



Safety

WITH WERMA -PRODUCTS





WERMA
SIGNALTECHNIK

Safe is safe

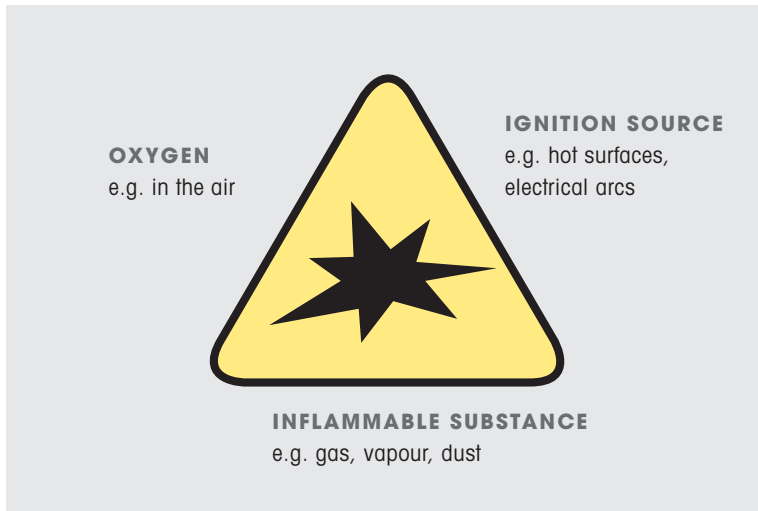
For over 50 years WERMA has been manufacturing electrical signal devices at the highest level. Thanks to our superior quality standards, consistent innovation, continuous product development and excellent service, we have grown steadily over the last few years.

As leaders in this field of technology, we owe it to our customers to continue to build on this success. We therefore invest 10 % of our expenditure in new developments. In this way, we can offer our customers innovative products which are at the leading edge of technological development in every detail.

In accordance with this philosophy, we have made it our goal to improve the range of products designed for deployment in hazardous areas. It is here in particular, where danger is at its greatest, that responsibility of those warning of such dangers is at its greatest.



The explosion



An explosion is an extremely rapid oxidation or decomposition reaction accompanied by a sudden rise in temperature and pressure.

As a rule, in order for explosions to occur in atmospheric air, three elements need to be present in the right proportions:

- Inflammable substance
- Oxygen (air)
- Ignition source

Inflammable substances

Inflammable refers to the capacity of substances to react with oxygen releasing light and/or thermal energy. Flammability is a precondition for combustion and thus for an explosion.

INFLAMMABLE GASES

A gas is a substance that exists in a gaseous state at a temperature of 20°C.

Many inflammable gases, especially those employed for heating or in technical applications, are compounds containing carbon and/or hydrogen. In combination with (air) oxygen an explosive atmosphere can form.

INFLAMMABLE LIQUIDS

Liquid refers to substances existing in a fluid state. Dependent on the characteristics of the substance, liquids display different evaporation rates.

Evaporation refers to the transition to the gaseous state, a process that occurs without the necessity of the liquid being brought to boiling point. This can occur, depending on the liquid, at relatively low temperatures.

This means that a potentially explosive atmosphere can build at the surface of inflammable liquids at room temperature and below.

INFLAMMABLE SOLIDS

If inflammable solids occur in the form of dust, fibres or lint, these can react with the atmospheric oxygen resulting in an explosion.

In addition to the chemical properties of the substance, the size of the solid particles, i.e. the increase in the total surface area the finer the particles, plays an important role.

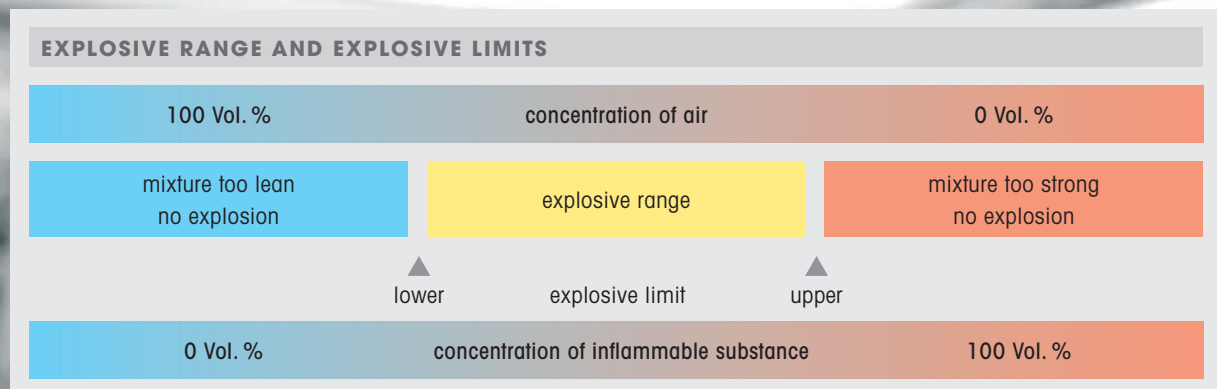
The required ignition energy is generally greater than in the case of gases and vapours.

Examples of inflammable dust include wood dust, cereal dust, flour dust, inflammable plastic dust, sugar dust and inflammable metal dust.



Oxygen

A potentially explosive atmosphere can only occur when the concentration of the inflammable substance in the air lies within a specific range. This „explosive range“ is defined by the upper and lower explosive limits. If the concentration of inflammable substance is too low, no explosion will take place, i.e. the concentration is too „lean“. If the concentration is too high there is not sufficient oxygen for an explosion to occur, i.e. the mixture is too „strong“.



Ignition sources

The ignition source provides the explosive mixture with the energy required to ignite. In the following the relevant types of ignition sources encountered in practice are discussed in more detail:

HOT SURFACES

Hot surfaces can ignite an explosive atmosphere when their temperature reaches the ignition temperature of the explosive mixture. Hot surfaces are sometimes intended (e.g. heating), however they also occur as a result of faults (overheating of bearings and brakes, defective electronic components etc.).

FLAMES AND HOT GASES

Flames are one of the most effective ignition sources. During normal operation flames and hot gases occur within combustion engines and analysis equipment. However within hazardous areas flames must be avoided or at the least, securely enclosed.

MECHANICALLY GENERATED SPARKS

Sparks can be generated during grinding, cutting and beating processes, depending on the combination of materials. By selecting a suitable combination of materials the occurrence of mechanically generated sparks can be reduced, e.g. by avoiding the combination of light metal and steel.

CHEMICAL REACTIONS

As a result of exothermic chemical reactions substances can be heated and thus form ignition sources. A raised ambient temperature or a defective heat dissipation can accelerate this process.

ELECTRIC SPARKS

Electric sparks can be generated by the opening and closing of electric circuits, even at low voltages. These sparks must generally be considered ignition sources.

DISCHARGE OF STATIC ELECTRICITY

Due to charge separation, sparks can be generated by static electricity, without the necessity of an electric voltage source. This also needs to be taken into consideration with non-electrical devices and components.

Charge separation occurs for example when devices are not earthed or when they are included in a potential equalization. Electrostatic discharges can occur when wearing synthetic textiles, rolling paper and plastic foil and during pneumatic conveyance procedures (e.g. the extraction of bulk material, filling a silo).

HIGH ENERGY WAVES

Wave energy entering explosive atmospheres is also principally to be considered as an ignition source. Ultrasound, electromagnetic radiation in the form of radio waves, IR radiation and visible light, as well as ionising radiation can, with sufficient intensity, ignite an explosive mixture. In practice, these dangers extend from mobile telephones, radio telephonic devices, barcode scanners and light barriers etc.

ADIABATIC COMPRESSION

Adiabatic compression refers to an increase in pressure without an accompanying exchange of heat with the environment. The energy required for the reduction in volume is transformed into heat. A practical application of adiabatic compression is the self ignition of a diesel engine. The explosive fuel-air mixture is compressed in a cylinder until it is heated beyond the ignition temperature and ignites.

Avoidance of explosions – explosion protection

Three types of explosion protection can be defined:

EXPLOSION PROTECTION		
Primary explosion protection: Preventing explosive atmospheres	Secondary explosion protection: Preventing ignition sources	Tertiary explosion protection: Reducing the effects of an explosion

PRIMARY EXPLOSION PROTECTION

Primary explosion protection entails preventing the formation of an explosive atmosphere by, for example adequate ventilation.

SECONDARY EXPLOSION PROTECTION

Secondary explosion protection measures come into effect when an explosive atmosphere still arises despite primary explosion protection: they entail the elimination of ignition source.

TERTIARY EXPLOSION

PROTECTION METHODS

These minimise the effects of an explosion by a pressure-resistant building construction or the controlled transference of the explosion pressure.

Legal basis

The member states of the European Community have set forth new EU directives in order to harmonise different European rulings. This means that national regulations come into line with the regulations within the European Community.

The basis of this new legal system is the European Directive 94/9/EG dated 23.03.04.

This directive defines the obligations of the manufacturer in the form of the demands made upon products manufactured encompassing electrical, and non-electrical devices as well as protection systems. This directive is also known as the ATEX Directive in reference to its original working title „Atmosphère explosible“. As it is anchored in Article 95 of the EU Agreement its usual title is ATEX 95.

All new production devices used in areas with explosion hazard must conform to the ATEX directive as from 01.07.03. All devices and machines installed before this date may still be used.

The basic standards for the construction of electrical devices are set forth in the EU Standards of the European Norm Organisation.

MANUFACTURERS' OBLIGATIONS

Safety in areas with explosive hazard can only be guaranteed through close cooperation between all those involved. Cooperation between manufacturer, installer, operator, tester and the relevant controlling body is essential.

The essential obligations for the manufacturer of explosion – protected components are:

- The devices must be marked according to their field of use.
- The Conformity Assessment Procedure demands that all requirements for the awarding of the CE mark be fulfilled.
- Devices in category 1 and 2 are to be tested by a third party testing authority to ensure that all regulations are observed. This is to be confirmed by the Type Examination Certificate.
- The manufacturer must prove that he has an appropriate quality management system.

Areas liable to explosion: Zone definitions

Areas liable to explosion as defined by §2 of the ElexV are areas in which a dangerous explosive atmosphere could arise due to site and production-induced conditions.

In order to judge the degree of protective measures required, the areas liable to explosion are classified by the operator into zones according to the probability of an explosive atmosphere arising.

DEFINITIONS OF THE ZONES ACC. TO §2 PARA 4 OF ELEXV (96)

AREAS LIABLE TO EXPLOSION CAUSED BY FLAMMABLE GASES		
Zone 0	Zone 1	Zone 2
Areas in which a dangerous explosive atmosphere consisting of a mixture of air and gas, vapours or mist is present continually, over a longer period or on a frequent basis.	Areas in which a dangerous explosive atmosphere consisting of gases, vapours or mist is to be expected from time to time.	Areas in which a dangerous explosive atmosphere consisting of gases, vapours or mist is not to be expected and where it does arise then in all probability only rarely and for a short period of time.

AREAS LIABLE TO EXPLOSION CAUSED BY FLAMMABLE DUST		
Zone 20	Zone 21	Zone 22
Sectors in which a dangerous explosive atmosphere consisting of a mixture of dust and air exists and is present continually, over a longer period or on a frequent basis.	Sectors in which a dangerous explosive atmosphere consisting of a mixture of dust and air is to be expected from time to time.	Sectors in which a dangerous explosive atmosphere caused by clouds of dust is not to be expected and where it does actually arise then in all probability only rarely and for a short period of time.

Devices groups and categories

Electrical components for use in areas liable to explosion can be divided in two groups:

- Group I: Electrical components in pit gas endangered mining areas.
- Group II: Electrical components in other areas liable to explosion from gas or dust.

The device groups are further divided up into device categories according to the Ex Zone:

AREAS LIABLE TO EXPLOSION CAUSED BY FLAMMABLE DUST							
Group I		Group II					
Category M		Category 1		Category 2		Category 3	
		G	D	G	D	G	D
1	2	(Gas)	(Dust)	(Gas)	(Dust)	(Gas)	(Dust)
		Zone 0	Zone 20	Zone 1	Zone 21	Zone 2	Zone 22

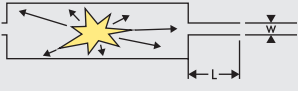

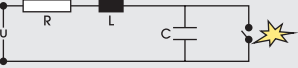

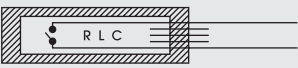
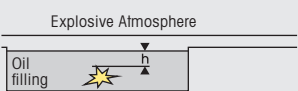
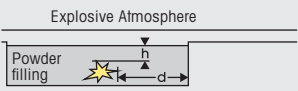
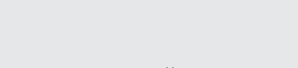
Specific construction regulations for explosion - protected components in gaseous or vaporous atmospheres

Specific construction regulations prevent electrical components in an explosion-endangered gas or vapour area from becoming a source of ignition. The so-called protection types guarantee safety depending on the Ex zone even in the event of malfunction.

The general requirements for electrical components in gas explosion endangered areas are defined in the IEC 60079-0, EN60079-0 (formerly: EN 5001 4) Part 0: general requirements.



Protection types in gas or vapour areas

FLAME-PROOF ENCLOSURES „d“		
IEC 60079-1, EN 60079-1 (previously: EN 50018)		If an explosion occurs inside a pressure resistant encapsulated housing it cannot break through into the surrounding atmosphere.
Electrical apparatus for explosive gas atmospheres – Part 1: Flameproof enclosures „d“		
INCREASED SAFETY „e“		
IEC 60079-7, EN 60079-7 (previously: EN 50019)		Sparks and high temperatures cannot arise due to increased safety measures.
Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety „e“		
INTRINSIC SAFETY „i“		
IEC 60079-11, EN 50020		The electric current in the circuit is kept so low that fiery sparks, arcing or temperatures cannot occur.
Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety „i“		
PRESSURIZED APPARATUS „p“		
IEC 60079-2, EN 60079-2 (previously: EN 50016)		The formation of a potentially explosive atmosphere inside housings is prevented by maintaining a positive internal pressure of inert gas in relation to the surrounding atmosphere.
Electrical apparatus for explosive gas atmospheres – Part 2: Pressurized enclosures „p“		
ENCAPSULATION „m“		
IEC 60079-18, EN 60079-18 (previously: EN 50028)		Components which could ignite an explosive atmosphere are encapsulated in a casting compound to prevent the ignition of the surrounding atmosphere.
Electrical apparatus for explosive gas atmospheres – Part 18: encapsulation „m“		
OIL IMMERSION „o“		
IEC 60079-6, EN 50015		Parts that could constitute an ignition source are completely surrounded by a protective liquid (e.g. oil), in order to prevent the ignition of an outer explosive atmosphere.
Electrical apparatus for explosive gas atmospheres – Part 6: Oil-immersion „o“		
POWDER FILLING „q“		
IEC 60079-5, EN 50017		Parts that could constitute an ignition source are securely arranged and completely surrounded by a filling material in order to prevent the ignition of an outer explosive atmosphere.
Electrical apparatus for explosive gas atmospheres – Part 5: Powder filling „q“		
PROTECTION TYPE „n“		
IEC 60079-15, EN 60079-15 (previously: EN 50021)		Special types of protection for applications in zone 2 and 22 include a description of the different protection principles. Dependent on the protection principle, the type of protection is supplemented with the addition of a letter.
Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test and marking of type of protection „n“ electrical apparatus		

Explosion groups for gases and vapours

The inflammability and ignition penetration power of an explosive mix is a substance typical property. Explosive mixtures of air with inflammable gases or vapours are divided into explosion groups I and II.

Explosion group I applies to pit gas and is only relevant in mining. In explosion group II the inflammability of the gases increases from IIA to IIB and IIC.

These define different criteria e.g with protection type „d-pressure-resistant encapsulation (EN 60079-1)“ the requisite slit types and dimensions, or, as in protection type „i-Intrinsic safety (EN 50020)“, the maximum permissible electricity and current ratings. No further sub-division of explosion group II is made for other protection types.

EXPLOSION GROUP	INFLAMMABLE SUBSTANCE	INFLAMMABILITY	
I	Methane		
II	A	Aceton, Petrol, Methanol, Propane, Toluene	relatively low
	B	Ethylene	
	C	Hydrogen, Acetylene	high



Temperature classification of gases and vapours

The ignition temperature of explosive gaseous and vaporous atmospheres is influenced by several different factors. These include size, type and consistence of the heated surface.

The IEC 60079-4 contains a „Method of determining ignition temperature“ with which it is possible to calculate the lowest practically possible temperature with relative accuracy.

Gases and vapours are classified here in in temperature classes. Explosion-protected components are laid out in their surface temperature so that ignition cannot occur on the surface.

IGNITION TEMPERATURES AND TEMPERATURE CLASSES OF EXPLOSION-ENDANGERED GAS AND VAPOUR ATMOSPHERES		
Temperature classes	Ignition temperature of the explosion-labile gas / vapour atmosphere	Permissible surface temperature of the component
T1	≥ 450°C	≤ 450°C
T2	≥ 300...≤ 450°C	≤ 300°C
T3	≥ 200...≤ 300°C	≤ 200°C
T4	≥ 135...≤ 200°C	≤ 135°C
T5	≥ 100...≤ 135°C	≤ 100°C
T6	≥ 85 ...≤ 100°C	≤ 85°C

The explosion group and the temperature class define which gas and vapour atmospheres the explosion protected equipment may be deployed in.

The following table indicates the temperature class and explosion group for a series of inflammable gases and vapours:

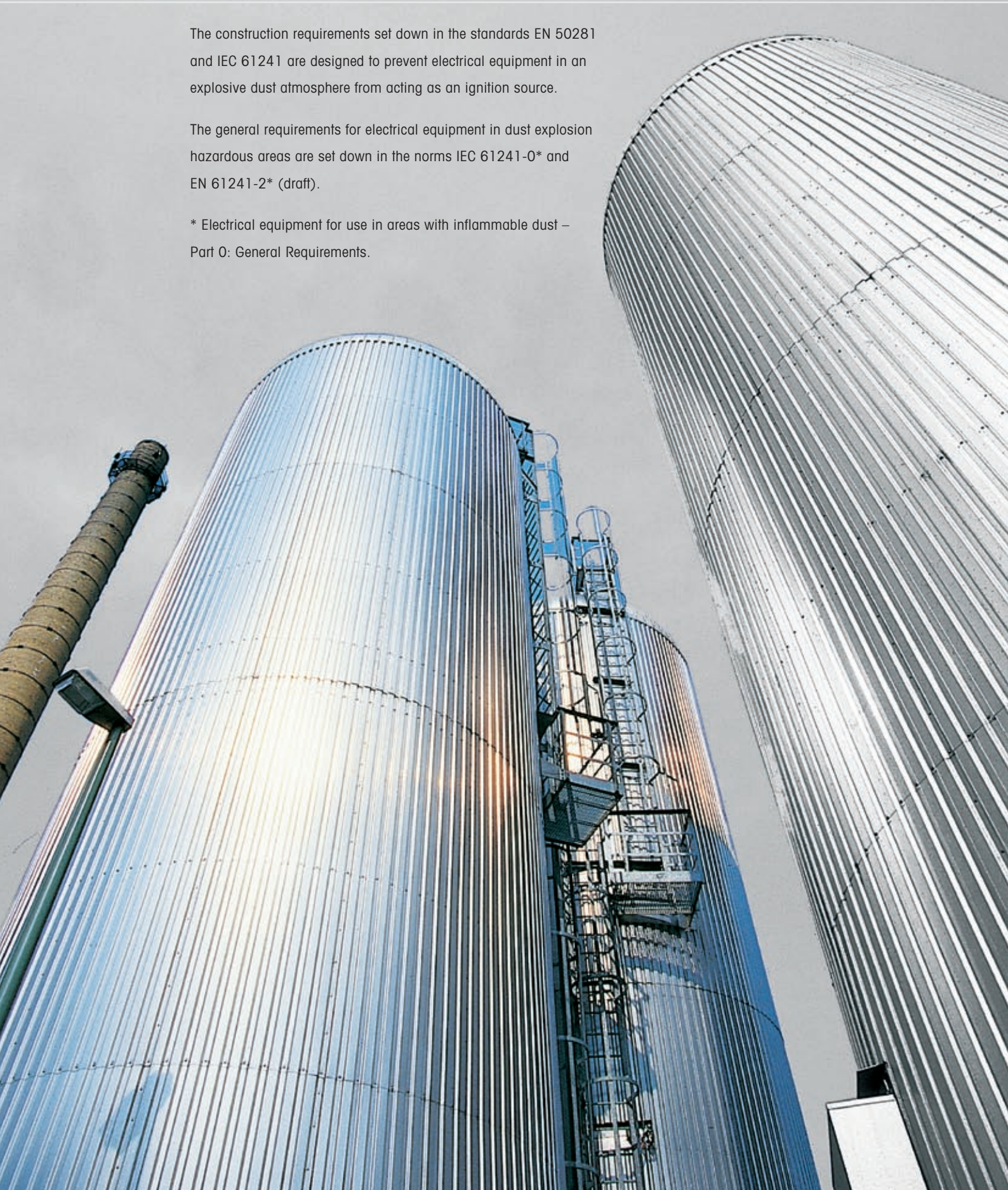
EXPLOSION GROUP AND TEMPERATURE CLASSIFICATION OF GASES AND VAPOURS						
Temperature Classification	T1	T2	T3	T4	T5	T6
Explosion Group						
I	Methane	–	–	–	–	–
IIA	Ammonia Methane Ethane Propane	Ethyl alcohol Cyclohexane n-Butane n-Hexane	Petrol Diesel	Acetaldehyd Ethyl aether	–	–
IIB	Town gas	Ethylene	Hydrosulfide Ethylene glykol	–	–	–
IIC	Hydrogen	Acetylene	–	–	–	Coal disulfide

Special construction requirements for explosion protected equipment in dust atmospheres

The construction requirements set down in the standards EN 50281 and IEC 61241 are designed to prevent electrical equipment in an explosive dust atmosphere from acting as an ignition source.

The general requirements for electrical equipment in dust explosion hazardous areas are set down in the norms IEC 61241-0* and EN 61241-2* (draft).

* Electrical equipment for use in areas with inflammable dust – Part 0: General Requirements.



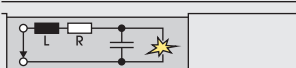
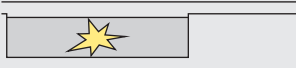


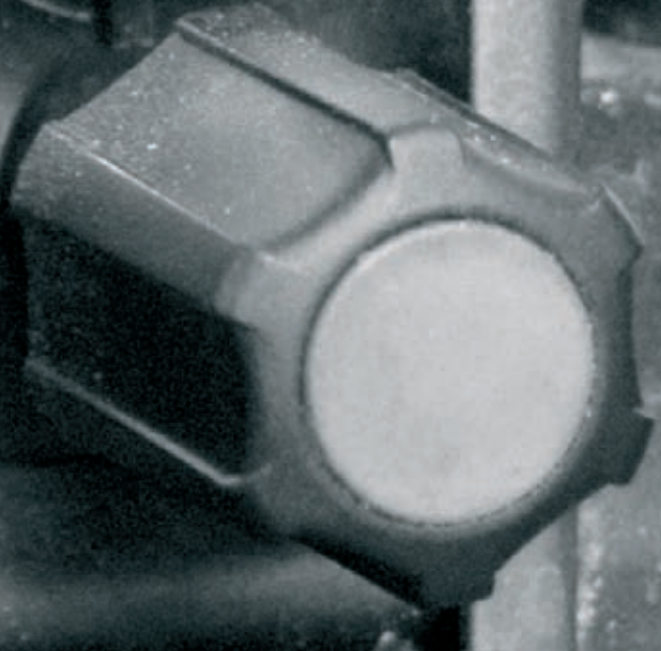
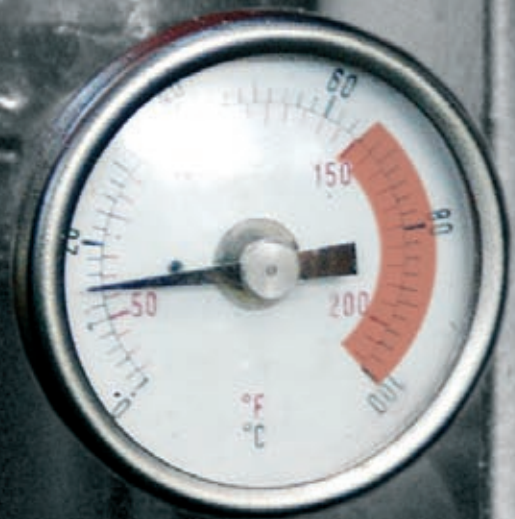
Protection types in dust areas

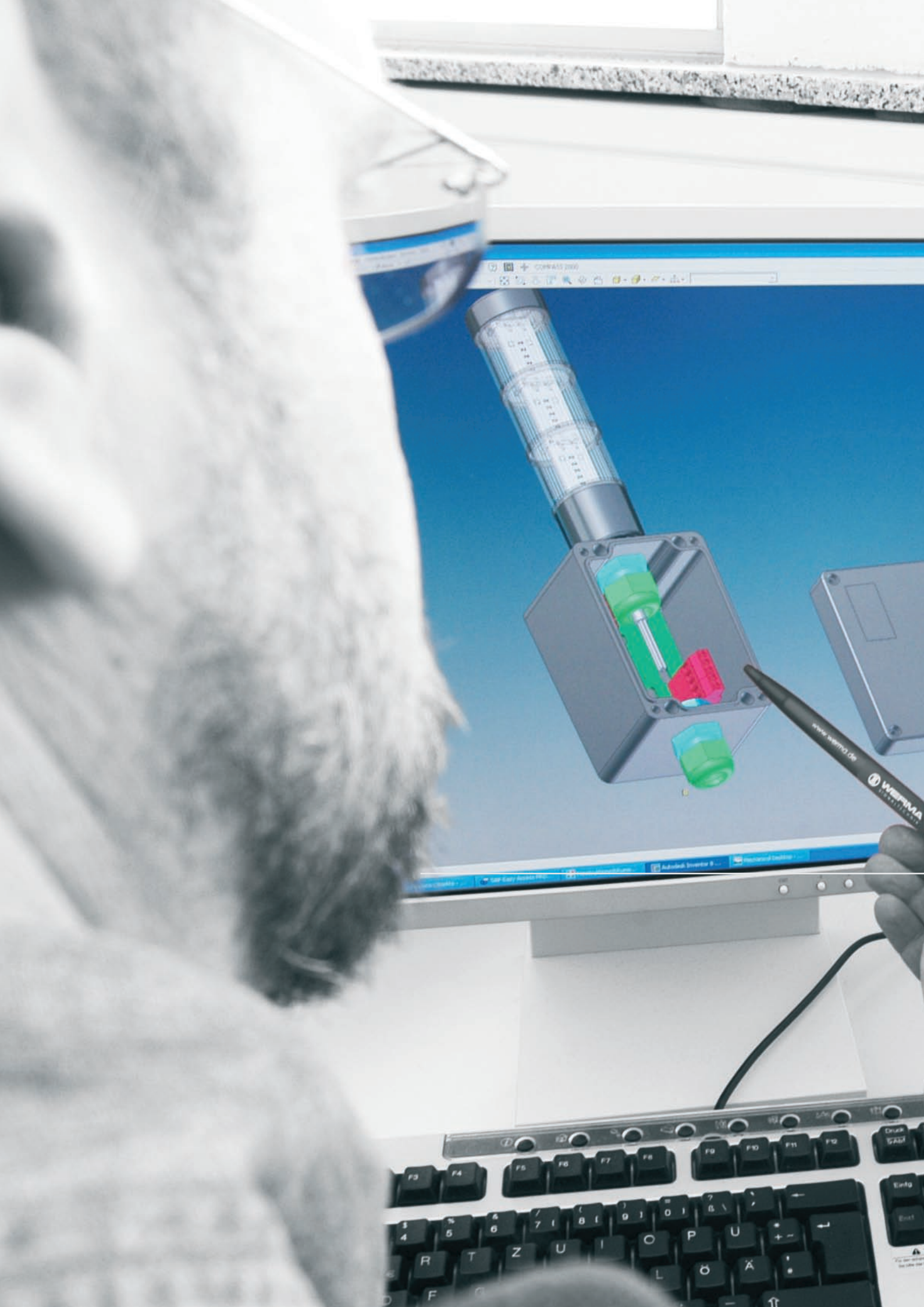
CENELEC (European Committee for Electrotechnical Standardisation) has established the norms EN 50281-1-1 and EN 50281-1-2. These norms are also reproduced as a German set of standards.

At present the IEC, within the framework of the unification of the dust and gas norms, is working to align the numbering of the dust Ex norms to the system employed in the IEC 60079 standards. This will result in a gas and dust explosion protection equivalent for the set of standards.

The norms for the dust explosion protection can be found in the standards IEC 61241, EN 61241 (draft) and EN 50281.

PROTECTION BY ENCLOSURE „iD“		
IEC 61241-1, EN 61241-1, EN 50281-1-1		The housing is dustproof. The Ex atmosphere is kept away from the ignition source, the surface temperature of the housing is restricted.
Electrical apparatus for use in the presence of combustible dust – Part 1: Protection by enclosures „iD“		
PRESSURIZATION „pD“		
IEC 61241-4, EN 61241-4 (draft)		The formation of an explosive atmosphere inside housings is prevented by a protective gas that maintains an overpressure relative to the surrounding atmosphere.
Electrical apparatus for use in the presence of combustible dust – Part 4: Type of protection „pD“		
INTRINSIC SAFETY „iD“		
IEC 61241-11, EN 61241-11(draft)		The energy in the electric circuit is kept so low that sparks, electric arcs and high temperatures that could serve as ignition sources cannot occur.
Electrical apparatus for use in the presence of combustible dust – Part 11: Protection by intrinsic safety „iD“		
ENCAPSULATION „mD“		
IEC 61241-18, EN 61241-18		Parts that could ignite an explosive atmosphere as a result of sparks are embedded in a potting compound so that the explosive atmosphere cannot be ignited.
Electrical apparatus for use in the presence of combustible dust - Part 18: Protection by encapsulation „mD“		





COMPASS 2000

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PROFESSIONAL



Guaranteeing your satisfaction

Extreme care must be taken when manufacturing Ex products. Such a rigorous approach begins at WERMA long before the first production step.

Our employees are specially trained in all issues relating to Ex products in instruction courses and production workshops. The complete production area has been set up in accordance with the regulations applying to this sensitive field of production and extended with WERMA's own developments.

When it comes to selecting our materials we do not make any compromises. Only material of the highest quality is used, ensuring that our products function failure-free, even under the toughest of conditions.

No Ex product enters serial production without being inspected and approved by an independent external test centre and subjected to extensive functional tests and quality controls in our own quality assurance department.

Over the last years our customers have been highly satisfied with us - we aim to ensure that this continues in the future.



Ex Signal Tower



- Zone 1 and 2, Zone 21 and 22
- Signal tower KombiSIGN in flame-proof enclosure
- Available with up to 3 light elements
- Also available as LED version

TECHNICAL SPECIFICATIONS

Dimensions (Diameter x Height)	155 mm x 425 mm
Housing	Aluminium, glass
Connection	Screwable connection max. 2.5 mm ² Contact protection according to VDE incl. approved pressure resistant cable gland NPT 3/4"
Explosion protection	⊕ II 2G EEx d II C T6 ⊕ II 2D Ex II IP66 85°C
Approval	L.C.I.E. 97 ATEX 6012

ORDER SPECIFICATIONS

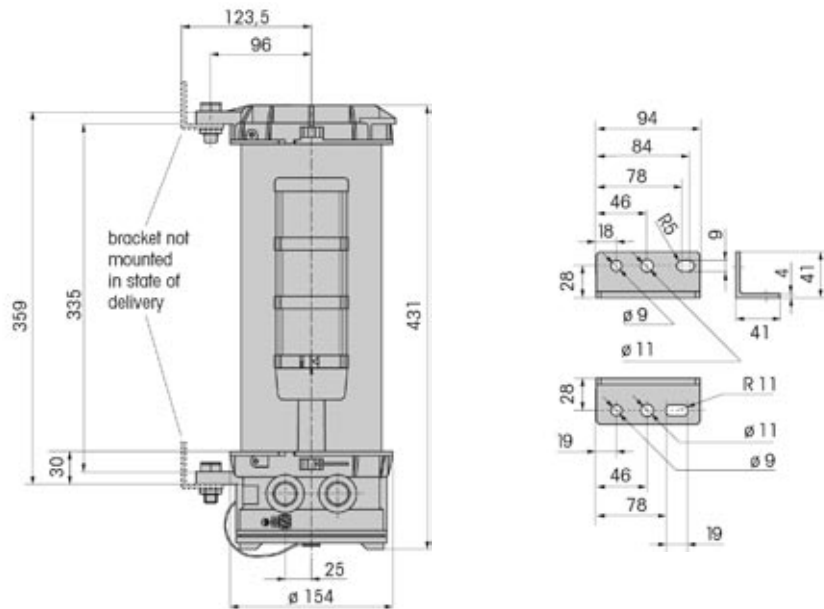
Voltage	12 – 230 V Bulb	24 V ≅ LED
Current consumption		45 mA per tier
Starting current		< 0.5 A
red / green	740 210 00	740 210 55
red / yellow / green	740 231 00	740 231 55

Life duration
up to 100,000 hrs

ACCESSORIES

Bulb BA 15d, 5 W, 24 V 955 840 35	Bulb BA 15d, 5 W, 230 V 955 840 38
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TECHNICAL DIAGRAMS



Ex Signal Tower



- Zone 1 and 2
- Competitively priced
Ex LED Signal Tower
- No additional zener barrier required
- Combination of encapsulation „m” and intrinsic safety „ib” with connection area „e”

TECHNICAL SPECIFICATIONS

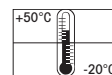
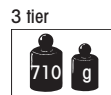
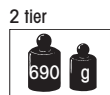
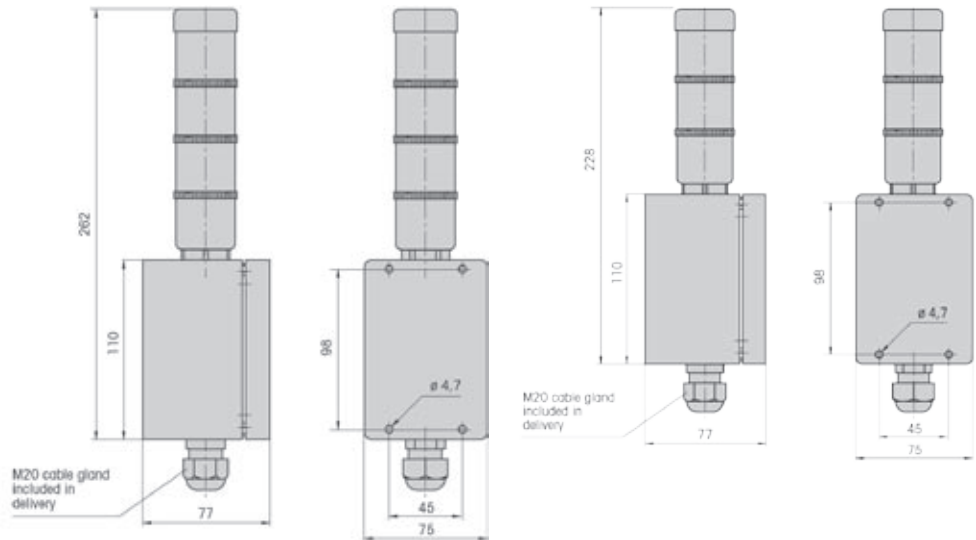
Dimensions of the Zener Barrier (L x B x H)	75 mm x 77 mm x 110 mm
Dimensions total	2 tier (L x B x H): 75 mm x 77 mm x 228 mm 3 tier (L x B x H): 75 mm x 77 mm x 262 mm
Housing	Polyester
Connection	Screwable connection max. 2.5 mm ² incl. approved cable gland „e”
Explosion protection	⊕ II 2G EEx me [ib] IIC T6
Approval	PTB 06 ATEX 2005

ORDER SPECIFICATIONS

Voltage	24 V =
Current consumption	< 90 mA
red / green	741 110 55
red / yellow	741 120 55
red / yellow / green	741 130 55

**Life duration
up to 100,000 hrs**

TECHNICAL DIAGRAMS



Ex LED Installation Beacon

- Ex LED Permanent Beacon with M 20 thread
- Suitable for use in gas and dust explosion endangered areas (Zone 2 and 22)
- Extremely high light intensity
- Modern Chip-On-Board technology
- Ideal for installation in limited space due to short thread



TECHNICAL SPECIFICATIONS

Housing	PC, black
Dome	PC, transparent
Connection	2 wires, c. 115 mm long
Fixing	Installation mounting for Ø 20.5 mm (M 20 x 1.5 mm)
Dimensions (Diameter x Height)	28.7 mm x 38.5 mm
Operating voltage	24 V =
Starting current	< 0.5 A at 24 V
Current consumption	< 45 mA at 24 V
Explosion protection	Ⓜ II 3G Ex nA II (fulfills T4, when temperature at place of operation lies between -20 and +50 °C) Ⓜ II 3D IP65 (fulfills T 75 °C, when temperature at place of operation lies between -20 and +50 °C)
Approval	BVS 05 E 041 U

Seal included in assembly.

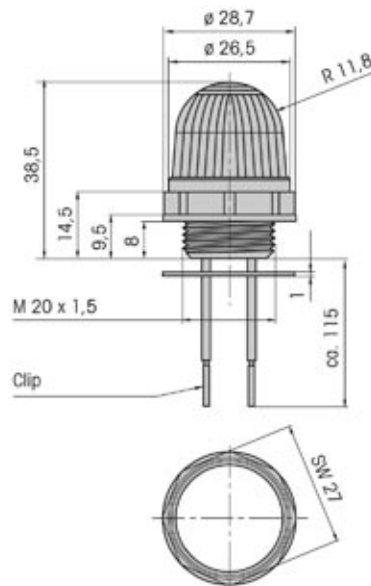
ORDER SPECIFICATIONS

Voltage	24 V =
red	770 100 55
green	770 200 55
yellow	770 300 55
clear	770 400 55

TECHNICAL DIAGRAMS



Mainly sideways illumination



Ex LED Installation Beacon

- Ex LED Permanent Beacon with M 22 thread for the control panelprogramme
- Suitable for use in gas and dust explosion endangered areas (Zone 2 and 22)
- Extremely high light intensity
- Modern Chip-On-Board technology



Mainly sideways illumination

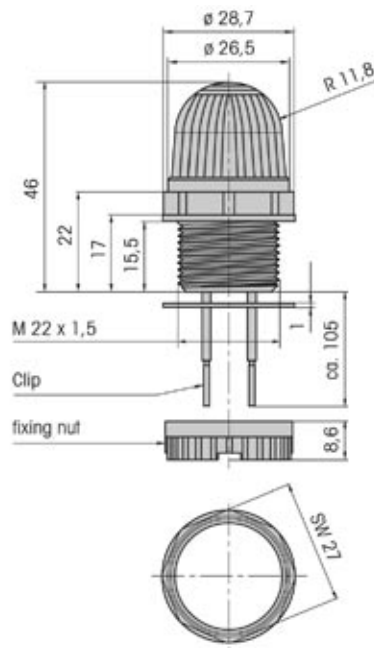
TECHNICAL SPECIFICATIONS

Housing	PC, black
Dome	PC, transparent
Connection	2 wires, c. 115 mm long
Fixing	Installation mounting for Ø 22.5 mm (M 22 x 1.5 mm)
Dimensions (Diameter x Height)	28.7 mm x 38.5 mm
Operating voltage	24 V =
Starting current	< 0.5 A at 24 V
Current consumption	< 45 mA at 24 V
Explosion protection	Ⓢ II 3G Ex nA II (fulfills T4, when temperature at place of operation lies between -20 and +50 °C) Ⓢ II 3D IP65 (fulfills T 75 °C, when temperature at place of operation lies between -20 and +50 °C)
Approval	BVS 05 E 041 U
Seal included in assembly.	

ORDER SPECIFICATIONS

Voltage	24 V =
red	771 100 55
green	771 200 55
yellow	771 300 55
clear	771 400 55

TECHNICAL DIAGRAMS



Ex Rotating Mirror Beacon

- Suitable for use in gas and dust explosion endangered areas (Zone 1 and 2, Zone 21 and 22)
- Flame-proof enclosure „d“ with „e“ connection area
- High life duration thanks to low wear wheel and disc drive
- Can be mounted as required



Wire guard (Accessory)



Clamp for tube mounting (Accessory)



Mounting plate (Accessory)



Bracket (Accessory)

TECHNICAL SPECIFICATIONS

Dimensions (Diameter x Height)	195 mm x 305 mm
Housing	Aluminium
Dome	Reinforced borosilicate glass
Mounting Plate	VA stainless steel
Connection	Screwable connection max. 2.5 mm ²
Cable gland	Cable gland M 20 x 1.5 mm Cable diameter 5 – 13 mm
Connection area	Increased Safety „e“
Drive	Wheel and disc drive, motor in centre of gravity
Installation position	as required
Mirror rotation rate	180 r.p.m.
Service life of drive	> 5,000 hrs
Duty cycle	100%
Fixing	Base mounting, Bracket mounting, Tube mounting
Explosion protection	⊕ II 2G Ex de IIC T3 – T4 (depending on version) ⊕ II 2D Ex tD A21 IP 66 T 105 °C – T 150 °C (depending on version)
Approval	PTB 06 ATEX 1039

Halogen bulb included in assembly.

ORDER SPECIFICATIONS

Voltage	24 V ≅	24 V ≅	115 V ≅	230 V ~	230 V ~
Halogen bulb	20 W	35 W	35 W	20 W	35 W
Current consumption	900 mA	1.6 A	350 mA	110 mA	170 mA
Temp. Class (gas)	T4	T3	T3	T4	T3
Surface Temp. (dust)	105 °C	150 °C	150 °C	105 °C	150 °C
red	783 110 75	783 100 75	783 100 77	783 110 68	783 100 68
yellow	783 310 75	783 300 75	783 300 77	783 310 68	783 300 68

ACCESSORIES

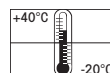
Wire guard	975 783 01
Mounting plate	975 783 02
Clamp for tube mounting 1 1/4"	975 783 03
Clamp for tube mounting 1 1/2"	975 783 04
Clamp for tube mounting 2"	975 783 05
Bracket	975 783 06

SPARE PARTS

Halogen bulb 20 W for 24 V ≅	955 885 25
Halogen bulb 20 W for 230 V ~	955 885 24
Halogen bulb 35 W for 24 V ≅	955 883 35
Halogen bulb 35 W for 115 V ~, 230 V ~	955 883 34

TECHNICAL DIAGRAMS

see next page



Ex Revolving Signal Beacon



Wire guard (Accessory)



Clamp for tube mounting (Accessory)



Mounting plate (Accessory)



Bracket (Accessory)

- Suitable for use in gas and dustexplosion endangered areas (Zone 1 and 2, Zone 21 and 22)
- 3 Fresnel lenses effect light convergence and optimise visibility
- Flame-proof enclosure „d“ with „e“ connection area
- Low rotation rate and high life duration thanks to low wear wheel and disc drive
- Can be mounted as required

TECHNICAL SPECIFICATIONS:

Dimensions (Diameter x Height)	195 mm x 305 mm
Housing	Aluminium
Dome	Reinforced borosilicate glass
Mounting Plate	VA stainless steel
Connection	Screwable connection max. 2.5 mm ²
Cable gland	Cable gland M 20 x 1.5 mm Cable diameter 5 – 13 mm
Connection area	Increased Safety „e“
Drive	Wheel and disc drive, motor in centre of gravity
Installation position	as required
Halogen bulb	G 6.35 35 W 12 V/24 V
Lens rotation rate	60 r.p.m.
Service life of drive	> 5,000 hrs
Duty cycle	100 %
Fixing	Base mounting, Bracket mounting, Tube mounting
Explosion protection	Ex II 2G Ex de IIC T4 Ex II 2D Ex tD A21 IP 66 T 105 °C
Approval	PTB 06 ATEX 1039
Halogen bulb included in assembly.	

ORDER SPECIFICATIONS

	24 V ≅	115 V ≅	230 V ~
Voltage	24 V ≅	115 V ≅	230 V ~
Current consumption	1.6 A	350 mA	170 mA
red	784 100 75	784 100 77	784 100 68
yellow	784 300 75	784 300 77	784 300 68

ACCESSORIES

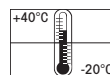
Wire guard	975 783 01
Mounting plate	975 783 02
Clamp for tube mounting 1 1/4"	975 783 03
Clamp for tube mounting 1 1/2"	975 783 04
Clamp for tube mounting 2"	975 783 05
Bracket	975 783 06

SPARE PARTS

Halogen bulb 35 W for 115 V ~, 230 V ~	955 883 34
Halogen bulb 35 W for 24	955 883 35

TECHNICAL DIAGRAMS

see next page



- Suitable for use in gas and dust explosion endangered areas (Zone 1 and 2, Zone 21 and 22)
- Flame-proof enclosure „d“ with „e“ connection area
- High flash power from two consecutive flashes
- Can be mounted as required



Wire guard (Accessory)



Clamp for tube mounting (Accessory)



Mounting plate (Accessory)



Bracket (Accessory)

TECHNICAL SPECIFICATIONS

Dimensions (Diameter x Height)	195 mm x 305 mm		
Housing	Aluminium		
Dome	Reinforced borosilicate glass		
Mounting Plate	VA stainless steel		
Connection	Screwable connection max. 2.5 mm ²		
Cable gland	Cable gland M 20 x 1.5 mm Cable diameter 5 – 13 mm		
Connection area	Increased Safety „e“		
Installation position	as required		
Flash energy	15 Ws		
Flash frequency	1 Hz		
Life duration	4 x 10 ⁶ flashes		
Fixing	Base mounting, Bracket mounting, Tube mounting		
Explosion protection	ⓧ II 2G Ex de IIC T5 ⓧ II2D Ex tD A21 IP 66 T 85 °C – T 90 °C (depending on the voltage)		
Approval	PTB 06 ATEX 1039		

ORDER SPECIFICATIONS

Voltage	24 V =	115 V ~	230 V ~
Current consumption	700 mA	300 mA	200 mA
Surface Temperature (dust)	85 °C	90 °C	85 °C
red	738 100 55	738 100 67	738 100 68
yellow	738 300 55	738 300 67	738 300 68

ACCESSORIES

Wire guard	957 783 01
Mounting plate	957 783 02
Clamp for tube mounting 1 1/4"	957 783 03
Clamp for tube mounting 1 1/2"	957 783 04
Clamp for tube mounting 2"	957 783 05
Bracket	957 783 06

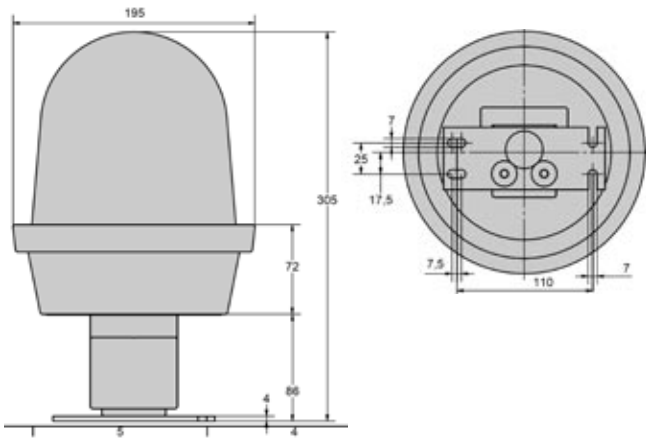
TECHNICAL DIAGRAMS

see next page

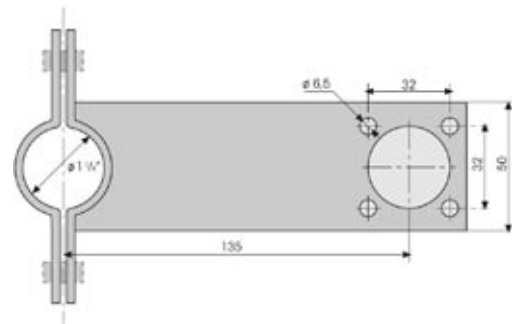


Technical Diagrams 738, 783, 784 and Accessories

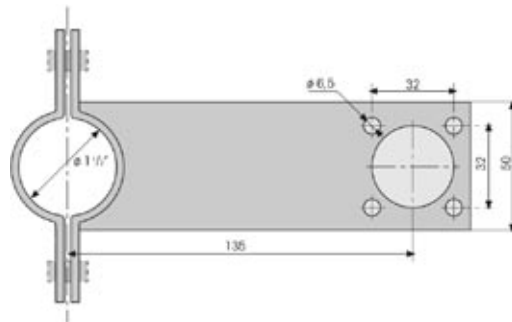
738 / 783 / 784 EX-LEUCHTEN



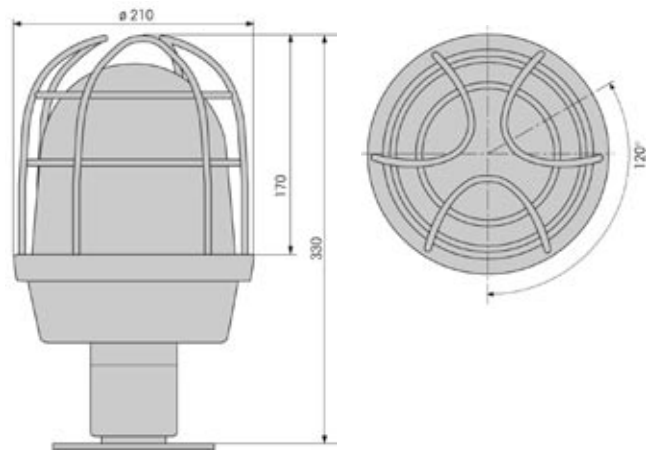
975 783 03 CLAMP FOR TUBE MOUNTING 1 1/4"



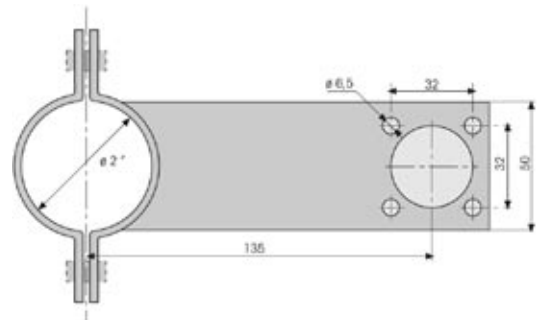
975 783 04 CLAMP FOR TUBE MOUNTING 1 1/2"



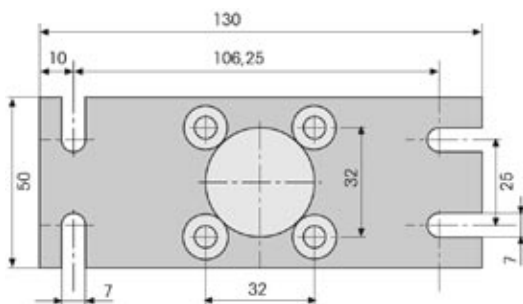
975 783 01 WIRE GUARD



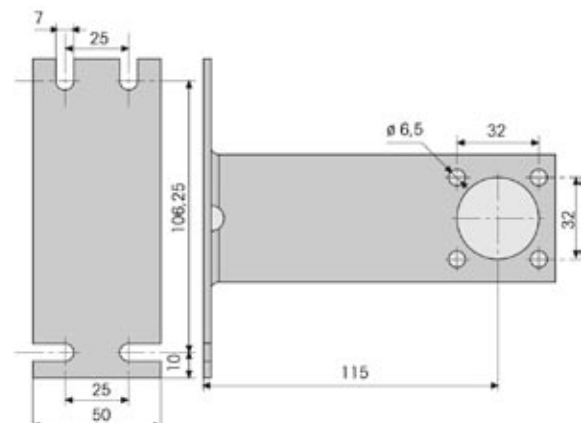
975 783 05 CLAMP FOR TUBE MOUNTING 2"



975 783 02 MOUNTING PLATE



975 783 06 BRACKET



- Zone 1 and 2
- Compact flashing beacon
- Versatile use



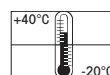
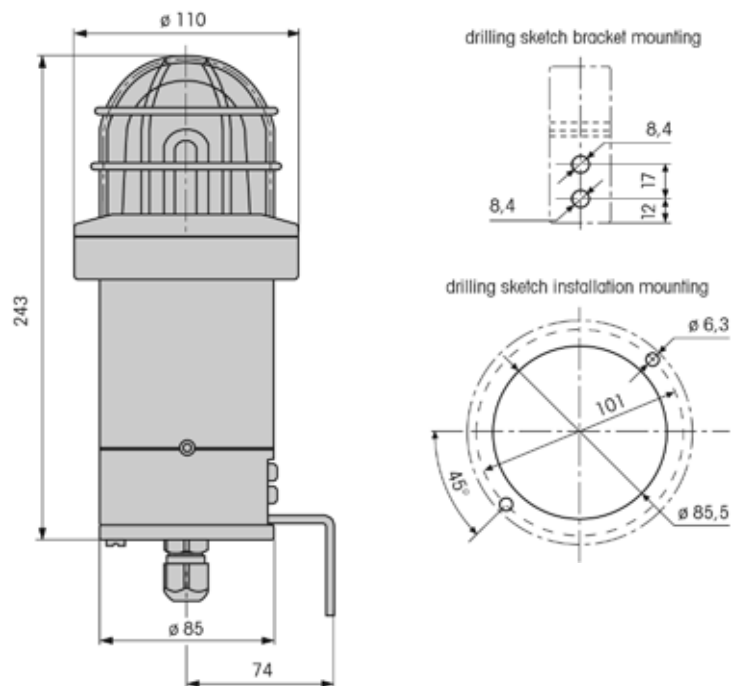
TECHNICAL SPECIFICATIONS

Dimensions (Diameter x Height)	110 mm x 243 mm
Housing	Aluminium
Dome	Reinforced borosilicate glass
Wire guard	Rust-proof steel, powder-coated
Connection	Screwable 1.5 mm ² fine-strand, 2.5 mm ² single-wire
Cable entry	Cable gland M 20 x 1.5 mm Cable diameter 6 – 9 mm
Current consumption	at 24 V: 1 A at 230 V: 200 mA
Life duration	5 x 10 ⁶ flashes
Explosion protection	⊕ II 2G EEx de IIC T6
Approval	PTB 01 ATEX 1057
Fixing	Bracket mounting, installation mounting
Flash frequency	1 Hz

ORDER SPECIFICATIONS

Voltage	24 V =	230 V ~
red	720 101 55	720 101 68
yellow	720 301 55	720 301 68

TECHNICAL DIAGRAMS





- Zone 1 and 2
- Sound output up to 119 dB (A)
- Connection area „e“
- UV-resistant
- Protected against corrosion

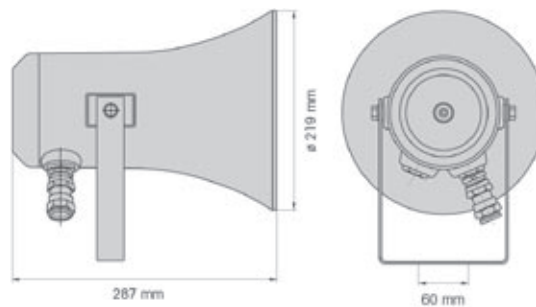
TECHNICAL SPECIFICATIONS

Dimensions (Depth x Width)	287 mm x 219 mm
Housing	Plastic (anti-static), UV-resistant, black
Fixing bow, lid screw	Stainless steel V4A (ASTM316), rust-free
Cable entry	Cable gland M 20 x 1.5 mm Cable diameter 6 – 13 mm
Connection	up to 2.5 mm ² (AWG14) solid up to 4 mm ² stranded
Connection area	Increased safety „e“
Input-output	max. 500 W, parallel connection of up to 20 loudspeakers
Connection voltage	100 V
Max. Power 70 Hz– 15000 Hz	25 W
Power levels via code terminals	25 W; 12,5 W; 8 W; 4 W; 2 W; 1 W
SPL 25 W / 1m	c. 119 dB (A)
SPL 1 W / 1 m	c. 107 dB (A)
Transmission range	280 – max. 10,000 Hz
Transmission range according to IEC 60268	330 – 6,000 Hz
Distortion factor 1 W / 1 kHz	≤ 4 %
Distortion factor 10 W / 1 kHz	≤ 5 %
Opening angle 1 kHz – 6 dB	130°
Opening angle 4 kHz – 6 dB	40°
Fixing	Wall mounting
Explosion protection	⊕ II 2 G EEx dem IIC T5
Approval	PTB 04 ATEX 1110

ORDER SPECIFICATIONS

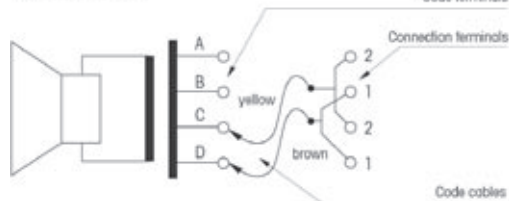
Spannung	100 V ~
	710 000 00

TECHNICAL DIAGRAMS

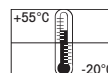


Connection diagram

Code terminals



Code cables





- Zone 0, 1 and 2
- 26 tones for a diverse range of applications
- For use with a Zener Barrier
- Adjustable sound output to 103 dB
- High protection rating IP 65
- Direct external setting of two tones possible

TECHNICAL SPECIFICATIONS

Dimensions (Diameter x Depth)	93 mm x 103 mm
Housing	ABS
Connection	Screwable connection max. 2.5 mm ²
Cable entry	Kabeldurchmesser max. 12 mm
Duty cycle	100 %
Operating voltage	24 V DC
Current consumption	14 mA
Tone types and frequencies	adjustable via DIP switch, see table on right-hand page
Fixing	Wall mounting, base mounting
Installation position	Sound outlet must not face upwards
Explosion protection	Ex II 1G EEx ia IIC T4
Approval	Baseefa 06 ATEX 0161

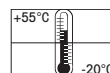
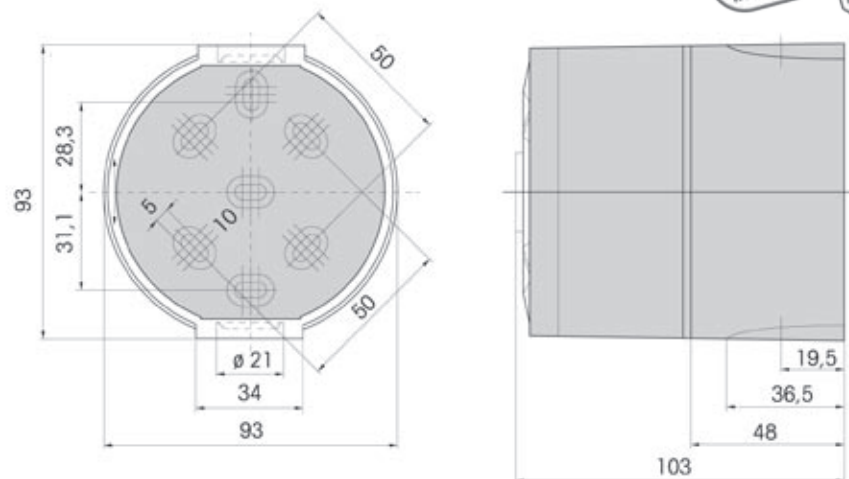
ORDER SPECIFICATIONS:

Voltage	24 V =
	714 000 55

ACCESSORIES

Zener Barrier	975 714 01
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TECHNICAL DIAGRAMS



The 714 Ex Multi-Tone Sounder offers a large choice of international signal tones for the widest spectrum of applications.



TONE TYPES AND FREQUENCIES

adjustable via DIP switch

Tone A No.	Tone type
1	Alternating 800/970 Hz in 2 Hz stroke
2	Rising 800/970 Hz in 7 Hz stroke
3	Rising 800/970 Hz in 1 Hz stroke
4	Continuous 2,850 Hz
5	Rising 2,400 – 2,850 Hz in 7 Hz stroke
6	Rising 2,400 – 2,850 Hz in 1 Hz stroke
7	500-1,200 Hz rising in 3 sec., 0.5 sec OFF
8	Falling 1,200 – 500 Hz in 1 Hz stroke
9	Alternating 2,400/2,850 Hz in 2 Hz stroke
10	Pulse 970 Hz in 0.5 Hz stroke
11	Alternating 800/970 Hz in 1 Hz stroke
12	Pulse 2,850 Hz in 0.5 Hz stroke
13	970 Hz pulse: 0.25 sec. ON/1 sec. OFF
14	Continuous 970 Hz
15	554 Hz/100 ms alternating 440 Hz/400 ms
16	660 Hz pulse: 150 ms ON, 150 ms OFF
17	660 Hz pulse: 1.8 sec. ON, 1.8 sec OFF
18	660 Hz pulse: 6.5 sec. ON, 13 sec OFF
19	Continuous 660 Hz
20	Alternating 554/440 Hz in 0.5 Hz stroke
21	Pulse 660 Hz in 1Hz stroke
22	2,850 Hz pulse: 150 ms ON/100 ms OFF
23	Rising 800/970 Hz in 50 Hz stroke
24	Rising 2,400 – 2,850 Hz in 50 Hz stroke
25	970 Hz pulse: 3 x 500 ms ON, 500 ms OFF, 1.5 sec. pause
26	2,850 Hz pulse: 3 x 500 ms ON, 500 ms OFF, 1.5 sec. pause



- Zone 1 and 2
- Fully encapsulated
- Signal horn for Ex protected areas
- Silicone free

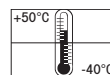
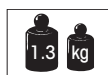
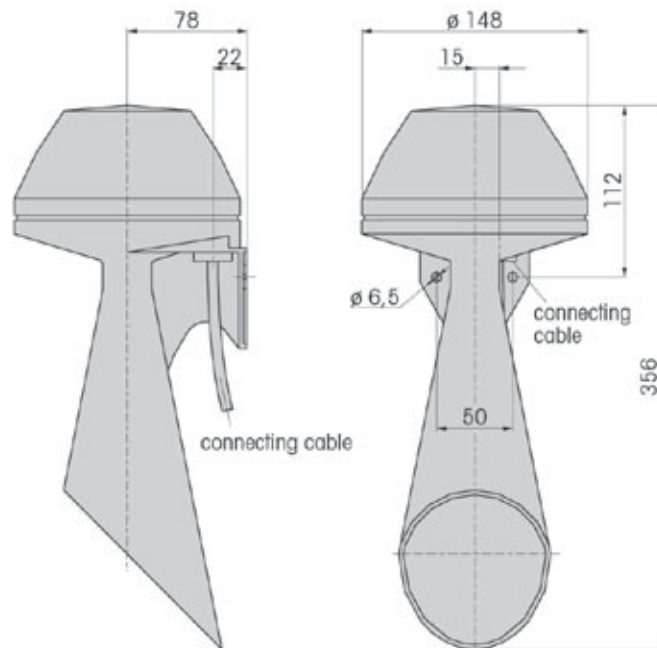
TECHNICAL SPECIFICATIONS

Dimensions (D x W x H)	152 mm x 148 mm x 356 mm
Housing	PC/ABS-Blend
Connection	Cable 3 m, 2 x 0.75 mm ²
Fixing	Bracket mounting, sound outlet facing downwards
Explosion protection	Ex II 2G EEx m II T5
Approval	BVS O3 ATEX E 118X

ORDER SPECIFICATIONS

Voltage	24 V =	24 V ~	48 V ~	115 V ~	230 V ~
Voltage range	21.6 V ... 26.4 V	21.6 V ... 26.4 V	37.8 V ... 52.8 V	102.5 V ... 126.5 V (50 Hz)	108 V ... 131 V (60 Hz)
Current consumpt.	350 mA	450 mA	220 mA	205 mA	70 mA
	750 000 55	750 000 65	750 000 66	750 000 67	750 000 68

TECHNICAL DIAGRAMS



Ex Signal Horn



- Zone 1 and 2, Zone 21 and 22
- Loud horn with continuous tone
- Modern design
- Cable gland
- Connection area „e“
- Concealed fixing screws
- IP 65 for indoor and outdoor applications
- Flexible mounting possibilities
- Suitable for use in areas liable to explosion caused by both gas or dust without the need for additional accessories

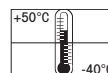
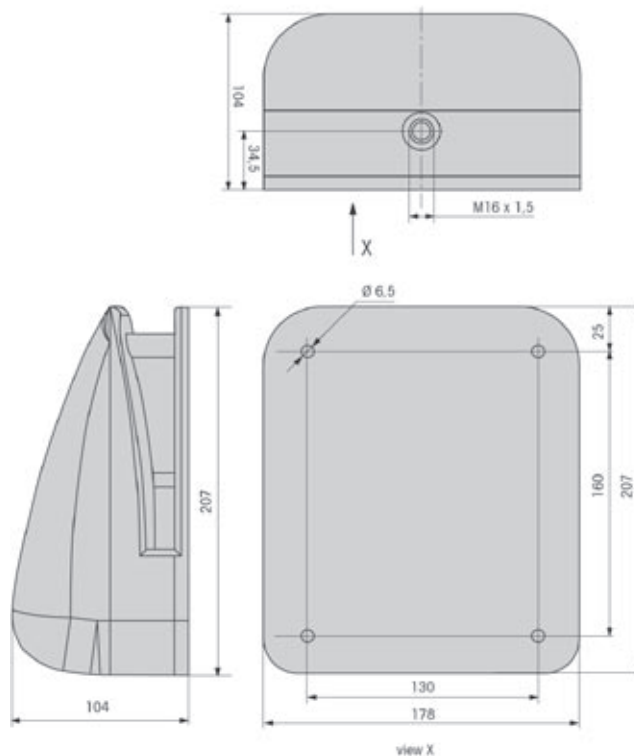
TECHNICAL SPECIFICATIONS

Dimensions (D x W x H)	207 mm x 178 mm x 104 mm
Fixing dimensions (D x W)	160 mm x 130 mm
Housing	PC
Connection	CAGE CLAMP® max. 2.5 mm ²
Cable entry	Cable gland M 16 x 1.5 mm, Cable diameter 5 – 9 mm
Fixing	Wall mounting, Surface mounting
Explosion protection	⊕ II 2G EEx me II T5, ⊕ II 2D IP65 70°

ORDER SPECIFICATIONS

Voltage	24 V =	24 V ~	48 V ~	115 V ~	230 V ~
Voltage range	21.6 V ... 26.4 V	21.6 V ... 26.4 V	37.8 V ... 52.8 V	102.5 V ... 126.5 V (50 Hz)	108 V ... 131 V (60 Hz)
Current consumpt.	350 mA	450 mA	220 mA	205 mA	70 mA
	761 000 55	761 000 65	761 000 66	761 000 67	761 000 68

TECHNICAL DIAGRAMS



Ex Electronic Installation Buzzer



Cap

- Zone 1 and 2
- Intrinsically safe Ex installation buzzer
- For use with a Zener Barrier
- IP 43 with cap
- Low current consumption
- Continuous tone

TECHNICAL SPECIFICATIONS

Dimensions (Diameter x Depth)	43 mm x 48 mm		
Housing	ABS		
Connection	Spades 6.3 x 0.8 mm		
Audio frequency	c. 2,400 Hz		
Duty cycle	100%		
Explosion protection	⊕ II 2G EEx ib IIC T4/T5/T6		
Approval	DMT 98 ATEX E 005 X		
Maximum values of the Zener barrier	Ui: 40 V =, li: 660 mA		
Minimum values of the Zener barrier	for 24 V =		
Maximum Input Power Pi	Temp.-	Max. surrounding temperature	
	Class	+ 40°C	+ 50°C + 60°C
	T4	Pi = 1.3 W	Pi = 1.2 W Pi = 1.0 W
	T5	Pi = 0.82 W	Pi = 0.66 W Pi = 0.52 W
	T6	Pi = 0.6 W	Pi = 0.45 W Pi = 0.3 W

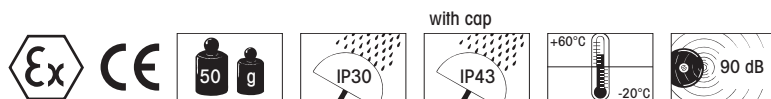
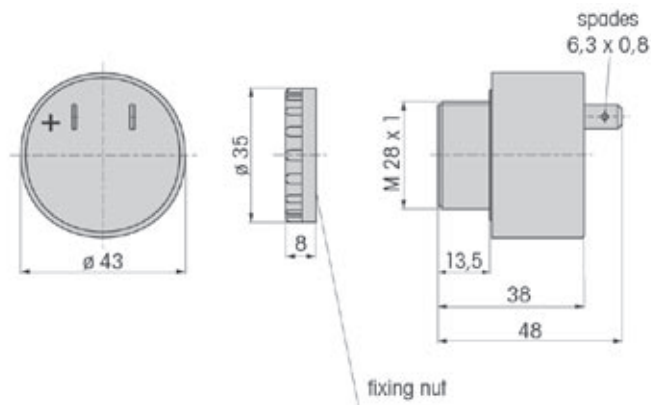
ORDER SPECIFICATIONS

Voltage	24 V =
Current consumption	20 mA
	718 000 55

ACCESSORIES

PC/ABS-Blend Cap (IP 43)	975 118 00
Zener Barrier	975 714 01

TECHNICAL DIAGRAMS



Make no compromises

When it comes to the safety of your employees and equipment you should make no compromises. Those working in especially hazardous areas need to know that no expense has been spared in ensuring their safety.

In the petrochemical and chemical industry these risks are readily apparent, however even in a joiner's workshop highly explosive mixtures can occur, placing special demands on the warning and signalling equipment.

WERMA guarantees you the highest quality for maximum safety.

Your job is dangerous enough as it is!





WERMA
SIGNALTECHNIK

D-78604 Rietheim-Weilheim

II 2 G EEx de IIC T6

Typ 720.101.55

PTB 01 ATEX 1057

F-Nr. B 1079

Prüfg. 03.03.00

Netz 24VDC / 1A

Lampe 15 WS

CE 0158



Minimum product marking of explosion-protected components

The Directive 94/9/EG (ATEX 95) section II defines an unequivocal marking for components in explosion-protected areas. This must include the following points:

- Name and address of the manufacturer
- Series number where applicable
- Description of series and type
- Details referring to the explosion protection type (examples):

GAS	CE	0102	⊕Ex	II	2 G	EEx	me	II	T5
DUST	CE	0102	⊕Ex	II	2 D		IP65		175°C
	1	2	3	4	5	6	7	8	9

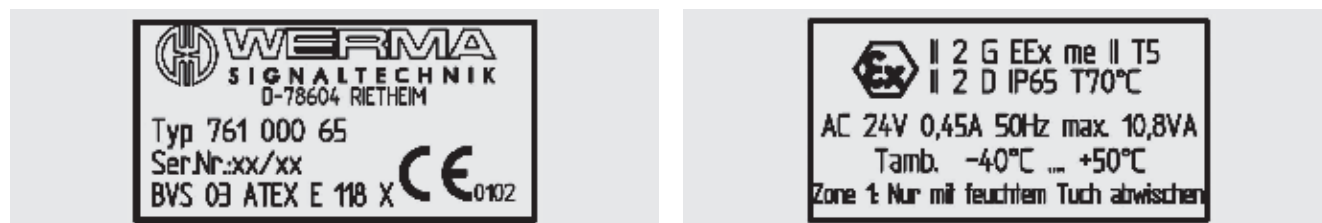
1	CE conformity marking
2	The number of the named authority monitoring production
3	Ex-Hexagon taken from the old regulations for explosive atmospheres (76/117/EWG, 82/130/EWG)
4	Device group, e.g. II
5	Device category, e.g. 2G or 2D
6	Symbols to show that one or more norms from norm series EN 60079 (formerly EN 50014ff.) or IEC/EN 61241) have been used. E = built acc. to European norm EX = Explosion protected component
7	Abbreviation of the protection type. All these used in the component must be named after the main ignition protection type, in the case of dust (protection through housing) additionally the IP rating. e.g. „me“: Main ignition protection type „m“, secondary type „e“.
8	Explosion group, eg II
9	Temperature class eg T5. In the case of dust (electrical apparatus protected by enclosures) the maximum surface temperature must be given.

Components for Zones 2 and 22 may not bear the ATEX mark in their device classification or display the number of a monitoring authority.

The details of the authority responsible for the testing of the component for the relevant norms must also be stated:

BVS	03	ATEX	E 118	X
3RD PARTY TESTING AUTHORITY	YEAR OF TESTING	ACC. TO DIRECTIVE 94/4/EG	CONSECUTIVE NO. OF CERTIFICATE	SPECIAL CONDITIONS

An example of product marking on an explosion-protected electrical component:



„Zone I: Only to be wiped with a damp cloth“. The minimal marking is augmented by recommendations vital for safe use.

The certificate of conformity is to be provided with every device as well as the compulsory marking.

The manufacturer hereby confirms conformity with the relevant norms and clearly states upon which

EU standards the CE mark is based. An instruction and mounting leaflet is to be provided with every device.

These documents should be filed safely by the user for future reference.

Everything you need to know at a glance

Internati

TYPICAL AMERICAN DANGER CATEGORIES IN ACCORDANCE WITH NEC 500 -

Flammable material	Example	Class	Group
Gases, vapors	Acetylene	Class I	Group F
	Ethylene	Class I	Group E
	Hydrogen	Class I	Group C
Dusts	Wood dust	Class II	Group D
	Dust of coal	Class II	Group F
	Starch dust	Class II	Group B
Dusts, Temp	Paint, wood and other	Class III	no further group

CLASSIFICATION OF THE EXPLOSION HAZARDOUS AREAS

Flammable material	Temporary behaviour of the explosive atmosphere	Classification of the explosion endangered areas			Marking of the electrical equipment according to CENELEC (ATEX)	
		CENELEC / IEC	US NEC NIS	US NEC ISB	Device group	Device category
Gases, vapors	Are continuously present, for long periods or frequently	Zone 0	Class I Zone 2	Class I Division 1	1	1E
	Are likely to occur	Zone 1	Class I Zone 1	Class I Division 2	2	2D or 2E
	Are seldom to occur and if they do they last for a few minutes only	Zone 2	Class I Zone 2	Class I Division 2	3	3D or 2D or 1E
Dusts	Are continuously present, for long periods or frequently	Zone 20	---	Class I Division 1	1	2D
	Are likely to occur	Zone 21	---	Class I Division 2	2	2D or 2E
	Are seldom to occur and if they do they last for a few minutes only	Zone 22	---	Class I Division 2 conductive dusts	3	3D or 2D or 1E
	Are seldom to occur and if they do they last for a few minutes only	Zone 22	---	Class I Division 2 non conductive dusts	3	3D or 2D or 1E
Fl gas (methane)	---	Zone 22	---	Class I Division 2	3	3D or 2D or 1E

EXPLOSION GROUP FOR ACCORDANCE TO CENELEC

Explosion Group	Subgroup
I	Subgroup I
IIA	Subgroup IIA
IIB	Subgroup IIB
IIC	Subgroup IIC

CLASSIFICATION OF DANGEROUS AREAS

Temperature class	Explosion group	Marking
T1	I	Marking I
T2	IIA	Marking IIA
T3	IIB	Marking IIB
T4	IIC	Marking IIC

WE
SIGNAL
D-78604 Riet
II 2 G EE
Typ 720.101.
PTB 01
r. B 1079
z 24VDC / 1A
nope 15 WS

CENELEC	IEC	ATEX	US NEC	US NEC	US NEC	US NEC	US NEC	US NEC
Class I	Class I	Zone 0	Class I	Class I	Class I	Class I	Class I	Class I
Class I	Class I	Zone 1	Class I	Class I	Class I	Class I	Class I	Class I
Class I	Class I	Zone 2	Class I	Class I	Class I	Class I	Class I	Class I

RECIPIENT BODY

Country	No.
Germany	0302
France	0308
Denmark	0297
Spain	0309
Belgium	0307
Poland	0306
Finland	0304
Sweden	0305
Italy	0303
USA	0301

PROTECTION TYPES

General Requirements	Flame Proof Enclosures	Intrinsic Safety	Intrinsic Safety	Pressure
Symbol				
Marking	1	1	1	1
Protection concept	Exclusion of ignition sources by enclosure	Avoidance of sparks and temperatures	Energy limitation of sparks and temperatures	Ex structural strength
Zone	1/2	1/2	0/1/2	1/2
IEC	80079-0	80079-1	80079-2	80079-3
CENELEC	EN 60079-0 (prev. EN 50204)	EN 60079-1 (prev. EN 50204)	EN 60079-2 (prev. EN 50204)	EN 50205
FM/US	FM 3820 (A, 2219)	FM 3820 (B, 2219)	FM 3820 (C, 2219)	FM 3820 (D, 2219)



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TEMPERATURE CLASSES AND PERMISSIBLE SURFACE TEMPERATURES OF THE COMPONENTS

Maximum surface temperature (°C)	NEC 500	EC	CEM/EC
450	T1	T1	T1
300	T2	T2	T2
280	T2A	-	-
260	T2B	-	-
230	T2C	-	-
215	T2D	-	-
200	T3	T3	T3
180	T3A	-	-
165	T3B	-	-
160	T3C	-	-
135	T4	T4	T4
120	T4A	-	-
100	T5	T5	T5
85	T6	T6	T6

FLAMMABLE LIQUIDS AND DUSTS IN ACCORDANCE WITH CERIALC / IEC / NEC 500 - EXAMPLES

Flammable liquid	Flammable dust	T1	T2	T3	T4	T5	T6
Ethyl alcohol	Flour	-	-	-	-	-	-
Cyclohexane	Coal	-	-	-	-	-	-
n-Butane	Asbestos	-	-	-	-	-	-
n-Pentane	Ethyl ether	-	-	-	-	-	-
Ethylene	Hydrofluoride	-	-	-	-	-	-
Acetylene	Ethylene glycol	-	-	-	-	-	Door ducts



Method	Encapsulation	Oil immersion	Sand Encapsulation	Protection Type	Protection by Enclosure
Ex atmosphere is kept apart from ignition source	Ex atmosphere is kept apart from ignition source	Ex atmosphere is kept apart from ignition source	Ex atmosphere is kept apart from ignition source	Different protection concepts for zone 2/22	Ex atmosphere is kept apart from ignition source
1/2	1/2	1/2	1/2	2/22	200/1/02
80079-18 EN 60079-18 (prev. only EN 50075)	80079-4 EN 50075	80079-5 EN 50077	80079-15 EN 60079-15 (prev. only EN 50071)	6124-1 EN 50281-1-1	
IL 2279	IL 2279	IL 2279			

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