FUNCTIONAL SAFETY

CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

RTD & TC temperature sensors
Series 111TE, 112TE, 113TE, 114TE, 215TE

Manufactured by:

Thermo Engineering S.r.l.
Via Giuseppina, 19
26030 Malagnino (CR) - Italy

suitable for the following safety function(s):

RTD: To generate an electric resistance in the circuit corresponding to the actual temperature of the measured environment.
TC: To generate a difference in electric potential corresponding to the actual temperature of the measured environment.

has been assessed per the relevant requirements of

IEC 61508:2010 Parts 1 to 2

and meets the requirements providing the following:

Systematic Capability: The compliance with the requirements for the avoidance of systematic faults and the requirements for the control of systematic faults have been achieved following the compliance Route 1_S.	SC 3
Hardware Safety Integrity: The constraints on hardware safety integrity have been verified in order to achieve a sufficiently robust architecture taking into account the level of element and subsystem complexity following the compliance Route 1_H and Route 2_H.	Type A
Random Safety Integrity: The estimated safety integrity, for each safety function, due to random hardware safe and dangerous failures rates (excluding "no part" and "no effect" contribution).	See page 2

The architectural constraints and the effects of random failures (PFH/PFD_{AVG}) must be verified for each specific application and safety function implemented by the E/E/PE safety-related system.

Certified by:

BYHON

BYHON Certification Director:

Rosati Francesco

CERTIFICATE No:
TRME-RTDTC-ENS-A01

Issued:
February 18th, 2025

Valid until:
February 17th, 2028

The owner of a valid certificate for an assessed product is authorized to affix the following mark to all recognized devices which are identical to the product assessed.

BYHON SIL

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17065
PRODUCT CERTIFICATION BODY
#8914

*The Certificate shall be reproduced only in its original entirety

The design of each Safety Instrumented Function (SIF) shall meet the requirements listed in the reference standards that shall be selected by taking into account the specific application. Specific activities necessary to investigate and reach a judgment on the adequacy of the functional safety achieved by the E/E/PE safety-related system or compliant items (elements/subsystems) has been conducted by an independent assessor.

The following failure rates data shall be used to the PFH/PFD_{AVG} estimation, taking into consideration all parameters such as redundancy, architectural constraints, diagnostic capability, also introduced by the whole system, including the considerations about the proof test and its effectiveness, mean time of restoration, up to the maintenance capability and its minimum characteristics.

Device failure rates

Element	Configuration	Sensing element architecture	λ_S	λ_{DU}	λ_{DD}
Sensor	RTD, 2 or 3 wire Low stress	1oo1	-	27	69
		2oo2	-	54	138
		1oo2	-	3	7
Sensor	RTD, 4 wire Low stress	1oo1	-	45	155
		2oo2	-	90	310
		1oo2	-	5	15
Sensor	RTD, 2 or 3 wire High stress	1oo1	-	108	277
		2oo2	-	215	553
		1oo2	-	11	28
Sensor	RTD, 4 wire High stress	1oo1	-	181	619
		2oo2	-	362	1238
		1oo2	-	18	62
Sensor	Thermocouple Low stress	1oo1	-	38	162
		2oo2	-	76	324
		1oo2	-	4	16
Sensor	Thermocouple High stress	1oo1	-	152	648
		2oo2	-	304	1296
		1oo2	-	15	65
Enclosure	Series 111TE, 112TE	-	-	256	183
Enclosure	Series 113TE	-	-	204	2
Enclosure	Series 215TE	-	-	43	-
Enclosure	Series 114TE	-	-	233	-

Note:

- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- For each device, to obtain the overall failure rate, a "Sensor" + an "Enclosure" shall be summed.
- The prescriptions contained in the safety manual SMan shall be followed.
- The device can be used in applications up to SIL 2 with HFT=0, and in applications up to SIL 3 with HFT=1 (where HFT is referred to the device as a whole, not at the internal architecture of the sensing elements). In any case, the SIL reached by the entire Safety Instrumented Function (SIF) must be verified by the System Integrator / Final User considering demand mode, architectures, proof test interval and effectiveness, availability of diagnostics.

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The Functional Safety Assessment report no.

25-TRM-RTDTC-FSA-01

dated:
February 18th, 2025

is an integral part of this certificate

Mod_12_CB Rev09

BYHON
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