-mechanical) may be determined in accordance with ANSI/UL 746B, h) the colour of the compound used for the test samples, where the compound specification will be influenced by changing the colour, i) Thermal conductivity if utilizing the alternative test method in 6.2.2.		P
5.3	Properties of the compound		-
5.3.1	Water absorption		-
	Either the compound shall be tested in accordance with 8.1.1 or, if this test is not performed,the certificate number for the equipment shall include the “X” suffix in accordance with the marking requirements of IEC 60079-0 and the specific conditions of use listed on the certificate shall detail the precautions necessary.		P
5.3.2	Dielectric strength		-
	Where the dielectric strength according to IEC 60243-1 at the maximum service temperature according to 8.2.2 a), of the compound is not		P

	available from the material manufacturer, a test shall be performed in accordance with 8.1.2.		
6	Temperatures		-
6.1	General		-
	The service temperature of the compound, determined in accordance with IEC 60079-0, shall not exceed the maximum value of the COT of the compound. The maximum surface temperature shall be determined in accordance with IEC 60079-0 under normal operation and under fault conditions as defined in 7.2.1. The “m” equipment shall be protected in such a way that encapsulation “m” is not adversely affected under these fault conditions.		P
6.2	Determination of the limiting temperatures		-
6.2.1	Maximum surface temperature The maximum surface temperature shall be determined using the test method given in 8.2.2 in accordance with the supply conditions specified in 4.4.		-
6.2.2	Temperature of the compound		-
	The hottest component shall be determined. The maximum temperature in the compound, adjacent to the hottest component, shall be determined using the test method given in 8.2.2 for normal operation. As an alternative the determination of the temperature of the hottest component in normal operation may be done by calculation, manufacturer’s specification or by testing the component under intended application conditions prior to encapsulating the component if the thermal conductivity of the compound is greater than that of air.		P
6.3	Temperature limitation		-
	Where the equipment may be subject to fault in accordance with 7.2.1, or where there is the possibility of an increased temperature, for example by an unfavourable input voltage in accordance with 7.2.1 or an unfavourable load, this shall be taken into account in determining the limiting temperatures. When a protective device is required to limit temperatures for safety reasons, it shall be an electrical or thermal device external to the equipment or directly integrated into the equipment, as defined in 7.9		P
7	Constructional requirements		-
7.1	General		-

	Where the compound forms part of the external enclosure it shall comply with the requirements of IEC 60079-0 for non metallic enclosures and non metallic parts of enclosures.		P
7.2	Determination of faults		-
7.2.	Fault examination		-
	When tested in accordance with IEC 60079-0, encapsulation “m” shall be maintained in the case of a) the most unfavourable output load and b) up to two internal countable faults for level of protection “ma”, and up to one internal countable fault for level of protection “mb”, taking into account 7.2.2, 7.2.3 and 7.2.4.		P
7.2.2	Components considered as not subject to fail		-
	For levels of protection “ma” and “mb” the following components shall be considered as not to fail if they are encapsulated according to the requirements of this standard, if they are suitable for the service temperature and if they are not operated at more than 2/3 of their rated voltage.		P
7.2.3	Isolating components		-
	The following components for the segregation of different circuits shall be considered to provide isolation and are not considered to fail across the segregation: • Galvanically separating components (e.g. optocouplers and relays), – if the rated insulation voltage conforms to 2U + 1 000 V r.m.s. 50+ % or 1 500 V r.m.s. whichever is greater (U is the sum of the rated r.m.s. voltages of both circuits), or – for a rated insulation voltage across the segregation of more than 60 V (sum of the rated r.m.s. voltages of both circuits), optocouplers and relays providing a double or reinforced insulation between the circuits per IEC 61140, or – complying with IEC 60079-11 for level of protection “ia” or “ib”.		P
7.3	Free space in the encapsulation		-
7.3.1	Group III “m” equipment		-
	The sum of the free spaces is not limited, but the volume of each individual free space is limited to 100 cm3. The thickness of the compound surrounding such free spaces shall meet the requirements of Table 2.		P
7.3.2	Group I and Group II “m” equipment		-
	The sum of the free spaces shall not exceed:		P

	• 100 cm3 for level of protection “mb” and “mc”; • 10 cm3 for level of protection “ma”.		
7.4	Thickness of the compound		-
7.4.1	“m” equipment		-
	The minimum thickness of compound surrounding the electrical components and circuit shall be in accordance with Table 4 and Figure 1. If solid insulation according to 7.2.4.3 is used in an enclosure with metallic walls as shown in Figure 1, the compound shall adhere to the wall.		P
7.4.2	Windings for electrical machines		-
	For electrical machines with windings in slots, the solid slot insulation shall have: a) for level of protection “ma” only, a minimum thickness of 0,1 mm and shall be extended by at least 5 mm beyond the end of the slot; b) for levels of protection “ma” and “mb”, the end of the slot and the end-winding shall be protected by the minimum thickness of compound in accordance with 7.4.1. A dielectric strength test in accordance with 8.2.4 shall be passed with a test voltage U = 2U + 1 000 V r.m.s. 50 + % with a minimum of 1 500 V a.c. at 48 Hz to 62 Hz.Varnish and similar coatings are not considered to be solid insulation.		P
7.4.3	Rigid, multi-layer printed wiring boards with through connections		-
	Multi-layer printed wiring boards complying with the requirements of IEC 62326-4-1, performance level C or IPC-A-600 and IPC-6012 or ANSI/UL 796.		P
7.5	Switching contacts		-
7.5.1	General		-
	Switching contacts shall be provided with an additional enclosure.		P
7.5.2	Level of protection “ma”		-
	This additional enclosure shall be in accordance with the requirements for hermetically-sealed devices as defined in IEC 60079-15 before encapsulation.		P
7.5.3	Level of protection “mb”		-
	This additional enclosure shall be made of inorganic material if the switched current exceeds 2/3 of the rated current specified by the manufacturer of the component or if the current exceeds 6 A.		P

7.6	External connections		-
	This test shall not be performed on Ex Components or where the enclosure of the “m” protected device does not serve as an external enclosure.		P
7.7	Protection of bare live parts		-
	Depending on the required EPL bare live parts that pass through the surface of the compound shall be protected by another type of protection as listed in IEC 60079-0 for the required EPL.		P
7.8	Cells and batteries		-
	When evaluating battery control arrangements with respect to the potential release of gas, the full range of operating temperatures, internal resistance and voltage capability shall be considered. It shall be assumed that batteries can become unbalanced, but cells with negligible resistance or voltage capability need not be taken into account.		P
7.9	Protective devices		-
	If relying on a protective device to limit maximum surface temperature when the “m” equipment is subjected to a single fault for level of protection “mb” or two faults for level of protection “ma”, the protective device shall be provided either external to the equipment or directly integrated into the equipment. Protective devices for level of protection “ma” shall be non resettable. Thermal protective devices for level of protection “mb” may be resettable. The protective device shall be capable of interrupting the maximum fault current of the circuit in which it is installed. The rated voltage of the protective device shall at least correspond to the working voltage of the circuit in which it is installed.		P
8	Type tests		-
8.1	Tests on the compound		-
8.1.1	Water absorption test		-
	When required by 5.3.1 the test shall be carried out on samples of the compound(s) used in “m” equipment. Three dry samples of the compound(s) shall be tested. The samples shall be circular with a diameter of 50 mm ± 1 mm and a thickness of 3 mm ± 0,2 mm. The samples shall be weighed then immersed for at least 24 h in water, at a temperature of 23 °C 2 0 + K. They shall then be taken out of the water, wiped dry and weighed again within 1 minute. The		P

	increase in mass shall not exceed 1 %.		
8.1.2	Dielectric strength test		-
	The sample shall be circular with a diameter of 50 mm ± 1 mm and a thickness of 3 mm ± 0,2 mm. The sample shall be symmetrically placed between electrodes 30 mm ± 1 mm in diameter, within a temperature controlled oven, set to achieve the maximum service temperature of the compound.		P
8.2	Tests on the apparatus		-
8.2.1	Test sequence		-
	The test sequence and number of samples are given in Annex B.		P
8.2.2	Maximum temperature		-
	sample of “m” equipment shall be subjected to a type test to ensure that: a) the temperature limits specified in 6.1 are not exceeded in normal operation; b) for level of protection “ma” and “mb” the maximum surface temperature is not exceeded under fault conditions as defined in 7.2.1. For “m” equipment without an external load, the test shall be carried out in accordance with the temperature measurements of IEC 60079-0 taking into account the supply conditions given in 4.4.		P
8.2.3	Thermal endurance test		-
	The test shall be carried out in accordance with IEC 60079-0. The temperature to be used as the reference service temperature for the test shall be either: a) the maximum surface temperature of the test sample under normal operation plus 20 K; or b) the maximum temperature at the component surface in the compound under normal operation, see 6.2.2.		P
8.2.4	Dielectric strength test		-
	The test shall be carried out on the following arrangements of circuits as applicable: a) between galvanically isolated circuits; b) between each circuit and all earthed parts; c) between each circuit and the surface of the compound or the non-metallic enclosure that, if necessary, can be clad with a conductive foil.		P
8.2.5	Cable pull test		-
	A further test sample shall be subjected to the cable pull test after conditioning according to 8.2.3.1 at the maximum temperature at the cable		P

	entry point.		
8.2.6	Pressure test for Group I and Group II electrical equipment		-
	For level of protection “ma” with any individual free spaces between 1 cm3 and 10 cm3 and level of protection “mb” with any individual free spaces between 10 cm3 and 100 cm3, two test samples shall be prepared with a pressure connection. Where there is more than one free space of a size requiring testing, the pressure test shall be carried out simultaneously in all those free spaces.		P
8.2.7	Test for resettable thermal protective device		-
	The function of the protective device shall be verified. This test shall be performed after the thermal endurance test. The device shall be capable switching its rated current ⩾ 5 000 times.		P
8.2.8	Sealing test for built-in protective devices		-
	The test is to be performed on five samples. With the test samples at an initial temperature of (25 ± 2) °C, they are suddenly immersed in water at a temperature of (50 ± 2) °C to a depth of not less than 25 mm for at least 1 min. The devices are considered to be satisfactory if no bubbles emerge from the samples during this test. Alternatively, a test can be applied where five samples are examined after the encapsulation to ensure that the compound has not entered the interior.		P
9	Routine verifications and tests		-
9.1	Visual inspections		-
	Each piece of “m” equipment shall be subjected to a visual inspection. No damage shall be evident, such as cracks in the compound, exposure of the encapsulated parts, flaking, inadmissible shrinkage, swelling, decomposition, failure of adhesion (separation of any adhered parts) or softening.		P
9.2	Dielectric strength test		-
	For circuits, which are accessible from the exterior the dielectric strength test shall be used to test the isolation of circuits from each other and from their environment. The test shall be carried out on these circuits in accordance with 8.2.4.		P
10	Marking		-
	In addition to the requirements of IEC 60079-0, the marking shall include:		P

	a) the rated voltage, b) the rated current, c) the prospective short-circuit current of the external electric supply source if less than 1 500 A, for example “Permitted supply short-circuit current: 500 A”. d) optionally, the permitted prospective short-circuit current of the external electrical supply if the equipment is designed for a short-circuit current of 1 500 A or more, for example “Permitted supply short-circuit current: 3 500 A”. e) for levels of protection “mb” and “mc” for EPL Db and EPL Dc, tested without a dust layer, the maximum surface temperature in degrees Celsius and the unit of measurement °C preceded with the letter “T”, (e.g. T 90 °C). For level of protection “ma” for EPL Da, and where appropriate for level of protection “mb” and “mc” for EPL Db and EPL Dc tested with dust layer, the maximum surface temperature TL shall be shown as a temperature value in degrees Celsius and the unit of measurement °C, with the layer depth L indicated as a subscript in mm, (e.g. T200 320 °C). In the case of Levels of Protection “mb” and “mc” for EPL Db or Dc, tested with a dust layer, The maximum surface temperature without the dust layer is not required to be marked. Alternatively the marking indicated in c), d) and e) above can be included in the instructions and the equipment shall be marked “X” to indicate this specific condition of use in accordance with the “specific conditions of use” marking requirements of IEC 60079-0.		

BS EN 60079-31:2014
Explosive atmospheres
Part 31: Equipment dust ignition protection by enclosure “t”

1	Scope		-
	This part of IEC 60079 is applicable to electrical equipment protected by enclosure and surface temperature limitation for use in explosive dust atmospheres. It specifies requirements for design, construction and testing of electrical equipment and Ex Components. This standard supplements and modifies the general requirements of IEC 60079-0. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirement of this standard takes precedence. This standard does not apply to dusts of explosives, which do not require atmospheric oxygen for combustion, or to pyrophoric substances. This standard does not apply to electrical equipment or Ex Components intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust.This standard does not take account of any risk due to an emission of flammable or toxic gas from the dust. Consideration of additional protective measures is required where the application of electrical equipment is in atmospheres, which can contain combustible dust as well as explosive gas, whether simultaneously or separately. Where the electrical equipment has to meet other environmental conditions, for example, protection against ingress of water and resistance to corrosion, additional measures can be necessary. The measures used should not adversely affect the integrity of the enclosure.		P
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. IEC 60079-0, Explosive atmospheres – Part 0:		P

	Equipment – General requirements IEC 60127 (all parts), Miniature fuses IEC 60691, Thermal-links – Requirements and application guide ISO 965-1, ISO general-purpose metric screw threads – Tolerances – Part 1: Principles and basic data		
3	Terms and definitions		-
	For the purposes of this document, the terms and definitions given in IEC 60079-0, as well as the following definitions, apply. NOTE Additional definitions applicable to explosive atmospheres can be found in IEC 60050-426.		P
3.1	dust ignition protection by enclosure “t”		-
	type of protection for explosive dust atmospheres where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures		P
3.2	joint		-
	place where the corresponding surfaces of two parts of an enclosure, or the conjunction of enclosures, come together		P
3.3	gasket		-
	compressible element provided in a joint to provide a degree of protection against the ingress of solid foreign objects and /or against ingress water/dust		P
4	General		-
4.1	Levels of protection		-
	Type of protection “t” is divided into three Levels of Protection based on the risk of the electrical equipment becoming an ignition source in an explosive dust atmosphere. Electrical equipment with dust ignition protection by enclosure “t” shall be either: • Level of Protection “ta” (EPL “Da”), or • Level of Protection “tb” (EPL “Db”), or • Level of Protection “tc” (EPL “Dc”). The construction and marking requirements apply to all electrical equipment, and in addition, the requirements for "ta" as given in 4.3 and the requirements for "tb" and "tc" as given in 4.4. Failure modes as defined in the industrial standard for particular components shall be taken into account when considering applicable fault conditions.		P
4.2	Equipment groups and ingress protection		-
	The relationship between the level of protection,		P

	the group, and ingress protection required is shown in Table 1.		
4.3	Requirements for electrical equipment with level of protection “ta”		P
4.3.1	Fault currency		-
	For Level of Protection “ta”, the electrical equipment shall be rated for connection to a circuit having a prospective short circuit current of not greater than 10 kA. Where the prospective short circuit current withstand is less than 10 kA, it shall be marked according to Clause 7.		P
4.3.2	Maximum surface temperature		-
	The requirements for maximum surface temperature for “ta” electrical equipment modify and supplement the requirements of IEC 60079-0. The marked maximum surface temperature shall be measured on the external surfaces of the enclosure and the surfaces of the internal components for electrical equipment with types of protection “ta” in accordance with 6.1.2. The highest of the measured temperatures shall be the basis for the maximum surface temperature marking.		P
4.3.3	Overpressure		-
	A positive internal pressure of 4 kPa shall be applied to the enclosure in accordance with 6.1.1.3 prior to the dust exclusion test.		P
4.3.4	Dust exclusion		-
	Dust exclusion by enclosure shall be carried out in accordance with 6.1.1.		P
4.3.5	Protective devices		-
4.3.5.1	General		-
	result of the temperature test of 6.1.2, a protective device is required. The protective device may be directly integrated into the electrical equipment or be external to the electrical equipment. Where the external protective device is not provided by the manufacturer as part of the electrical equipment, the marking shall include the symbol “X” in accordance with IEC 60079-0, and the specific Conditions of Use shall detail the required ratings and characteristics of the protective device. The protective device shall be capable of interrupting the maximum current of the circuit in which it is installed. If the electrical equipment contains		P

	a cell or battery and a control device is provided to prevent overheating of the cell or battery, the control device can also be considered as a protective device, provided it also protects the complete electrical equipment from exceeding the maximum surface temperature.		
4.3.5.2	Thermal protective devices		-
	The electrical equipment shall be protected by one or more integral thermal protective devices. Thermal protective devices shall not be of a self-resettable type and shall be duplicated unless conforming to IEC 60127 series or IEC 60691, in which case only one device is necessary. Alternatively, if it can be demonstrated that an overcurrent protective device can be used to provide thermal protection, such a device may be used. The overcurrent protective device used in this way shall conform to IEC 60127 series and shall be rated at not more than 170 % of the maximum rated current of the electrical equipment. When an overcurrent protective device is not also used as a thermal protective device, it is permissible for the overcurrent protective device to be located outside the enclosure of the electrical equipment. In this case,the marking shall include the symbol "X" in accordance with IEC 60079-0 and the Specific Conditions of Use shall detail the required overcurrent protective device.		P
4.3.6	Protection for arcing and sparking parts		-
	Where normally arcing and sparking parts are incorporated, these parts shall have a supplementary enclosure inside the main enclosure. This supplementary enclosure shall meet the requirements for a “tc” enclosure with the following exceptions and modifications: • The tests for thermal endurance to heat and cold and resistance to light, specified in 6.1.1.1 are not applicable, • A COT of at least equal to the lower specified ambient temperature and at least 20 K greater than the maximum service temperature applies for non-metallic materials, • The internal enclosure is not considered to have external surfaces and the resistance to ultraviolet light and electrostatic requirements are not applicable, • The requirements for threaded entries, hinges,		P

	and requirements for threaded fasteners are not applicable, • Resistance to impact test is performed in accordance with 6.1.1.2 with no hot and cold impact testing required, • Pressure test is not applied, • IP6X is required.		
4.4	Requirements for electrical equipment with Level of Protection “tb” and “tc”		-
4.4.1	Maximum surface temperature		-
	The marked maximum surface temperature shall be measured on the external surfaces of the enclosure for electrical equipment with types of protection “tb” and “tc" in accordance with 6.1.2 with no dust layer on the external surfaces under normal operating conditions.		P
4.4.2	Over pressure		-
	A positive internal pressure of 2 kPa shall be applied to the enclosure in accordance with 6.1.1.3 prior to the dust exclusion test, except where the design of the electrical equipment is such that gaskets or seals are physically constrained from moving e.g. an “O” ring in a groove.		P
4.4.3	Dust exclusion		-
	Dust exclusion by enclosure shall be carried out in accordance with 6.1.1.		P
5	Construction		-
5.1	Joints		-
5.1.1	General		-
	All joints in the structure of the enclosure, whether permanently closed or designed to be opened from time to time, shall fit closely together within the tolerances specified in the documentation. They shall be effectively sealed against the ingress of dust and shall comply with the following particular requirements and be subjected to the test of 6.1.1. The use of grease alone to maintain the integrity of the seal is not considered to satisfy this requirement.		P
5.1.2	Threaded joints		-
	• The number of engaged threads for all threaded joints, employing parallel threads without an additional seal or gasket shall be not less than five threads and with a tolerance quality of medium or fine according to ISO 965-1. Tapered threaded joints without an additional		P

	seal or gasket shall engage no less than 3½ threads. • Hinges shall not be used as a means of maintaining a seal unless: – correct compression of the gasket is achieved without causing undue movement, stress or distortion to the gasket; and – they are manufactured from materials that would not affect the correct function of the sealing means. Where necessary, a means shall be provided to facilitate correct alignment of mating parts.		
5.1.3	Gaskets and seals		-
	Gaskets under compression in joints may be used to ensure the effectiveness of the enclosure sealing. All gaskets and seals shall be of one-piece continuous construction, i.e. with an uninterrupted periphery. One-piece construction also includes gaskets and seals that have been permanently joined to form an uninterrupted periphery while maintaining the mechanical properties of the gasket or seal material. Unless all gaskets are secured to one face of the mating surface, either by adhesive or mechanically secured, the design of the enclosure shall be such that gaskets are correctly positioned. Except for a slight amount of lubricant necessary for assembly or an adhesive material on one side of the mating surfaces, joints using gaskets shall not be supplemented by the application of a sealant material. A flexible seal, e.g. a bellows, shall be such that it is not over-stressed at any point and shall be protected from external mechanical damage and secured at each end by mechanical means.These requirements do not apply to internal seals of cable glands.		P
5.1.4	Cemented joints		-
	Cemented joints shall not be used on mating parts which need to be removed to gain access to field wiring connections or in-service adjusting facilities.		P
5.1.5	Operating rods, spindles and shafts		-
	Openings in enclosures for rods, spindles or shafts shall have means to inhibit the ingress of dust, other than only grease or compound, both		P

	when the spindles, rods or shafts are in motion and when they are at rest.		
5.1.6	Windows		-
5.1.6.1	Windows employing a cemented joint		-
	A window design employing a cemented joint shall be such that it is cemented either directly into the wall of the enclosure so as to form with the latter an inseparable assembly, or into a frame such that the assembly can be replaced as a unit.		P
5.1.6.2	Windows employing a gasket joint		-
	A window design employing a gasket for dust exclusion shall be such that it is mounted directly in the wall or cover of the enclosure. No separate detachable frame is required.		P
5.2	Cable glands		-
	Cable glands, whether integral or separate, shall meet the requirements of IEC 60079-0, and the joint requirements of 5.1. In addition, cable glands shall meet the requirements of Table1. Where cable glands are separate: – threaded cable glands may be evaluated as Ex Equipment cable gland, – other cable glands may be evaluated only as an Ex Component, – cable glands with other thread forms to those specified here may be evaluated only with the electrical equipment or as an Ex component.		P
5.3	Entries		-
5.3.1	Plain entries The clearance holes for plain entries shall have a diameter not more than 0,7 mm greater than the nominal diameter of the entry thread gland or fitting. The inside of the enclosure shall be provided with sufficient room to attach a locknut to the gland or fitting.		-
5.3.2	Threaded entries		-
	Threaded entries are considered to meet the requirements for “ta”, “tb” and “tc” electrical equipment if they are: • Tapered threads with not less than 3 threads, • Parallel threads with not less than five threads, with a tolerance class of 6H or better according to ISO 965-1, • Parallel threads with less than five threads with a tolerance class of 6H or better according to ISO 965-1 and are provided with an additional seal or gasket. If the additional seal is not an integral part of the electrical equipment,		P

	the marking shall include the symbol "X" in accordance with IEC 60079-0 and the Specific Conditions of Use that detail the required use of a seal or gasket. An advisory marking of the requirement for a seal or gasket may appear on the electrical equipment as an alternative to the requirement for the “X” marking.		
6	Verification and tests		-
6.1	Type tests		-
6.1.1	Type tests for dust exclusion by enclosures		-
6.1.1.1	General		-
	Samples of the electrical equipment shall be subjected to the thermal endurance to heat, thermal endurance to cold and impact tests specified in IEC 60079-0, and the drop test if applicable. If there is a supplementary enclosure, there shall be no visual damage to the supplementary enclosure caused by the impact testing of the main enclosure. The supplementary enclosure may be removed during the thermal endurance to heat and thermal endurance to cold tests.		P
6.1.1.2	Impact test for supplementary enclosures		-
	The impact test for supplementary enclosures shall be performed in accordance with the resistance to impact test of IEC 60079-0 using the 1 kg mass dropped from a height of 0,2 m. There shall be no damage which invalidates the type of protection.		P
6.1.1.3	Pressure test		-
	A positive internal pressure of at least: • 4 ± 0,4 kPa for level of protection “ta” electrical equipment, or • 2 ± 0,2 kPa for level of protection “tb” and “tc” electrical equipment,shall be applied to the electrical equipment for 6010 s –0 . Any breathing or draining device may be sealed for this test if the pressure cannot be maintained. Any seals of the breathing or draining device shall be removed and the sample shall be subjected to the IP test in the condition it is in after the completion of this test. This test is not required for cable glands evaluated as Ex Equipment cable gland. If the design of the electrical equipment is such that any gaskets or seals are physically constrained from moving, e.g. an “O” ring in a groove, this test is not required to be conducted		P

	for “tb” and “tc” electrical equipment.		
6.1.1.4	IP test		-
	The samples shall be IP tested for the different level of protection as given in Table 1. Any grease in the joints shall be removed before the IP test is performed.		P
6.1.2	Thermal tests		-
	For “tb” and “tc” electrical equipment the test shall be carried out as described in IEC 60079-0. For “ta” electrical equipment, the maximum surface temperature test of IEC 60079-0 is conducted with the electrical equipment surrounded by at least a 200 mm layer of dust on all sides. The final temperature shall have been considered to have been reached when the rate of rise of temperature does not exceed 1 K/24h. This test is carried out as described in IEC 60079-0 and with one additional fault applied to the electrical equipment. NOTE See IEC 60079-0 for the specification of the test dust		P
6.2	Routine tests		-
	There are no additional routine tests required for levels of protection “ta”, “tb”, or “tc”.		P
7	Marking		-
	These requirements supplement the requirements of IEC 60079-0, which are applicable to Levels of Protection "ta", “tb” and “tc”. The symbol for the Type of Protection used shall be “ta”, “tb”, or “tc”, as applicable.		P

Table 1 – Level of Protection, equipment group and ingress protection (IP) relationship

Level of Protection	Group IIIC	Group IIIB	Group IIIA
"ta"	IP6X	IP6X	IP6X
"tb"	IP6X	IP6X	IP5X
"tc"	IP6X	IP5X	IP5X

Ingress protection shall be determined in accordance with degree of protection (IP) of enclosures as specified in IEC 60079-0 for level of protection "tb" and "tc". For Level of Protection "ta" the level of depression shall be increased to at least 4 KPa for a period of least 8 h. Any grease in the joints shall be removed before the IP test is performed.

When IP5X is required, all enclosures including rotating machines, shall satisfy the test and acceptance requirements of IP5X, as specified in IEC 60529.

EN 60079-1:2014
Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"

4.1	Level of protection (equipment protection level, EPL)		-
	Electrical equipment with flameproof enclosure “d” shall be one of the following: – level of protection “da” (EPL “Ma” or “Ga”); – level of protection “db” (EPL “Mb” or “Gb”); or – level of protection “dc” (EPL “Gc”). The requirements of this standard shall apply to all levels of protection unless otherwise stated.		P
4.2	Requirements for level of protection “da”		-
	Level of protection “da” is only applicable to catalytic sensors of portable combustible gas detectors.The following are the additional specific requirements for level of protection “da” that modify or supplement the requirements of this standard: – the maximum free internal volume shall not exceed 5 cm3; – the electrical conductors into the sensor shall employ a sealed joint, in accordance with Clause 6, directly in the wall of the enclosure; – the breathing device of the sensor shall comply with Clause 10, and shall be bonded to the wall of the enclosure so as to eliminate any gaps (such as cementing per 6.1 or sinter bonding) or shall be press-fitted to the wall of the enclosure with supplemental mechanical means of securing (such as swaging); – supplied by a circuit of Level of Protection “ia”, with a maximum dissipated power limited to 3,3 W for Group I and 1,3 W for Group II; and NOTE Catalytic elements operate normally at a high temperature. If the power dissipation is increased beyond normal operating levels, the element fails to an open circuit. Therefore, the required power limitation provides a limitation of the external surface temperature. – the non-transmission tests of 15.3 or 15.4.4 (if applicable) are modified to increase the number of non-transmission tests as shown in Table 1.		P
4.3	Requirements for level of protection “db”		-
	Other than specific requirements for level of protection “da” and “dc”, all other requirements of		P

	this standard shall apply to level of protection “db”.		
4.4	Requirements for level of protection “dc”		-
4.4.1	General		-
	The requirements for level of protection “dc” are applicable to electrical equipment and Ex components with electrical switching contacts and are found in 4.4.2 through 4.4.3.		P
4.4.2	Construction of “dc” devices		-
4.4.2.1	General		-
	The requirements of 4.4.2.2 through 4.4.2.5 replace those of Clause 5 through Clause 13. For equipment in level of protection “dc” that is intended for connection to field wiring, Clause 13 applies.		-
4.4.2.2	Free internal volume		-
	The free internal volume shall not exceed 20 cm3.		P
4.4.3	Tests for “dc” devices		-
	For devices involving level of protection “dc”, components shall be subjected to the type test specified in 15.5. After the test, the device or component shall show no visible signs of damage, no external ignition shall occur, and there shall be no failure to clear the arc when the switch contacts are opened.		P
5	Flameproof joints		-
5.1	General requirements		-
	shall comply, in the absence of pressure, with the appropriate requirements of Clause 5. The design of joints shall be appropriate to the mechanical constraints applied to them. The dimensions given in 5.2 to 5.5 specify the essential parameters of flamepaths. In instances where any of the following apply (for example, in order to comply with the test for non-transmission of an internal ignition): – the minimum length of the flameproof joint as stated by the documentation is greater than the relevant minimum; or – the maximum gap of the flameproof joint as stated by the documentation is less than the relevant maximum; or – the minimum number of threads engaged for the flameproof joint as stated by the documentation is more than the relevant minimum; NOTE 1 IEC 60079-0 defines the documentation as the documents that give a full and correct		P

	specification of the explosion safety aspects of the electrical equipment. the equipment certificate number shall include the "X" suffix in accordance with the marking requirements of IEC 60079-0 and the specific conditions of use listed on the certificate and in the instructions shall detail one of the following: – dimensions of the flameproof joints shall be detailed; or – specific drawing referenced that details the dimensions of the flameproof joints; or – specific guidance noted to contact the original manufacturer for information on the dimensions of the flameproof joints; or – specific indication that the flameproof joints are not intended to be repaired.		
5.2	Non-threaded joints		-
5.2.1	Width of joints (L)		-
	The width of joints shall not be less than the minimum values given in Tables 2 and 3. The width of joints for cylindrical metallic parts press-fitted into the walls of a metallic flameproof enclosure of a volume not greater than 2 000 cm3 may be reduced to 5 mm, if a) the design does not rely only on an interference fit to prevent the part being displaced during the type tests of Clause 15, b) the assembly meets the impact test requirements of IEC 60079-0, taking the worst-case interference fit tolerances into account, and c) the external diameter of the press-fitted part, where the width of the joint is measured, does not exceed 60 mm.		P
5.2.2	Gap (i)		-
	The gap, if one exists, between the surfaces of a joint shall nowhere exceed the maximum values given in Tables 2 and 3.The surfaces of joints shall be such that their average roughness Ra does not exceed 6,3 µm. NOTE Average roughness is derived from ISO 468. Determination can be made by visual comparison to a reference plate.		P
5.2.3	Spigot joints		-
	For the determination of the width L of spigot joints, one of the following shall be taken into account:		P
5.2.4	Holes in joint surfaces		-
	Where a plane joint or the plane part or partial cylindrical surface (see 5.2.6) of a joint is interrupted by holes intended for the passage of		P

	threaded fasteners for assembling the parts of a flameproof enclosure, the distance l to the edge of the hole shall be equal to or greater than.		
5.2.5	Conical joints		-
	Where joints include conical surfaces, the width of the joint and the gap normal to the joint surfaces shall comply with the relevant values in Table 2 and Table 3. The gap shall be uniform through the conical part. For electrical equipment of Group IIC, the cone angle shall not exceed 5°. NOTE The cone angle is taken to be the angle between the major axis of the cone and the surface of the cone.		P
5.2.6	Joints with partial cylindrical surfaces (not permitted for Group IIC)		-
	There shall be no intentional gap between the two parts (see Figure 9a). The width of the joint shall comply with the requirements of Table 2. The diameters of the cylindrical surfaces of the two parts forming the flameproof joint, and their tolerances, shall ensure compliance with the relevant requirements for the gap of a cylindrical joint as given in Table 2.		P
5.2.7	Flanged joints for acetylene atmospheres		-
	Flanged joints are only permitted for electrical equipment of Group IIC intended for use in explosive gas atmospheres containing acetylene provided all of the following conditions are met: – gap i ≤ 0,04 mm; – width L ≥ 9,5 mm; and – volume ≤ 500 cm3.		P
5.2.8	Serrated joints		-
	Serrated joints need not comply with the requirements of Tables 2 and 3 but shall have – at least five fully engaged serrations, – a pitch greater than or equal to 1,25 mm, and – an included angle of 60° (± 5°). Serrated joints shall only be used for joints that are fixed in place during operation.		P
5.3	Threaded joints		-
	Threaded joints shall comply with the requirements given in Tables 4 or 5.		P
5.4	Gaskets (including O-rings)		-
	If a gasket of compressible or elastic material is used, for example, to protect against the ingress of moisture or dust or against leakage of a liquid, it shall be applied as a supplement, that is to say neither be taken into account in the		P

	determination of the width of the flameproof joint nor interrupt it.		
5.5	Equipment using capillaries		-
	The capillaries shall either comply with the gap dimensions given in Table 2 or Table 3 for cylindrical joints using 0 as the diameter of the inner part, or when the capillaries do not conform to the gaps given in these tables, the equipment shall be evaluated in accordance with the test for non-transmission of an internal ignition given in 15.3.		P
6	Sealed joints		-
6.1	Cemented joints		-
6.1.1	General		-
	Parts of a flameproof enclosure may be cemented either directly into the wall of the enclosure so as to form with the latter an inseparable assembly, or into a metallic frame such that the assembly can be replaced as a unit without damaging the cement.		P
6.1.2	Mechanical strength		-
	Cemented joints are only intended to ensure the sealing of the flameproof enclosure of which they form a part. Arrangements shall be made in the construction so that the mechanical strength of the assembly does not depend upon the adhesion of the cement alone. Supplemental mechanical means of securing the cemented joint shall not be defeated by the opening of doors or covers that are intended to be opened during installation or maintenance.		P
6.1.3	Width of cemented joints		-
	The shortest path through a cemented joint from the inside to the outside of a flameproof enclosure of volume V shall be ≥ 3 mm if V ≤ 10 cm3 ≥ 6 mm if 10 cm3 < V ≤ 100 cm3 ≥ 10 mm if V > 100 cm3		P
6.2	Fused glass joints		-
6.2.1	General		-
	Fused glass joints are glass-to-metal joints formed by the application of molten glass into a metal frame that results in either a chemical or physical bond between the glass and the metal frame.		P
6.2.2	Width of fused glass joints		-
	The path through a fused glass joint from the inside to the outside of a flameproof enclosure shall be ≥ 3 mm.		P
7	Operating rods		-

	Where an operating rod passes through the wall of a flameproof enclosure, the following requirements shall be met: – if the diameter of the operating rod exceeds the minimum width of the joint specified in Tables 2 and 3, the width of the joint shall be at least equal to this diameter but without, however, having to exceed 25 mm;		P
8	Supplementary requirements for shafts and bearings		-
8.1	Joints of shafts		-
8.1.1	General		-
	Flameproof joints of shafts of rotating electrical machines shall be arranged so as not to be subject to wear in normal service.		P
8.1.2	Cylindrical joints		-
	Where a cylindrical joint contains grooves for the retention of grease, the region containing the grooves shall neither be taken into account when determining the width of a flameproof joint nor interrupt it (see Figure 17).		P
8.1.3	Labyrinth joints		-
	Labyrinth joints which do not comply with the requirements of Tables 2 and 3 may nevertheless be considered as complying with the requirements of this standard if the tests specified in Clauses 14 through 16 are satisfied.		P
8.1.4	Joints with floating glands		-
	The determination of the maximum degree of float of the gland shall take account of the clearance in the bearing and the permissible wear of the bearing as specified by the manufacturer. The gland may move freely radially with the shaft and axially on the shaft but the gland shall remain concentric with the shaft. A device shall prevent rotation of the gland.		P
8.2	Bearings		-
8.2.1	Sleeve bearings		-
	A flameproof joint of a shaft gland associated with a sleeve bearing shall be provided in addition to the joint of the sleeve bearing itself and shall have a width of joint at least equal to the diameter of the shaft but not exceeding 25 mm. If a cylindrical or labyrinth flameproof joint is used in a rotating electrical machine with sleeve bearings, at least one face of the joint shall be of non-sparking metal (for example, leaded brass) whenever the air gap between stator and rotor is greater than the minimum radial clearance k (see		P

	Figure 20) specified by the manufacturer. The minimum thickness of the nonsparking metal shall be greater than the air gap.		
8.2.2	Rolling-element bearings		-
	In shaft glands equipped with rolling-element bearings, the maximum radial clearance m (see Figure 20) shall not exceed two-thirds of the maximum gap permitted for such glands in Tables 2 and 3.		P
9	Light-transmitting parts		-
	For light-transmitting parts of other than glass, the requirements in Clause 19 of this standard apply.		P
10	Breathing and draining devices which form part of a flameproof enclosure.		-
10.1	General		-
	Breathing and draining devices shall incorporate permeable elements which can withstand the pressure created by an internal explosion in the enclosure to which they are fitted, and which shall prevent the transmission of the explosion to the explosive atmosphere surrounding the enclosure.		P
10.2	Openings for breathing or draining		-
	The openings for breathing or draining shall not be produced by deliberate enlargement of gaps of flanged joints.		P
10.3	Composition limits		-
	The composition limits of the materials used in the device shall be specified either directly or by reference to an existing applicable specification.		P
10.4	Dimensions		-
	The dimensions of the breathing and draining devices and their component parts shall be specified.		P
10.5	Elements with measurable paths		-
	Interstices and measurable lengths of path need not comply with the values given in Tables 2 and 3, provided that the elements pass the tests of Clauses 14 through 16.		P
10.6	Elements with non-measurable paths		-
	Where the paths through the elements are not measurable (for example, sintered metal elements), the element shall comply with the relevant requirements of Annex B.		P
10.7	Removable devices		-
10.7.1	General		-
	If a device can be dismantled, it shall be		P

	designed to avoid reduction or enlargement of the openings during re-assembly.		
10.7.2	Mounting arrangements of the elements		-
	The breathing and draining elements shall be sintered, or fixed by other suitable methods: – either directly into the enclosure to form an integral part of the enclosure; or – in a suitable mounting component, which is clamped or screwed into the enclosure so that it is replaceable as a unit.		P
10.8	Mechanical strength		-
	The device and its guard, if any, shall, when mounted normally, pass the test for resistance to impact of IEC 60079-0.		P
10.9	Breathing devices and draining devices when used as Ex components		-
10.9.1	General		-
	In addition to 10.1 through 10.7 inclusive, the following requirements shall apply to breathing and draining devices which are evaluated as Ex components.		P
10.9.2	Mounting arrangements of the elements and components.		-
	The breathing and draining elements shall be sintered or cemented in accordance with Clause 6, or fixed by other methods into a suitable mounting part to form the mounting component.		P
10.9.3	Type tests for breathing and draining devices used as Ex components.		-
	Attachment of the sample device under test shall be made on the end of the test rig enclosure in the same manner as it would normally be mounted on a flameproof enclosure. The test shall be performed on the sample.		P
10.9.4	Ex component certificate		-
	The Ex component certificate shall include, in the schedule of limitations, the details necessary to properly select a breathing or draining device for attachment to a type tested flameproof enclosure. The schedule of limitations shall include, as a minimum, the following: a) the maximum recorded surface temperature obtained during the type test corrected to 40 °C, or to the higher marked ambient; b) service temperature range for non-metallic enclosures and non-metallic parts of enclosures;		P
11	Fasteners and openings		-
11.1	Fasteners accessible from the outside and necessary for the assembly of the parts of a		P

	flameproof enclosure shall – for Group I, be special fasteners complying with the requirements of IEC 60079-0, with the head shrouded or provided in counter-bored holes or inherently protected by the equipment construction, – for Group II, be special fasteners complying with the requirements of IEC 60079-0.		
11.2	Fasteners of plastic material or light alloys are not permitted.		P
11.3	In carrying out the type tests specified in Clause 15, the screws and nuts specified by the manufacturer shall be used.		P
11.4	Studs shall comply with 11.3 and shall be securely fixed, i.e. they shall be welded or riveted or permanently attached to the enclosure by another equally effective method.		P
11.5	Fasteners shall not pass through the walls of a flameproof enclosure unless they form a flameproof joint with the wall and are non-detachable from the enclosure, for example by welding, riveting or an equally effective method.		P
11.6	In the case of holes for screws or studs which do not pass through the walls of flameproof enclosures, the remaining thickness of the wall of the flameproof enclosure shall be at least one-third of the nominal diameter of the screw or stud with a minimum of 3 mm.		P
11.7	When screws are fully tightened into blind holes in enclosure walls, with no washer fitted, at least one full thread shall remain free at the base of the hole.		P
11.8	Openings, other than for entry devices, may be provided in the wall of a flameproof enclosure for optional installation of devices such as pushbuttons. If the optional device is not installed in the resulting opening at the time of manufacturing, the opening shall be closed by a device such that the flameproof properties of the enclosure are maintained.		P
11.9	Threaded doors or covers shall be additionally secured by means of a hexagon socket set screw, or some equally effective method.		P
12	Materials		-
12.1	Flameproof enclosures shall withstand the relevant tests prescribed in Clauses 14 through 16.		P
12.2	When several flameproof enclosures are assembled together, the requirements of this standard apply to each of them separately, and		P

	in particular to the partitions separating them and to all the bushings and operating rods which pass through the partitions.		
12.3	When an enclosure contains several intercommunicating compartments, or when it is subdivided because of the disposition of the internal parts, pressures and rates of rise of pressure greater than normal may be produced.		P
12.4	When cast iron is used, the material shall be not less than the quality 150.		P
	NOTE Cast iron quality 150 is defined by ISO 185.		P
12.5	Liquids shall not be used in flameproof enclosures when there is a risk of producing oxygen, or an explosive mixture, more hazardous than that for which the enclosure was designed, by the decomposition of these liquids. They may, however, be used if the enclosure passes the tests prescribed in Clauses 14 through 16 for the type of explosive mixture produced; however, the surrounding explosive atmosphere shall be appropriate to the group for which the electrical equipment is constructed.		P
12.6	In flameproof enclosures of Group I, insulating materials subjected to electrical stresses capable of causing arcs in air and which result from rated currents of more than 16 A (in switching equipment such as circuit-breakers, contactors, isolators) shall have a comparative tracking index equal to or greater than CTI 400 M.		P
13	Entries for flameproof enclosures		-
13.1	General		-
	The flameproof properties of the enclosure are not altered if all entries meet the relevant requirements given in this clause and shall be one of the following: – internal metric threads with a tolerance class of 6H or better according to ISO 965-1 and ISO 965-3, and any chamfer or undercut is limited to a maximum depth of 2 mm from the external wall surface; – external metric threads with a threaded part of at least 8 mm in length and at least eight full threads. If the thread is provided with an undercut, then a non-detachable and noncompressible washer or equivalent device shall be fitted to ensure the required length of thread engagement;		P
13.2	Threaded holes		-
	Threaded holes in enclosures to facilitate cable		P

	glands or conduit entries shall have the thread type and size identified, for example M25 or 1/2NPT. This may be accomplished by – marking of the specific thread type and size adjacent to the hole in accordance.		
13.3	Non-threaded holes (for Group I only)		-
	For Group I only, plain (non-threaded) holes to facilitate the installation of cable glands or bushings shall state the following in the documents defining the electrical equipment: a) minimum width of joint “L” and maximum gap for flanged, cylindrical or spigot joint; b) mounting stud or bolt specifications (such as diameter, thread, tensile strength, length, head type, torque) and position (such as pitch circle diameter and spacing); c) keeper plate, and associated fastener(s), dimension requirements and position (such as quantity, spacing of the holes to support the gland, diameter, coupling means); d) minimum tensile strength requirement of materials, fasteners, etc. (based on equipment reference pressure);		P
13.4	Cable glands		-
	Cable glands, whether integral or separate, shall meet the requirements of this standard, the relevant requirements of Annex C and create, on the enclosure, the joint widths and gaps prescribed in Clause 5.		P
13.5	Conduit sealing devices		-
13.6	Plugs and sockets and cable couplers		-
	If attached on a flameproof enclosure plugs and sockets shall be constructed and mounted so that they do not alter the flameproof properties of the enclosure on which they are mounted, even when the two parts of the plugs and sockets are separated.		P
13.7	Bushings		-
	Bushings, whether integral or separate, shall meet the requirements of this standard, the relevant requirements of Annex C and create, on the enclosure, the joint widths and gaps prescribed in Clause 5.		P
13.8	Blanking elements		-
	If, at the determination of the manufacturer, entries provided in a flameproof enclosure are not intended to always be used, they shall be closed by Ex equipment or Ex component blanking elements so that the flameproof properties of the enclosure are maintained.		-

14	Verification and tests		-
	The requirements of IEC 60079-0 concerning verification and testing are, for the type of protection flameproof enclosure “d”, supplemented by the following requirements.		P
15	Type tests		-
15.1	General		-
	The type tests shall be carried out in the following sequence: a) determination of the explosion pressure (reference pressure) in accordance with 15.2.2 on one sample that may or may not have been subjected to the tests of enclosures in accordance with IEC 60079-0; b) overpressure test in accordance with 15.2.3 on one of the samples which has been subjected to the tests of enclosures in accordance with IEC 60079-0; and c) test for non-transmission of an internal ignition in accordance with 15.3 on one sample that may or may not have been subjected to the tests of enclosures in accordance with IEC 60079-0 and may or may not have been subjected to the test from b) above.		P
15.2	Tests of ability of the enclosure to withstand pressure		-
	The object of these tests is to verify that the enclosure can withstand the pressure of an internal explosion.		P
15.3	Test for non-transmission of an internal ignition		-
15.3.1	General		-
	Gaskets (see 5.4) shall be removed. While some grease may remain, excessive grease shall be removed (see 5.1). The enclosure is placed in a test chamber. The same explosive mixture is introduced into the enclosure and the test chamber at the same pressure.		P
15.3.2	Electrical equipment of Groups I, IIA and IIB		-
	Alternatively, if the gaps of a test specimen do not fulfil the above condition, one of the following methods may be used for the type test for non-transmission of an internal ignition:		P
15.4	Tests of flameproof enclosures with breathing and draining devices		-
15.4.1	General		-
	The tests in accordance with 15.4.2 to 15.4.4 inclusive shall be carried out in the following order on a sample after the impact strength test of 10.7.2.		P
15.4.2	Tests of ability of the enclosure to withstand		-

	pressure		
	The tests shall be made in accordance with 15.2 with the following additions and modifications.		P
15.5	Tests for “dc” devices		-
	Any elastomeric or thermoplastic material which is used for the purpose of sealing a cover which is intended to be opened in service, or which is unprotected against mechanical or environmental damage, shall be removed wholly or partially before the device or component is subjected to the type test when such removal will result in a more onerous test. NOTE Any remaining non-metallic parts of the enclosure will have been subjected to the thermal endurance tests.		P
16	Routine tests		-
16.1	General		-
16.1.1	The following routine tests are intended to ensure that the enclosure withstands the pressure and also that it contains no holes or cracks connecting to the exterior. The routine tests include an overpressure test made according to one of the methods described for the type tests in 15.2.3. For equipment intended for use at an ambient temperature below –20 °C, a pressure test at normal ambient temperature is sufficient.		P
16.1.2	The routine overpressure test may be made by the first method even when the overpressure type test has been made by the second method.		P
16.1.3	When the second method is chosen, the routine test consists of		P
	– an explosion test with, inside and outside the enclosure, the appropriate explosive mixture specified in 15.2.2 (for the determination of explosion pressure) at 1,5 times atmospheric pressure, or – an explosion test with the appropriate explosive mixture specified in 15.2.2 (for the determination of explosion pressure) at 1,5 times atmospheric pressure inside of the enclosure, followed by a non-transmission test with explosive mixtures as specified in 15.3.2.2 or 15.3.3.2 (test for non-transmission of an internal ignition, with enlarged gaps) inside and outside the enclosure at atmospheric pressure, or		P
16.2	Enclosures not incorporating a welded construction		-
	For enclosures that do not incorporate welded constructions, routine overpressure tests are		P

	not required under either of the following conditions: – for volumes less than or equal to 10 cm3; or – for volumes greater than 10 cm3, and when the prescribed type test has been made at a static pressure equal to four times the reference pressure.		
16.3	Enclosures incorporating a welded construction		-
	For enclosures or parts of enclosures that incorporate a welded construction, the integrity of the welded construction shall be verified by means of routine overpressure testing.		P
16.4	Bushings not specific to one flameproof enclosure		-
16.5	Acceptance criteria		-
	The routine tests are considered satisfactory if a) the enclosure withstands the pressure without suffering permanent deformation of the joints or damage to the enclosure, and b) when the test has been made by the dynamic followed by the static tests of 16.1.3, there is no leakage through the walls of the enclosure or, if tested dynamically, there is no transmission of an internal ignition.		P
16.6	Batch testing		-
	Where the routine overpressure testing is replaced by a batch test according to the following criteria based on ISO 2859-1[5]: – For a production batch up to 100, a sampling of 8 needs to be tested at 1,5 times the reference pressure with no failures. – For a production batch from 101 to 1 000, a sampling of 32 needs to be tested at 1,5 times the reference pressure with no failures. – For a production batch from 1 001 up to 10 000, a sampling of 80 needs to be tested at 1,5 times the reference pressure with no failures. – Batches above 10 000 must be subdivided into smaller batches.		P
17	Switchgear for Group		-
17.1	General		-
	Group I flameproof enclosures which are to be opened from time to time on site, for example, for adjustment purposes or for resetting of protection relays, and which contain remotely operated switching devices in which circuits can be made or broken by a separate influence (e.g. mechanical, electrical, electro-optical, pneumatic, acoustic, magnetic, or thermal) when		P

	this influence is not applied manually to the equipment itself, and which produce in-service arcs or sparks capable of igniting an explosive mixture, shall comply with the following requirements.		
17.2	Means of isolation		-
	All accessible conductors, except those of intrinsically safe circuits complying with IEC 60079-11 and those for bonding or earthing, shall be capable of being isolated from the supply before the opening of the flameproof enclosure.		P
17.3	Doors or covers		-
	These doors or covers shall be mechanically interlocked with an isolator so that a) the enclosure retains the properties of the flameproof enclosure, type of protection “d”, as long as the isolator is closed, and b) the isolator can only be closed when these doors or covers ensure the properties of the flameproof enclosure, type of protection “d”.		P
18	Lampholders and lamp caps		-
18.1	General		-
	The following requirements apply to lampholders and lamp caps which together have to form a flameproof enclosure, type of protection “d”, so that they may be used in luminaires of increased safety, type of protection “e”.		P
18.2	Device preventing lamps working loose		-
	The device which prevents lamps working loose, required in IEC 60079-7, increased safety “e”, may be omitted for threaded lampholders provided with a quick-acting switch in a flameproof enclosure, type of protection “d”, which breaks all poles of the lamp circuit before contact separation.		P
18.3	Holders and caps for lamps with cylindrical caps		-
	Holders and caps for tubular fluorescent lamps shall comply with the dimensional requirements of data sheets Fa6 of IEC 60061		P
18.4	Holders for lamps with threaded caps		-
	The threaded part of the holder shall be of a material which is resistant to corrosion under the likely conditions of service.		P
19	Non-metallic enclosures and non-metallic parts of enclosures		-
19.1	General		-
	The following requirements apply to non-metallic enclosures and non-metallic parts of enclosures, except for		P

	a) sealing rings of cable glands or conduit sealing devices, for which Clause C.3 applies, b) cemented joints for which Clause 6 applies, and c) non-metallic parts on which the type of protection does not depend.		
19.2	Resistance to tracking and creepage distances on internal surfaces of the enclosure walls		-
	When an enclosure or a part of an enclosure of non-metallic material serves directly to support live bare parts, the resistance to tracking and the creepage distances on the internal surfaces of the walls of the enclosure shall comply with the requirements of IEC 60079-7 or IEC 60079-15, as applicable. However, for enclosures of electrical equipment of Group I which may be subjected to electrical stresses capable of producing arcs in air and which result from rated currents of more than 16 A, the requirements stated in 12.6 shall be observed.		P
19.3	Requirements for type tests		-
	For non-metallic enclosures and non-metallic parts of enclosures, the type tests in this standard are modified in accordance with the following sequence: a) determination of the explosion pressure (reference pressure) in accordance with 15.2.2 on one sample that may or may not have been subjected to the tests of enclosures in accordance with IEC 60079-0; b) overpressure test in accordance with 15.2.3 on all of the samples which has been subjected to the tests of enclosures in accordance with IEC 60079-0; c) test for non-transmission of an internal ignition in accordance with 15.3 on one sample subjected to the tests indicated in b) above; d) test of erosion by flame in accordance with 19.4 on the sample subjected to the tests indicated in c) above; and e) test for non-transmission of an internal ignition in accordance with 15.3 on the sample subjected to the tests indicated in d) above.		P
19.4	Test of erosion by flame		-
	This test only applies to enclosures of volume greater than 50 cm3 and of which the flameproof joints have at least one face of plastic material. The sample shall be prepared as described in		P

	15.3, except that gaps of flanged joints and plane parts of spigot joints shall be set to a value between 0,1 mm and 0,15 mm. For bushings which are common to two adjacent flameproof enclosures, the test shall be carried out in the enclosure giving the worst conditions.		
20	Marking		-
20.1	General		-
	Flameproof enclosures "d" shall be marked in accordance with IEC 60079-0 with the following additional marking for the type of protection "d“: – For Level of Protection "da", complying with the requirements of 4.2 the marking shall include "da". – For Level of Protection "db", complying with the requirements of 4.3 the marking shall include "db".		P
20.2	Caution and warning markings		-
	Where any of the following markings are required, the text as described in Table 14, following the word “CAUTION” or “WARNING,” may be replaced by technically equivalent text or symbols. Multiple warnings may be combined into one equivalent warning.		P
20.3	Informative markings		-
	Where any of the following markings are required, the text as described in Table 15 may be replaced by technically equivalent text or symbols. Multiple warnings may be combined into one equivalent warning.		P

Table 1 – Number of non-transmission tests for level of protection "da"

Equipment group	Number of non-transmission tests
I	50
IIA	50
IIB	50
IIC	50 hydrogen and 50 acetylene

Table 2 – Minimum width of joint and maximum gap for enclosures of Groups I, IIA and IIB

Type of joint		Minimum width of joint L mm	Maximum gap mm														
			For a volume cm³ $V \leq 100$			For a volume cm³ $100 < V \leq 500$			For a volume cm³ $500 < V \leq 2\,000$			For a volume cm³ $2\,000 < V \leq 5\,750$			For a volume cm³ $V > 5\,750$		
			I	IIA	IIB	I	IIA	IIB	I	IIA	IIB	I	IIA	IIB	I	IIA	IIB
Flanged, cylindrical or spigot joints		6	0,30	0,30	0,20	–	–	–	–	–	–	–	–	–	–	–	–
		9,5	0,35	0,30	0,20	0,35	0,30	0,20	0,08	0,08	0,08	–	0,08	0,08	–	0,08	–
		12,5	0,40	0,30	0,20	0,40	0,30	0,20	0,40	0,30	0,20	0,40	0,20	0,15	0,40	0,20	0,15
		25	0,50	0,40	0,20	0,50	0,40	0,20	0,50	0,40	0,20	0,50	0,40	0,20	0,50	0,40	0,20
Cylindrical joints for shaft glands of rotating electrical machines with:	Sleeve bearings	6	0,30	0,30	0,20	–	–	–	–	–	–	–	–	–	–	–	–
		9,5	0,35	0,30	0,20	0,35	0,30	0,20	–	–	–	–	–	–	–	–	–
		12,5	0,40	0,35	0,25	0,40	0,30	0,20	0,40	0,30	0,20	0,40	0,20	–	0,40	0,20	–
		25	0,50	0,40	0,30	0,50	0,40	0,25	0,50	0,40	0,25	0,50	0,40	0,20	0,50	0,40	0,20
		40	0,60	0,50	0,40	0,60	0,50	0,30	0,60	0,50	0,30	0,60	0,50	0,25	0,60	0,50	0,25
	Rolling-element bearings	6	0,45	0,45	0,30	–	–	–	–	–	–	–	–	–	–	–	–
		9,5	0,50	0,45	0,35	0,50	0,40	0,25	–	–	–	–	–	–	–	–	–
		12,5	0,60	0,50	0,40	0,60	0,45	0,30	0,60	0,45	0,30	0,60	0,30	0,20	0,60	0,30	0,20
		25	0,75	0,60	0,45	0,75	0,60	0,40	0,75	0,60	0,40	0,75	0,60	0,30	0,75	0,60	0,30
		40	0,80	0,75	0,60	0,80	0,75	0,45	0,80	0,75	0,45	0,80	0,75	0,40	0,80	0,75	0,40

Constructional values rounded according to ISO 80000-1 [3] should be taken into consideration when determining the maximum gap.

NOTE In this edition of IEC 60079-1, two new columns were introduced into Table 2 that subdivided the previous single "$V > 2\,000$" column into a "$2\,000 < V < 5\,750$" column and a "$V > 5\,750$" column. This subdivision was made to introduce maximum gap dimensions for flanged, cylindrical or spigot joints with minimum width of joint L of 9,5 mm where none existed previously. Specifically, it introduced the values "0,08" for Groups IIA and IIB when volume is "$2\,000 < V < 5\,750$" and "0,06" for Group IIA when volume is "$V > 5\,750$". These maximum gap values and the associated volume subdivisions are based on historic US Class I, Division 1 explosion-proof gap dimensions documented in ANSI/UL 1203 [4].

Table 3 – Minimum width of joint and maximum gap for Group IIC enclosures

Type of joint		Minimum width of joint L mm	Maximum gap mm			
			For a volume cm³ $V \leq 100$	For a volume cm³ $100 < V \leq 500$	For a volume cm³ $500 < V \leq 2\,000$	For a volume cm³ $V > 2\,000$
Flanged joints[a]		6	0,10	–	–	–
		9,5	0,10	0,10	–	–
		15,8	0,10	0,10	0,04	–
		25	0,10	0,10	0,04	0,04
Spigot joints (Figure 2a)	$e \geq 6$ mm $d \geq 0,5\,L$ $L = e + d$ $f \leq 1$ mm	12,5	0,15	0,15	0,15	–
		25	0,18[b]	0,18[b]	0,18[b]	0,18[b]
		40	0,20[c]	0,20[c]	0,20[c]	0,20[c]
Cylindrical joints Spigot joints (Figure 2b)		6	0,10	–	–	–
		9,5	0,10	0,10	–	–
		12,5	0,15	0,15	0,15	–
		25	0,15	0,15	0,15	0,15
		40	0,20	0,20	0,20	0,20
Cylindrical joints for shaft glands of rotating electrical machines with rolling element bearings		6	0,15	–	–	–
		9,5	0,15	0,15	–	–
		12,5	0,25	0,25	0,25	–
		25	0,25	0,25	0,25	0,25
		40	0,30	0,30	0,30	0,30

[a] Flanged joints are permitted for explosive mixtures of acetylene and air only in accordance with 5.2.7.

[b] Maximum gap of cylindrical part increased to 0,20 mm if $f < 0,5$ mm.

[c] Maximum gap of cylindrical part increased to 0,25 mm if $f < 0,5$ mm.

The constructional values rounded according to ISO 80000-1 should be taken into consideration when determining the maximum gap.

Table 4 – Cylindrical threaded joints

Pitch	≥ 0,7 mm [a]
Thread form and quality of fit	Medium or fine tolerance quality according to ISO 965-1 and ISO 965-3[b]
Threads engaged	≥ 5
Depth of engagement	
Volume ≤ 100 cm³	≥ 5 mm
Volume >100 cm³	≥ 8 mm

[a] Where the pitch exceeds 2 mm, special manufacturing precautions may be necessary (for example, more threads engaged) to ensure that the electrical equipment can pass the test for non-transmission of an internal ignition which is prescribed in 15.3.

[b] Cylindrical threaded joints which do not conform with ISO 965-1 and ISO 965-3 in respect of thread form or quality of fit are permitted if the test for non-transmission of an internal ignition, prescribed in 15.3, is passed, when the width of the threaded joint specified by the manufacturer is reduced by the amount specified in Table 9.

Table 5 – Taper threaded joints [a, c]

Threads provided on each part	≥ 5 [b]

[a] Internal and external thread shall have the same nominal size.

[b] Threads shall conform to the NPT requirements of ANSI/ASME B1.20.1 and shall be made-up wrench tight. External threaded parts shall be provided with:

1) an effective thread length not less than the "L2" dimension; and

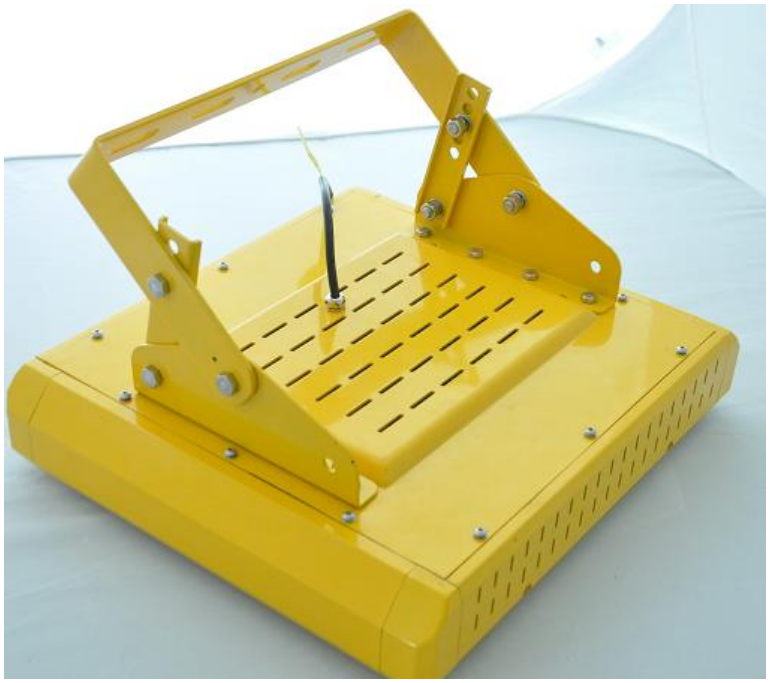
2) if a shoulder is provided, a length not less than the "L4" dimension between the face of the shoulder and end of the thread.

Internal threads shall gauge at "flush" to "2 turns large" using an L1 plug-gauge.

[c] Where the tapered threaded joint consists of both the internal and external threaded parts with at least 4,5 fully engaged threads, the requirements of footnote b in this table need not be applied.

NOTE See Annex C for tapered thread requirements applicable to flameproof entry devices.

Photo of Sample



EC Declaration of conformity

Council Directive 2014/34/EU on Equipment for Explosive Atmospheres

SHENZHEN CARY TECHNOLOGY CO,.LTD
Building 1, No.29 Industrial West Zone, Makan Road, Xili, Nanshan, Shenzhen, China

Certify that the product described is in conformity with the Equipment for Explosive Atmospheres 2014/34/EU as mended

Product Name :

LED Explosion Flood Luminaire

Item No:

KLE1029-300,KLE1029-250,KLE1029-200,KLE1029-180,KLE1029-150, KLE1029-120,KLE1029-100,KLE1029-80,KLE1029-50,KLE1029-30

The product has been assessed by the application of the following standards:

EN 60079-0:2012+AC:2014,EN 60079-1:2014
EN 60079-18:2014, BS EN 60079-31:2014

Issue place and date

Company stamp and Signature of authorized personnel

Notice

1. This test report shall be invalidation without the cachet of the testing laboratory.
2. This copied report shall be invalidation without sealed the cachet of the testing laboratory.
3. This report shall be invalidation without tester signature.
4. This altered report shall be invalidation.
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6. The test results presented in this report relate only to the object tested.