Ex22TC50F EMISSION CONTROL PROBE 4-20 mA WITH STEEL CABLE

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1.1 STANDARD FEATURES

Code	Description
AT	**Tropicalisation of the Printed Circuit** Application of a protective paint on the printed circuit
BS40	**TC standard probe fastening bush AISI304** Standard TC probe fixing flange. Muff male thread 1-1/4
ExdPC20_1	**Cable glands Exd M20** Additional cable glands in Exd execution for cables without armour. Thread M20, IP66. Cable diameter from 5.5 to 13 mm. Position and number of cable glands by specification of the client. Certification: Ex II 2G Exd / Exe / Exia IIC Gb Ex II 2D Ex tb IIIC Db Temperature: -40°C < Ta < 90°C Certificate: INERIS 09 ATEX 0028X - IECEx INE 11.0017X - EAC Ex Material: Brass-Nichel

II 3D Ex tc IIIC IP66 T85°C

Code: Ex22TC50F : ATEX - Zone 22

Lenght avaliable: 75, 100, 150, 200, 250, 300, 350 mm
400, 500, 650, 800, 1000, 1550 mm

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GENERIC DOCUMENTATION. THE SPECIFIC DOCUMENTATION IS ATTACHED TO THE SEQUENCER

2.1 GENERAL DESCRIPTION

2.2 PREREQUISITE

The need to signal in advance possible leakages of the dedusting system avoiding high costs of environmental reclamation and of plants stop-overs brought, since a long time, to the use of electronic equipments dedicated to a better environmental safeguard. With the use of these devices it is possible to signal any failure that can produce dangerous emissions in the atmosphere which are symptom of breakdown in the dedusting plant. Especially, it is possible to control any breaks of the filtering surfaces, broken bags or cartridges.

The use of TC probes allows therefore to identify the dust particles which are present in the gases that go through the filter due to any breaks or failures of the bags or cartridges where the quantities of dusts to remark are considerable 100÷400

For a correct functioning of the TC probe, the cartridges or the bags must be mounted in a vertical position.

The TC probe is seldom used for the continuous monitoring of the dustiness degree present in the discharge duct of the gases in the atmosphere.

The above-mentioned use entails a more complicated calibration and a deep knowledge of the device.

2.3 TRIBO-CHECK® TC PROBE OPERATION PRINCIPLE

The probe's operation principle is founded on the TRIBO ELECTRIC 'T-E' effect.

This physical phenomenon is caused by the friction of particles suspended in the air against the surface of a probe which is placed in the measurement area. Particular electronic circuits which are located inside the probe allow to transform the static electricity generated by the T-E phenomenon into the electric signal proportional to the quantity of particles that generated it.

2.4 SENSITIVITY TO THE 'TE' EFFECT

The sensitivity to the TRIBO-ELECTRIC effect of the probe varies according to the type of dusts to be monitored, depending on the flow rate and characteristics of the system. On the basis of acquired experiences, it has been established that this sensitivity, namely the possibility that the probe generates an electric signal consequently to the collision of the particles suspended in the gases to be monitored, starts with minimum dust concentrations from 3÷8 mg/m3 (± 20 %) to 200 mg/m3 (± 20 %) in an acceptable linear way.

The signal generated by the TC probe depends on the type of material analyzed, the speed of the gas in the duct, the probe's length and the density of the particles in the duct.

2.5 OPERATION

The TC probe notes the passage of particles which are present in the gases by turning this physical phenomenon into an electric signal 4÷20 mA proportional to the dustiness degree.

A rotary switch located inside the head of the probe (SW 21) allows to change the amplification of the exit signal in order to permit a correct use of the TC probe in the most part of the dedusting systems.

The output signal (4÷20 mA) can be adjusted to program the activation of any alarms when the dust emissions overtake the values which have been set according to the law restrictions allowed.

3.1 TECHNICAL FEATURES

Supply Voltage	16 ÷ 24 VDC / 100 mA
Output signal	4 ÷ 20 mA Activ. Maximum load 350 Ohm
Terminals	1,5 mm2 130 V / 13,5 A
GAS temperature	120°C with BS40 (Standard)
GAS temperature	200°C with BS200 (On Request)
GAS temperature	400°C with BS400 (On Request)
GAS temperature	550 °C with BS400H (On Request)
Operating temperature	- 20 °C ÷ + 60 °C
Relative humidity	80%
Dimensions / Protection degree	IP66
Particle Size	>= 0.3 µm
steel cable lebght (meter)	4 ÷ 20 mt.

Device in class III.

We reserve the right to make any change without notice.

4.1 INSTALLATION RULES AND SECURITY

4.2 For the electrical connections use antiflame shielded cable 3 x 0,75 mm²

4.3 Remove the TC probe in case of electric weldings on the support structure of it and during the maintenance.

4.4 Pretect the 'head' of the probe against the direct exposure to sun light.

4.5 Every kind of operation on TC probe must be done without dust in the air and with supply voltage Off

4.6 A remarkable quantity of rain or water in the sampled gases could distort the reading of the signal.

4.7 The lack of application of existing rules and standards of installation and safety exonerate the manufacturer of responsibility.

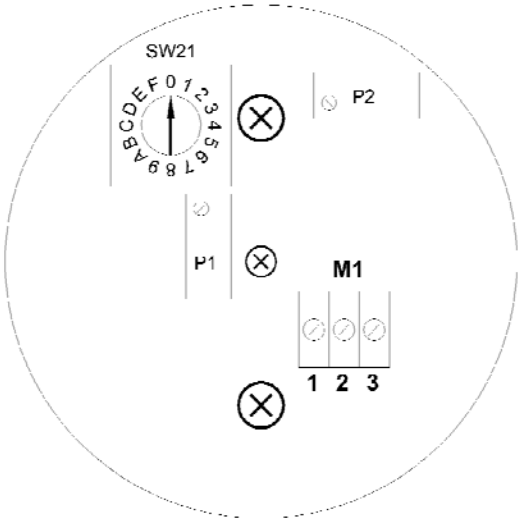
4.8 **Insert a fast 200 mA fuse on the supply voltage according to IEC / EN 60127, if not connected to the same equipment manufacturer.**

4.9 Not securety equipment

4.10 Avoid the accumulation of dust on the probe HEAD. Remove it with a damp cloth if necessary.

4.11 For connections to PLC or to other devices please use the provided units with galvanically isolated entry.

5.1 THRESHOLD, LAYOUT, WIRING DIAGRAM



SW21 : Rotative switch to regulate the amplification of the output signal

- **0** Minimum amplification
- **F** Maximum amplification

M1: External electrical connection

- **1** + Power supply (16 ÷ 24 VDC / 100 mA)
- **2** - Power supply / Output signal
- **3** + Output signal 4 ÷ 20 mA

The trimmer P1 and P2 SHOULD NOT BE REGULATED

	* COLOR OF THE CABLE
1 + Power supply (16 ÷ 24 VDC / 100 mA)	WHITE
2 - Power supply / Output signal	YELLOW
3 + Output signal 4 ÷ 20 mA	BROWN

Link to all models of the probe with a predisposition for tribo probe TC50

20 21 22 23

EARTH : Earth connection

(1) + Power supply (16 ÷ 24 VDC / 100 mA)

(2) - Power supply / Output signal

(3) + Output signal 4 ÷ 20 mA

1 2 3

* Connecting cable
Option on request. Code: CS

WARNING:
A wrong connection may irreparably damage the probe

6.1 POSITIONING AND OPERATING

6.2 POSITIONING AND OPERATING

The installation of the TC probe is done by fixing the BS40 flange to the duct to be monitored.

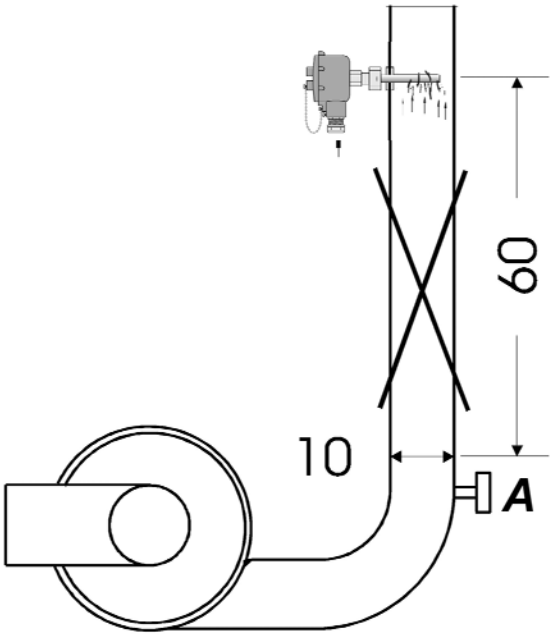
The BS40 flange, in AISI304 material, should be fixed in a part of the duct where isokinetic conditions happen.

The above condition, as a general rule, is placed at a distance of 6÷10 times from the diameter of the duct from the nearer bend from the side of the origin of the gases.

In this area, the components of turbulence in the gases present inside the duct are practically unimportant.

This condition is essential for the correct functioning of the monitoring and the reliability of the registered data.

It is suitable to install the probe with a slight bent downwards (head of the probe slightly upward compared to the end of the metallic pole) so that possible drops of condensation that can appear on the sensitive part of the probe can slip into the duct.



6.3 HOLE FOR CALIBRATION

For the next calibration for the simulation of the TC probe, it is necessary to provide for a hole with its plug in order to allow the introduction of dust. This hole should be positioned in vertical line duct under the TC probe at a certain distance to assure isokinetic conditions in the point of measurement (see next picture A).

6.4 FASTENING

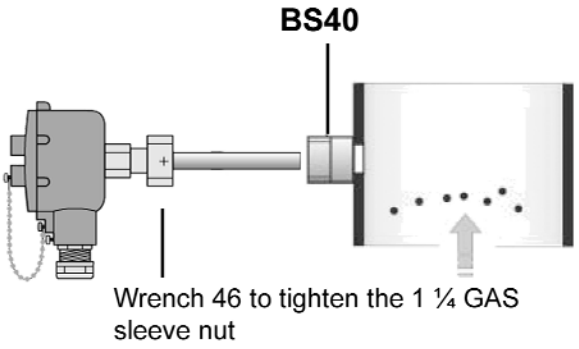
The standard BS40 flange is a muff male thread of 1¼ GAS with 35 mm hole.

BS40 is fixed to the duct by means of a welding on the same axis where the 35mm hole has been made. See the picture.

When the fixing operation of the probe is finished, introduce the TC probe.

The probe is fixed by closing the 1¼ GAS nut.

In case of high temperatures, consider longer flanges (see the picture)



6.5 DUCT GROUNDING

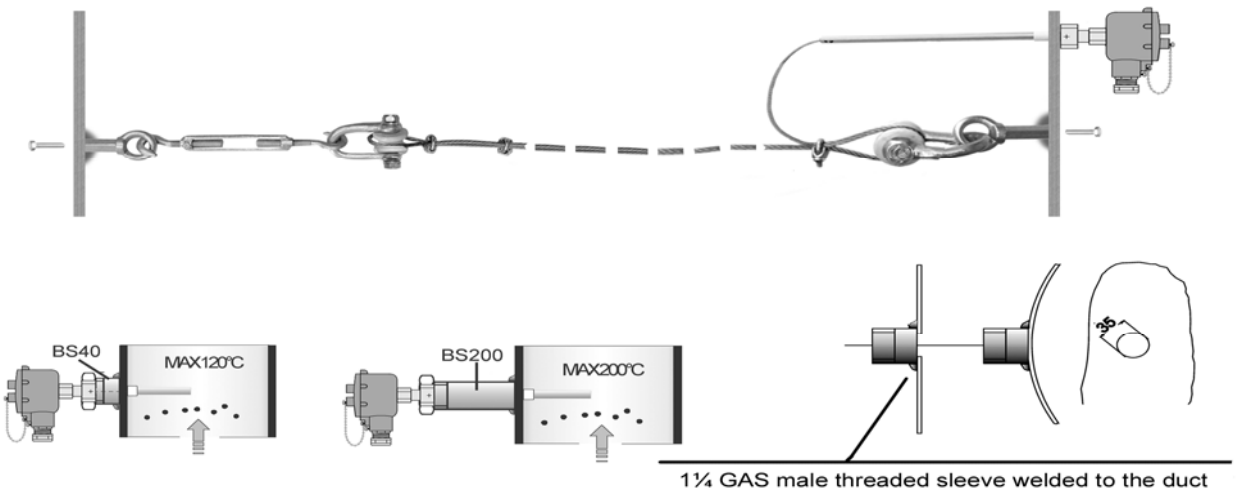
For a correct functioning of the probe it is essential that the sampling duct is connected to the ground.

6.6 MAINTENANCE

The TC probe does not require a particular maintenance.

Could be necessary polish up with a rag soaked of detergent (alcohol, gasoline etc.) the sensitive part of the probe (inside pole) without particular precautions.

The necessity to clean the probe should be checked after 6 months of operation or more frequently in case of gas with high umidity that could create deposits and consequently provoke alterations to the operation of the probe.



7.1 PROBE CALIBRATION

There are three methods for the calibration of the TC probe

1. For COMPARISON with data coming from isokinetic analysis in the gas to be sampled.
2. For SIMULATION with pre-weighed quantities put in the duct if the datas from the isokinetic analysis done in apposite laboratories are not available.
3. Calibration to detect only the broken bag or broken cartridge.

7.2 CALIBRATION FOR COMPARISON (SEE PRACTICAL EXAMPLE CALIBRATION FOR COMPARISON 7.7)

In order to proceed with the calibration of the probe, you must know the data concerning the quantity of dust present in the gases in mg/m3.

These data are normally released by special laboratories during the periodical gas analysis These analysis must be done according to the law restrictions.

7.3 CALIBRATION FOR SIMULATION (SEE PRACTICAL EXAMPLE CALIBRATION FOR SIMULATION 7.8)

The calibration of the probe is recommended after a certain period of operation of the plant. The above mentioned period is necessary to allow the filtering material to reach the typical characteristics of the functioning (filter partially dirty).

7.4 CALIBRATION OF THE 4÷20 mA SIGNAL

The function of the TC probe is to convert the triboelectric 'T-E' physical phenomenon, produced by a certain quantity of dust present in the gases, in an electric signal 'STC' 4÷20 mA.

In order to calibrate the STC signal, it is essential that the sampling duct contains a measurable quantity of dust.
In default of dust, it is impossible to proceed with the calibration.

The STC signal must be calibrated in order to cover the whole range of emissions.

In order to proceed with the calibration, the probe must be connected to an instrument that detects the 4÷20mA output signal.

1. Without dust emissions, the value must be 4mA (value pre-determined by the calibration from the manufacturer's laboratory).
2. With the maximum value of emissions estimated, the signal must be around 14÷18 mA.

In practice, if according to law regulations for certain types of material the maximum level of emissions allowed is equal to 20 mg/m3, the STC signal must be adapted to this value in the presence of maximum emissions.

You can get this calibration by acting on the rotary switch present inside the head of the probe (SW21).

By leaving a margin of 20÷30 % against the maximum value allowed, you can consider that: 0÷20 mg/m3 = 4÷17 mA.

Over 20 mA the STC signal saturates by making insignificant the higher values of dustiness.

This fact does not constitute a problem, since the goal of this application is to control by means of an alarm threshold that the emission limits envisaged by the law are not overtaken.

The STC signal generated is handled by electronic equipments (ESA sequencers, PLC, PC) that convert it into a digital value.

The digital value can easily be adapted to the value of the quantity of dust present in the duct.

7.5 SENSITIVITY

The TC probe, by triboelectric effect generates a STC electric signal which is function of 4 parameters:

1 Length of the probe
2 Speed of the gases in the sampling duct
3 Type of material present in the smokes
4 Density of dust

The degree of sensitivity of the probe means the possibility to convert the value of the T-E signal (source) in a certain STC 4÷20mA electric signal that can be used by the various equipments connected to it.

The ratio KTC between the two entities is called SENSITIVITY: STC = KTC x T-E.

7.6 SENSITIVITY REGULATION

KTC is a variable coefficient depending by the switch SW21 place inside of the TC probe (See Pg. 2).

SW21 allows to change the sensibility amplifying or attenuating the response of STC.

Normally SW21 comes set in position 8 to a low level after the laboratory tests.

7.7 PRACTICAL EXAMPLE OF CALIBRATION FOR COMPARISON

It is supposed to know, by means of data coming from previous analysis, that the duct contains around 10 mg/m3 with an output signal of 18 mA.

Suppose that the maximum value allowed by the law is of 20 mg/m3.

In order to obtain the best calibration, you should adapt the two values in the way that about 70% of the STC signal (15÷16 mA) corresponds to the maximum dustiness value allowed (20 mg/m3).

On a scale of 4÷20 mA. The value at 50% is of 12 mA

Having previously noticed an output signal from the probe of 18 mA for 10 mg/m3, it is evident that the amplification is too high.

It is supposed to know, by means of data coming from previous analysis, that the duct contains around 10 mg/m3 with an output signal of 18 mA.

Suppose that the maximum value allowed by the law is of 20 mg/m3.

In order to obtain the best calibration, you should adapt the two values in the way that about 70% of the STC signal (15÷16 mA) corresponds to the maximum dustiness value allowed (20 mg/m3).

On a scale of 4÷20 mA. The value at 50% is of 12 mA

Having previously noticed an output signal from the probe of 18 mA for 10 mg/m3, it is evident that the amplification is too high.

An increase of 30 % of dustiness can be enough to bring the signal to the full range around 20mA by rendering illegible all the emission values above 13 mg/m3.

Therefore, it is necessary to reduce the sensitivity through SW21 placed inside the probe.

If you consider a higher margin of reading of 30% of STC over the maximum limit of emissions allowed (20mA = 20 mg/m3+ 30% = 26 mg/m3), a simple calculation shows that at 10 mg/m3 the signal must be around 10÷11 mA.

Therefore, it is sufficient to regulate the SW21 rotary switch in the way to bring the STC output signal around this range of current and set the activation of the alarm of high emission at about16 mA.

7.8 PRACTICAL EXAMPLE OF CALIBRATION FOR SIMULATION

If the data obtained by the analysis are not available, by following this most approximate method it is possible to make the same calibrations as previously described. You must simulate an emission of a certain quantity of dust.

This method consists in putting the pre-weighed quantities through the hole mentioned in point 6.3 into the sampling duct in a pre-fixed time and measure the STC signal generated by the TC probe.

For this calibration it is necessary to know the range of the duct.

The calibration for simulation cannot be done in the absence of dust.

The following example indicates how to proceed:

Range of the duct = 100000 m3/h

Emission that you wish to simulate = 10 mg/m3

Time of insertion of dust in the duct = 60sec.

Quantity of dust to out in 1 minute = 10x100000x60/3600 = 16,66 g.

So, putting in the duct 16,66g in 1 minute, the correspondent emission is 10 mg/m3

Proceed as indicated in point 7.5 CALIBRATION OF THE 4÷20mA SIGNAL

7.9 CALIBRATION OF THE ALARM FOR BROKEN BAG OR BROKEN CARTRIDGE

This type of calibration is relatively simpler than the previous example 7.7 and 7.8 because it consists in checking that the STC signal detects an anomalous passage of dust in the duct..

As the broken bag or the broken cartridge causes emissions of considerable quantities of dust which are visible at the exit of the chimney, the calibration of the probe becomes simpler.

This type of calibration is done by throwing in the duct a handful of dust through the hole (see point 6.3) and checking the increase of the STC signal which is generally considerable.

This peak of the STC signal is used to detect the broken bag by means of the connected equipments or the internal relay in case of TC50R probe.

8.1 WARRANTY

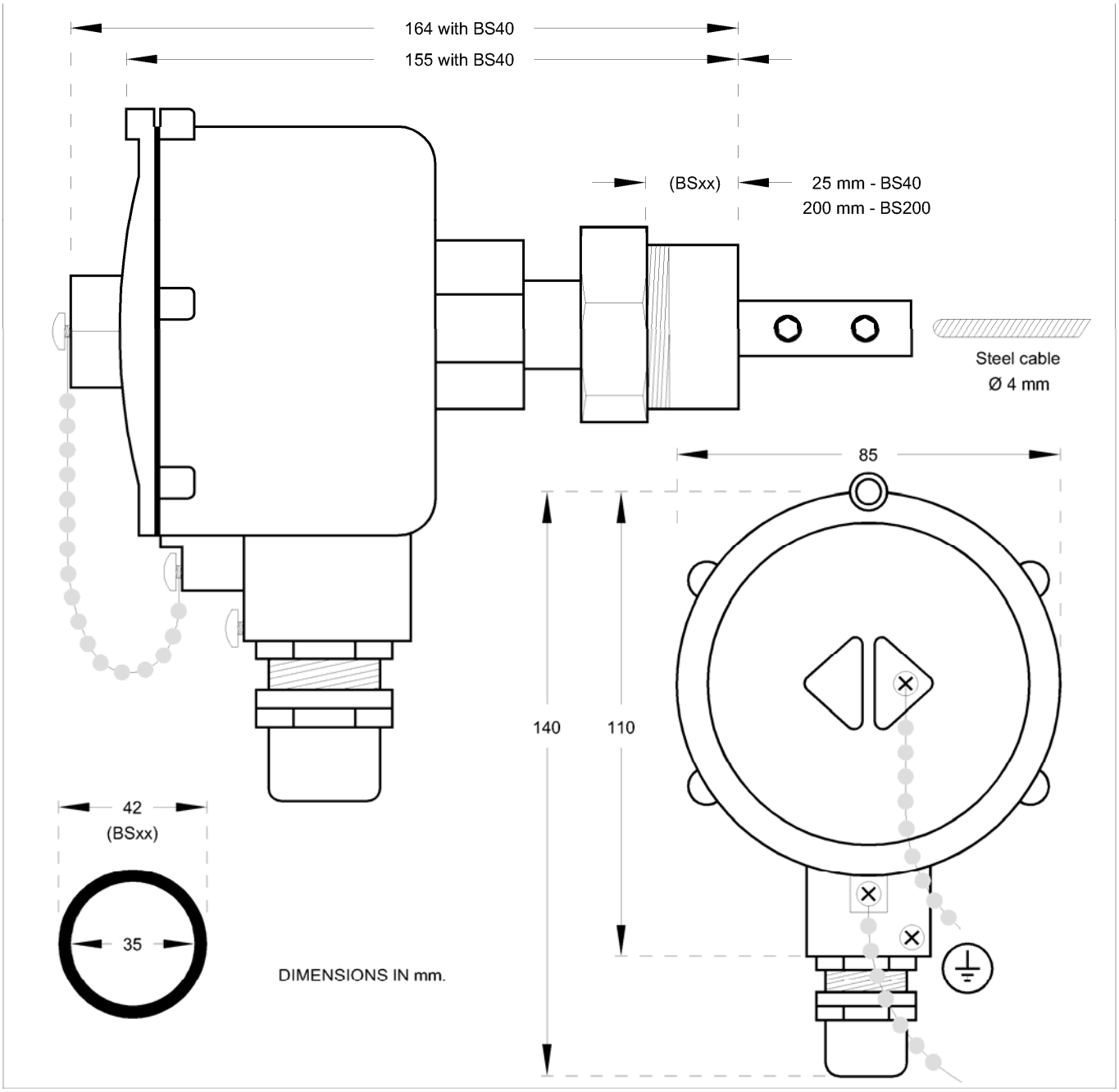
The warranty lasts 4 years. The company will replace any defective electronic component, exclusively at our laboratory, unless otherwise agreed, upon the Company's prior consent.

WARRANTY EXCLUSION

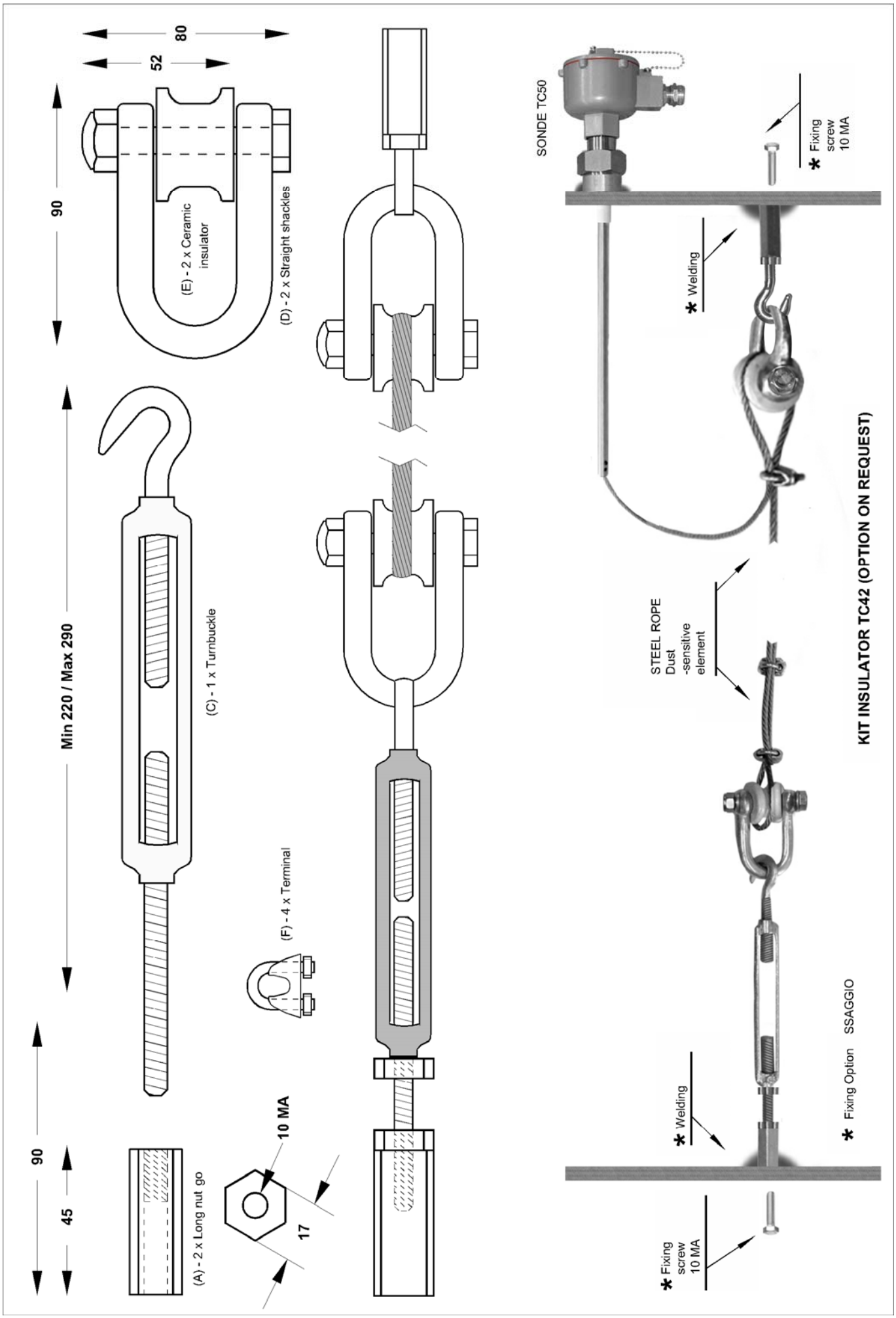
The warranty is not valid in case of:

1) Tampering or unauthorized repairs.
2) Wrong use of the device, not in compliance with technical data.
3) Wrong electrical wiring.
4) Inobservance of the installation rules.
5) Use of the device, not in compliance with CE rules.
6) Atmospheric events (Lightning, electrostatic discharge), Overvoltage.

9.1 ENCLOSURE DIMENSIONS



10.1 KIT STEEL CABLE WITH CERAMIC ISOLATOR (OPTION)



Dichiarazione di conformità UE
EU Declaration of Conformity (DoC)

Company name / Company name:	ESA Electronic Engineering	
Postal address / Postal address:	Via Kennedy, 28	
Postcode and City / Postcode and City:	20010	Mesero (MI)
Telephone / Telephone:	+39 02 972 89 899	
E-Mail address / E-Mail address:	esa@esaelectronic.it	

declare that the DoC is issued under our sole responsibility and belongs to the following product:

Apparatus model / Apparatus model:	Ex22TC50F
Product Type / Product Type:	Emission control / Emission control
Serial number / Serial number:	
Object of the declaration / Object of the declaration:	Ex22TC50F

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation
The object of the declaration described above is in conformity with the relevant Union harmonisation legislation
Directives 2014/30/UE, 2014/34/UE and 2011/65/UE amended by 2015/863/UE
Directives 2014/30/UE, 2014/34/UE and 2011/65/UE amended by 2015/863/UE
The following harmonised standards and technical specifications have been applied:
The following harmonised standards and technical specifications have been applied:

Title / Title	Date of standard / Date of standard
EN 60730-1	2011
EN 63000	2018
EN 60079-0	2018
EN 60079-31	2014

II 3D Ex tc IIIC IP66 T85°C

Amministratore delegato / Managing director

Signed for and on behalf of / Signed for and on behalf of

Mesero, 22 / 11 / 2021

BELLINELLI GIANFRANCO

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ADDITIONAL INSTALLATION RULES (ATEX ZONA 22)

The ATEX certification decade in case of every type of modifications of the original device that are not done by the manifacturer
All the electrical wiring must be done according to the Europen rule EN 60079-14
In case of faulty that does not depend only to the fuse, switch off immediately the supply voltage and contact the supplier. The reparation of the device must be done only in our laboratory and the device must be sent with the enclosure to our factory.

ATEX MARKING DETAILS

CE	EUROPEAN UNION Conformity brand
Ex	Useful in ATEX classified zone with potentially explosive atmosphere.
II	Group II. Surface plant
3D	Category - Dust
Ex tc	Protection by enclosure
IIIC	Explosive conductive powders
IP66	Protection degree
T85°C	Maximum surface temperature
20<Ta<+60°C	Ambient temperature