

ATEX/IECEX SAFETY INSTRUCTIONS

ZENER BARRIER ZBA1S



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1. Scope

The equipment described in this technical note is an three channels intrinsically safe passive, non-galvanically isolated, associated apparatus according to EN/IEC 60079-0, EN/IEC 60079-11, EN/IEC 60079-26.

2. Identification

The equipment is identified according to the following model reference:

ZBA1S

3. Rated characteristics

Working Ambient temperature: **-20°C ÷ +60°C**

Storage Ambient temperature: **-25°C ÷ +70°C**

Rating: **14 Vrms** differential and **8 Vrms** to ground for **connector CN3**, **20 Vrms** for **connector CN1** and **CN2**

Maximum safe voltage (Um): **250V_{rms}**

Maximum safe current (current interruption capability): **1500A**

Degree of Protection: **IP20**

4. System description

The intrinsically associated apparatus is a:

- Diode safety barrier according to clause 9.1 of EN/IEC 60079-11
- Linear
- Non galvanically insulated between I.S. and non I.S. branches
- Non galvanically insulated, on non I.S. branches, up to 375Vdc/pk
- Fully encapsulated so forming a single non-recoverably unit
- Equipped with double terminals for I.S. high integrity earth
- Equipped in modular plastic housing
- Mounting on 35 mm DIN mounting rail acc. to EN 60715:2001
- Connected by screw connection terminals, max. core cross-section 2 x 2.5 mm²

The whole system expected normative marking is

For ATEX only:

II (1)G, II (1)D, I (M1)

For IECEx only:

[circuit(s) in zone 0/1/2]

For ATEX and IECEx:

[Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I (-20 °C ≤ Tamb ≤ +60 °C)

5. Normative references

- Explosive atmospheres. Equipment. General requirements:
EN 60079-0 : 2018
IEC 60079-0 : 2017
- Explosive atmospheres. Equipment protection by intrinsic safety "i"
EN60079-11 : 2012
IEC60079-11 : 2011
- Explosive atmospheres - Part 26: Equipment with Equipment Protection Level (EPL) Ga
EN 60079-26 : 2015
IEC 60079-26 : 2014
- Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
EN 61326-1 : 2013
(IEC 61326-1 : 2012)

6. Directives and conformity

The equipment is designed, assembled and tested according to Standards reported in in the following in order to guarantee the respect of EHSR of the European ATEX 2014/34/EU Directive and according to OD033/IEC60079-0 of the IECEx scheme, for equipment and component intended to be installed in potentially explosive atmospheres.

Moreover the system is realized according to the following:

European directive	2014/34/EU	Atex
European directive	2014/30/EU	Electromagnetic Compatibility

7. Mandatory installation conditions

Prior the installation and the start-up of the assembly strictly refer to the Safety Instructions of the manufacturer of the assembly and to the specific instructions of adopted equipment.

Prior the start-up of the assembly the grounding effectiveness must be verified.

Prior the start-up of the assembly the potential equalization bonding must be verified.

The assembly conforms to the Essential Health and Safety Requirements only if installed and used according to the minimum requirement and limitations contained in the documents of explosion risk and in the explosion risk analysis (documents under the responsibility of the User) and according to the mandatory installation conditions of this document.

The assembly must be installed by skilled personnel and can be put in service only after a suitable training to operators regarding the safety instructions and the maintenance of the assembly.

An equipment could be "X" marked: in this event strictly follow the special conditions for safe use of the equipment.

It is forbidden to put in service the assembly without the verification of the conformity and the correct installation according to Standards for assemblies installed in hazardous locations.

8. Scope of the instructions

The personnel operating in places with a risk of explosion due to the presence of gas, vapours, mist need to be trained and instructed in relations with the precautions, the behaviour, the operating procedures which are regulated by the Law.

As integration, these instructions are furnished as a mandatory guide for the correct use of the product they are referred to in systems intended to be used in places with the risk of explosion for the presence of gas, vapour, mist.

9. Safety instructions

Use of the system is admitted for the purpose they are intended only.

The performances of the product are guaranteed when the use of the system is within the limits and boundaries prescribed in this instruction manual and the applicable standards.

Use of the product not conforming to the regulations will invalidate the safety properties.

When parts or the whole product are damaged, deformed or broken, the product itself loses part or all its properties, including the provisions of safety.

Component certificates, if used and applied, have been used as a base for a final assessment of equipment certificate or protection system certificate.

The safety measures for the equipment used at the place of installation as far as operations and maintenance of the enclosures must follow the specific instructions contained in this manual and the additional applicable norms (together with the local and the electrical installation specific regulations) in areas with explosion risk, i.e. EN/IEC 60079-14 and EN/IEC 60079-17, regarding the installation and start up verifications and periodical verifications, and EN/IEC 60079-19 regarding maintenance.

For all details regarding the procedures mentioned above, refer to all the applicable directives.

10. Place of installation

The system is a construction of electrical group II or group I, therefore designed to be used in surface industry installations or interfaced, when installed in surface with underground work premises or installations and/or mining.

The system can be used only with prior relations to standards:

EN/IEC 60079-10-1 and EN/IEC 60079-10-2, for classifications of the area of installation;

EN/IEC 60079-14 for electrical installations rules.

The system is eligible to be installed in a not classified area interfacing circuits installed in Zone0, Zone1 or Zone 2 or Zone 20, Zone 21 or Zone 22 as associated apparatus according to EN/IEC 60079 definitions.

The installer and user are always responsible to respect the constraint and restrictions of the place of installation synthesized in limits and characteristics shown above.

11. Relevant parameters

Channel connector CN3 - CN6:

Tamb = -20°C / +60°C

to Safe area:	to Hazardous Area:	
Connector: CN3	Connector: CN6, Terminals: 11 vs 12	
	Differential	Common Mode
Um=250Vrms	Uo = 19,70 V	Uo = 9,90 V
Im = 1500A	Io = 0,139 A	Io = 0,278 A
Rating: 14 Vrms differential and 8 Vrms to ground for connector CN3	Po = 0,685 W	Po = 0,689 W
	Ro = 142,5 Ω	Ro = 35,625 Ω
	Co = 0,231 μF (IIC)	Co = 3,2 μF (IIC)
	Lo = 2,00 mH (IIC)	Lo = 0,4 mH (IIC)
	Lo/Ro = 52,22 μH/Ohm (IIC)	Lo/Ro = 51,69 μH/Ohm (IIC)

Channel connector CN1 - CN4 and connector CN2 - CN5:

Tamb = -20°C / +60°C

to Safe area:	to Hazardous Area:	
Connector: CN1 and CN2	Connector: CN4 and CN5, terminals 3 vs 4 and terminals 7 vs 8	
	Differential	Common Mode
Um=250Vrms	Uo = 22,2 V	Uo = 22,2 V
Im = 1500A	Io = 35,5 mA	Io = 142 mA
Rating: 20 Vrms for connector CN1 and CN2	Po = 0,198 W	Po = 0,789 W
	Ro = 627,0 Ω	Ro = 156,75 Ω
	Co = 0,160 μF (IIC)	Co = 0,160 μF (IIC)
	Lo = 25 mH (IIC)	Lo = 1,5 mH (IIC)
	Lo/Ro = 180,93 μH/Ohm (IIC)	Lo/Ro = 45,23 μH/Ohm (IIC)

Uo, Io, Po, Co, Lo, Lo/Ro: Electrical parameters and reactive parameters to be matched in the intrinsically safe system according to EN/IEC 60079-14 and EN/IEC60079-25

For installations in which both the Ci and Li of the Intrinsically Safe apparatus exceed 1 % of the Co and Lo parameters of the Associated Apparatus (excluding the cable), then 50 % of Co and Lo parameters are applicable and shall not be exceeded (50 % of the Co and Lo become the limits which must include the cable such that Ci device + C cable ≤ 50 % of Co and Li device + L cable ≤ 50 % of Lo).

PARAMETERS SUMMARY TABLE

	IIC Ga			IIB Ga , IIC Da			IIA Ga			I Ma		
	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)
CONNECTOR CN6 differential	0,231	2	52,22	1,45	9	208,88	5,72	15	417,77	7,4	20	685,40
CONNECTOR CN6 common mode	3,2	0,4	51,69	22	2	206,78	115	3,5	413,56	87	5	2714,00
CONNECTOR CN4 and CN5 differential	0,16	25	180,93	1,11	100	723,75	4,08	200	1447,50	5,7	300	2374,80
CONNECTOR CN4 and CN5 common mode	0,16	1,5	45,23	1,11	7	180,93	4,08	15	361,87	5,7	20	593,70
	IIC Gc			IIB Gc, IIC Dc			IIA Gc			I Mb		
	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)	Co (μF)	Lo (mH)	Lo/Ro (μH/Ω)
CONNECTOR CN6 differential	0,96	4	117,49	5,9	15	469,99	21,5	35	939,98	25	50	1542,16
CONNECTOR CN6 common mode	22	0,9	116,31	500	4	465,25	500	8	930,51	87	10	6106,51
CONNECTOR CN4 and CN5 differential	0,61	60	407,10	3,76	200	1628,43	14,6	400	3256,87	16,6	700	5343,31
CONNECTOR CN4 and CN5 common mode	0,61	4	101,77	3,76	15	407,10	14,6	30	814,21	16,6	50	1335,82

The parameters of common mode have to use when the field hazardous-area equipment and interconnections are not isolated from earth sufficiently and are not capable of withstanding a 500Vac 48Hz to 60Hz 1 minute isolation test (dielectric withstand voltage test).

12. Installation

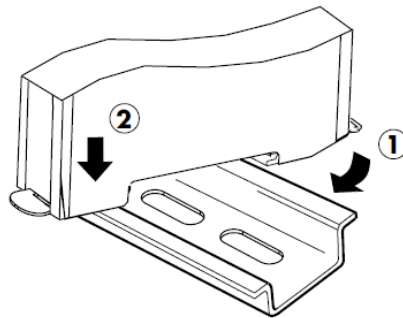
Safety diodes barriers must be installed in safe area only inside enclosure with adequate ingress protection related to installation area.

Refer to EN/IEC 60079-14 and EN/IEC 60079-25, with special reference to additional requirement for intrinsically safe installations.

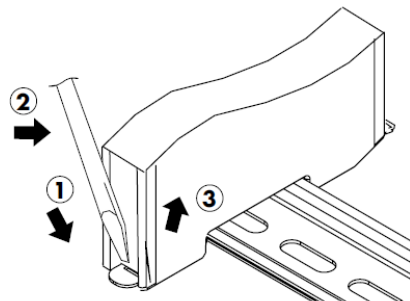
The equipment clamps directly onto standard T-section DINrail (EN 60715:2001). Before mounting the barriers, make sure the rail length is sufficient for the proposed number of barriers and for other mounting accessories.

Make sure that there is sufficient clearance between the DIN-rail and any possible obstruction (eg, other columns of barriers) to remove barriers and install accessories such as rails.

Provide sufficient height for tagging strip supports and insulating spacers when fitted.



Hook the hazardous-area end of the clamp over the DIN-rail and push the safe-area end of the barrier firmly down by hand until it clicks into place. Check that the barrier is securely clamped into place; to remove a barrier, use the tip of a screwdriver (with a blade width of 4 to 5mm, minimum shaft length 60mm) to ease the metal clip at the base on the safe-area end outwards until the barrier is freed and can be removed easily by unhooking the end.



Make sure the barrier is properly clamped onto the rail. In a row of barriers, one end of an improperly mounted barrier will stick up slightly.

Once the barrier is fitted, its foot grips the DIN-rail strongly in order to maintain positional stability.

The unit should not be forced along the rail. If it is necessary to reposition a barrier, detach it from the DIN-rail and re-attach it in the correct location. Where minor repositioning is needed, relieve the pressure on the spring of the mounting foot with a screwdriver and ease the unit into place.

13. Barrier connection

Connectors CN1, CN2 and CN3 must be connected towards safe are equipment.

Connectors CN4, CN5 and CN6 ONLY can be connected to intrinsically safe apparatus installed in hazardous area.

Safe 50mm distance minimum must be guaranteed between non-IS and IS loops if not oteherways protected.

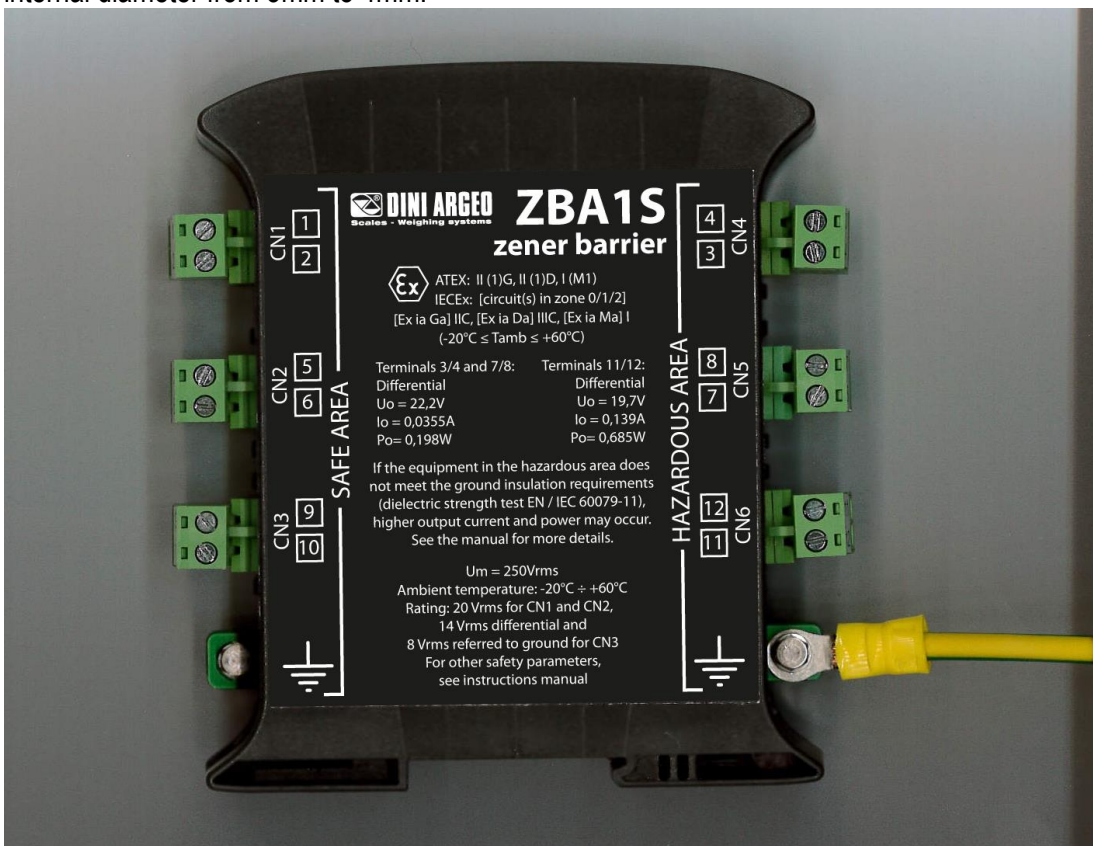
A safe 6 mm distance together with minimum IP protection according to EN/IEC 60079-14 and EN/IEC 60079-0 and EN/IEC 60529 must be guaranteed among IS channels. If not, faults must be considered among IS channels according to EN/IEC 60079-14.

Field hazardous-area equipment and interconnections should be isolated from earth sufficiently to be capable of withstanding a 500Vac 48Hz to 60Hz 1 minute isolation test (dielectric withstand voltage test). If field hazardous-area equipment and interconnections are not isolated from earth sufficiently and are not capable of withstanding a 500Vac 48Hz to 60Hz 1 minute isolation test (dielectric withstand voltage test), the parameters of common mode have to use.

Cable screen must be connected in one point only (to IS barrier earth facility is preferred).

Earth connection of the IS safety barrier must be connected directly to high integrity grounding point through a single 4mm² minimum, 1 Ohm maximum, wire or by mean of a couple of 1,5mm² minimum, 1 Ohm maximum, wires.

The connection of earth wire to earth connection of the zener barrier must be did with a ring terminal with internal diameter from 3mm to 4mm.



Picture 1

The zener barrier and weighing system must be connected at the same point of earth.

14. Verification and maintenance

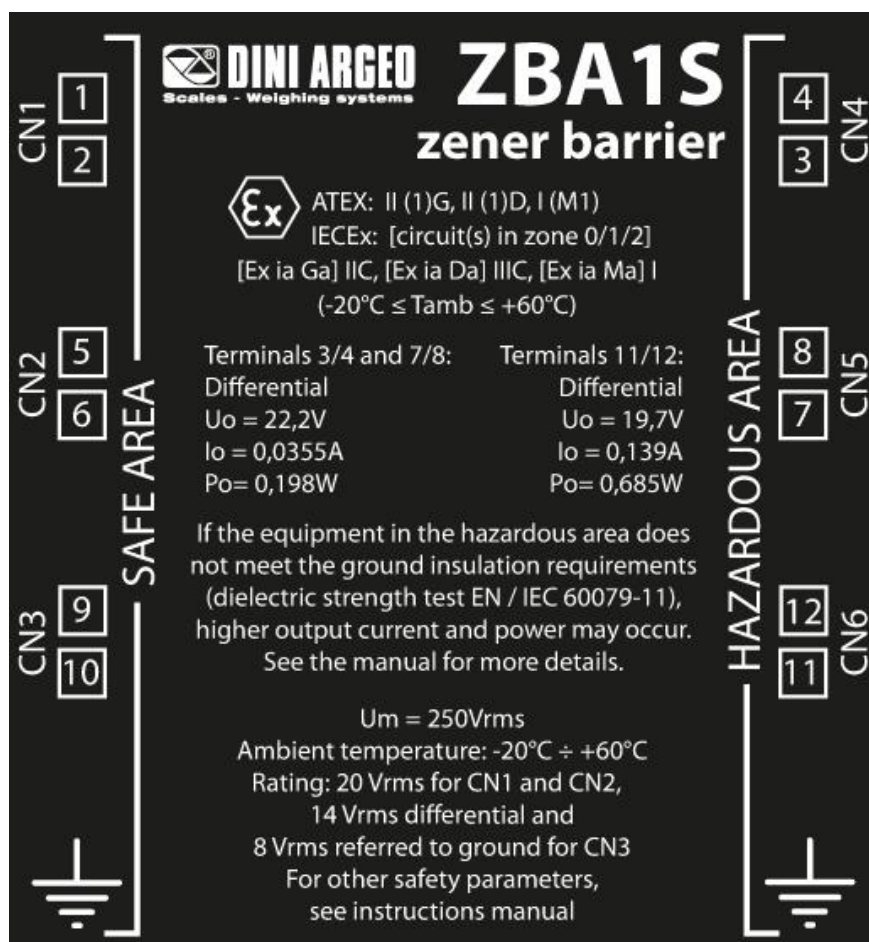
Periodic testing and maintenance must be conducted according to EN/IEC 60079-17.

The continuity (< 1 Ohm) of the IS earth connection must be tested periodically according to EN/IEC 60079-17.

15. Label content

Labels is reported on every cabinet, in external and visible position.

The content of the labels is the following:



Dini Argeo Srl, Via della Fisica, 20 - 41042 Spezzano di Fiorano - Italy : Manufacturer Name and Address

ZBA1S: Model type and Name

12345678: Serial number (unity number)

2018: Year

EPT 17 ATEX 2593: ATEX certificate number

EUR 18.0028: IECEx certificate number

2261: Notify Body number that it controls Production / Product Quality Assurance

15.1 Marking conforming to EC Directive 2014/34/EU and IECEx norms



European Union marking for equipment intended to be installed in hazardous location for the presence of potentially explosive atmospheres.

II

Equipment group suitable for the surface industry.

(1)

Category 1 associated apparatus of an equipment suitable to be installed in safe area and connected to circuits installed in zone 0, Zone 1 and zone 2.

G

Gas, vapour or mist are the combustible substances concurring to the formation of potentially explosive atmosphere.

II

Equipment group suitable for the surface industry.

(1)

Category 1 associated apparatus of an equipment suitable to be installed in safe area and connected to circuits installed in zone 20, Zone 21 and zone 22.

D

Dust is the combustible substance concurring to the formation of potentially explosive atmosphere.

I

Equipment suitable to be connected to circuits installed in zone classified for the presence of grisou (mines only).

(M1)

Category M1 associated apparatus of an equipment suitable to be installed in safe area and connected to circuits installed in mines category M1.

[Ex ia Ga]

Intrinsically safe associated apparatus (safety diodes barriers) assessing an equipment protection level (EPL) suitable for gas, vapour, mist level 'a', that is suitable for connection to circuits installed in Zone 0, Zone 1, Zone 2.

IIC

Equipment suitable to be connected to circuits installed in zone classified for the presence of gas, vapour, mists up to group IIC.

[Ex ia Da]

Intrinsically safe associated apparatus (safety diodes barriers) assessing an equipment protection level (EPL) suitable for dust level 'a', that is suitable for connection to circuits installed in Zone 20, Zone 21, Zone 22.

IIIC

Equipment suitable to be connected to circuits installed in zone classified for the presence of combustible dust up to group IIIC (conductive dust).

[Ex ia Ma]

Intrinsically safe associated apparatus (safety diodes barriers) assessing an equipment protection level (EPL) suitable for mines 'a', that is suitable for connection to circuits installed in grisou mines.

I

Equipment suitable to be connected to circuits installed in zone classified for the presence of grisou (mines only).



Community marking CE of conformity to all applicable directives

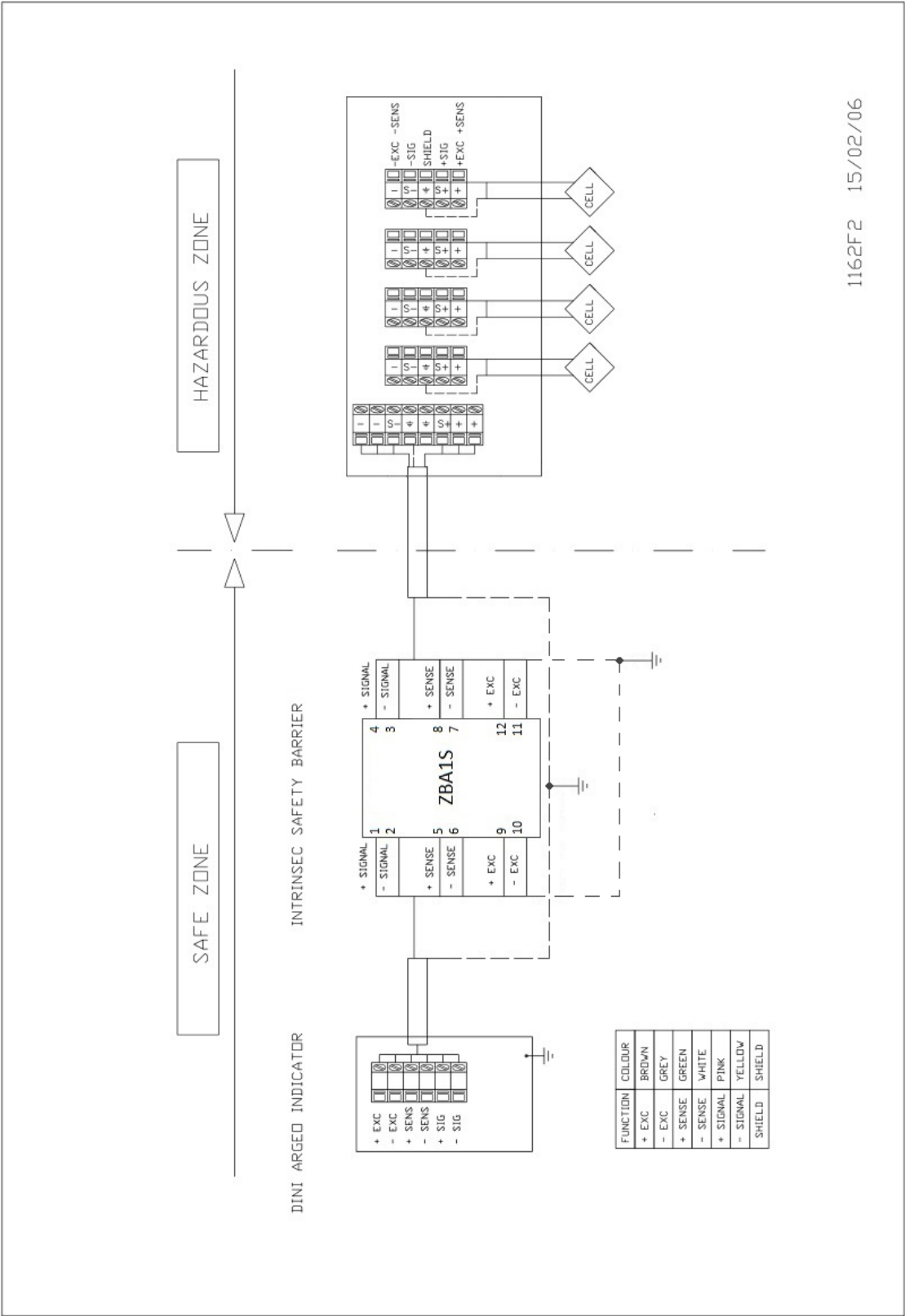
-20°C ≤ Tamb ≤ +60°C

Admitted ambient temperature range

Um = 250Vrms

Maximum perspective breaking voltage

16. Electric scheme



1162F2 15/02/06

EU DECLARATION OF CONFORMITY

According to European Directives 2014/30/EU and 2014/34/EU,

We **DINI ARGEO S.R.L.**
Via della Fisica, 20
41042 Spezzano di Fiorano Mod.se (MO) – Italy

Declare under our responsibility that the equipment:
Intrinsically safe associated apparatus (diode safety barrier) ZBA1S

Described in this declaration conform to the following directives:

- **ATEX Directive 2014/34/EU**
- **EMC Directive 2014/30/EU**

The conformity is confirmed by the observance of the following international standards:

For ATEX Directive 2014/34/EU:

Explosive atmospheres. Equipment. General requirements:

IEC 60079-0:2017 / EN IEC 60079-0:2018

Explosive atmospheres. Equipment protection by intrinsic safety

"I"

IEC 60079-11:2011 / EN 60079-11:2012

Explosive atmospheres - Part 26: Equipment with Equipment

Protection Level (EPL) Ga

IEC 60079-26:2014 / EN 60079-26:2015

For EMC Directive 2014/30/EU

Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements

IEC 61326-1:2012 / EN 61326-1:2013

For the purpose of affixing the ATEX marking on the machine, it is followed what required from Annex III of directive 2014/34/EU preparing document with the following technical file name: **EX-001 - rev.1 of 29/10/2021.**

The ATEX marking on the equipment:

II (1)G, II (1)D, I (M1) [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I (-20 °C ≤ Tamb ≤ +60 °C)

EU certificate type nr: EPT 17 ATEX 2593

Notified body for ATEX/Q surveillance: **2261 TÜV CYPRUS (TÜV NORD)**

Inside the company, technical data, technical file production, technical file retention are in charge to:

Technical Department. The buyer is responsible that during the working conditions are respected all operating and safety regulations indicated on the user manual.

Spezzano di Fiorano, 24/01/2022

Signature
Mark Johnson Jr.
President



Dini Argeo declares that the products are only affected by minor or formal changes with respect to the new edition of the standards. These changes are not relevant for compliance with the essential health and safety requirements. The products still comply with the ATEX Directive. This declaration is also valid if the marking and the certificates of the listed devices correspond to previous editions of standards.