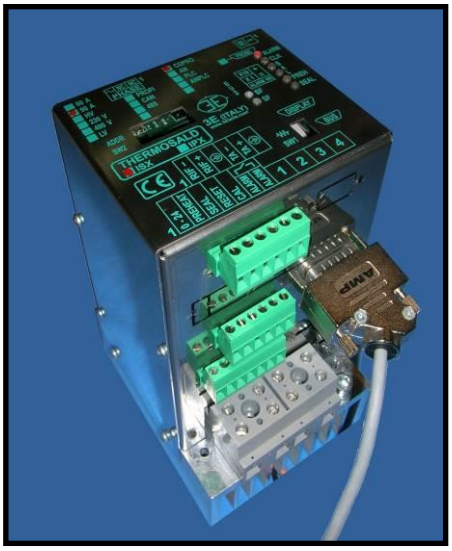
THERMOSALD
ISX

A MODULAR SYSTEM
FOR
IMPULSE SEALING



ISX SCR

ISX SCR HP

ISX HF

ISX LOW COST SCR

USER AND INSTALLATION MANUAL
V9

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1 INTRODUCTION

This USER MANUAL is the only complete document associated with the product presented on the cover and contains all the information for using it correctly.

Before using this product, be sure to have read chapter 2 - SAFETY WARNINGS AND CERTIFICATIONS.

1.1 REVISIONS OF THIS MANUAL

Rev.	***Date***	***SW***	***Description***
1	12/10/2020	V7.3 V9.0 V10.0	New ISX SCR models New ISX HF models New ISX LOW COST SCR models New models with PLC option
2	17/6/2021	V7.3 V9.0 V10.0	New ISX SCR HP models
3	12/07/2021	V7.3 V9.0 V10.0	Minor changes
4	14/09/2021	V7.3 V9.0 V10.0	Changed default for parameter “Max period offset[us]” Minor changes
5	22/10/2021	V7.3 V9.0 V10.0	Minor changes
6	23/11/2021	V7.3 V9.0 V10.0	Minor changes
7	9/12/2021	V7.3 V9.0 V10.0	Minor changes
8	6/6/2022	V7.3 V9.0 V10.0	Minor changes
9	10/6/2022	V7.3 V9.0 V10.0	Minor changes

2 SAFETY WARNINGS AND CERTIFICATIONS

In order to use the product presented on the cover and documented in this USER MANUAL, it is necessary to have adequate technical training in the sector, to consult and follow carefully this USER MANUAL and to adhere to the current SAFETY REGULATIONS. Improper use of the device can lead to dangerous conditions for the operator and for things and people in the whereabouts.

The following symbol is used throughout this manual to highlight particularly important information as far as safety is concerned:

Use the thermoregulator in compliance with the regulations otuliend in par. 2.1.

Make the CONNECTIONS as outlined in chapter 4 - CONNECTIONS.

Use only certified sealing elements (e.g. sealing bands, wires) with a suitable TEMPERATURE COEFFICIENT (>=800PPM/K) specified by the sealing element manufacturer (see par. 5.3.6).

Carry out the CONFIGURATION as outlined in chapter 5 - CONFIGURATION AND DIAGNOSTICS.

COMMISSION this product as outlined in chapter 8 - COMMISSIONING.

Carry out MAINTENANCE as outlined in chapter 9 - MAINTENANCE.

Do not use the device in an explosive environment or with explosive materials.

Do not use the device with flammable material without taking the necessary precautions.

Do not use the device in ATEX zones 20 and 21.

Do not use the device in an ATEX zone 22 environment. In this case, it is mandatory to make the area of the sealing element explosion-proof.

To increase the reliability of the application, consider the following measures:

- **Use a double check on the MAX TEMPERATURE (see par. 5.3.9) provided in redundant models (see chapter 11) with COPROCESSOR (see chapter** 7**).**

- **Use the TEMPERATURE PROBES (see par.** 5.3.7**) provided in the relating models (see chapter** 11**).**
- **Use the fieldbus to perform runtime monitoring via the PLC of the critical "Temperature coefficient" variables (see par.** 5.3.6**), "Current temperature" (see par.** 5.3.8**) and "Max Sealing Temperature" (see par.** 5.3.9**).**
- **Use the fieldbus to duplicate the emergency relay via a PLC output and the alarm information coming from the bus itself (see par.** 5.3.1**).**

There are models in which the maximum temperature and coefficient are limited (see chapter 11)
There are models in which the maximum temperature is limited and the coefficient is fixed (see chapter 11)

2.1 CONFORMITY TO STANDARDS - CE MARKING

This device complies with the essential requirements of the following EU Directives applicable to the product, with reference to the following harmonized standards:

ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the approximation of the laws of the member states relating to electromagnetic compatibility and repealing Directive 89/336/EC

With reference to the following harmonized standards:

EN 61000-6-2 (2005-08) + EC (2005) + IS1 (2005)
Electromagnetic Compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-3 (2007-01) + A1
Electromagnetic Compatibility (EMC) Part 6-3: Generic standards - Emission for residential environments

EN 61000-6-4 (2007-01) + A1 (2011)
Electromagnetic Compatibility (EMC) Part 6-4: Generic standards - Emission for industrial environments

LOW VOLTAGE DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member states relating to electrical equipment designed for use within certain voltage limits.

With reference to the following harmonized standards:

EN 60204-1 + A1 +AC
Safety of machinery – Machine electrical equipment – Part 1: Generic standards.

*DIRECTIVE **2002/95/EC** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.*

*DIRECTIVE **2002/96/EC** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE).*

*DIRECTIVE **2011/65/EC** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.*

2.1.1 DECLARATION OF CONFORMITY

3E S.r.l. Via del Maccabreccia 46 – 40012 Lippo di Calderara – Bologna - Italy

CE	**DICHIARAZIONE DI CONFORMITÀ** ***DECLARATION OF CONFORMITY*** In accordo allo standard: *UNI CEI EN ISO/IEC 17050-1(2010)* *According to UNI CEI EN ISO/IEC 17050-1 (2010)*
N° :	*Indicate the reference number for the declaration*
Costruttore: *Manufacturer:*	*3E S.r.l.*
Indirizzo Costruttore: *Manufacturer's address:*	*Via del Maccabreccia 46 – 40012 Lippo di Calderara – Bologna - ITALY*

Dichiara sotto la propria responsabilità che il prodotto:
Declares that the product:

THERMOSALD ISX
È conforme ai requisiti essenziali delle Direttive Comunitarie applicabili: *Conforms to essential requirements according to EU Directives:*
LOW VOLTAGE DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the approximation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits *DIRECTIVE 2014/35/UE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits* in riferimento alle seguenti normative armonizzate: *in reference to following standards:* ✓ EN 60204-1 + A1 + AC Sicurezza del macchinario – Equipaggiamento elettrico delle macchine *Safety of machinery – Electrical equipment of machines - Part 1: General requirements*

DIRETTIVA COMPATIBILITA' ELETTROMAGNETICA 2014/30/UE DEL PARLAMENTO EUROPEO E DEL CONSIGLIO del 26 febbraio 2014 concernente il ravvicinamento delle legislazioni degli Stati membri relative alla compatibilità elettromagnetica e che abroga la direttiva 89/336/CE

ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 26 February 2014 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

in riferimento alle seguenti normative armonizzate:
in reference to following standards:

- ✓ EN 61000-6-2 (2005-08) + EC (2005) + IS1 (2005)

Compatibilità elettromagnetica (EMC) Parte 6-2: Norme generiche - Immunità per gli ambienti industriali
Electromagnetic compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments

- ✓ EN 61000-6-3 (2007-01) + A1)

Compatibilità elettromagnetica (EMC) Parte 6-3: Norme generiche -Emissione per gli ambienti residenziali
Electromagnetic compatibility (EMC) Part 6-3: Generic standards – Emission for residential environments

- ✓ EN 61000-6-4 (2007-01) + A1 (2011)

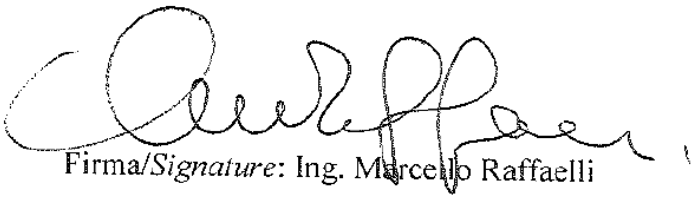
Compatibilità elettromagnetica (EMC) Parte 6-4: Norme generiche - Emissione per gli ambienti industriali
Electromagnetic compatibility (EMC)Part 6-4: Generic standards – Emission standard for industrial environments

DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27 January 2003 on waste electrical and electronic equipment (WEEE)

DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

Data/*Date*: 22/11/2017



3 DESCRIPTION

3.1 MARKET INTRODUCTION

THERMOSALD ISX is a modular line of configurable and compatible products designed to meet all the requirements of the IMPULSE SEALING market. THERMOSALD ISX is the result of the company's many years of experience in impulse sealing and is fully compatible with all previous THERMOSALD PWM, THERMOSALD SCR, THERMOSALD UPSCR, THERMOSALD ISC thermoregulators.

Its modularity and high configurability allow you to choose the right model, from the most economical FULLY ANALOGICAL to the most expensive and sophisticated one with COPROCESSOR and the main FIELDBUSES.

The ISX SCR models combine the know-how described above within products based on the traditional technology of the SCR power modules.

The ISX SCR HP models exploit the same technology as the previous models, but have been designed for specific use in those applications where high power consumption is required. They feature cooling fans to better withstand thermal stress on site and a high-performance SCR power module.

DC-powered ISX HF models are designed for ultra-high-speed applications and to ensure operation even in working environments where the power grid is severely disrupted.

Finally, the range is completed by the ISX LOW COST SCR thermoregulators, the most economical models of the line, which are fully compatible with all previous THERMOSALD PWM and THERMOSALD SCR analog thermoregulators.

3.2 PRODUCT DESCRIPTION, APPLICATIONS AND ADVANTAGES

Like the previous impulse thermoregulators, THERMOSALD ISX can heat a sealing sealing band, a cutting/sealing wire, or a sealing element in general to the set temperature in a very short time without using additional probes. This technology makes it possible to obtain very high working speeds for sealing and/or cutting polyethylene, polypropylene, ecological and heat-sealable plastic films in general.

The product is used on all packaging machines with sealing and/or cutting requirements: vertical and horizontal filling machines, shrinkwrappers, shoppers, vacuum packing machines, etc.

Temperature is controlled directly on the heating element, the control allows the temperature to be maintained even at high speeds, avoids temperature drift between the first seal and the subsequent ones during the production run, and prevents overheating of the support bars and consequent mechanical problems caused by expansion. Any cooling air blow and/or other measures can further increase the speed and improve the quality of the seal.

At a frequency that may be the mains frequency on SCR models or at a frequency generated internally on HF models, THERMOSALD ISX reads the voltage and current on the sealing band, calculates the resistance and, therefore, the temperature (which is a function of the resistance) and reduces in closed loop the current heating the sealing band. This current is supplied, on SCR models by a power transformer by means of phase reduction performed on the secondary winding of the power transformer, and by an external DC power supply unit on HF models.
By means of this thermoregulator structure, the user can implement the application without practically having voltage or current limits, since the problem is completely focused on the power transformer or the external power supply unit (see par. 4.3.3) and on technical plant regulations.

3.3 MAIN TECHNICAL FEATURES

The following is a list of the most important technical and functional features of the new THERMOSALD ISX product in the following order: first the new features introduced in this new model followd by those inherited from previous models.

3.3.1 NEW FEATURES OF ISX MODELS

- **24VDC LOW VOLTAGE POWER SUPPLY**
  It allows you to use the same thermoregulator regardless of the mains voltage.

- **POWER SUPPLY ON THE TRANSFORMER'S SECONDARY WINDING (SCR MODELS) OR FROM DIRECT VOLTAGE (HF MODELS)**

- **CALIBRATION IN ENVIRONMENT UP TO - 30°C**

- **TEMPERATURE PROBE OPTION FOR ACCURATE CALIBRATION**
  (Not available on LOW COST models)
  To resume the drift of the sealing band over time.

- **COMPATIBILITY WITH ALL MAJOR FIELDBUSES**
  (Not available on LOW COST models)

- **COPROCESSOR OPTION FOR REDUNDANT CONTROL**
  (Not available on LOW COST models)

- **ONBOARD PLC OPTION WITH SEALING TIMES**
  (Not available on LOW COST models)
  To allow you to use the thermoregulator with timeframes and internal logic for total control of small semi-automatic sealing machines.

- **GUIDED SIZING OF POWER TRANSFORMER (SCR MODELS) OR DC PSU (HF MODELS) VIA DISPLAY PANEL OR FIELDBUS**
  (Not available on LOW COST models)

- **COMPATIBILITY WITH ALL PREVIOUS MODELS ALSO ANALOG**
  To allow the replacement of obsolete models in the machine and ensure continuity in spare parts.

- ***0-5V or 0-10V ANALOG INPUTS* FOR SETTING PRE-HEATING AND SEALING TEMPERATURE VIA POTENTIOMETER OR PLC ANALOG OUTPUT**
  (Available on standard models with ANALOG OPTION or LOW COST models)

- **0-5V ANALOG OUTPUT TO THE PLC FOR CURRENT TEMPERATURE AND ALARMS**
  (Available on standard models with ANALOG OPTION or LOW COST models)

- **HOT CALIBRATION AT PROGRAMMABLE TEMPERATURE WITH TEMPERATURE PROBE**
  (Available on versions V7.3 and from versions V10)

- **POSSIBILITY OF COMPENSATING THE TEMPERATURE OF THE DRIFT SEALING BAND DUE TO THE SEALING AREA BEING MUCH SMALLER THAN THE TOTAL LENGTH**

- **SPEED**
  50/60Hz mains frequency control (ISX SCR)
  250Hz high frequency control (ISX HF)

- **COOLING**
  ISX SCR HP models feature automatic device temperature control, which envisages the starting of the cooling fans in the event of device overheating and an alarm in case of cooling system failure.

3.3.2 FEATURES INHERITED FROM PREVIOUS MODELS

- **FULLY AUTOMATIC CALIBRATION**
  To perform calibration simply without selectors and trimmers. The thermoregulator adapts to any sealing band used through automatic calibration.
  On ISX SCR and ISX HF models, calibration can be started by pressing the calibration button on the display panel, via a digital input to the thermoregulator, or by a command sent via the fieldbus.
  On LOW COST models, calibration can be started by pressing a calibration button on the thermoregulator for 3 seconds or by activating the CALIBRATION INPUT signal from the PLC for 3 seconds.

- **DETAILED DIAGNOSTICS FOR TROUBLESHOOTING**
  Powerful diagnostics alert the user to any problem that has occurred in the machine, from a wiring error during installation to a fault problem during regular operation.
  On all models, in the event of warnings or alarms, the balance LEDs flash to indicate exactly the number.
  In all models there is a relay contact that opens in the event of an alarm.
  On ISX SCR and ISX HF models, diagnostic information can also be displayed on the display panel or retrieved through the fieldbus.
  On models with an analog or LOW COST option, diagnostic information can also be read via an analog output.

- **GROUND CURRENT SENSOR**
  To stop the machine in the event of current leakage from the grounded sealing band and consequent sealing malfunction.

- **ON-LINE ANALYSIS OF RESISTANCE, VOLTAGE, AND CURRENT VALUES OF THE SEALING BAND**
  Thedevice allows you to view and compare theoretical, commissioning, and run time values of resistance, voltage, current, and power to help the operator diagnose any machine problems.

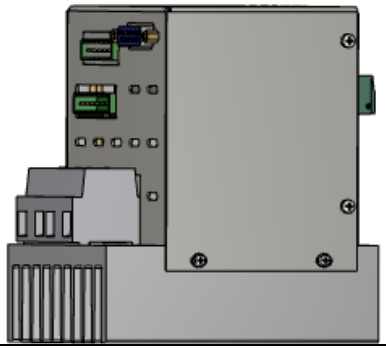
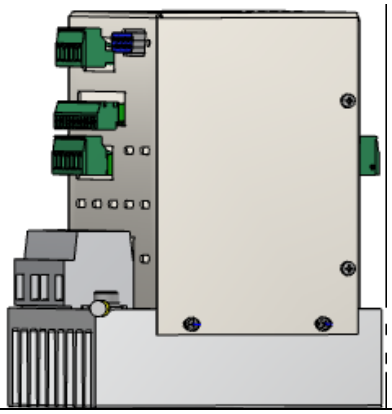
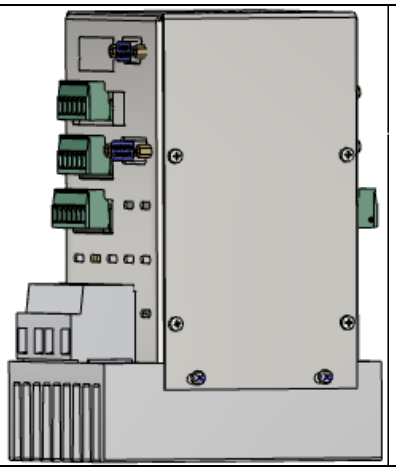
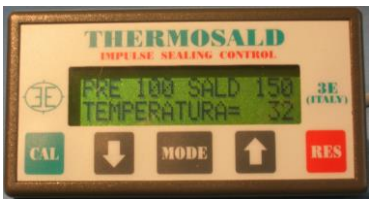
- **ALPHANUMERIC DISPLAY IN 6 LANGUAGES WITH { IP65 OPTION**
  (Not available on LOW COST models)

- **THERMOREGULATOR PARAMETERIZATION WITH DIGITAL TEMPERATURE SETTING AND EDITING OF SEALING PARAMETERS**
  (Not available on LOW COST models)

3.4 CONFIGURATIONS

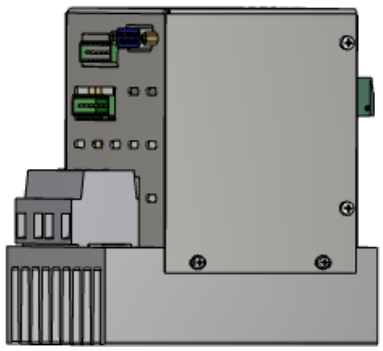
You can build the thermoregulator that best suits your machine's needs on the same basic dimensions (see ANNEX E - MECHANICAL DIMENSIONS).

3.4.1 ISX SCR, ISX SCR HP and ISX HF Models

3 LEVELS	4 LEVELS	5 LEVELS
	1 additional level for: - FIELDBUS - COPROCESSOR - ANALOG - PLC - ANALOG and PLC	1 additional level for: - FIELDBUS 1 additional level for: - COPROCESSOR
		
		
SET-UP FOR DISPLAY PANEL		

3.4.2 ISX LOW COST SCR Models

4 LEVELS



3.5 APPLICATION DEFINITION AND TECHNICAL REPORT

When defining a new application it is advisable to contact 3E for the analysis of the technical problems and the choice of the components to be used. During this stage 3E will be able to draw up the Technical Report with all the relevant information.

Pulse thermoregulator Thermosald
Commissioning calculation

Date: 02/09/2020
Customer: 3E
Machine: TEST

Band

Width: 4 [mm]
Thickness: 0,25 [mm]
Chanfered: No
Total length: 600 [mm]
Active length: 540 [mm]
Bands number in series: 1
Bands number in parallel: 2
Speed factor: 1,8
Resistivity: 0,850 [Ohm x mmq / m]
Heating current: 30 [A / mmq]
Duty cycle: 0,7

Theorical calculations

Resistance = 0,23 [Ohm]
Active current max = 60 x 1,8 = 108 [A]
Active tension = 13,77 x 1,8 = 24,8 [V]
Active power max = 578,3 x 3,2 = 1874 [VA]

Power transformer

Nominal power = 2000 [VA]
Intermittent service = 50 [%]
Real power = 1000 [VA]
Primary voltage: 0 - 400Vac +SH
Secondary voltage: 0 - 25Vac
Power cable: 10mm^2

Note:

4 CONNECTIONS

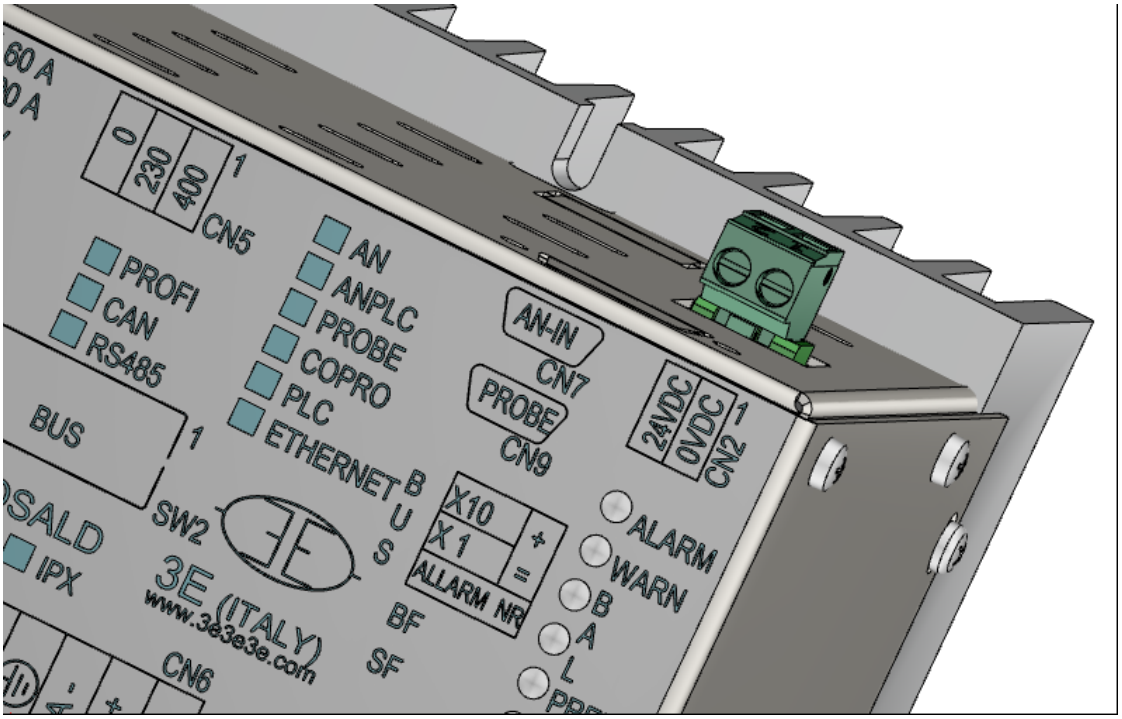
Before making any CONNECTIONS you should carefully have read chapter 2 - SAFETY WARNINGS AND CERTIFICATIONS

This device must be installed in accordance with the requirements of the IEC - EN60204 standard.

4.1 WIRING DIAGRAMS

This paragraph describes the main connection modalities according to the Thermosald model chosen.

4.1.1 24V POWER SUPPLY CONNECTION



For the detailed information about the CN2 connector, see par. 4.2.3.

4.1.2 DIGITAL SIGNALS CONNECTIONS

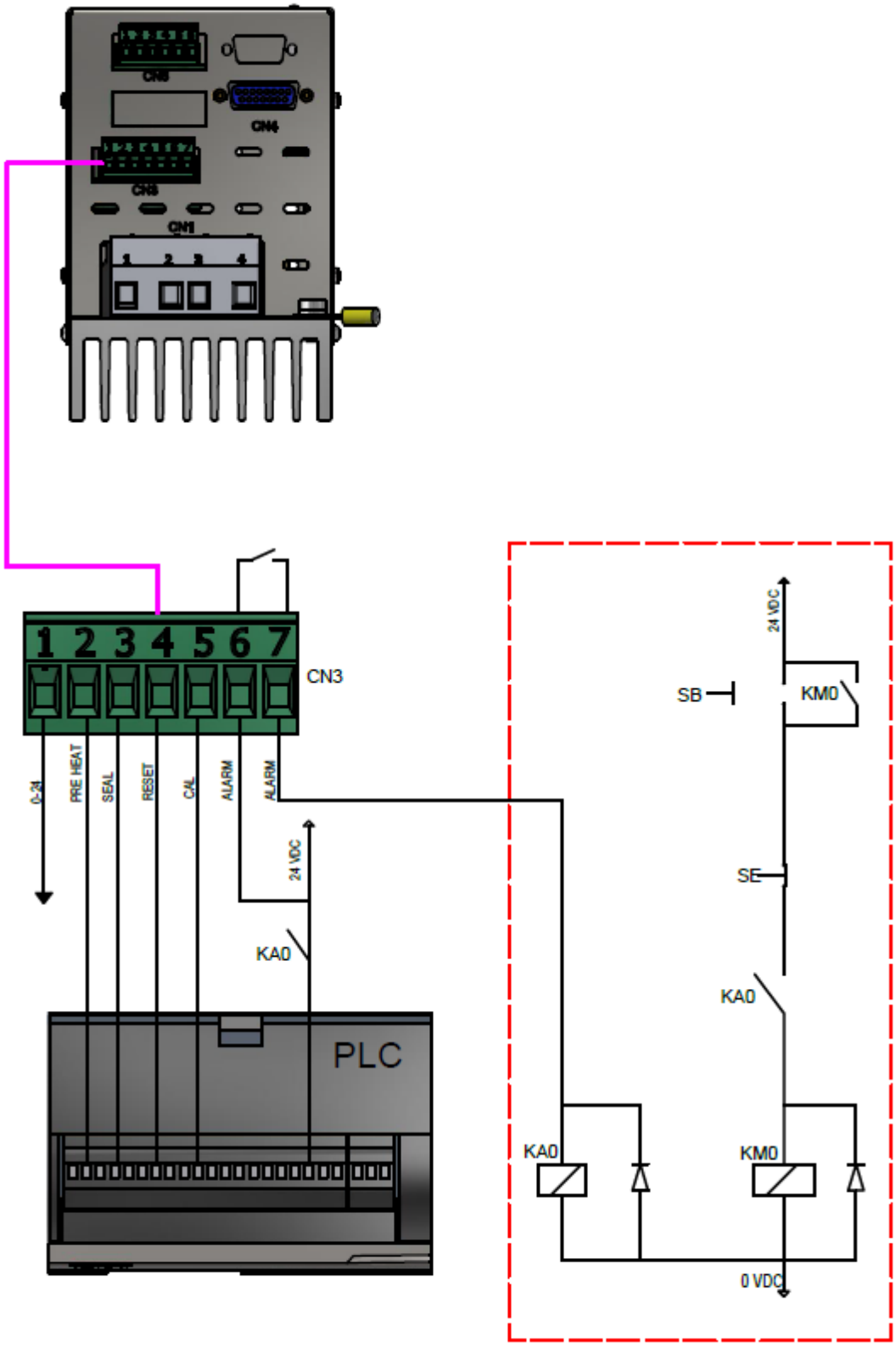


Figure 1

For the detailed information about the CN3 connector, see par. 4.2.4.

KA0	Auxiliary relay for alarm output to PLC and emergency contactor
KM0	Emergency contactor
SB	Emergency contactor reset button
SE	E-Stop mushroom-shaped button

4.1.3 POWER CONNECTIONS - CHECK ON SECONDARY WINDING (valid for ISX SCR and ISX LOW COST SCR models)

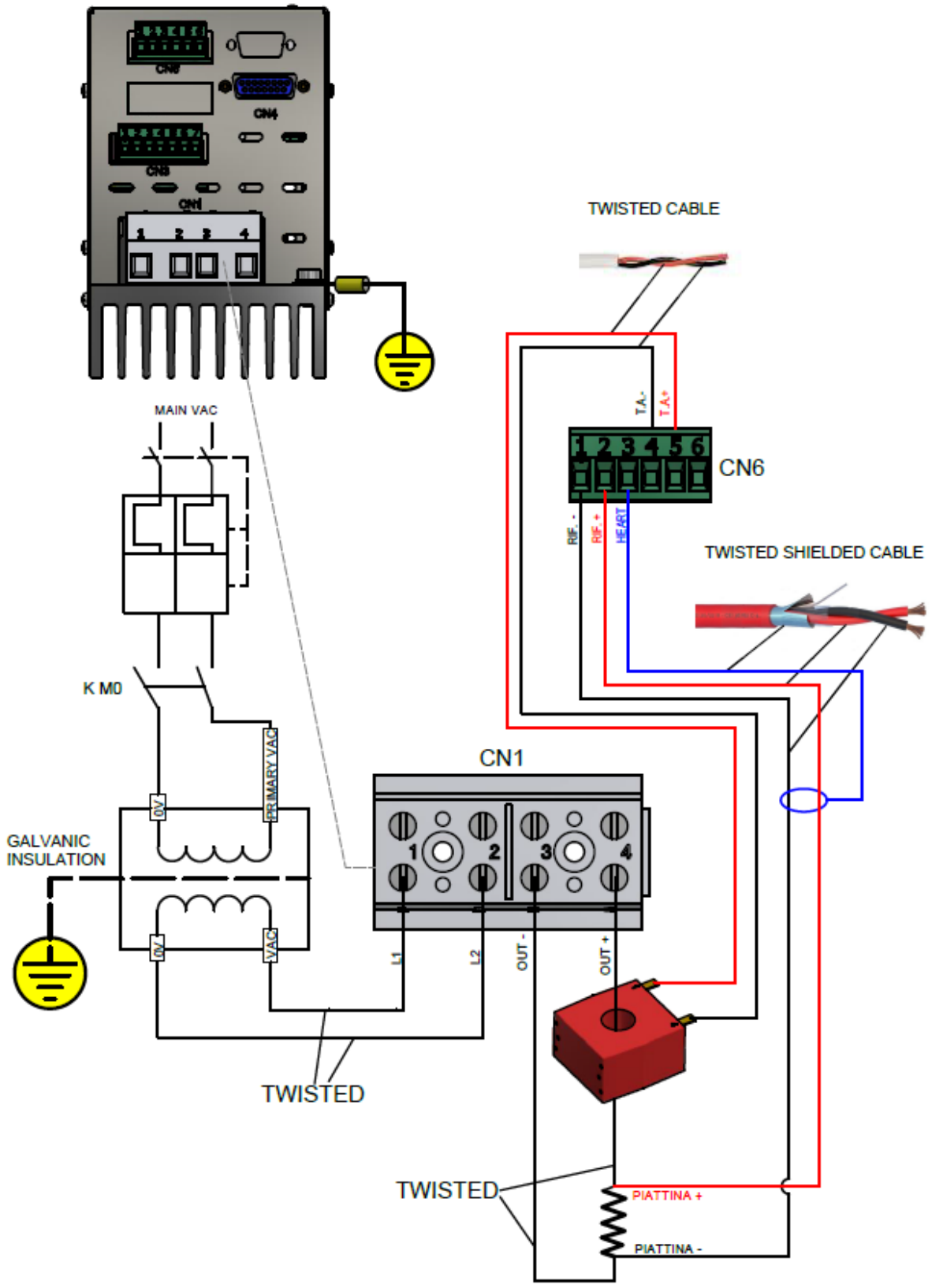


Figure 2

Pins CN1/2 and CN1/3 are grounded internally with a 100 Ohm resistor.

For models equipped with COPROCESSOR OPTION, the CN6 connector, the reference cable, the Amperometric Transformer (A.T.), the CN9 connector and the temperature probe are doubled in the models, where envisaged.

For the detailed information about the CN1, CN6, CN9 connectors, see par. 4.2.1, par. 4.2.6, par. 4.2.9.

4.1.4 POWER CONNECTIONS – CHECK IN DC (valid for ISX HF models)

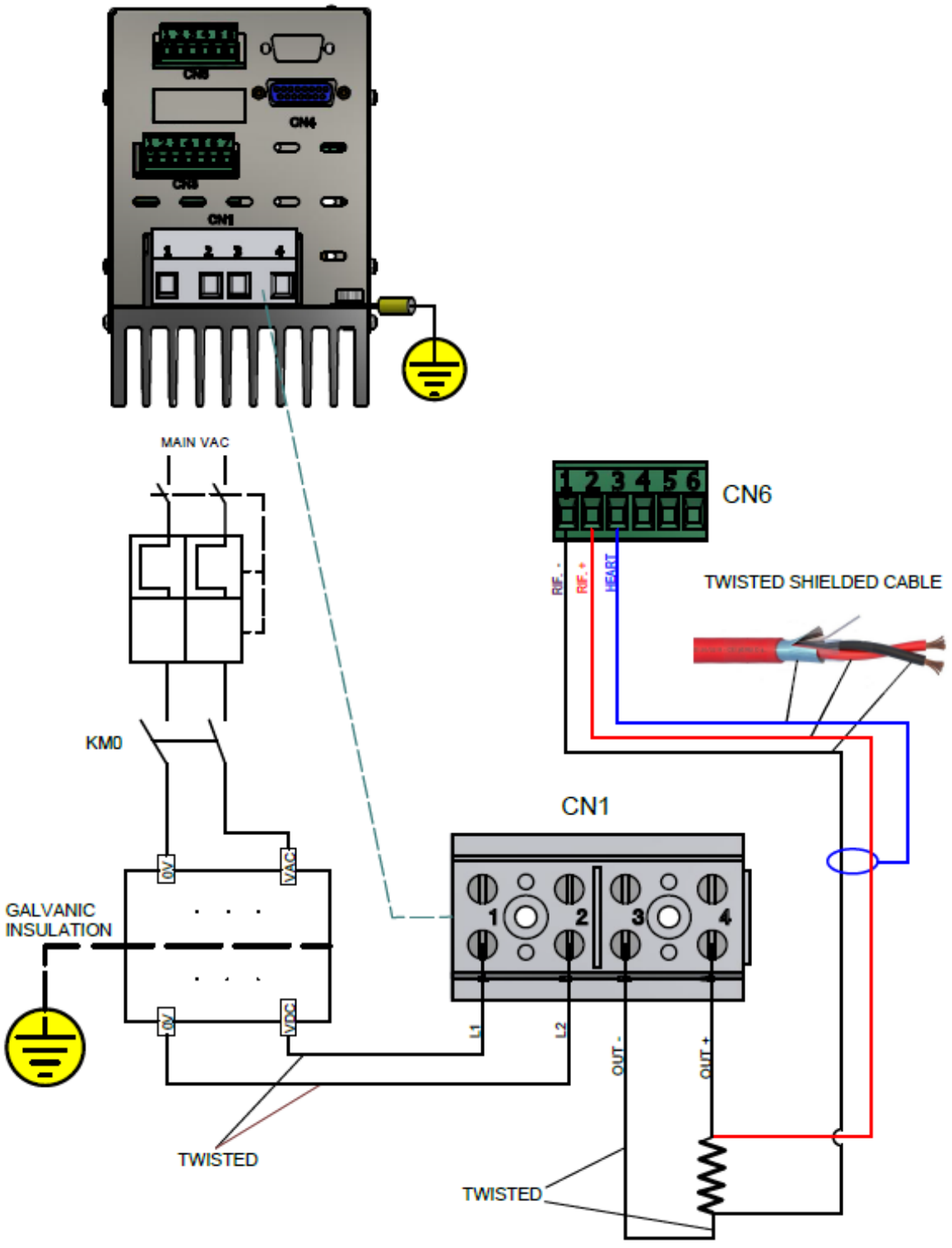


Figure 3

Pins CN1/2 and CN1/3 are grounded internally with a 1 Ohm (first series), 10 Ohm (second series), or 100 Ohm (following series) resistor.

For models equipped with COPROCESSOR OPTION, the CN6 connector, the reference cable, the CN9 connector and the temperature probe are doubled in the models, where envisaged.

For the detailed information about the CN1, CN6, CN9 connectors, see par. 4.2.2, par. 4.2.6, par. 4.2.9.

4.1.5 CONNECTION WITH OPERATOR PANEL (not valid for ISX LOW COST models)

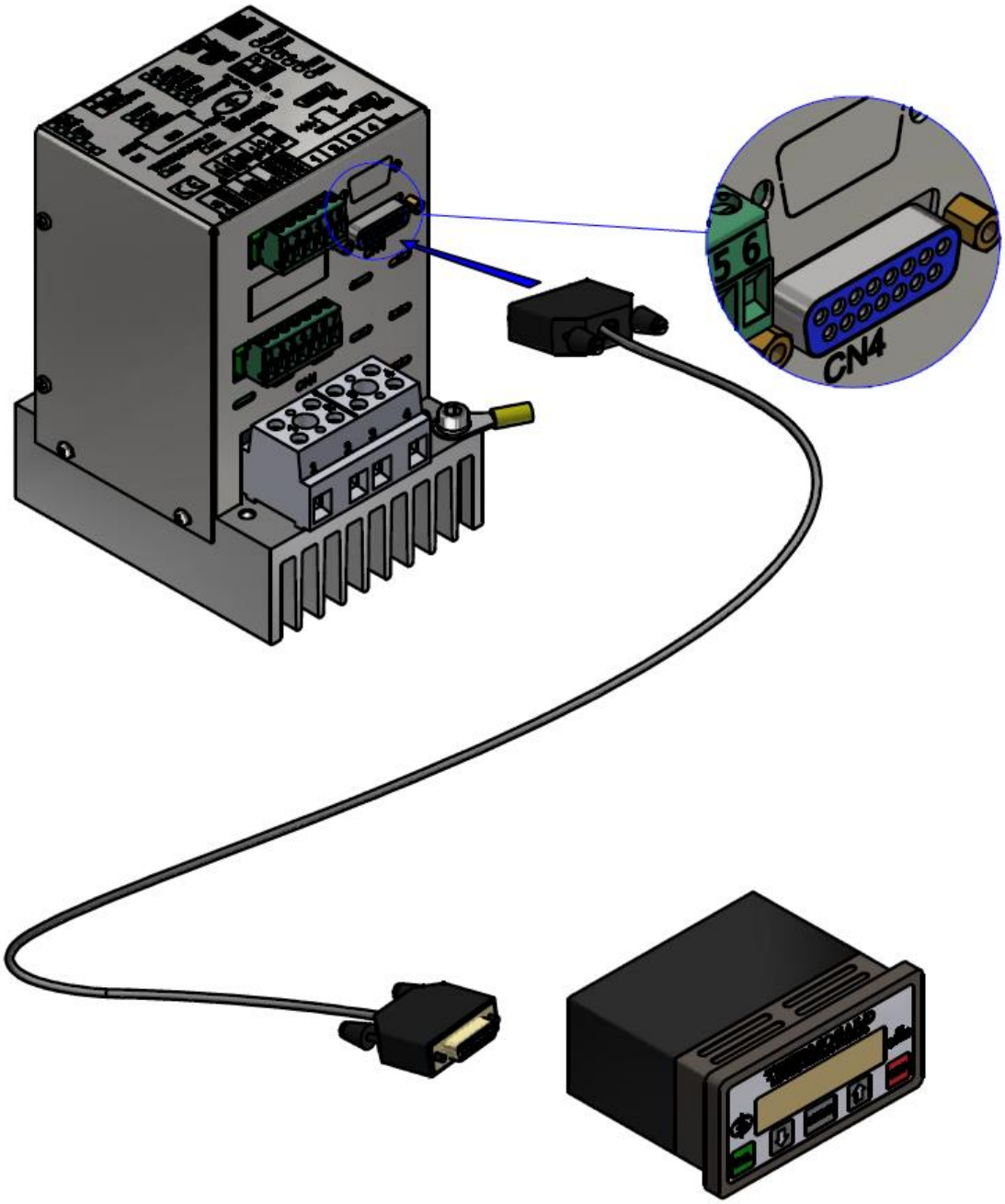


Figure 4

The connection cable between the thermoregulator and the display panel must be shielded with pin-to-pin connection. Cable core section must be at least 0.25 mm² and maximum length 20 m. It is advisable to use cables supplied by 3E available in various lengths (see par. 11.1.13).
For the detailed information about the CN4 connector, see par. 4.2.5.

4.1.6 ANALOG CONNECTIONS WITH PLC, POTENTIOMETERS, VOLTMETER (valid for ISX LOW COST and ISX models with analog option)

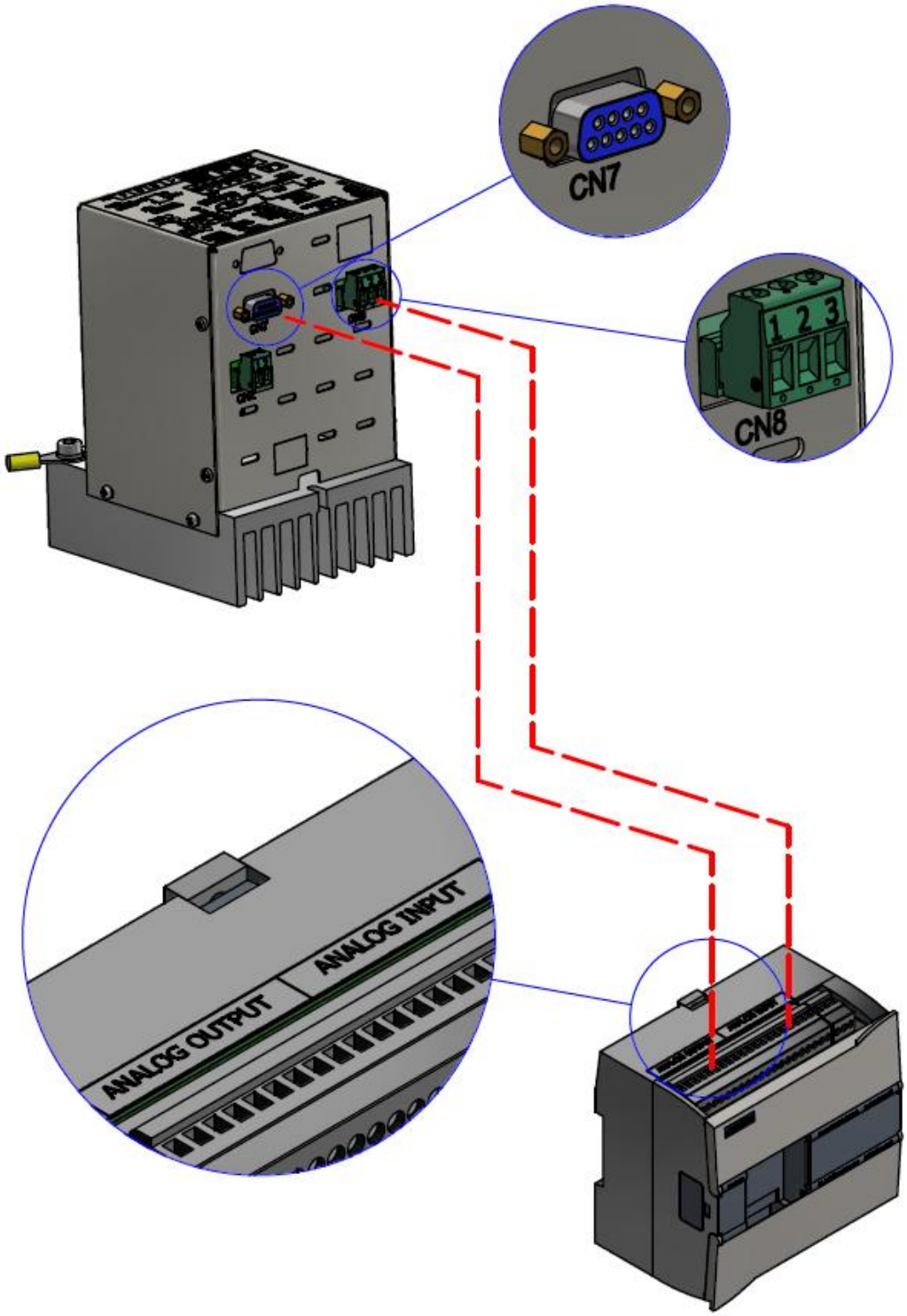


Figure 5

For the detailed information about CN7 and CN8 connectors, see par. 4.2.7 and par. 4.2.8.

4.1.7 CONNECTION WITH FIELDBUS AND OPERATOR PANEL, ETHERNET-based versions (not valid for ISX LOW COST models)

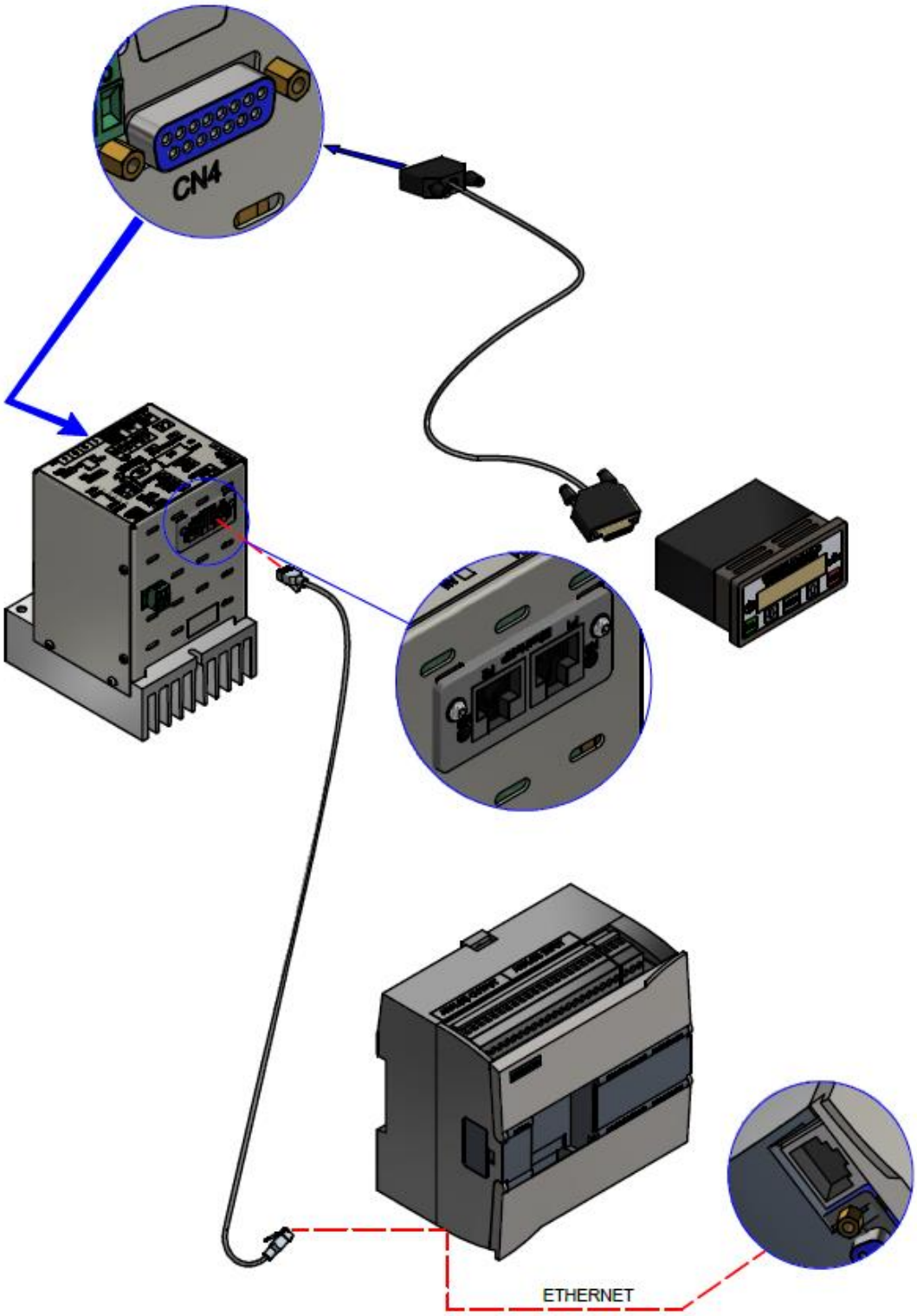


Figure 6

The operator panel is not essential for fieldbus operation.

For the detailed information about the connectors, see par. 6.2 - CONNECTIONS AND DIP SWITCHES.

4.1.8 CONNECTION WITH FIELDBUS AND OPERATOR PANEL, Modbus RTU RS485 and Profibus versions (not valid for ISX LOW COST models)

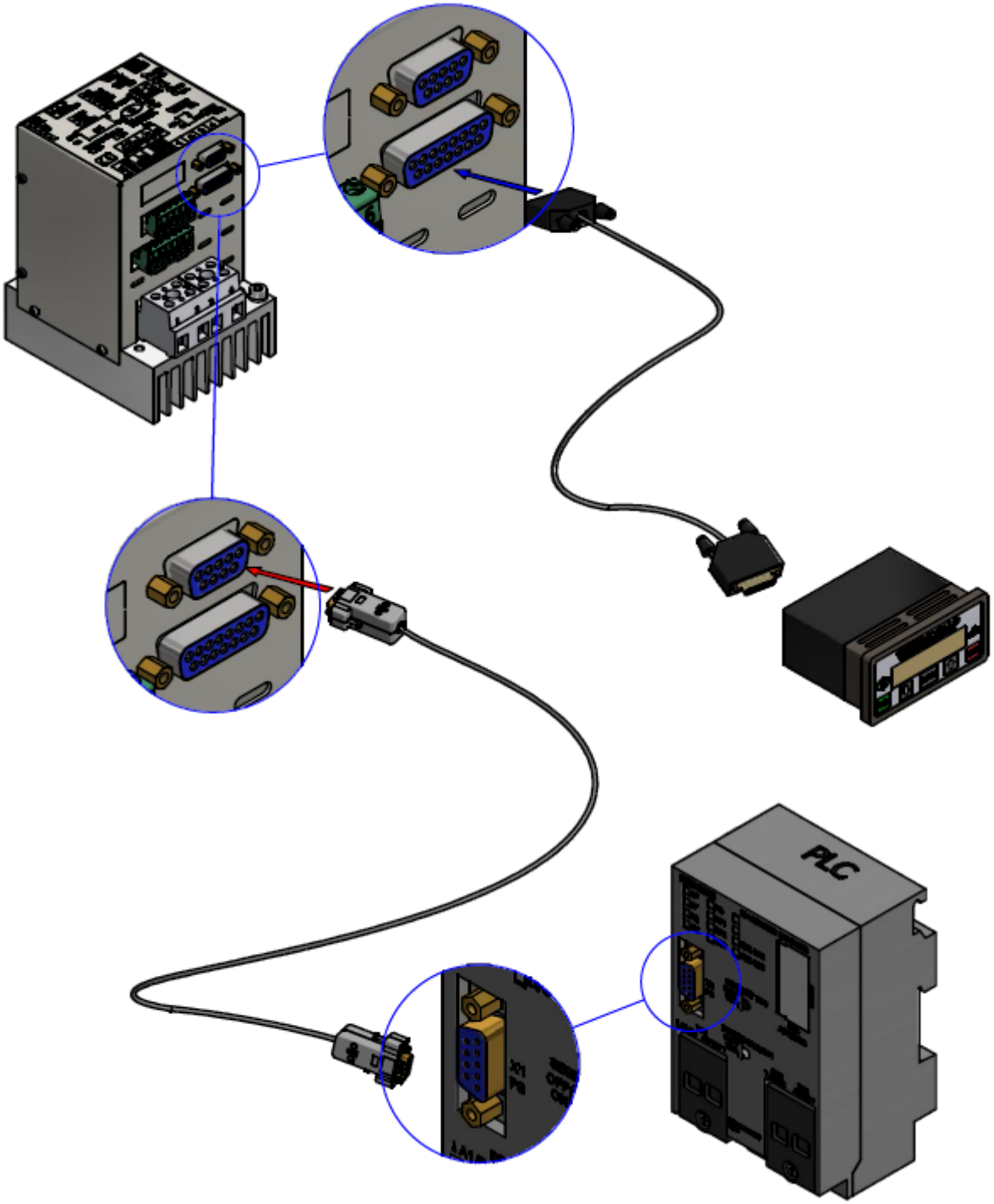


Figure 7

The operator panel is not essential for fieldbus operation.
For the detailed information about the connectors, see par. 6.2 - CONNECTIONS AND DIP SWITCHES.

4.1.9 DIGITAL CONNECTIONS WITH PLC (valid for ISX models with PLC option)

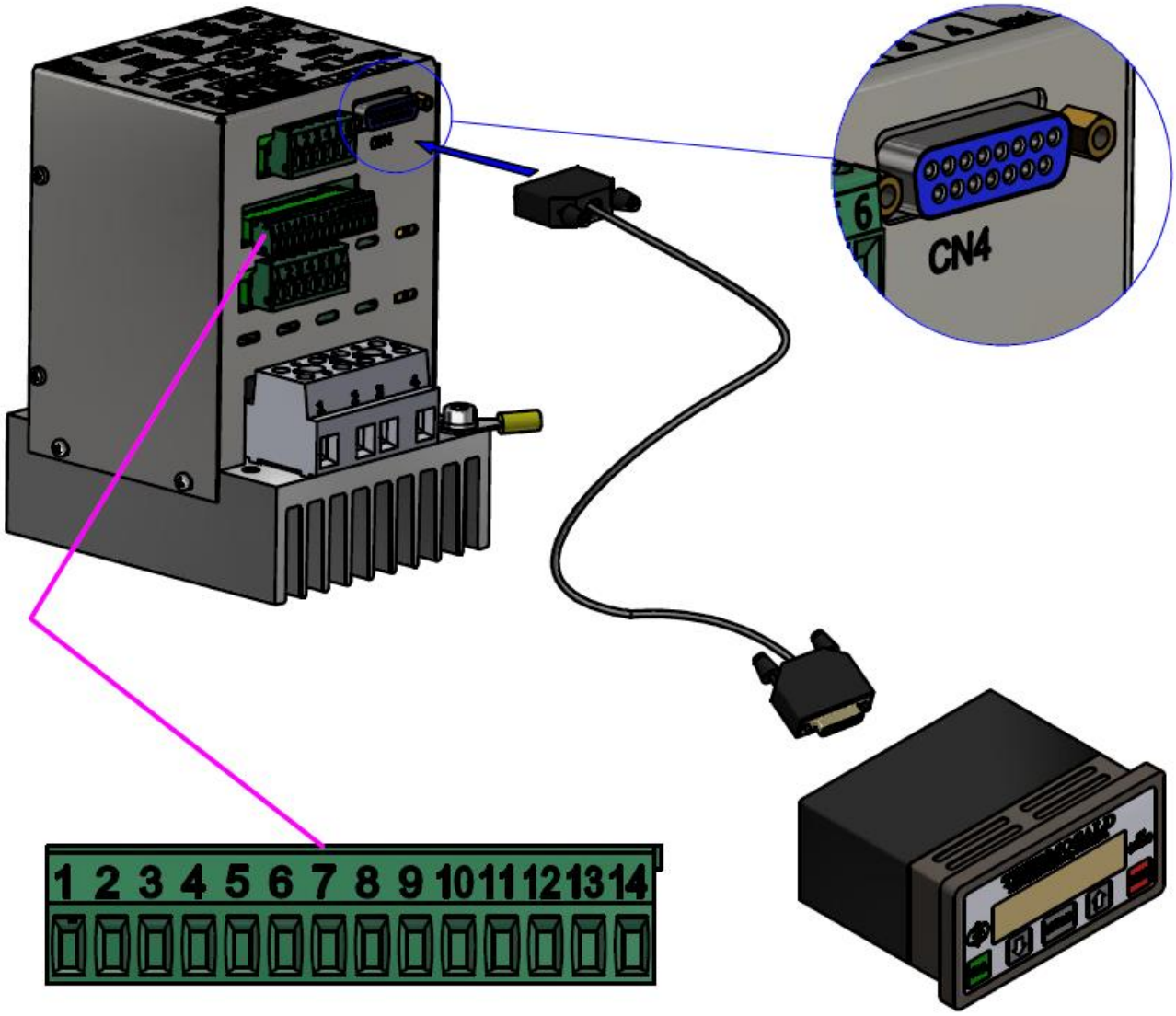


Figure 8

For the detailed information about the CN12 connector, see par. 4.2.10.

4.1.10 CONNECTIONS WITH TEMPERATURE PROBE (not valid for ISX LOW COST models)

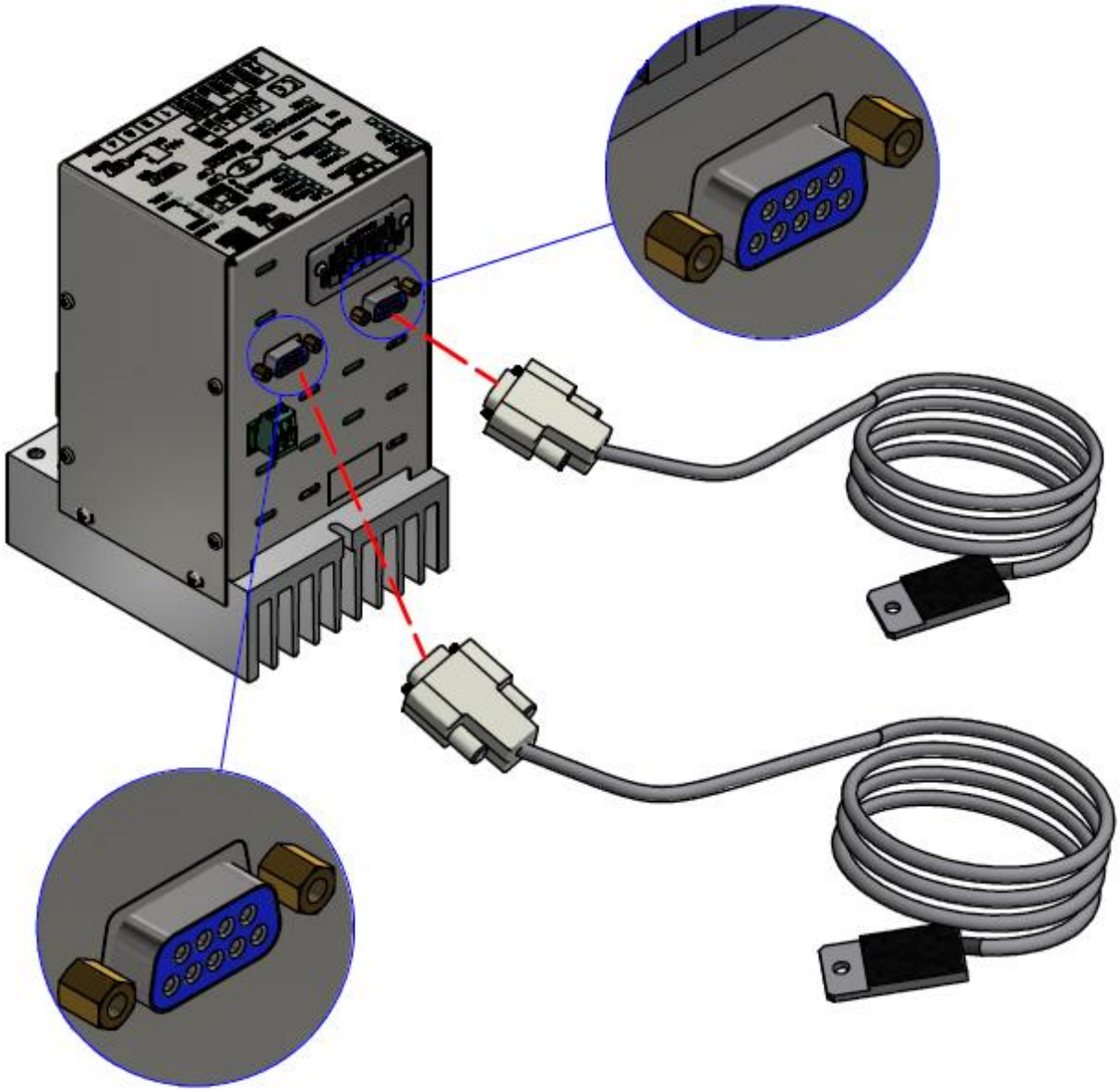


Figure 9

The above figure shows the configuration of a Thermosald with a Coprocessor option with two 3ES109B1 temperature probes connected (see par. 11.1.13). The probe can also be requested on models without Coprocessor.
The 3ES109B1 screen (see par. 11.1.13) must be connected to the connector housing (sensor side is not connected).

For the detailed information about the connections, see par. 4.2.9 - CN9 (and CN19) – TEMPERATURE PROBE CONNECTOR (9 FEMALE POLES)

4.2 CONNECTORS

Below is the list of all the connectors and the description of their PINS. Concerning the specific connectors of the models equipped with fieldbus, refer to par. 6.2 - CONNECTIONS AND DIP SWITCHES.

Concerning the electrical specifications relating to the signals, refer to chapter 10 - THERMOREGULATOR AND PANELTECHNICAL DATA.

4.2.1 CN1 – POWER TERMINAL STRIP (ISX SCR and ISX LOW COST SCR Models)

PIN	NAME	DESCRIPTION
PIN1	L1	ALTERNATING POWER SUPPLY
PIN2	L2	ALTERNATING POWER SUPPLY
PIN3	OUT-	SEALING BAND -
PIN4	OUT+	SEALING BAND +

4.2.2 CN1 – POWER TERMINAL STRIP (ISX HF Models)

PIN	NAME	DESCRIPTION
PIN1	L1	DC + POWER SUPPLY
PIN2	L2	DC - POWER SUPPLY
PIN3	OUT-	SEALING BAND -
PIN4	OUT+	SEALING BAND +

4.2.3 CN2 - CONTROL CIRCUIT POWER SUPPLY TERMINAL STRIP

PIN	NAME	DESCRIPTION
PIN 1	0VDC	0 Vdc power supply
PIN 2	24VDC	24 Vdc power supply

4.2.4 CN3 – CONTROLS TERMINAL STRIP

PIN	NAME	DESCRIPTION
PIN1	0-24	COMMON 0V (24Vdc for low active controls)
PIN2	PREHEAT	24Vdc PRE-HEATING CONTROL (0Vdc for low active controls)
PIN3	SEAL	24Vdc SEALING CONTROL (0Vdc for low active controls)
PIN4	RESET	24Vdc RESET CONTROL (0Vdc for low active controls)
PIN5	CAL	24Vdc CALIBRATION CONTROL (0Vdc for low active controls)
PIN6	ALARM	SEALING ALARM (N.O. CONTACT)
PIN7	ALARM	SEALING ALARM (N.O. CONTACT)

4.2.5 CN4 – CONNECTOR FOR DISPLAY PANEL (15 FEMALE POLES) (not provided on low cost models)

PIN1	+5 Vdc
PIN2	0 V
PIN3	SPI-SDO
PIN4	SPI-SCK
PIN5	SPI-SDI
PIN6	
PIN7	
PIN8	
PIN9	SPI-SS
PIN10	RESERVED
PIN11	RESERVED
PIN12	RESERVED
PIN13	RESERVED
PIN14	
PIN15	

4.2.6 CN6 – REFERENCES TERMINAL STRIP

PIN	NAME	DESCRIPTION
PIN1	REF-	SEALING BAND REF- REFERENCE
PIN2	REF+	SEALING BAND REF+ REFERENCE
PIN3	EARTH	REFERENCES CABLE SHEATH (do not connect on machine side)
PIN4	A.T.-	A.T.- REFERENCE
PIN5	A.T.+	A.T.+ REFERENCE
PIN6	EARTH	A.T. CABLE SHEATH (do not connect on machine side)

4.2.7 CN7 – POTENTIOMETERS CONNECTOR (9 MALE POLES)

Shielded cable is recommended. The shield must be connected to the cap of the connector.

PIN1	10K POTENTIOMETER +4.5V PRE-HEATING To be used only with a potentiometer.
PIN2	10K POTENTIOMETER REF+ PRE-HEATING
PIN3	10K POTENTIOMETER 0V PRE-HEATING
PIN4	Jump with PIN3 if PIN1, PIN2 and PIN3 are connected to a potentiometer. DO NOT jump with PIN3 if PIN2 and PIN3 are connected to the analog output of a PLC.
PIN5	
PIN6	10K POTENTIOMETER +4.5V SEALING To be used only with a potentiometer.
PIN7	10K POTENTIOMETER REF+ SEALING
PIN8	10K POTENTIOMETER 0V SEALING
PIN9	Jump with PIN8 if PIN6, PIN7 and PIN8 are connected to a potentiometer. DO NOT jump with PIN8 if PIN7 and PIN8 are connected to the analog output of a PLC.

4.2.8 CN8 – ANALOG OUTPUT TERMINAL STRIP

Shielded cable is recommended.

PIN 1	ANALOG 0 Vdc
PIN 2	ANALOG REFERENCE OUTPUT
PIN 3	ANALOG REFERENCE OUTPUT CABLE SHIELD

4.2.9 CN9 (and CN19) – TEMPERATURE PROBE CONNECTOR (9 FEMALE POLES)

PIN1	0V Green wire 3ES109B1 probe (see par 11.1.13)
PIN2	+5Vdc – Brown wire 3ES109B1 probe (see par 11.1.13)
PIN3	
PIN4	
PIN5	
PIN6	
PIN7	CLOCK – Yellow wire 3ES109B1 probe (see par 11.1.13)
PIN8	
PIN9	DATA – White wire 3ES109B1 probe (see par 11.1.13)

4.2.10 CN12 – PLC TERMINAL STRIP

PIN1	COMMON 0V
PIN2	IN0 (24VDC=ACTIVE, 0V=NOT ACTIVE)
PIN3	IN1 (24VDC=ACTIVE, 0V=NOT ACTIVE)
PIN4	IN2 (24VDC=ACTIVE, 0V=NOT ACTIVE)
PIN5	Not connected
PIN6	Not connected
PIN7	Not connected
PIN8	Not connected
PIN9	Not connected
PIN10	COMMON 24 VDC
PIN11	OUT0 (24VDC=ACTIVE, 0V=NOT ACTIVE)
PIN12	OUT1 (24VDC=ACTIVE, 0V=NOT ACTIVE)
PIN13	OUT2 (24VDC=ACTIVE, 0V=NOT ACTIVE)
PIN14	Not connected

4.3 CONNECTIONS TECHNICAL NOTES

The following is a list of all the components needed to make the final application and some important technical tips.

Before carrying out any operation, disconnect the electrical panel and check that there is no voltage at the mains connection terminals.

4.3.1 THERMOREGULATOR

Screw the thermoregulator by means of the appropriate fixing holes inside the electrical panel on a grounded galvanized plate.

The thermoregulator must be installed in a vertical position, protected from agents such as dust, water, corrosive acids.

Connect the protective earth to the PE bolt of the thermoregulator, marked by the yellow/green indicator on the heat-sink, using a wire with a core section greater than or equal to that of the power cables (see par. 4.3.7.2**). It is advisable to connect the ground conductor directly to the galvanized support plate as close as possible.**

The device does not require any special ventilation during use, but must be installed in a sufficiently ventilated area; once the machine is fully operational, check that the thermoregulator's heat-sink does not exceed 60°C, in which case increase ventilation of the panel or install a high-power SCR HP model (see par. 11.1.7).

4.3.2 Amperometric Transformer (only for SCR models)

The amperometric transformer must be mounted inside the electrical panel near the thermoregulator.
Pins 4 and 1 must be connected respectively to PIN4 and PIN5 of the CN6 connector (see par. 4.2.6) using a twisted pair.
To choose the suitable cable, see chapter 10 - THERMOREGULATOR AND PANELTECHNICAL DATA.
For the correct orientation of the A.T. see par. 4.1.3.

4.3.3 Power transformer, DC PSU, Technical Report

The power transformer (ISX SCR models) or DC power supply unit (ISX HF models) is used to power the sealing sealing band as shown in the diagrams above (see par. 4.1): in general, the choice of the power transformer model or power supply unit depends on the geometric characteristics of the sealing band, the temperatures involved and the timeframes of the final application.

In both cases, there must be a galvanic isolation between the input and the output to avoid electrocution in case of contact with the sealing element and to comply with current regulations.

It is recommended to size the power transformer or DC power supply unit together with 3E (see par. 3.5 - APPLICATION DEFINITION AND TECHNICAL REPORT).

4.3.3.1 Constructional notes on the power transformer

It is advisable to use transformers with overlapped windings to improve the magnetic coupling between primary and secondary. Envisage the screen between primary and secondary to avoid mains voltage leakage on the secondary and improve noise immunity.

The screen must be grounded using an appropriate cable.
The transformer structure is grounded by mechanical fastening to the metal plate of the cabinet, which in turn shall be properly grounded.

4.3.4 SIZING OF PROTECTIONS

The suggested protections must be verified by the application design engineer.

4.3.4.1 SCR Models

Envisage a CURVE D protection magnetothermal circuit breaker on the transformer's primary winding to disconnect the mains as indicated in the diagrams in par. 4.1.3.
The maximum current for the sizing of the electrical protections is written in the Technical Report.

At the discretion of the design engineer it is possible to put electrical protections (magnetothermic, fuse) on the secondary of the power transformer too.
The maximum current for the sizing of the possible electrical protections is written in the Technical Report.

4.3.4.2 HF Models

Refer to the DC power supply unit manual for the choice of the electrical protections on DC power supply unit input (see diagrams in par. 4.1.4).

At the discretion of the design engineer it is possible to put electrical protections (magnetothermic, fuse) on the output of the DC power supply unit.
Refer to the DC power supply unit manual for the choice of the possible electrical protections on the DC power supply unit output.

4.3.5 MAINS FILTER

For THERMOSALD ISX, which works by reducing the mains wave on the transformer’s secondary winding, there are no cases of interference with other nearby devices; as such, you can avoid installing the mains filter, in compliance with EMC regulations.

4.3.6 SAFETY CHAIN WIRING

The safety chain must be made as shown in the base drawing (see par. 4.1).

The emergency output contact of the thermoregulator opens in the event of an alarm and must interrupt the thermoregulator's power supply. It is suggested to perform this interruption electromechanically by means of a power contactor suitably sized for the currents involved, without going through the PLC, then simultaneously sending the information to the PLC.

This approach allows the thermoregulator to intervene in no time directly on the power supply, independently from the PLC software management.

In the very rare case of failure of the electronic power switch inside the thermoregulator, the contactor is the only way to avoid uncontrolled overheating up to the breakage of the sealing elements.
This fault can be simulated by short-circuiting PIN1 and PIN4 of the power terminal strip (see par. 4.3.1 and 4.3.2).

Provide for an emergency stop button as indicated in the diagrams (par ref. 4.2); this button must have a non-automatic reset, and be located in a non-hazardous area easily accessible to the operator; it must stop sealing and cut off power immediately.

Disconnect the thermoregulator power circuit when the machine's mechanical protections are open.

4.3.7 SEALING BAR WIRING

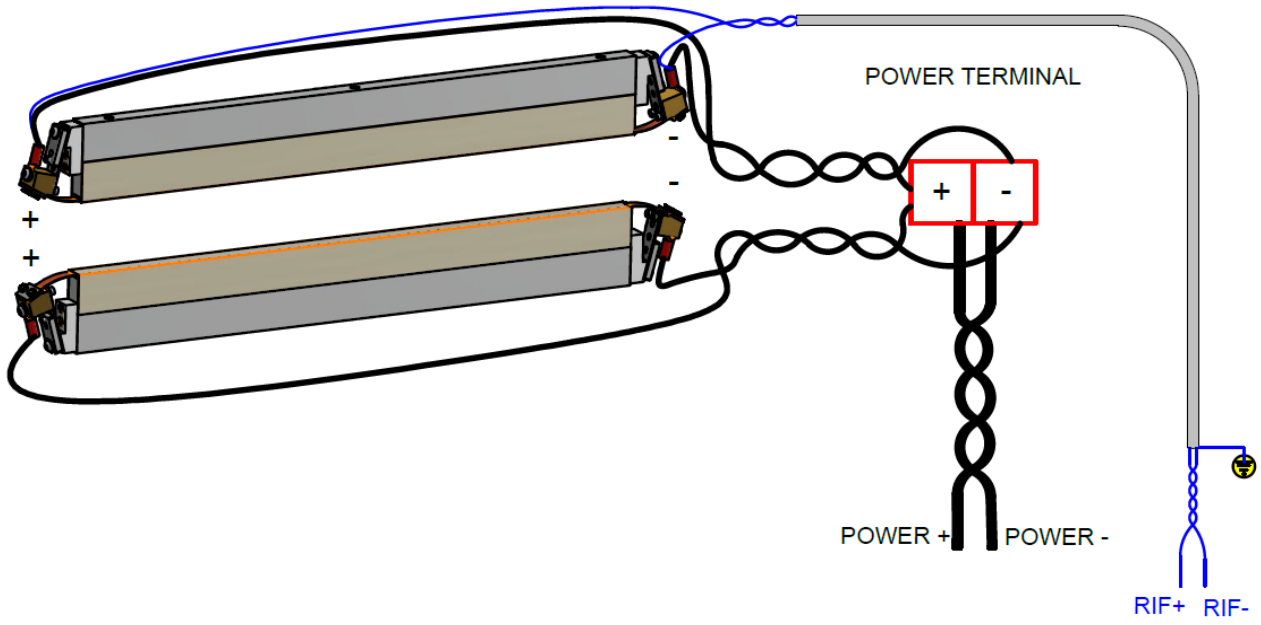


Figure 10

The max distance between the thermoregulator and the heating elements is 20 meters.

4.3.7.1 Sealing bars

Make sure that the bars provide excellent insulation of the sealing element to earth so as to avoid areas with overtemperatures (see par. 5.3.8). To avoid short circuits, it is advisable to position and/or treat the sealing elements so that there is no accidental contact with the machine's metal structure.

It is essential to ensure that the opposing sealing rods are perfectly aligned so as to avoid areas with overtemperatures (see par. 5.3.8**).**

4.3.7.2 Power cables

It is essential to ensure optimum contact for all power connections.

It is essential to ensure that on opposing sealing bars the sealing elements are consistently polarized as shown in the diagram in Figure 10, so as to avoid areas with overtemperatures (see par. 5.3.8**).**

Figure 10 shows the wiring carried out with two parallel sealing bands: the power cables come out from the same side and are twisted up to the power terminal strip on board the machine.

If a single sealing band is used, simply refer to the connection diagram of one of the two bars.

The power cables between the power terminal strip and the thermoregulator must be twisted, as well as those between the thermoregulator and the transformer.

Cable runs should be as short as possible; there should also be no loops that can produce appreciable inductive effects.

The thermoregulator has passed the immunity tests carried out in a heavy industrial environment; however, the cable route should be kept as separate as possible from the cables of other devices, especially if electrically very noisy (electric sealing machines, brushless drives, inverters). Absolutely avoid proximity to power cables wound in coils, as this causes a very strong electromagnetic coupling problem that even the use of shields may not be able to reduce.

The sealing band is referenced to earth through the thermoregulator: do not connect the sealing band directly to earth.

To make the correct choice of the power cables' core section, refer to the “Technical Report” (see par. 3.5 - APPLICATION DEFINITION AND TECHNICAL REPORT).

In case of EMC interference, mount two Wurth ferrites 74271211 on the CN1/1-CN1/2 twisted pair and on the CN1/3-CN1/4 twisted pair, respectively.

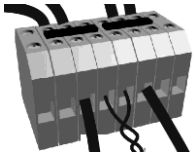
4.3.7.3 Reference cables

The reference cables CN6/1 and CN6/2 (see par. 4.2.6) must be shielded-twisted or at least twisted with section at least 1mmq (it is possibile to use for example the code 3EA0015 cable supplied by 3E): in the case of a shielded cable, connect the shield only on the thermoregulator side; the ideal connection is that they are fixed directly on the terminals of one of the two sealing bands, as shown in Figure 10.

To decrease the risk of breaking the reference cables, in applications with not-too-short sealing bands, it is a good compromise to connect these cables on the machine terminal strip close to the sealing bands.

Twist the reference cables and keep them separate from the power cables.

4.3.7.4 Power terminal strip on-board the machine



The power terminal strip must ensure an excellent contact. It is advisable to use screw contacts.

It should be placed as near as possible to the sealing bars.

In case more than one thermoregulator is used, this machine terminal strip must be placed in an independent box, one for each thermoregulator: in this way, you can be sure that the cables of one thermoregulator do not interconnect with the cables of another thermoregulator, as shown in Figure 11.

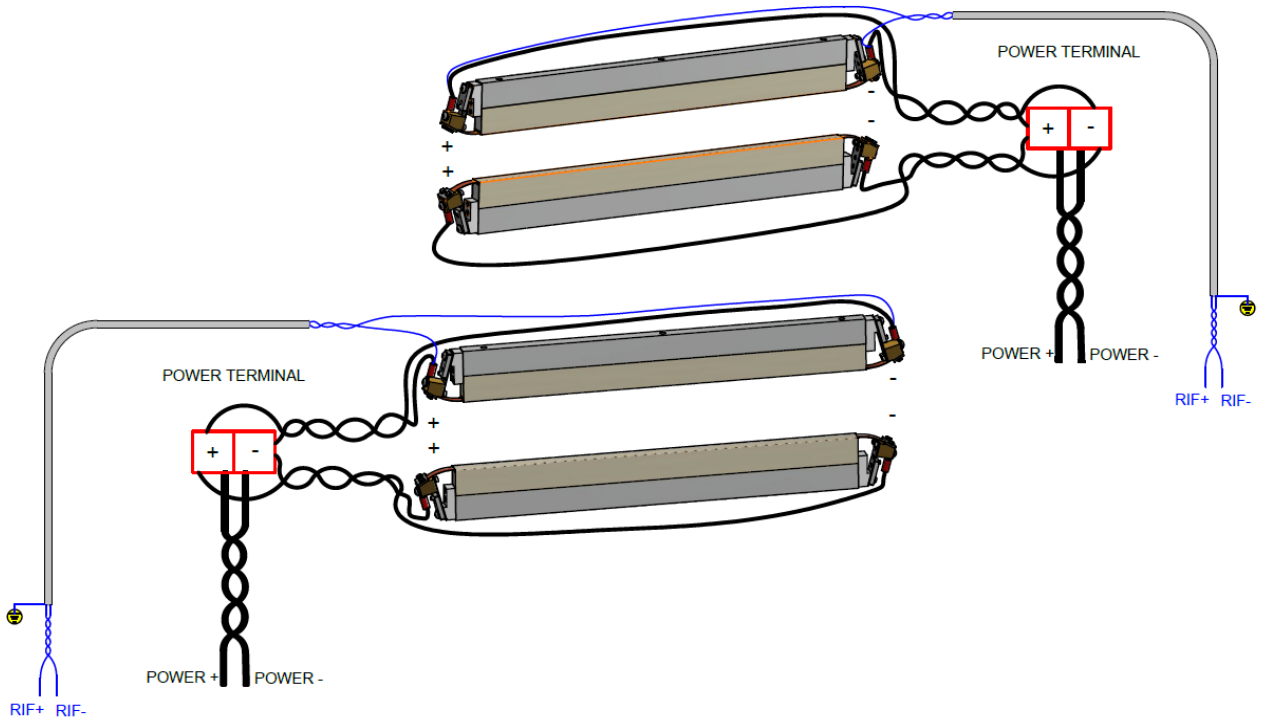


Figure 11

5 CONFIGURATION AND DIAGNOSTICS

Before starting the CONFIGURATION you should carefully have read chapter 2 - SAFETY WARNINGS AND CERTIFICATIONS

Configuration and diagnostics can be carried out through the multilingual panel (see par. 4.1.5, par. 5.1, par. 5.3), the fieldbus (see par. 4.1.7, par. 4.1.8, par. 5.3), the analog interface (see par. 4.1.6, par. 5.3), and a regular LED interface (see par. 5.2, par. 5.3).

5.1 MULTILINGUAL PANEL

Below is some general information on using the multilingual panel.

NOTE: You can return to the home page from any page by touching the RES button repeatedly.

NOTE: To access the pages of the LEVEL 2 submenu, touch the MODE button and then the DOWN ARROW ▼ and UP ARROW ▲ keys.

NOTE: Proceed as follows to edit any displayed parameter:

Touch the MODE button to access the edit status: “? 080”

Touch the DOWN ARROW ▼ and UP ARROW ▲ keys to change the datum: “? 081”

Touch the MODE button to exit from the edit status: “= 081”

The diagram in Figure 12 qualitatively shows the logical menu structure of the panel starting from the main page to the different submenus.

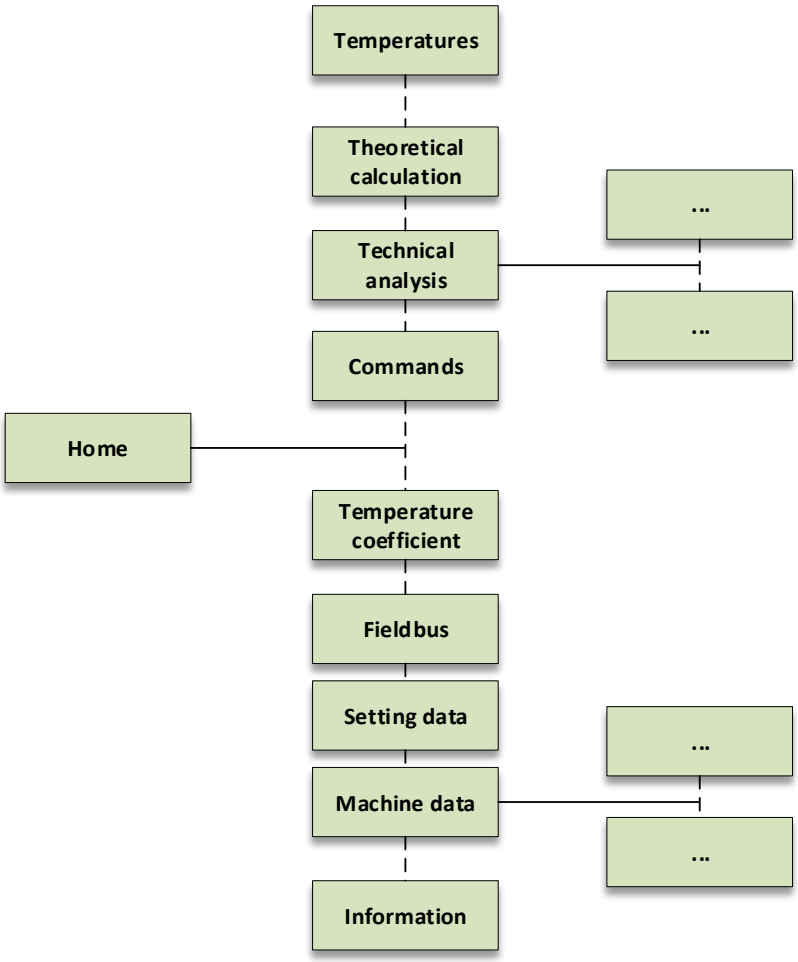

Temperatures
Theoretical calculation
Technical analysis
...
...
Commands
Home
Temperature coefficient
Fieldbus
Setting data
...
Machine data
...
Information

Figure 12

5.2 LED INTERFACE

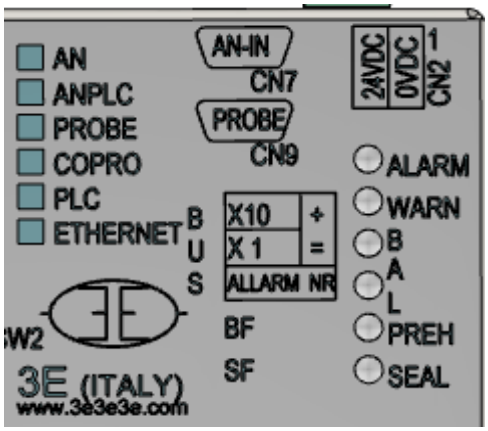


Figure 13

The figure above shows the LED interface that is on the device's upper guard. For the detailed information about the operation of the LEDs, refer to par. 5.3.

5.3 FUNCTIONS AND PARAMETERS

This paragraph describes all the functions implemented in the thermoregulator and relating parameters.

NOTE TO APPLICATION SOFTWARE DEVELOPERS

Some of the parameters in the following tables are marked with:

- "**A**": variables required for the final application
- "**B**": variables recommended for the final application

For advanced users, it is advisable to provide for the addition of two generic fields by means of which you can read and write any address: this can be very useful to carry out a detailed analysis of possible problems on site and to be able to solve specific problems possibly even remotely.

5.3.1 ALARMS, WARNINGS, RESETS

Thermosald is equipped with powerful diagnostics capable of detecting on-site problems related to the application and thus generating some alarms or warnings. In case of alarm, in order to avoid dangerous situations on the final application, Thermosald opens the internal alarm relay in order to interrupt current on the sealing band (see par. 4.1.2 and par. 4.2.4).
The current alarm or warning is shown on the main page of the display panel and can be read by the fieldbus. The occurrence of a warning does not cause the alarm relay to open. An alarm always has priority over a warning.

The alarm condition is also communicated to the user by the LEDs on the device. In the event of an alarm, the red ALARM LED on the thermoregulator lights up instantly; in this condition, the alarm number can be identified by counting the pulses of the green balancing LED for the tens (e.g. 9 pulses = 90) + the pulses of the red balancing LED for the units (e.g. 10 pulses = 0/8 pulses = 8).

In the event of a warning, the yellow WARNING LED on the thermoregulator lights up instantly; the number of warnings can be identified by counting the pulses of the LEDs according to the logic described above for the alarm.

Alarms and warnings are also shown on the main page of the display panel, if present.

In models equipped with a fieldbus, you can read the current alarm or warning number via the PLC. Refer to the table below for more details.
In this case, if you need to duplicate the emergency contact for safety reasons, the PLC can also use the information coming via the fieldbus to open a contact on the emergency chain. The detection of a communication timeout on the fieldbus must also be managed to open this contact on the emergency chain or, in general, to trigger an alarm on the final application.

In the models equipped with analog option or in the Low Cost models, the information related to the alarm number can be retrieved through the analog output. For more details see par. 5.3.18 - ANALOG OUTPUT AND DIAGNOSTICS (models equipped with analog option and Low Cost models).

To understand how to solve an alarm by eliminating its causes, follow the suggestions provided by the display panel if present and consult this manual at ANNEX D - LIST OF ALARMS AND MESSAGES (CAUSES - REMEDIES).

In case of need, for example to resume the production cycle, some alarms can be disabled, but this operation must be used with great caution because it could lead to dangerous situations: it is therefore advisable to contact 3E Sales Office before disabling any alarm. The disabling of the alarm must in any case be considered temporary and immediate action must be taken to clear the alarm causes.
The following alarms cannot be disabled: 71, 72, 73, 81.

PARAMETERS						
Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
Alarm disabled 1	Allows the disabling of an alarm.	ALARM DISABLED 1 Home\Machine data	9 0009H (UINT16)	0	0	255
Alarm disabled 2	Allows the disabling of an alarm.	ALARM DISABLED 2 Home\Machine data	13 000DH (UINT16)	0	0	255
Warning time [s]	In the event of a warning, the thermoregulator signals the anomaly without stopping in alarm status; the message is displayed for the seconds indicated by this parameter; if set to 0 the message is not displayed; if set to a maximum value of 10 seconds the message remains until the next reset.	WARNING TIME Home\Setting data	265 0109H (UINT16)	3 (Modelli con opzione WARNING 3S) 10 (Altri modelli)	0	10
READ-ONLY VARIABLES						
Alarm/warning number **(A)**	Indicates the current alarm or warning. Use the “Thermoregulator status” variable (see par. 5.3.2) to distinguish between alarm and warning.	Home	769 0301H (UINT16)	X	0	255
Current alarm *(From versions V10)*	Indicates the current alarm.	Home	1046 0416H (UINT16)	X	0	255
Current warning *(From versions V10)*	Indicates the current warning.	Home	1047 0417H (UINT16)	X	0	255

The main task of the RESET command is to reset an alarm and set the thermoregulator back to working condition after the problem that caused the alarm has been solved.
This command also interrupts some application-related configuration procedures that may be protracted such as calibration procedures.

The reset command can be activated through the RESET signal on CN3 (see par. 4.2.4) or through the multilingual panel as indicated below in par. 5.3.1.1.

The reset can also be performed via the fieldbus through the relating command bit present on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).

5.3.1.1 RESET activation via the multilingual panel

Touch the “RES” key on the multilingual panel (see Figure 14).

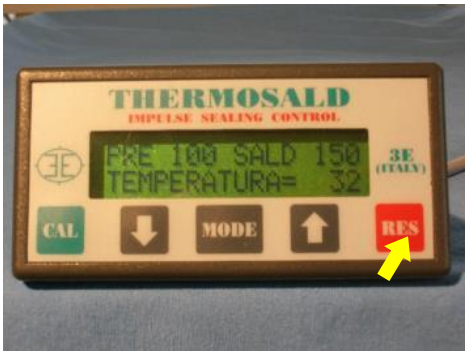


Figure 14

5.3.2 THERMOREGULATOR STATUS

The thermoregulator indicates its internal status. This information can be viewed on the display panel or read via the fieldbus communication interface.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
READ-ONLY VARIABLES						
Thermoregulator status **(A)**	[000]=[0x00]=Power off [001]=[0x01]=Regulator off (Only on versions V7 and from versions V10) [017]=[0x11]=Not Calibrated [096]=[0x60]=Balancing [100]=[0x64]=Current loop (Not active on versions V7 and from versions V9) [112]=[0x70]=Pre-heating [128]=[0x80]=Sealing [136]=[0x88]=Master reset in progress [153]=[0x99]=Calibration in progress [154]=[0x9A]=Scaling [155]=[0x9B]=Scaling completed [158]=[0x9E]=Hot calibration in progress (Only on versions V7 and from versions V10) [170]=[0xAA]=Burn-in in progress (Not active on versions V7 and from versions V9) [187]=[0xBB]=Calibration awaiting coprocessor [238]=[0xEE]=Alarm	Home	774 0306H (UINT16)	X	0	238
Machine not calibrated	[0]=Machine calibrated	Home	12 000CH	1	0	1

	[1]=Machine not calibrated		(UINT16)			

5.3.3 MASTER RESET

By means of the MASTER RESET operation you can restore the status of the Thermosald to the condition it was in when it left the factory.

After a MASTER RESET, set the parameters to the desired values before using the device.

During the MASTER RESET the 6 LEDs on the top right of the device remain lit for a few seconds. The operation can be started either by activating the RESET and CALIBRATION signals on CN3 (see par. 4.2.4) simultaneously for 6 seconds, or by using the multilingual panel as described later in par. 5.3.3.1.
The master reset can also be performed via the fieldbus through the relating command bit present on the COMMANDS WORD (see par. 6.6.3.2) by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).
If Modbus RTU RS485 is used, you should anyway connect the RESET and CALIBRATION signals on CN3: in this way it will be possible to restore the device to factory condition even in case the fieldbus malfunctions.

The MASTER RESET will not reset the fieldbus communication parameters if the command is sent through the fieldbus itself.

5.3.3.1 Activation of the MASTER RESET through the multilingual panel

Touch the “DOWN ARROW” + “UP ARROW” keys on the multilingual panel simultaneously for 6 seconds. The panel will display the Master reset status (see Figure 15).

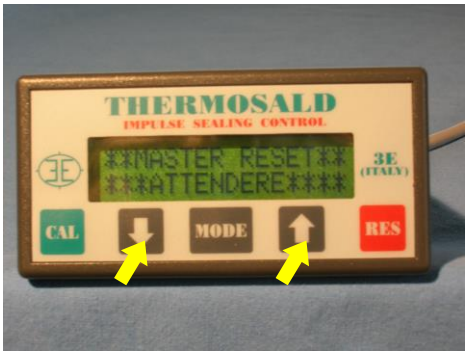


Figure 15

5.3.4 EMERGENCY TEST

The thermoregulator has an alarm output contact (see par. 4.2.4) that opens at any alarm condition and that must open the emergency chain accordingly.
You can check the correct operation of the system emergency chain by means of the emergency test command (see par. 4.1.2) and, in particular, you can check that in alarm condition Thermosald is able to set the system to a safe condition. On activating the command the alarm output relay must open, the power circuit must consequently open and remain switched off. In case any chain component is faulty, the thermoregulator will trigger alarm 79.

The control can be activated via the display panel in two possible ways:

- At power-up, by pressing the "MODE" key when prompted, then "EXECUTE”.
- From the main "Home" page, by pressing the "MODE" key, then scrolling down the first level menu until you find the relevant item.

The command can also be given via the fieldbus through the relating command bit present on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).

5.3.5 CALIBRATION

Thermosald must be calibrated once it leaves the factory or following a master reset. If power is on, this condition is indicated by the LED interface on the thermoregulator (4 LEDs on the device remain in a flashing status), signaled by the display panel, and can be detected via the fieldbus (see par. 5.3.2 and par. 5.3.3).

Calibration must be carried out with the machine cold and with stable temperature to allow the sealing band to be very close to the room temperature set in the CALIBRATION TEMPERATURE parameter or, if the TEMPERATURE PROBE is present, to be very close to the temperature of the probe (see par. 5.3.7**).**

Calibration can be started by activating the CALIBRATION signal on CN3 (see par. 4.2.4) for 3 seconds, or by using the multilingual panel, as described later in par. 5.3.5.1.
You can start the CALIBRATION also via the fieldbus through the relating command bit on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).

Calibration can be performed again later if necessary, for example if the type of sealing band connected to the thermoregulator is changed or if maintenance is carried out. It is advisable to carry out calibrations following the first one by switching off the power (warning 33), activating the command, waiting for warning 32, and then switching on the power.

During the entire calibration procedure the 2 balancing LEDs on the device flash simultaneously.

The calibration procedure can be interrupted by activating the RESET command. This command can be activated by means of the relating command bit on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS). Interruption of the calibration procedure generates alarm 60, which must then be reset.

When you perform the first calibration after a master reset, the thermoregulator stores the data of this first calibration so that they can later be compared with the data in real time (see par. 5.3.12 Technical analysis). The data of subsequent calibrations are not stored by the machine: if you wish to overwrite the data of one calibration with those of a subsequent one, use the SAVE FIRST CALIBRATION DATA command via the multilingual panel, as described in par. 5.3.5.2.
You can execute the SAVE FIRST CALIBRATION DATA command also via the fieldbus through the relating command bit on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).

The table with the parameters and variables related to the calibration functionality is shown below.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Calibration level [%] (On versions V7 and from versions V9)	Allows you to change the calibration level in case of F096.	CAL. LEVEL Home\Machine data	22 0016H (UINT16)	66	0	100

5.3.5.1 Starting the CALIBRATION through the multilingual panel

The panel's status is the one shown in Figure 16 when it left the factory or following a master reset. Touch the “CAL” button on the panel for 3 seconds to start the calibration procedure.
If the machine is already calibrated, the panel switches to the status shown in Figure 17 when you touch the “CAL” button; on touching the “MODE” key you return to the case shown in Figure 16.

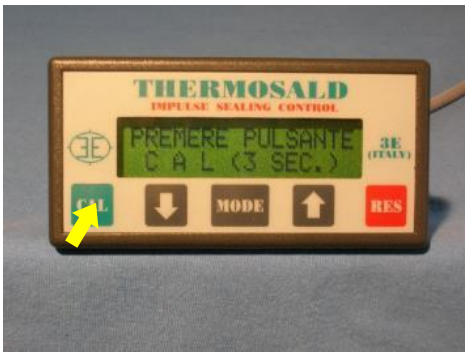


Figure 16

Figure 17

5.3.5.2 SAVE FIRST CALIBRATION DATA through the multilingual panel

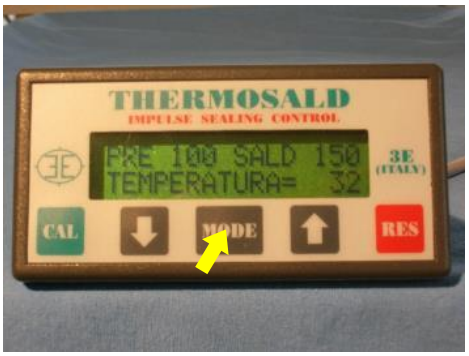


Figure 18

Touch the “MODE” key in the screen shown in Figure 18 and scroll the arrow down until you see “Save calibration data”. Now touch the “MODE” key twice to confirm your choice and overwrite the first calibration data with those relating to the last calibration carried out.

5.3.6 TEMPERATURE COEFFICIENT

The Temperature Coefficient is the parameter that allows you to adapt the thermoregulator to the type of material used for the sealing element in order to obtain the set temperature. Before changing the value of this parameter, contact your 3E Sales Office.

The initial setting of the TEMPERATURE COEFFICIENT must be equal to the value of the temperature coefficient of the sealing element used.

After any change to the TEMPERATURE COEFFICIENT, it is advisable to compare the current temperature indicated by the thermoregulator with the actual temperature of the heating element (see par. 5.3.8**)**

For applications where the maximum temperature is critical, it is advisable to check at runtime, through the PLC, that the value of the "Temperature coefficient" parameter does not deviate from the desired value.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Temperature coefficient [PPM]	1210 (Steel) 3800 (Kovar) Editing this parameter will reset the “Delta coefficient hot calibration [PPM]” parameter, see par. 5.3.15	TEMP COEFF. (PPM) Home\Temperature coefficient	14 000EH (UINT16)	1210 900 C900 models 900 CM1210 models	600 900 C900 models 600 CM1210 models	4000 8000 (Versions V7 and from versions V9) 900 C900 models 1210 CM1210 models
READ-ONLY VARIABLES						
Units per °C x 100	System resolution	RESOLUTION Home\Temperature coefficient	15 000FH (UINT16)	X	0	65535

5.3.7 Temperature probe

At the end of the calibration procedure the thermoregulator sets as temperature of the sealing band the value contained in the "Calibration temperature" parameter. In the absence of the temperature probe the user can act on this parameter according to the room temperature and thus vary the machine's calibration point, i.e. the temperature in a balanced status at the end of calibration.

Instead, temperature probes (see par. 4.1.10 **and 4.2.9) allow you to set this parameter automatically, and must be positioned on the bar or in the immediate vicinity of the sealing element to ensure the most reliable measurement possible.**

The temperature probe can be connected on models with the PRECISION SENSOR option.

The temperature probe can be enabled or disabled by means of the "*Temperature Probe Enable*" parameter, which can be set from the panel or the fieldbus.
Once the probe is enabled, its value is contained in the "*Bar probe temperature*" variable, and can be displayed on the panel inside the "Technical analysis" section (see par. 5.3.12) or read via the fieldbus.
The temperature probe is also used for the hot calibration procedure; for more details see par. 5.3.15.

On models equipped with a COPROCESSOR, the *"Calibration temperature [°C]"* parameter of the COPROCESSOR and the *"Calibration temperature [°C]"* parameter of the BASE must not differ by more than 3 degrees.
In case the two respective temperature probes are used (see par. 4.1.10 **and 4.2.9) they must be positioned appropriately to detect comparable temperatures.**

On models equipped with COPROCESSOR the probes must be both connected or both not connected.
On models where the maximum temperature is limited, both probes must be connected.

On models where the maximum temperature is limited the *"Calibration temperature [°C]"* parameter should not be changed.

On models where the maximum temperature is limited the *"Temperature probe enable"* parameter should not be modified.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Calibration temperature [°C] **(A)**	Balancing temperature set at the end of the calibration procedure	BALANCING TEMPER. Home	258 0102H (INT16)	30	-32768	32767
Cooling gradient during balancing [°C/10sec]	Indicates the maximum temperature cooling rate, above which calibration is not enabled and warning 38 appears. Increasing this parameter may result in loss of accuracy	GRADIENT G/SEC Home\Setting data	264 0108H (UINT16)	4	0	65535
Temperature probe enable	Acquired automatically during MASTER RESET; allows you to calibrate the sealing bar to actual room temperature.	TEMP. SENSOR ENABLE Home\Machine data	24 0018H (UINT16)	X	0	1

5.3.8 CURRENT TEMPERATURE

The temperature supplied by the thermoregulator may vary depending on how the wiring is done.

The temperature supplied by the thermoregulator has a degree resolution and is an average temperature: pay attention to the areas where the sealing element is not in contact with the material, and if necessary provide for adequate copper plating or other mechanical devices, and keep the sealing element resting evenly on the entire bar. Any active area of the sealing element not in contact with the product will increase in temperature, resulting in a consequent decrease in temperature of the remaining part.

If you wish to align the actual temperature of the sealing element with the temperature detected by the thermoregulator, perform experimental measurements with an external thermometer and, if there are small differences, adjust the TEMPERATURE COEFFICIENT (see par. 5.3.6).

In the event of a short circuit between the sealing element and the ground, the thermoregulator stops regulation and instantly opens the emergency contact to prevent the temperature from rising. When the short circuit occurs, a spark may still be generated with energy depending on the characteristics of the system.

If the electrical polarization of opposing sealing elements is performed correctly as shown in Figure 10 in par. 4.3.7, no sparks or overtemperature zones can be generated. If this polarization is not observed, the thermoregulator may not detect the fault.

Once calibrated, with or without a temperature sensor, the thermoregulator is able to provide the user with a current temperature datum. This information is available on the multifunction panel or via the fieldbus. In the latter case, with reference to par. 5.3.2, the current temperature is valid in the Balancing, Preheating and Sealing states. In the "Power off" (Warning 33) and "Regulator off" (Warning 31) states, the temperature fed back is -273 °C.
The "BAL" LEDs on the thermoregulator indicate the current temperature status with respect to the currently set temperature: if the current temperature is lower than the set temperature, the red LED will be on; if the current temperature is higher than the set temperature, the green LED will be on; if the current temperature is within tolerance, both LEDs will be on.

For applications in which the maximum temperature is critical, it is advisable to verify at runtime through the PLC that the "Current temperature" value does not exceed the maximum temperature value (see par. 5.3.9**).**

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
READ-ONLY VARIABLES						
Current temperature [°C] **(A)**	Indicates the sealing element's current temperature	TEMPERATURE Home	768 0300H (INT16)	X	-32768	32767

5.3.9 PRE-HEATING, SEALING, MAX TEMPERATURE

Preheating and sealing are the two states in which the thermoregulator works in closed loop and maintains the temperature set points on the sealing element set on the respective parameters, listed in the table below. For temperature management in models equipped with the analog option, refer to par. 5.3.17.
Preheating allows you to bring the sealing element to a lower temperature than the sealing temperature (typically between 30 and 50 degrees lower, and in any case depending on the application), so as to reach the sealing temperature quickly and ensure repeatability.
The typical combined use of preheating and sealing is shown in more detail later in ANNEX A - SEALING CYCLE.

Preheating and sealing can be activated by signals PRE-HEATING and SEALING on CN3 (see par. 4.2.4), or through the multilingual panel, from the *Home/Commands* submenu.
PRE-HEATING and SEALING can be activated also via the fieldbus through the relating command bit present on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).

The two leds PREH and SEAL signal the activation of the respecting commands PRE-HEATING and SEALING.

When the preheating and sealing commands are activated via the fieldbus, it is advisable to use two PLC outputs to make the commands available on the wire as well. This may be useful in the event of on-site intervention by 3E Technical Support.

If in the Preheating or Sealing states the current temperature exceeds the value of the "Max Sealing Temperature" parameter, the thermoregulator generates alarms 67 and 68.

For applications in which the maximum temperature is critical, it is advisable to check at runtime through the PLC that the value of the "Max Sealing Temperature" parameter does not deviate from the desired value.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Pre-heating temperature [°C] **(A)**	Allows you to set the pre-heating temperature	PRE-HEATING TEMP. Home\Temperatures	269 010DH (UINT16)	100 80 (T130 Models) 80 (TM135 Models) 80	0 0 (T130 Models) 0 (TM135 Models) 0	Max Sealing temperature

				(T160 Models) 90 (T180 Models) 90 (TM200 Models)	(T160 Models) 0 (T180 Models) 0 (TM200 Models)	
Sealing temperature [°C] **(A)**	Allows you to set the sealing temperature	SEALING TEMP. Home\Temperatures	270 010EH (UINT16)	150 130 (T130 Models) 130 (TM135 Models) 130 (T160 Models) 140 (T180 Models) 140 (TM200 Models)	0 0 (T130 Models) 0 (TM135 Models) 0 (T160 Models) 0 (T180 Models) 0 (TM200 Models)	Max Sealing temperature
Max Sealing temperature [°C] **(A)**	Allows you to set the sealing element's max temperature	MAX SEAL. TEMP. Home	262 0106H (UINT16)	250 130 (T130 Models) 135 (TM135 Models) 160 (T160 Models) 180 (T180 Models) 200 (TM200 Models) 500 (with T500 option)	0 130 (T130 Models) 0 (TM135 Models) 160 (T160 Models) 180 (T180 Models) 0 (TM200 Models) 0 (with T500 option or from V10 versions)	300 130 (T130 Models) 135 (TM135 Models) 160 (T160 Models) 180 (T180 Models) 200 (TM200 Models) 500 (with T500 option or from V10 versions)

5.3.10 Theoretical Calculations

As mentioned earlier, you can instruct the thermoregulator with the application information in order to derive theoretical data regarding the sizing of the power supply. These data need not be entered for thermoregulator operation.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Ohm x mm²/mt x 1000	Electrical resistivity	OHM X MM²/MT. Home\Theoretical calculation	514 0202H (UINT16)	850	0	65535
Sealing band length [mm]	Length of the sealing band	SEALING BAND LENGTH Home\Theoretical calculation	515 0203H (UINT16)	0	0	65535
Sealing band thickness [mm x 100]	Thickness of the sealing band	SEALING BAND THICKNESS Home\Theoretical calculation	516 0204H (UINT16)	0	0	65535
Wire diameter [mm x 100]	Diameter of the wire	WIRE DIAMETER Home\Theoretical calculation	517 0205H (UINT16)	0	0	65535
Sealing band width [mm x 10]	Width of the sealing band	SEALING BAND WIDTH Home\Theoretical calculation	518 0206H (UINT16)	0	0	255
Amperes/mm²	Current density	AMPERES PER MM² Home\Theoretical calculation	519 0207H (UINT16)	30	0	255
Number of parallel sealing bands	Sealing system topology	No. IN PARALLEL Home\Theoretical calculation	520 0208H (UINT16)	1	0	255
Number of sealing bands in series	Sealing system topology	No. IN SERIES Home\Theoretical calculation	521 0209H (UINT16)	1	0	255
Speed factor x 10	Speed factor multiplied by 10	SPEED FACTOR Home\Theoretical calculation	540 021CH (UINT16)	1	0	255
READ-ONLY VARIABLES						
Duty cycle x 10 (Read only from versions V9)	Duty cycle	- Home\Theoretical calculation	522 020AH (UINT16)	7	7	7

5.3.11 I2T

The I2T function is no longer active on versions V7 and from versions V9.

5.3.12 Technical analysis

The technical analysis allows the user to perform all the on-site diagnostic checks to monitor the proper functioning of the final application. In particular, the technical analysis allows you to compare the actual data read on site with the limits of the device, the data stored during calibration and with the theoretical data if the information regarding theoretical calculations has been compiled.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
READ-ONLY VARIABLES						
Maximum full-wave effective I for alarm 90 [A]	Maximum full wave rms current	MAX I Home\Technical analysis	531 0213H (UINT16)	The value depends on the model. See chapter 10	0	65535
Theoretical full-wave effective I [A]	Theoretical rms current of the full-wave sealing band derived from theoretical calculations	THEORETICAL I Home\Technical analysis	523 020BH (UINT16)	X	0	65535
Theoretical R [ohm x 100]	Theoretical resistance of the sealing band derived from theoretical calculations	THEORETICAL R Home\Technical analysis	524 020CH (UINT16)	X	0	65535
Theoretical full-wave effective V [V]	Theoretical full-wave effective sealing band voltage derived from theoretical calculations	THEORETICAL V Home\Technical analysis	525 020DH (UINT16)	X	0	65535
Theoretical full-wave effective P [VA]	Theoretical power of the full-wave sealing band (V x I x “Duty cycle”) derived from theoretical calculations	THEORETICAL P Home\Technical analysis	526 020EH (UINT16)	X	0	65535
First calibration full wave effective I0 [A] **(B)**	First calibration full wave rms current Stored automatically during first	I0 Home\Technical analysis	527 020FH (UINT16)	X	0	65535

	calibration or after first calibration data backup command					
First calibration R0 [ohm x100] **(B)**	Calibration resistance Stored automatically during first calibration or after first calibration data backup command	R0 Home\Technical analysis	528 0210H (UINT16)	X	0	65535
First calibration full wave effective V0 [V] **(B)**	First calibration full wave rms voltage Stored automatically during first calibration or after first calibration data backup command	V0 Home\Technical analysis	529 0211H (UINT16)	X	0	65535
First calibration full wave effective P0 [VA] **(B)**	First calibration full wave effective power (V x I x “Duty cycle”)	P0 Home\Technical analysis	530 0212H (UINT16)	X	0	65535
Last calibration full wave effective I0 (A) (From versions V10)	Last calibration full wave rms current	-	1028 0404H (UINT16)	X	0	65535
Last calibration R0 (ohm x100) (From versions V10)	Last calibration resistance	-	1029 0405H (UINT16)	X	0	65535
Last calibration full wave effective V0 (V) (From versions V10)	Last calibration full wave rms voltage	-	1030 0406H (UINT16)	X	0	65535
Last calibration full wave effective P0 (VA) (From versions V10)	Last calibration full wave effective power (V x I x “Duty cycle”)	-	1031 0407H (UINT16)	X	0	65535
Full-wave effective I [A] **(B)**	Current full wave rms current	I Home\Technical analysis	770 0302H (UINT16)	X	0	65535
R [ohm x100] **(B)**	Current resistance	R Home\Technical analysis	771 0303H (UINT16)	X	0	65535

Full-wave effective V [V] **(B)**	Current full wave rms voltage	V Home\Technical analysis	772 0304H (UINT16)	X	0	65535
Full-wave effective P [VA] **(B)**	Current full wave effective power (V x I x “Duty cycle”)	P Home\Technical analysis	773 0305H (UINT16)	X	0	65535
No-load power supply voltage [V x 100] *(On versions V7 and from versions V9. From versions V10 also on fieldbus)*	Current no-load power supply voltage	NO-LOAD TRANSFORMER SECONDARY V Home\Technical analysis	1049 0419H (UINT16)	X	0	65535
Load power supply voltage [V x 100] *(On versions V7 and from versions V9. From versions V10 also on fieldbus)*	Current load power supply voltage	LOAD TRANSFORMER SECONDARY V Home\Technical analysis	1050 041AH (UINT16)	X	0	65535
Full operating conditions % **(B)**	Operating at full capacity. The datum is updated every 10 seconds with the sealing command pulsed or always active 100=Operating mode not protected, optimal working condition 0= Operating mode protected, working condition to be improved	FULLY OPERATING CONDITIONS Home\Technical analysis	778 030AH (UINT16)	X	0	100
Active temperature probe	Indicates whether or not the temperature sensor was detected	ACT. Home\Technical analysis	776 0308H (UINT16)	X	0	1
Bar probe temperature [°C]	Indicates the sensor's current temperature	TEMP. SENSOR Home\Technical analysis	777 0309H (INT16)	X	- 32768	32767
Maximum COPRO full-wave effective I for alarm 90 [A]	*COPRO* maximum full wave rms current	COPROCESSOR MAX I Home\Technical analysis	-	The value depends on the model. See	0	65535

				chapter 10		
First COPRO calibration (A) full wave effective I0 (From versions V10)	First COPRO calibration full wave rms current Stored automatically during first calibration or after first calibration data backup command	COPROCESSOR I0 Home\Technical analysis	1024 0400H (UINT16)	X	0	65535
First COPRO calibration R0 (ohm x100) (From versions V10)	COPRO Calibration Resistance Stored automatically during first calibration or after first calibration data backup command	COPROCESSOR R0 Home\Technical analysis	1025 0401H (UINT16)	X	0	65535
First COPRO calibration full wave effective V0 (V) (From versions V10)	First calibration full wave rms voltage COPRO Stored automatically during first calibration or after first calibration data backup command	COPROCESSOR V0 Home\Technical analysis	1026 0402H (UINT16)	X	0	65535
First COPRO calibration full wave effective P0 (VA) (From versions V10)	First COPRO calibration full wave effective power (V x I x “Duty cycle”)	COPROCESSOR P0 Home\Technical analysis	1027 0403H (UINT16)	X	0	65535
Last COPRO calibration full wave effective I0 (A) (From versions V10)	Last COPRO calibration full wave rms current	-	1032 0408H (UINT16)	X	0	65535
Last COPRO calibration R0 (ohm x100) (From versions V10)	Last COPRO calibration resistance	-	1033 0409H (UINT16)	X	0	65535
Last COPRO calibration full wave effective V0 (V) (From versions V10)	Last *COPRO* calibration full wave rms voltage	-	1034 040AH (UINT16)	X	0	65535

Last COPRO calibration full wave effective P0 (VA) (From versions V10)	Last COPRO calibration full wave effective power (V x I x “Duty cycle”)	-	1035 040BH (UINT16)	X	0	65535
COPRO temperature probe active	Indicates whether or not the temperature sensor was detected on the *COPRO*	COPROCESSOR ACT. Home\Technical analysis	-	-	-	-
COPRO bar probe temperature [°C]	Indicates the current temperature of the sensor on the *COPRO*	COPROCESSOR TEMP. SENSOR Home\Technical analysis	-	-	-	-
COPRO current temperature [°C]	Indicates the current temperature of the sealing element read by the COPRO	COPROCESSOR TEMPERATURE Home\Technical analysis	-	-	-	-
Number of writes in permanent memory from power on *(On versions V7 and from versions V9. From versions V10 also on fieldbus)*	Stores the actual number of writes made in permanent memory since the last power-up	EEPROM WRITES Home\Technical analysis	1048 0418H (UINT16)	X	0	65535
Current leakage to ground alarm 70 [mA] (Up to versions V7.3.15)		CURR. EARTH LEAK. Home\Technical analysis	783 030FH (UINT16)	X	0	65535

5.3.13 TEMPERATURE INCREASE

This function makes it possible to compensate for the decrease in sealing temperature caused by the width of the product to be sealed being much smaller (e.g. 1/3) than the useful sealing area (central area of the strip without coppering).
The "Sealing temperature increase" parameter is the total increase in sealing temperature in degrees. The increase occurs:

- In pulsed sealing on the falling edge of the sealing command.
- In continuous sealing, with the sealing command always active, on the rising edge of the preheating command.

Parameter “No. of Seals Increase” is the number of seals required to obtain the total increase in sealing temperature set in the "Sealing temperature increase" parameter. Saldature” è il numero di saldature necessario per ottenere l’aumento totale della temperatura di saldatura impostato nel parametro “Incremento temperatura Saldatura”.
The "Time increase to reset" parameter is the time in seconds needed to restore the initial SEALING TEMPERATURE conditions.

Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
PARAMETERS						
Sealing temperature increase [°C]	Total temperature increase for sealing band compensation	TEMPER. INCREASE Home\Setting data	266 010AH (UINT16)	0	0	255
No. of Seals Increase	Number of seals for temperature increase	INCREASE No. Home\Setting data	267 010BH (UINT16)	0	0	255
Time increase to reset [s]	Initial temperature reset time	TIME RESET Home\Setting data	284 011CH (UINT16)	0	0	255

5.3.14 REGULATOR ENABLE (on versions V7 and from versions V10)

The regulator's enabling function allows keeping the regulator disabled and then activating the adjustment via the fieldbus through the relating command bit present on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).
The command's acquisition time is ≤ 25 ms.
When in the regulator-disabled status, the thermoregulator generates Warning 31.

Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
PARAMETERS						
Regulator enabled	Enables or disables the adjustment of the sealing band	REGULATOR ENABL. Home\Machine data	28 001CH (UINT16)	1	0	1

5.3.15 HOT CALIBRATION (on versions V7 and from versions V10)

Calibration is used to bring the sealing element to the temperature set by the set point and detected by the temperature probe (see par. 5.3.7), by automatically adding a delta to the temperature coefficient (see par. 5.3.6).
The hot calibration can be started with the relating command from the panel through the multilingual panel, from the *Home/Commands* submenu or via the fieldbus through the relating command bit present on the COMMANDS WORD (see par. 6.6.3.2) or by writing the "Command Code" parameter (see par. 5.3.26 - COMMANDS).
The hot calibration parameters are those shown in the table below.
When the hot calibration is started, the status changes to "Hot calibration in progress".
Hot calibration can fail, generating alarm 87 "HOT CALIBRATION FAILED: COEFFICIENT TOO LOW" or alarm 88 "HOT CALIBRATION FAILED: COEFFICIENT TOO HIGH".
Calibration can take a considerable time; if it must be interrupted, simply activate the reset command via the panel or fieldbus: in this case alarm 60 is generated, which in turn must be reset to bring the thermoregulator back to normal working conditions.
If, on the other hand, the calibration ends correctly, the "Delta coefficient hot calibration (PPM)" variable contains information regarding the correction applied.

PARAMETERS						
Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
Temperature hot calibration [°C]	Set point temperature for hot calibration (°C)	Home\Commands	532 0214H (INT16)	100	Calibration temperature	Max Sealing temperature
Probe tolerance temperature hot calibration [°C]	Probe read tolerance with respect to set point (°C)	Home\Commands	533 0215H (UINT16)	3	0	255
Probe accuracy tolerance hot calibration [°C]	Probe absolute read tolerance (°C)	Home\Commands	534 0216H (UINT16)	1	0	255
Stabilization time hot calibration [s]	Stabilization time starting from probe within tolerance (s)	Home\Commands	535 0217H (UINT16)	10	0	65535
READ-ONLY VARIABLES						
Delta coefficient hot calibration [PPM]	Correction made by the hot calibration to the temperature coefficient (PPM) This parameter is reset to 0 if the "Temperature coefficient [PPM]" parameter is changed, see par. 5.3.6.	Home\Commands	536 0218H (UINT16)	0	0	65535

5.3.16 FIELDBUS

PARAMETERS						
Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
Type of Bus/RS485 baudrate	RS485 [001]=9600 Baud [002]=19200 Baud [003]=28800 Baud [004]=38400 Baud [005]=48000 Baud [006]=57600 Baud OTHER BUSES See “Read-Only variables”	MODBUS RTU RS485 Home\Fieldbus	10 000AH (UINT16)	1	1	6
MODBUS RS485 Idle Char	[0]=Automatic from BaudRate, [1]=1ms, .. [10]=10ms (Default), .. [50]=50ms .. [100]=100ms	IDLE CHAR Home\Fieldbus	274 0112H (UINT16)	10	10 (up to versions V9) 0 (from versions V10)	100 (up to versions V9) 50 (from versions V10)
RS485 Master Timeout [s] *(From versions V10)*	Time after which, if not queried, Thermosald considers the connection aborted with the master.	MASTER TIMEOUT Home\Fieldbus	1045 0415H (UINT16)	5	1	255
READ-ONLY VARIABLES						
Type of Bus/RS485 baudrate	NO BUS [000=NO BUS] RS485 [001-006] See “Parameters” PROFIBUS [011=PROFIBUS] PROFINET [021=PROFINET] ETHERNET/IP [031=ETHERNET/IP] MODBUS/TCP [041=MODBUS/TCP] POWERLINK [051=POWERLINK]	TYPE OF BUS Home\Fieldbus	10 000AH (UINT16)	X	X	X

	ETHERCAT [061=ETHERCAT]					
Slave address/Byte 4 IP address	RS485 (selection from dip switch SW2[1..7]) PROFIBUS (selection from dip switch SW2[1..8]) PROFINET [Not used] ETHERNET/IP (selection from dip switch SW2[1..8]) MODBUS/TCP (selection from dip switch SW2[1..8]) POWERLINK (selection from dip switch SW2[1..8]) ETHERCAT [Not used]	BUS ADDRESS Home\Fieldbus	11 000BH (UINT16)	X	See par. 6.2	See par. 6.2
RS485 Stop Bit	RS485 [000]=1 stop bit, [001]=2 stop bit (selection from dip switch SW2[8]) OTHER BUSES [Not used]	No. of STOP BITS Home\Fieldbus	272 0110H (UINT16)	X	See par. 6.2	See par. 6.2

5.3.17 ANALOG (models equipped with analog option and Low Cost models)

On models equipped with the analog option, you can manage the set point value of the preheating and sealing temperatures (see par. 5.3.9) from two analog inputs on the CN7 connector (see par. 4.2.7) according to three different operating modes that can be set via parameter " Analog mode configuration".

PARAMETERS						
Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
Analog mode configuration	[0]=Only analog [1]=Analog + Panel or Fieldbus [2]=Only Panel or Fieldbus	DISPLAY CONFIGURATION Home\Machine data	6 0006H (UINT16)	0	1	2

If the "Analog mode configuration" parameter is set to operate in the "Analog only" mode, the temperature set points are set from the value of the respective analog inputs and the maximum temperature is 300°C.

If the set mode is "Analog + Panel or Fieldbus", the set points of the temperatures are set starting from the value of the analog inputs as in the previous case, but may be limited by the values of the respective parameters (see par. 5.3.9).

If the set mode is "Only Panel or Fieldbus", the analog inputs are not used and the temperature set points are those set on the relative parameters by Display or Fieldbus.

The "Analog mode configuration" parameter is set to 0 at the first power on or after a MASTER RESET; if the connection with the panel or on the models equipped with Fieldbus is detected, the parameter is automatically set to 2. The "Analog + Panel or Fieldbus" mode must be set explicitly.

On models equipped with standard analog input, the resolution is 13,3 mV/degree (300°C=3.99V).
The thermoregulator will trigger an alarm if an input exceeds 4.2V.

On models equipped with the 10V analog input option, the resolution is 26,6 mV/degree (300°C=7.98V).
The thermoregulator will trigger an alarm if an input exceeds 8.4V.

The analog preheating and sealing references must be maintained at the desired value for the duration of the relevant preheating and sealing command.

5.3.18 ANALOG OUTPUT AND DIAGNOSTICS (models equipped with analog option and Low Cost models)

In models equipped with the analog option, a 0-5V analog output on the CN8 connector (see par. 4.2.8) provides diagnostic information about the thermoregulator depending on the thermoregulator's status:

- **Normal operating condition without power**
  Analog output value: 0 V

- **Normal operating condition with power on**
  The analog output value indicates the current temperature with resolution of 10mv/degree (e.g. 1V = 100 degrees)

- **Alarm condition**
  The alarm condition can be detected by the emergency contact on the CN3 connector (see par. 4.2.4).
  The analog output value indicates the current alarm with the mapping shown in the table below (see also ANNEX D - LIST OF ALARMS AND MESSAGES (CAUSES - REMEDIES)).

Output value ± 0,05 [V]	Alarm
1.0	78
1.5	46
2.0	48
2.0	49
2.5	69
3.0	89
3.5	93
4.0	94
4.5	97
4.5	76
5.0	Generic alarm: see the green-red LED interface on the device for details about the alarm

5.3.19 PLC (only models equipped with PLC option)

On the models equipped with this function some predefined programs are available to allow the user to solve the most common application problems by properly connecting the digital inputs and outputs available on the CN12 connector (see par. 4.2.10).
The following table shows the list of all the parameters related to this functionality.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
PLC Enable	(UNSIGNED INT 16) [0]=PLC disabled [1]=PLC program 1 … [n]=PLC program N	PLC OPTION Home\Machine data	18 0012H (UINT16)	1 (PLC option models) 0 (other models)	0	1 (PLC option models) 0 (other models)
PLC Program 1 Bar max closing time [ms x 10]	TMaxBC	MAX CLOS. TIME Home\Prog01 parameters	276 0114H (UINT16)	100	0	255
PLC Program 1 Closed bar command activation preheating delayed[ms x 10]	tPreHeatDelayBC	PREH.DELAY BAR CL. Home\Prog01 parameters	277 0115H (UINT16)	40	0	1000
PLC Program 1 Sealing time [ms x 10]	tS	SEALING T. Home\Prog01 parameters	278 0116H (UINT16)	80	0	65535
PLC Program 1 Cooling time after end of sealing [ms x 10]	tCEoS	COOL. AFTER SEAL. Home\Prog01 parameters	279 0117H (UINT16)	120	0	65535
PLC Program 1 Bar closed time after end of sealing [ms x 10]	tBCEoS	BAR CL. AFTER SEAL. Home\Prog01 parameters	280 0118H (UINT16)	20	0	65535
PLC Program 1 Bar max opening time [ms x 10] *(On versions V9, from versions V10 also on fieldbus)*	TMaxBO	MAX OPEN. TIME Home\Prog01 parameters	1052 041CH (UINT16)	100	0	255

After the connection of the INPUT/OUTPUT signals on the CN12 connector and the configuration of the parameters, it is advisable to check that no dangerous situations can occur for the user.

5.3.19.1 PLC Program 1 operation (PLC enable = 1)

Program 1 (see ANNEX A - SEALING CYCLE) uses the two output signals OUT0 and OUT1, respectively, as the bar closing and cooling activation commands, the IN0 input signal as the bar closed sensor, and the IN1 input signal for starting the sequence related to the program, as described below and shown by the graph in Figure 19.
If the IN1 signal is off, the thermoregulator remains in a balanced status and the OUT0 and OUT1 outputs are off.

The sequence is triggered by activating the IN1 command, which brings the thermoregulator into the preheat status. After a tPreHeatDelayBC time, the bar closing command is activated and the thermoregulator remains in the preheating status until the bar closed end stroke. When the limit switch is activated, the thermoregulator switches to the sealing status and remains there for a time tS. After this time has elapsed, the machine returns to the balancing status and activates the cooling command. After a tCEoS time has elapsed, the cooling command is deactivated, and after a tBCEoS time, the bar closing command is deactivated. The thermoregulator then waits for the disabling of IN1 and a new enabling of the same to restart with a new sequence.

If IN1 is disabled during the execution of the sequences, the thermoregulator immediately returns to the balanced status and the OUT0 and OUT1 outputs are disabled.
If, at any time, the closed-bar command is not consistent with the end-of-stroke status, alarm 45 is generated when the TMaxBC or TMaxBO delays expire (see ANNEX D - LIST OF ALARMS AND MESSAGES (CAUSES - REMEDIES)).

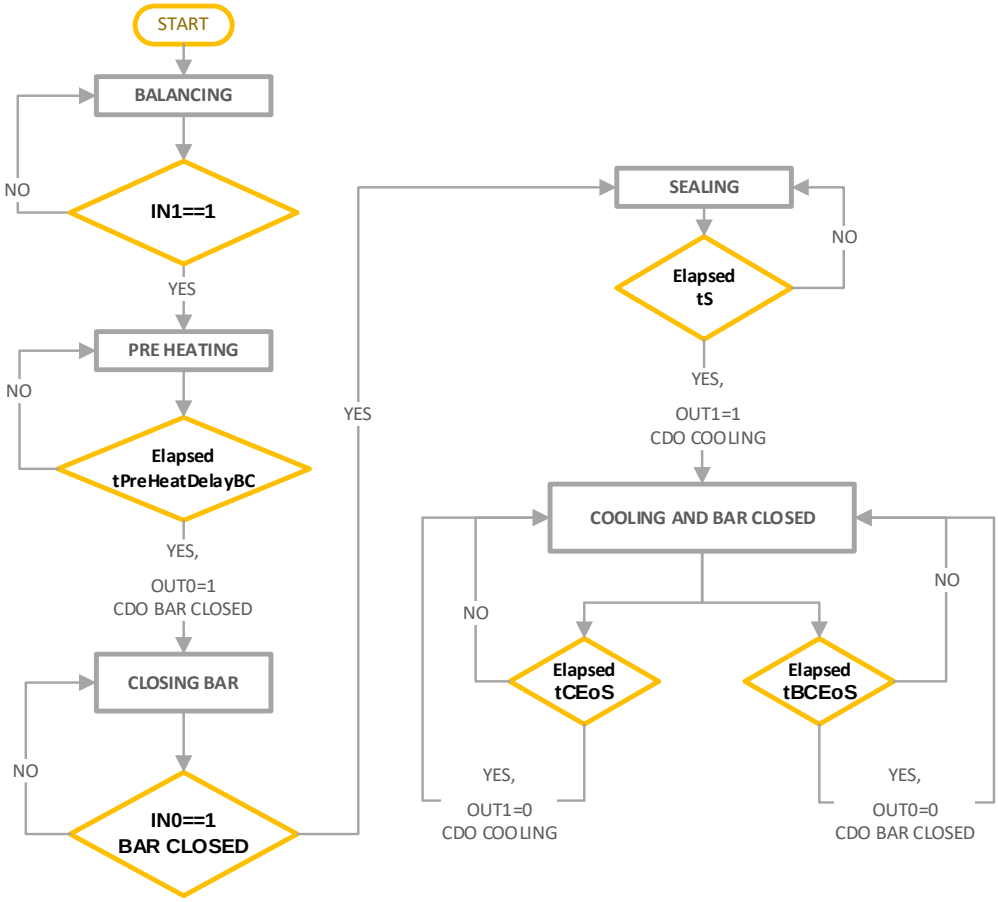


Figure 19 – Program 1 Sequences

5.3.20 BURN-IN

The Burn-In function is no longer active on V7 versions and from V9 versions.

5.3.21 CURRENT CONTROL

The current control function is no longer active on V7 versions and from V9 versions.

5.3.22 CONFIGURATION BACKUP

The permanent memory of the default thermoregulator is written at each parameter change. In case the fieldbus is used and the parameters are stored in the PLC and/or you need to edit parameters frequently during operation, you can disable the writing in the permanent memory to avoid damaging it by changing the parameter indicated in the following table.

Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
PARAMETERS						
Permanent memory backup at configuration change from bus (On versions V7 and from versions V9)	[0]=Disabled [1]=Enabled	CONF. BACKUP FROM BUS Home\Settings data	779 030BH UINT16	1	0	1

5.3.23 CONFIGURATION PROTECTION

The configuration protection function prevents the panel user from changing all or part of the parameters, depending on whether the total or partial mode is set.
To use this function, you must assign a value different from 0 to the "Password" parameter.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Passwords	[0]=Password disabled [1]=Partial password enabled [2]=Total password enabled	PASSWORD ENABLE Home\Machine data	19 0013H UINT16	0	0	2
Key Password	Password value	KEY PASSWORD Home\Machine data	20 0014H UINT16	0	0	9999

5.3.24 PANEL CONFIGURATION

Below is a list of parameters which allow a few customizations on the user panel.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Panel language	Language configuration: [0]=ITALIAN [1]=ENGLISH [2]=FRENCH [3]=GERMAN [4]=SPANISH [5]=Can be customized	LANGUAGE SELECTION Home\Setting data	257 0101H UINT16	0	0	5
Unit of measure in degrees on the panel	Temperature display: [0]=° Centigrade [1]=° Fahrenheit	DEGREES DISPLAY Home\Setting data	259 0103H UINT16	0	0	1
Temperature setting on page 1	Allows you to view and change the sealing temperature on the main page using the “UP ARROW” and “DOWN ARROW” keys.	PAG1 TEMPER. SETTING Home\Setting data	281 0119H UINT16	0	0	1

5.3.25 ADVANCED CONFIGURATION PARAMETERS

The table below shows the advanced configuration parameters. They are intended for an advanced user and it is recommended that you always contact 3E Sales Office before making any changes.

Name	Description	Panel string Panel path (see Figure 12)	Dec Bus ID Hex Bus ID Type	Default	Min	Max
PARAMETERS						
Mode configuration	[0]=Impulse sealing	CONFIGURATION Home	5 0005H UINT16	0	0	0
Max Sealing Time [ms x 100]	Sealing time check. This parameter is used to set the maximum time of the sealing command; if the duration of the sealing command exceeds this value, the thermoregulator triggers alarm F085. For applications with the sealing command always active, or to deactivate the control, this parameter must be set to 0.	MAX SEAL. TIME Home\Setting data	263 0107H UINT16	0	0	65535
Sealing band length threshold for alarm 69 grounded sealing band [%] *(On SCR models and on HF models from versions V7.3.16)*	Ground leakage tolerance	GROUNDED SEALING BAND Home\Setting data	282 011AH UINT16	20	20	100
Sealing band leakage full wave effective I threshold for alarm 70 grounded sealing band [mA] *(Only on HF models up to*	Grounded leakage tolerance	GROUNDED SEALING BAND Home\Setting data	1051 041BH (UINT16)	1000 (up to V7.3.14) 500 (from V7.3.15)	50	50000

version V7.3.15)						
Latch end-of-seal temperature 3s	[0]=the current temperature is continuously updated [1]=at the end of sealing, the current temperature stores the end-of-seal temperature for 3 seconds.	SEAL. END T. SET. Home\Setting data	268 010CH (UINT16)	0	0	1
Heating ramp [degrees/100ms]	Speed of temperature increase resulting from a preheating or sealing command [U/M degrees / 100 ms]. Increasing this parameter means decreasing the time needed to bring the sealing band to temperature and thus increasing the speed, decreasing the stability, and decreasing the life of the sealing band.	RAMP Home\Machine data	0 0000H (UINT16)	60 (on SCR models up to V9.0.8 and on HF models up to V7.3.7) 40 (on SCR models from V9.0.9, on HF models from V7.3.8, and from versions V10)	0	255
KV gain	Proportional loop gain. Increasing this parameter means increasing the response speed of the loop and thus making the system more ready. Excessive increase can lead to system instability and thus temperature oscillation.	KV PROPORTIONAL G. Home\Machine data	1 0001H (UINT16)	100 (SCR) 50 (HF)	0	65535
KINT GAIN (x10)	Integrative loop gain. Increasing this parameter means increasing the temperature accuracy and the speed of reaching the desired temperature. To increase system stability, increase this parameter.	KI INTEGRATIVE G. Home\Machine data	2 0002H (UINT16)	40 (SCR) 5 (HF)	0	65535

	Excessive increase can lead to a temperature overflow resulting from a preheating or sealing command.					
Final KINT threshold [%]	Limits the maximum value of the hot integrative component: increasing this value increases the hot overshoot	FINAL INTEGR. THRESH. Home\Machine data	3 0003H (UINT16)	60	0	100
Initial KINT threshold [%] (from version V4.4)	Limits the maximum value of the cold integration component: increasing this value increases the heating rate	INITIAL INTEGR. THRESH. Home\Machine data	26 001AH (UINT16)	10	0	100
End-Of-Seal KINT threshold [%] (from version V4.4)	Limits the maximum value of the integrative component in production: increasing this value increases the bar temperature during production	E-O-S INTEGR. THRESH. Home\Machine data	27 001BH (UINT16)	90	0	100
KD Derivative gain	Derivative loop gain. Increasing this parameter increases the response speed of the loop and therefore makes the system readier to variations. Excessive increase can lead to system instability and, as such, temperature oscillation.	KD DERIVATIVE G. Home\Machine data	8 0008H (UINT16)	30 (SCR) 10 (HF)	0	65535
Read margin T [ms] (from version V4.4)	Allows you to change the reading time of the AD converters. Modifying this parameter makes it possible to correct abnormal operation of the power transformer if it is undersized.	READ DELAY Home\Machine data	25 0019H (UINT16)	1200 (SCR) 400 (HF)	1000 (SCR) 200 (HF)	2000 (SCR) 1000 (HF)
Partial short circuit factor (x10)	Allows you to establish an instantaneous current threshold,	SEMISHORT FACTOR Home\Machine data	4 0004H (UINT16)	12	0	20

	due to a partial short circuit, above which the thermoregulator triggers alarm F097.					
Max phase T [us]	*Allows you to decrease the regulator's max phase*	MAX PHASE DECR. Home\Machine data	275 0113H (UINT16)	1200	0	65535
Power timeout x 10 [s] *(Only* SCR models)	Timeout to enter the Power Off status.	POWER TIMEOUT Home\Machine data	273 0111H (UINT16)	5	0	255
Power off threshold [%] *(Only* HF models)	Voltage level compared to the maximum power value to enter the Power Off status.	POWER THRESH. OFF Home\Machine data	782 030EH (UINT16)	80	0	100
Max period offset[us] *(Only* SCR models)	Maximum sine wave deflection.	MAX PERIOD OFFSET Home\Machine data	538 021AH (UINT16)	400 2000 (from version 9.0.14)	0	5000
Max retries period reset *(Only* SCR models)	Period offset tolerance	PERIOD RESET Home\Machine data	539 021BH (UINT16)	5	0	255

5.3.26 COMMANDS

In case a model equipped with the fieldbus option is used, all thermoregulator commands can be activated by writing the specific code relating to the command you wish to activate to the address shown in the following table. All codes are shown in the following table.
If the specific fieldbus is equipped with an exchange area, the commands can be activated also through a COMMANDS WORD bit (see par. 6.6.3.2).

VARIABLES						
Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
Command code	Alarm reset=[014] Calibration=[015] Save data to eeprom=[016] (Not active from versions V5.1) Read data from eeprom=[017] (Not active from versions V5.1) Burn-in on=[018] (Not active on versions V7 and from versions V9) Burn-in off=[019] (Not active on versions V7 and from versions V9) Emergency test=[020] Hot calibration=[023] (On versions V7 and from versions V10) Save calibration data=[026] Save coprocessor data=[027] (Not active from versions V5.1) Disable coprocessor alarms=[028] (Not active from	COMMANDS Home\Commands	1285 0505H (UINT16)	-	-	-

	versions V5.1) Pre-heating on=[031] Pre-heating off=[032] Sealing on=[033] Sealing off=[034] Current loop on=[035] (Not active on versions V7 and from versions V9) Current loop off=[036] (Not active on versions V7 and from versions V9) Regulator on=[041] (On versions V7 and from versions V10) Regulator off=[042] (On versions V7 and from versions V10) Master reset=[099]					

5.3.27 INFORMATION

READ-ONLY VARIABLES						
Name	**Description**	**Panel string** **Panel path (see Figure 12)**	**Dec Bus ID** **Hex Bus ID** **Type**	**Default**	**Min**	**Max**
Company reference	Company name	3E s.r.l. – BO – ITALY Home\Information	-	-	-	-
Support reference	Email address to contact for any product support	SUPPORT sales@3e3e3e.com Home\Information	-	-	-	-
Model	[10]=ISX SCR [11]=ISX HF	MODEL Home\Information	21 0015H (UINT16)	X	0	65535
Rated current [A]	Indicates the rated current value supported by the	RATED I Home\Machine data	7 0007H	X	0	65535

	power hardware (e.g. 90A)		(UINT16)			
Major	[0]=Minor [1]=Major	-	16 0010H (UINT16)	X	0	1
Low voltage	[0]=Standard voltage [1]=Low voltage	BASIC UNIT VERSION Home\Information	17 0011H (UINT16)	X	0	1
Release software major (ASCII)	Value of the major version of the base board software	BASIC UNIT VERSION Home\Information	512 0200H (UINT16)	X	0	65535
Release software minor (ASCII)	Value of the minor version of the base board software	BASIC UNIT VERSION Home\Information	513 0201H (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1036 040CH (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1037 040DH (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1038 040EH (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1039 040FH (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1040 0410H (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1041 0411H (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1042 0412H (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1043 0413H (UINT16)	X	0	65535
Reserved (From versions V10)	-	-	1044 0414H (UINT16)	X	0	65535
Panel Software Version	Value of the software version of the display panel	DISPLAY VERSION Home\Information	-	-	-	-
T500 option	[0]=Not present	-	780	X	0	1

(From versions V9)	[1]=Present		030CH (UINT16)			
Fixed parameters option of maximum temperature and temperature coefficient *(From versions V9)*	[0]=Not present [1]=T180 C900 [2]=T130 C900 [3]=T160 C900 [4]=TM200 CM1210 [5]=TM135 CM1210	-	781 030DH (UINT16)	X	0	5
Coprocessor present *(From versions V9)*	[0]=Not present [1]=Present		*1053* *41DH* (UINT16)	X	0	1

6 FIELDBUS

This chapter describes in detail the communication interfaces developed on the thermoregulator:

- MODBUS RTU RS485 HALF DUPLEX
- PROFIBUS DPV0 with cyclical exchange up to 12Mbps
- PROFINET IO RT with cyclical exchange
- ETHERNET/IP
- POWERLINK
- MODBUS/TCP
- ETHERCAT

In particular:

- In par. 6.1, 6.1, the description of the communication parameters of the individual interfaces
- In par. 6.2, the description of the connections and the hardware configuration through dip switches
- In par. 6.3, the description of the thermoregulator's LED diagnostics
- In par. 6.4, the description of telegrams and exchange areas
- In par. 6.5, the description of communication commissioning
- In par. 6.6, the description of the communication protocols
- In par. 6.7, the description of the functionalities available on the web page of the device, if any

To continue reading this chapter, you must know the basic functionalities related to the buses listed above.

The thermoregulator acts as the communication slave.

6.1 INTRODUCTION

6.1.1 MODBUS RTU RS485 HALF DUPLEX

The implementation supports the Modbus RTU SLAVE (Remote Terminal Unit) format. Refer to the "Modicon Modbus Protocol Reference Guide", PI-MBUS-300, Rev. J for MODBUS RTU RS485 HALF DUPLEX manual for more details on the standard.

6.1.1.1 Communication parameters

Parameter	Range	Default
DEVICE ADDRESS	1-127	1
IDLE CHAR BEFORE TX	0-100 [ms.]	10 [ms]

6.1.1.2 Idle char before TX

Transmission start and end times during which no characters are transferred. The time between the last character transmitted by the master and the first character answered by the slave must be 2 x “idle char”. E.g.: 2 x 10 ms = 20ms.
The IDLE CHAR BEFORE TX parameter can be edited via software using the protocol outlined in par. 6.6.1 - Reading and writing variables (MODBUS RTU RS485 V5 HALF DUPLEX.

6.1.1.3 Device Address

To change the DEVICE ADDRESS see par. 6.2.1.2 - Setting the DEVICE ADDRESS.

6.1.1.4 Serial parameters

Parameter	Range	Default
BAUD RATE	9600-19200-28800-38400-48000-57600	9600
DATA BIT (LSB first)	8	8
PARITY	None	none
START BIT	1	1
STOP BIT	1.2	2

6.1.1.5 Baud Rate

The BAUD RATE parameter can be edited via software using the protocol outlined in par. 6.6.1 - Reading and writing variables (MODBUS RTU RS485 V5 HALF DUPLEX.

6.1.1.6 STOP BIT

To change the STOP BIT see par. 6.2.1.3 - Setting the STOP BIT.

6.1.2 PROFIBUS

6.1.2.1 Communication parameters

Parameter	Range	Default
DEVICE ADDRESS	1-128	1

To change the DEVICE ADDRESS see par. 6.2.2.2 - Setting the DEVICE ADDRESS.

6.1.3 PROFINET

6.1.3.1 Communication parameters

Parameter	Default
DEVICE NAME	“”
IP ADDRESS	0.0.0.0
SUBNET MASK	0.0.0.0

To change the DEVICE NAME or the IP ADDRESS see par. 6.5.3.1 - Software change of device name and IP address.

6.1.4 ETHERNET/IP

6.1.4.1 Communication parameters

Parameter	Default
IP ADDRESS	192.168.0.55
SUBNET MASK	255.255.255.0

To change the IP ADDRESS see paragraphs 6.2.4.2 - Setting the IP ADDRESS and 6.5.4.2 - Software change of IP address.

6.1.5 POWERLINK

6.1.5.1 Communication parameters

Parameter	Range	Default
DEVICE ADDRESS	1-239	1

To change the DEVICE ADDRESS see par. 6.2.5.2 - Setting the DEVICE ADDRESS.

6.1.6 MODBUS/TCP

6.1.6.1 Communication parameters

Parameter	Default
IP ADDRESS	192.168.0.55
SUBNET MASK	255.255.255.0

To change the IP ADDRESS see paragraphs 6.2.6.2 - Setting the IP ADDRESS and 6.5.6.1 - Software change of IP address.

The port used by the protocol is 502.

6.1.7 ETHERCAT

6.1.7.1 Communication parameters

No communication parameter to be configured.

6.2 CONNECTIONS AND DIP SWITCHES

6.2.1 MODBUS RTU RS485 HALF DUPLEX

6.2.1.1 Hardware connection

The thermoregulator can communicate with a PC or PLC supervisor through the CN10 connector (see 6.2.9 - CN10 Connector).
A shielded cable with a grounded shield must be used for connection.

CN10 is a 9-pole female connector (CN10/3=channel A+; CN10/8= channel B-).
N.B.: when the RS485 bus does not transmit, the following condition must be met:

A+ - B- > 200mV

6.2.1.1.1 NOTE FOR CONNECTION WITH SIEMENS

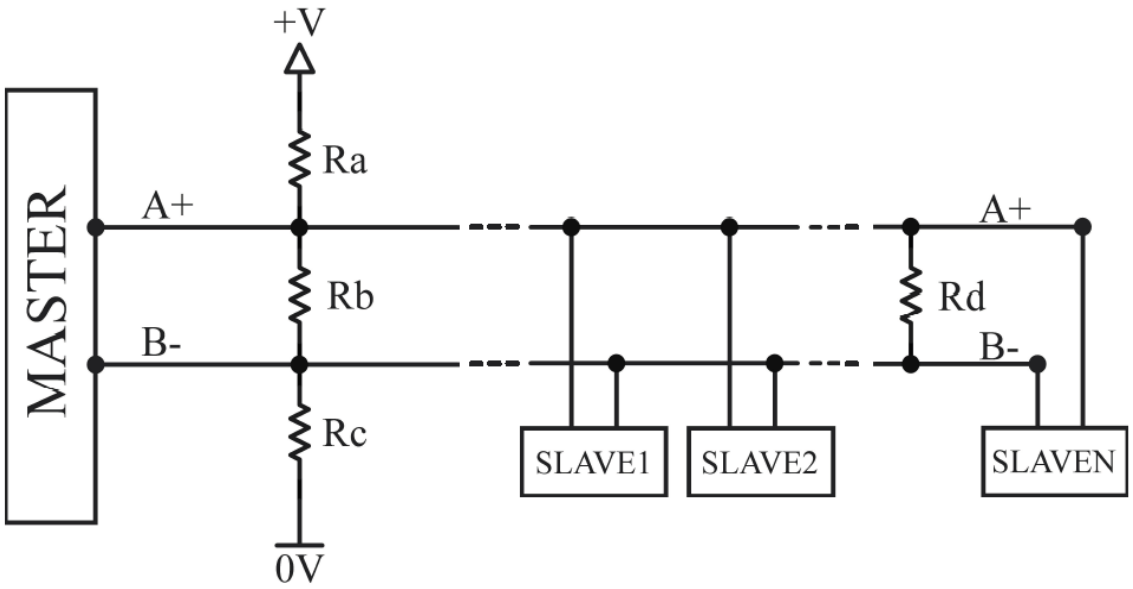
A+ must be connected to Siemens channel B+; B- must be connected to Siemens channel A- (+ with + and - with -).

6.2.1.1.2 Pull-up, pull-down resistors and termination of lines A+ and B-

For the correct operation of the bus, you need to insert the pull-up and pull-down resistors, which at times are preinstalled in the line master, on lines A+ and B-; otherwise an external power supply unit must be inserted.

In general it is preferable to connect the 0V of the slaves to the 0V of the master and to the 0V of the power supply unit, if present, and ground everything on the master side.

Connection example:

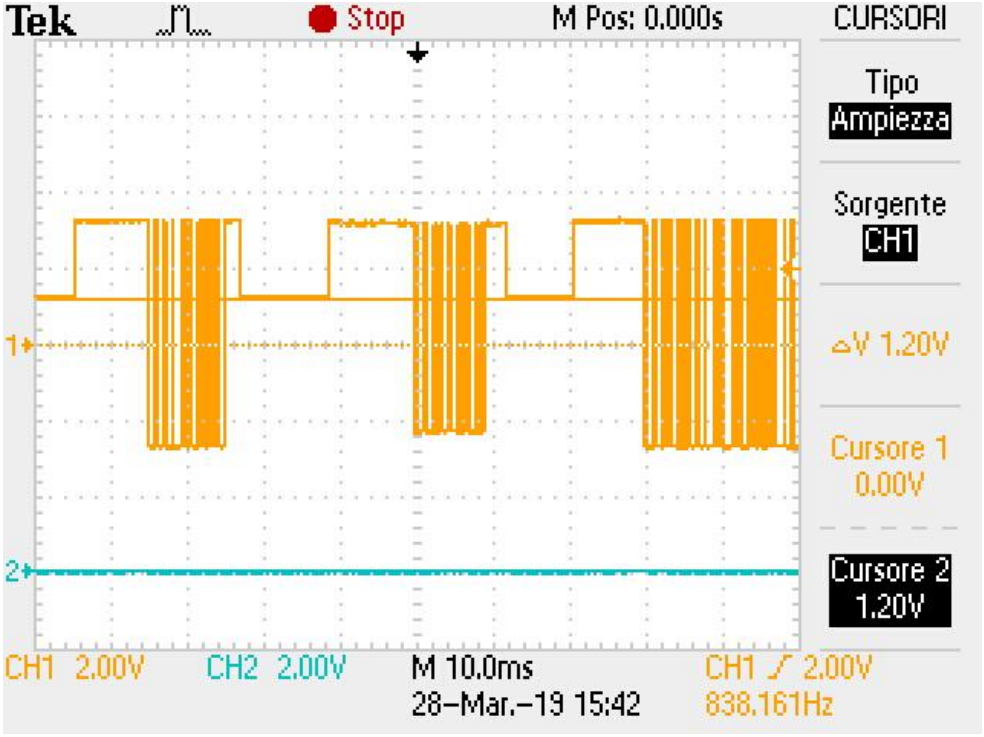


Bus configurations example:

RA=RC Pull-up/Pull-down (Ω)	RB A+ - B- (Ω)	RD Termination (Ω)	V A+ - B- (mV)	NOTES
390	220	-	1100	-
390	220	220	620	Termination only if necessary
1000	220	-	495	-
1000	220	220	260	Termination only if necessary

If Profibus cables are used for connection, leave all terminations open, including the last one.
Should you need to terminate the line, use an external RD resistor.

Typical waveform:

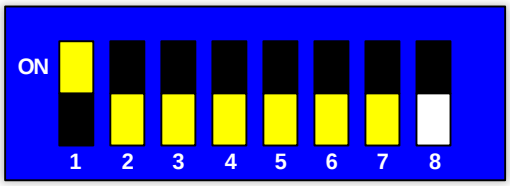
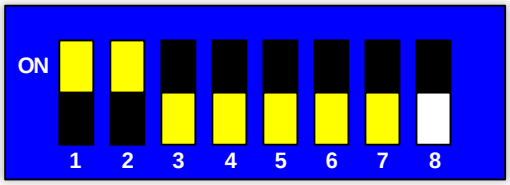


6.2.1.2 Setting the DEVICE ADDRESS

Set the RS485 address using the device's dip-switches SW2[1..7].

The address is set in binary format. If the status of the dip switches is changed, you must turn the thermoregulator off and then back on again.

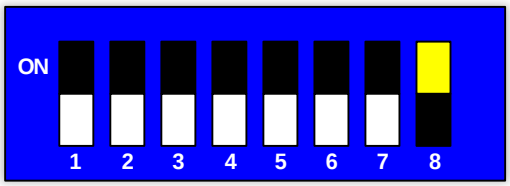
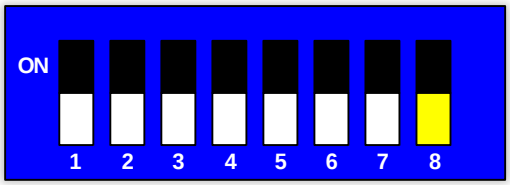
EXAMPLES:

DEVICE ADDRESS = 1	SW2[1]=ON SW2[2..7]=OFF	
DEVICE ADDRESS = 3	SW2[1]=ON SW2[2]=ON SW2[3..7]=OFF	

6.2.1.3 Setting the STOP BIT

Set the stop bit using the device's dip-switch SW2[8]. If the status of the dip switches is changed, you must turn the thermoregulator off and then back on again.

EXAMPLES:

2 STOP BIT	SW2[8]=ON	
1 STOP BIT	SW2[8]=OFF	

6.2.2 PROFIBUS

6.2.2.1 Hardware connection

The thermoregulator can communicate with a PC or PLC supervisor through the CN10 connector (see 6.2.9 - CN10 Connector).

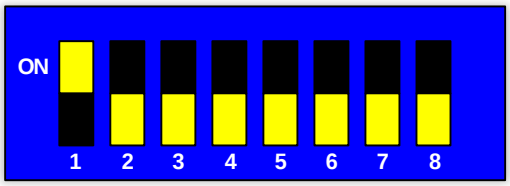
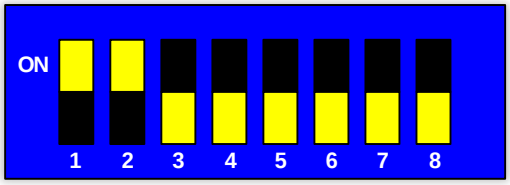
6.2.2.2 Setting the DEVICE ADDRESS

Set the PROFIBUS address using the device's SW2 dip-switches.

For the factory default dip switch value see par 6.1.2.

The address is set in binary format. If the status of the dip switches is changed, you must turn the thermoregulator off and then back on again.

EXAMPLES:

DEVICE ADDRESS = 1	SW2[1]=ON SW2[2..8]=OFF	
DEVICE ADDRESS = 3	SW2[1]=ON SW2[2]=ON SW2[3..8]=OFF	

6.2.3 PROFINET

6.2.3.1 Hardware connection

The thermoregulator is equipped with an Ethernet switch made up of two RJ45 connectors (see 6.2.8 - Ethernet Switch HMS-ANYBUS CompactCom). Speed is 100Mbps.

6.2.4 ETHERNET/IP

6.2.4.1 Hardware connection

The thermoregulator is equipped with an Ethernet switch made up of two RJ45 connectors (see 6.2.8 - Ethernet Switch HMS-ANYBUS CompactCom). Speed is 100Mbps.

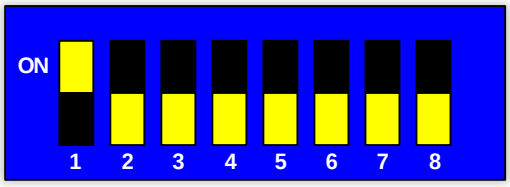
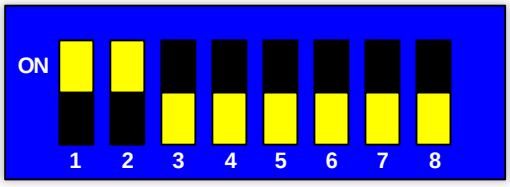
6.2.4.2 Setting the IP ADDRESS

If switch SW2 is set to 0 (default) the least significant byte of the previously set IP address is kept. For the default value set when leaving the factory, see par. 6.1.4.

If switch SW2 has a value between 1 and 254, the least significant byte of the IP address is set to the value of switch SW2. Address 255 is not valid as it is a broadcast address.

The address is set in binary format. If the status of the dip switches is changed, you must turn the thermoregulator off and then back on again.

EXAMPLES:

IP ADDRESS = xxx.xxx.xxx.xx1	SW2[1]=ON SW2[2..8]=OFF	
IP ADDRESS = xxx.xxx.xxx.xx3	SW2[1]=ON SW2[2]=ON SW2[3..8]=OFF	

6.2.5 POWERLINK

6.2.5.1 Hardware connection

The thermoregulator is equipped with a switch made up of two RJ45 connectors (see 6.2.8 - Ethernet Switch HMS-ANYBUS CompactCom). Speed is 100Mbps.

6.2.5.2 Setting the DEVICE ADDRESS

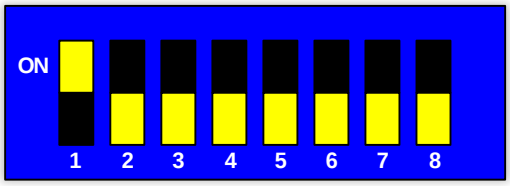
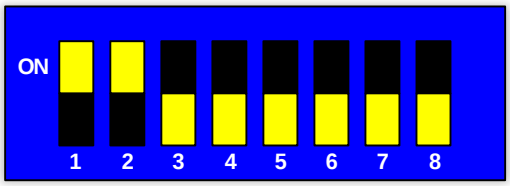
If switch SW2 is set to 0, the previously set Powerlink address is kept.

If the value of switch SW2 is within the range (see par. 6.1.5), the Powerlink address is set to that value.

For the factory default dip switch value see par 6.1.5.

The address is set in binary format. If the status of the dip switches is changed, you must turn the thermoregulator off and then back on again.

EXAMPLES:

DEVICE ADDRESS = 1	SW2[1]=ON SW2[2..8]=OFF	
DEVICE ADDRESS = 3	SW2[1]=ON SW2[2]=ON SW2[3..8]=OFF	

6.2.6 MODBUS TCP

6.2.6.1 Hardware connection

The thermoregulator is equipped with an Ethernet switch made up of two RJ45 connectors (see 6.2.8 - Ethernet Switch HMS-ANYBUS CompactCom). Speed is 100Mbps.

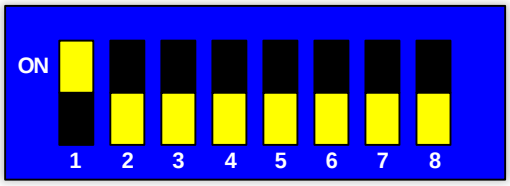
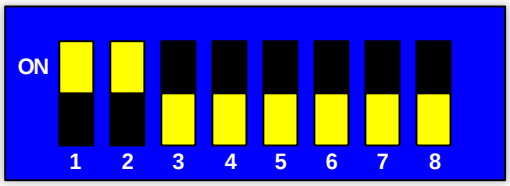
6.2.6.2 Setting the IP ADDRESS

If switch SW2 is set to 0 (default) the least significant byte of the previously set IP address is kept. For the default value set when leaving the factory, see par. 6.1.6.

If the SW2 switch has a value between 1 and 254, the least significant byte of the IP address is set to the value of switch SW2. Address 255 is not valid as it is a broadcast address.

The address is set in binary format. If the status of the dip switches is changed, you must turn the thermoregulator off and then back on again.

EXAMPLES:

IP ADDRESS = xxx.xxx.xxx.xx1	SW2[1]=ON SW2[2..8]=OFF	
IP ADDRESS = xxx.xxx.xxx.xx3	SW2[1]=ON SW2[2]=ON SW2[3..8]=OFF	

6.2.7 ETHERCAT

6.2.7.1 Hardware connection

The thermoregulator is equipped with an Ethernet switch made up of two RJ45 connectors (see 6.2.8 - Ethernet Switch HMS-ANYBUS CompactCom).

6.2.8 Ethernet Switch HMS-ANYBUS CompactCom

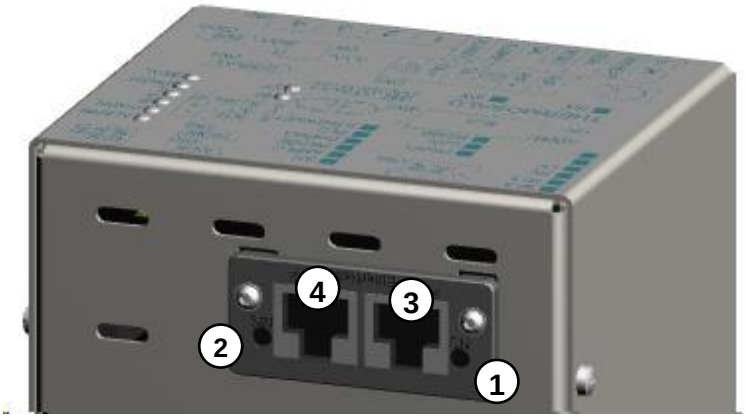


Figure 20 – Ethernet Switch models *AB*

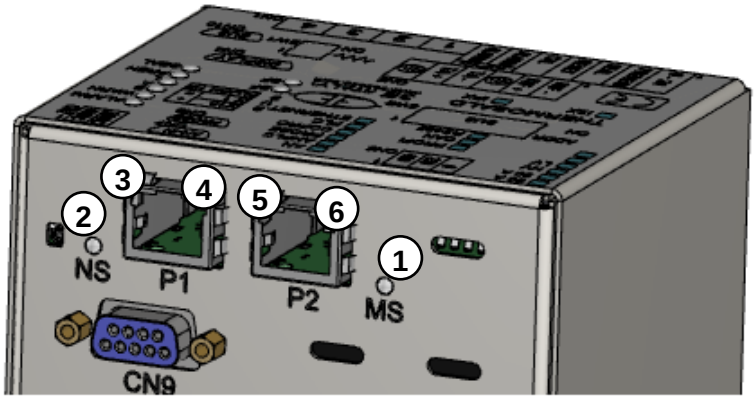


Figure 21 – Ethernet Switch models *AB B40*

6.2.9 CN10 Connector

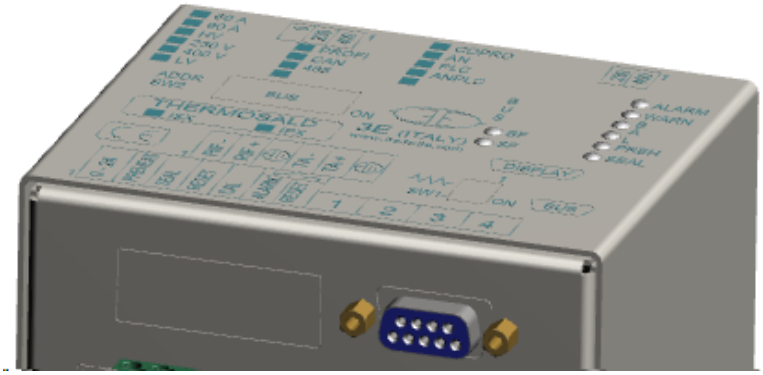


Figure 22 - CN10 Connector

CN10 – PROFIBUS/SERIAL 485 CONNECTOR (9 FEMALE POLES)

PIN1	
PIN2	
PIN3	Profibus B-/Rs485 A+
PIN4	Profibus Enable Output
PIN5	Isolated 0V output
PIN6	Isolated +5V output
PIN7	
PIN8	Profibus A+/Rs485 B-
PIN9	

For further details, see par. 6.2.1.1**.**

6.3 LED SIGNALING INTERFACE

6.3.1 MODBUS RTU RS485 HALF DUPLEX

BF LED	Meaning
On	Cable not connected: see 6.2.1.1 - Hardware connection. Starting from the V10 models, the timeout can be programmed through parameter 1045 (see par 5.3.16).
Flashing	Cable connected, address not received. Check that the master is using the address set on the module.
Off	Communication present, no error.

6.3.2 PROFIBUS

BF LED	SF LED	Meaning
On	x	Cable not connected: see 6.2.2.1 - Hardware connection.
Flashing	Off	Cable connected, data exchange not active. Check that the master is using the address set on the module.
Flashing	On	Communication present, configuration error.
Off	Off	Communication present, no error.

6.3.3 PROFINET

6.3.3.1 Models *AB (*see 6.2.8, Figure 20)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

NS LED (#1) (Network Status)	MS LED (#2) (Module Status)	Meaning
On (Green)	x	Connection with master established, master running.
Flashing (Green)	x	Connection with master established, master stopped.
Off	x	Connection with master absent. Check that the Ethernet cable is connected and that the master is using the IP address and device name set on the module.
x	1 Flash (Green)	Presence of one or more diagnostic events.
x	On (Green)	Regular operation.
x	Flashing (1s, Green)	Flash DCP. Used by the tools for identifying the node on the network.
x	On (Red)	Module fault, contact 3E Technical Support.
x	1 Flash (Red)	The expected identification does not match the actual identification.
x	2 Flashes (Red)	IP address not set. Assign an IP address.
x	3 Flashes (Red)	Device name not set. Assign a name to the device.
x	4 Flashes (Red)	Module fault. Contact 3E Technical Support.

The operation of the Link/Activity port 1 (#3) and Link/Activity port 2 (#4) LEDs on the RJ45 connectors is summarized in the table below.

Link/Activity LEDs	Meaning
Off	No connection.
On (Green)	Ethernet connection present, no activity.
Flashing (Green)	Ethernet connection present, activity.

6.3.3.2 Models *AB B40 (*see 6.2.8, Figure 21)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

NS LED (#1) (Network Status)	**MS LED (#2) (Module Status)**	**Meaning**
Off	x	Power supply missing. Connection with master absent.
On (Green)	x	Connection with master established. Master RUNNING.
1 Flash (Green)	x	Connection with master established. Master STOPPED or I/O data incorrect. Profinet IRT synchronization not finished.
Flashing (Green)	x	Node identification on the network.
On (Red)	x	Module fault, contact 3E Technical Support.
1 Flash (Red)	x	Name not configured.
2 Flashes (Red)	x	IP address not configured.
3 Flashes (Red)	x	Actual identification different from expected identification.
x	Off	Power supply missing. Module initializing now.
x	On (Green)	Regular operation.
x	1 Flash (Green)	Presence of diagnostic events.
x	On (Red)	Module fault, contact 3E Technical Support.
x	Green/Red Flash	Firmware update in progress.

The operation of the LEDs on the RJ45 connectors is summarized in the following table.

LED	**Meaning**
3/5 Off 4/6 Off	No connection.
3/5 Yellow Flashing 4/6 Off	Ethernet connection present (10 Mbit/s), activity.
3/5 Green Flashing 4/6 Off	Ethernet connection present (100 Mbit/s), activity.
3/5 Green Flashing 4/6 Green Flashing	Ethernet connection present (1 Gbit/s), activity.

6.3.4 ETHERNET/IP

6.3.4.1 Models *AB (*see 6.2.8, Figure 20)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

NS LED (#1) (Network Status)	MS LED (#2) (Module Status)	Meaning
On (Green)	x	Online Module. One or more connections made.
Flashing (Green)	x	Online Module. No connection. Check that the master is using the IP address set on the module.
Off	x	The module has not configured the IP address. Check that the Ethernet cable is connected.
On (Red)	x	Duplicate IP address. Delete all IP address conflicts.
Flashing (Red)	x	The module has configured the IP address but one or more connections are in timeout. Check that the Ethernet cable is connected.
x	On (Green)	Regular operation. The module is controlled correctly, master running.
x	Flashing (Green)	Module not configured or master stopped. Check the master's status.
x	On (Red)	Module fault. Contact 3E Technical Support.
x	Flashing (Red)	Module fault. Contact 3E Technical Support.

The operation of the Link/Activity port 1 (#3) and Link/Activity port 2 (#4) LEDs on the RJ45 connectors is summarized in the table below.

Link/Activity LEDs	Meaning
Off	No connection.
On (Green)	Ethernet connection present (100 Mbit/s), no activity.
Flashing (Green)	Ethernet connection present (100 Mbit/s), activity.
On (Yellow)	Ethernet connection present (10 Mbit/s), no activity.
Flashing (Yellow)	Ethernet connection present (10 Mbit/s), activity.

6.3.4.2 Models *AB B40 (*see 6.2.8, Figure 21)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

NS LED (#1) (Network Status)	**MS LED (#2) (Module Status)**	**Meaning**
Off	x	Power supply missing. IP address not configured.
On (Green)	x	Online, one or more connections made.
Flashing (Green)	x	Online, no connection made.
On (Red)	x	Duplicate IP address. Module fault, contact 3E Technical Support.
Flashing (Red)	x	Timeout of one or more connections.
x	Off	Power supply missing.
x	On (Green)	Scanner RUNNING.
	Flashing (Green)	Module not configured. Scanner IDLE.
x	On (Red)	Module fault. Contact 3E Technical Support.
x	Flashing (Red)	Module configured, stored parameters are not consistent with currently used parameters.

The operation of the LEDs on the RJ45 connectors is summarized in the following table.

LED	**Meaning**
3/5 Off 4/6 Off	No connection.
3/5 Yellow Flashing 4/6 Off	Ethernet connection present (10 Mbit/s), activity.
3/5 Green Flashing 4/6 Off	Ethernet connection present (100 Mbit/s), activity.
3/5 Green Flashing 4/6 Green Flashing	Ethernet connection present (1 Gbit/s), activity.

6.3.5 POWERLINK

6.3.5.1 Models *AB (*see 6.2.8, Figure 20) and models *AB B40 (*see 6.2.8, Figure 21)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

STS LED (#1) (NS)	**ERR LED (#2) (MS)**	**Meaning**
Flashing (50ms, Green)	x	Ethernet level connected. Powerlink traffic not detected.
1 Flash (Green)	x	Only asynchronous data.
2 Flashes (Green)	x	Synchronous and asynchronous data. PDO data not present. In this status, the sent process data are declared not valid and the received process data must be ignored.
3 Flashes (Green)	x	Ready for normal operation. Synchronous and asynchronous data. PDO data not present. In this status, the sent process data are declared not valid and the received process data must be ignored.
On (Green)	x	Regular operation. Synchronous and asynchronous data. PDO data sent and received.
Flashing (200ms, Green)	x	Module stopped, due to controlled shutdown for example. PDO data not present. In this status, the sent process data are declared not valid and the received process data must be ignored.
x	On (Red)	Module fault. Contact 3E Technical Support.

6.3.5.2 Models *AB (*see 6.2.8, Figure 20)

The operation of the Link/Activity port 1 (#3) and Link/Activity port 2 (#4) LEDs on the RJ45 connectors is summarized in the table below.

Link/Activity LEDs	**Meaning**
Off	No connection.
On (Green)	Ethernet connection present, no activity.
Flashing (Green)	Ethernet connection present, activity.

6.3.5.3 Models *AB B40 (*see 6.2.8, Figure 21)

The operation of the LEDs on the RJ45 connectors is summarized in the following table.

LED	**Meaning**
3/5 Off 4/6 Off	No connection.
3/5 Yellow Flashing 4/6 Off	Ethernet connection present (10 Mbit/s), activity.
3/5 Green Flashing 4/6 Off	Ethernet connection present (100 Mbit/s), activity.
3/5 Green Flashing 4/6 Green Flashing	Ethernet connection present (1 Gbit/s), activity.

6.3.6 MODBUS/TCP

6.3.6.1 Models *AB (*see 6.2.8, Figure 20) *and* models *AB B40 (*see 6.2.8, Figure 21)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

NS LED (#1) (Network Status)	**MS LED (#2) (Module Status)**	**Meaning**
Off	x	Power supply missing or IP address not configured. Module fault. Contact 3E Technical Support.
On (Green)	x	Received at least one Modbus message.
Flashing (Green)	x	Awaiting the first Modbus message.
On (Red)	x	Duplicate IP address. Module fault.
Flashing (Red)	x	Modbus messages timeout.
x	Off	Power supply missing.
x	On (Green)	Regular operation.
x	On (Red)	Module fault. Contact 3E Technical Support.
x	Flashing (Red)	Module fault. Contact 3E Technical Support.
x	Green/Red Flashing	Firmware update in progress.

6.3.6.2 Models *AB (*see 6.2.8, Figure 20)

The operation of the Link/Activity port 1 (#3) and Link/Activity port 2 (#4) LEDs on the RJ45 connectors is summarized in the table below.

Link/Activity LEDs	**Meaning**
Off	No connection.
On (Green)	Ethernet connection present (100 Mbit/s), no activity.
Flashing (Green)	Ethernet connection present (100 Mbit/s), activity.
On (Yellow)	Ethernet connection present (10 Mbit/s), no activity.
Flashing (Yellow)	Ethernet connection present (10 Mbit/s), activity.

6.3.6.3 Models *AB B40 (*see 6.2.8, Figure 21)

The operation of the LEDs on the RJ45 connectors is summarized in the following table.

LED	**Meaning**
3/5 Off 4/6 Off	No connection.
3/5 Yellow Flashing 4/6 Off	Ethernet connection present (10 Mbit/s), activity.
3/5 Green Flashing 4/6 Off	Ethernet connection present (100 Mbit/s), activity.
3/5 Green Flashing 4/6 Green Flashing	Ethernet connection present (1 Gbit/s), activity.

6.3.7 ETHERCAT

6.3.7.1 Models *AB (*see 6.2.8, Figure 20) *and models AB B40 (*see 6.2.8, Figure 21)

The table describes the operation of the LED interface located on the sides of the Ethernet switch.

RUN LED (#1) (NS)	**ERR LED (#2) (MS)**	**Meaning**
Off	x	Power supply missing or “INIT” status.
On (Green)	x	“OPERATIONAL” status.
Flashing (Green)	x	“PRE-OPERATIONAL” status.
1 Flash (Green)	x	“SAFE-OPERATIONAL” status.
Fast flashing	x	“BOOT” status.
On (Red)	x	Module fault. Contact 3E Technical Support.
x	Off	Power supply missing or no errors.
x	Flashing (Red)	Configuration not valid. Contact 3E Technical Support.
x	1 Flash (Red)	Unexpected change of status. Contact 3E Technical Support.
x	2 Flashes (Red)	Watchdog timeout. Contact 3E Technical Support.
x	On (Red)	Module fault. Contact 3E Technical Support.
x	Fast flashing	Problem in “BOOT” status. Contact 3E Technical Support.

6.3.7.2 Models *AB (*see 6.2.8, Figure 20)

The operation of the Link/Activity port 1 (#3) (IN) and Link/Activity port 2 (#4) (OUT) LEDs on the RJ45 connectors is summarized in the table below.

Link/Activity LEDs	**Meaning**
Off	No connection.
On (Green)	Ethernet connection present, no activity.
Flashing (Green)	Ethernet connection present, activity.

6.3.7.3 Models *AB B40 (*see 6.2.8, Figure 21)

The operation of the LEDs on the RJ45 connectors is summarized in the following table.

LED	**Meaning**
3/5 Off 4/6 Off	No connection.
3/5 Yellow Flashing 4/6 Off	Ethernet connection present (10 Mbit/s), activity.
3/5 Green Flashing 4/6 Off	Ethernet connection present (100 Mbit/s), activity.
3/5 Green Flashing 4/6 Green Flashing	Ethernet connection present (1 Gbit/s), activity.

6.4 PLC MASTER – THERMOSALD SLAVE COMMUNICATION SOFTWARE INTERFACE

6.4.1 Modbus RTU RS485 Registers

ID or Address (Dec)	ID or Address (Hex)	Variable name
BANK 00		
0	0000H	Heating ramp [degrees/100ms]
1	0001H	KV gain
2	0002H	KINT gain (x10)
3	0003H	Final KINT threshold [%]
4	0004H	Partial short circuit factor (x10)
5	0005H	Mode configuration
6	0006H	Analog mode configuration
7	0007H	Rated current [A]
8	0008H	KD derivative gain
9	0009H	Alarm disabled 1
10	000AH	Type of Bus/RS485 baudrate
11	000BH	Slave address
12	000CH	Machine not calibrated
13	000DH	Alarm disabled 2
14	000EH	Temperature coefficient [PPM]
15	000FH	Units per °C x 100
16	0010H	Major
17	0011H	Low voltage
18	0012H	PLC enable
19	0013H	Password
20	0014H	Key password
21	0015H	Model
22	0016H	Calibration level (%)
23	0017H	Max I2T effective I [A]
24	0018H	Temperature probe enable
25	0019H	Read margin T [ms] (from version V4.4)
26	001AH	Initial KINT threshold [%] (from version V4.4)
27	001BH	End-of-seal KINT threshold [%] (from version V4.4)
28	001CH	Regulator enabled (On versions V7 and from versions V10)
BANK 01		
256	0100H	Burn-in No. of Cycles (Not active on versions V7 and from versions V9)
257	0101H	Panel language
258	0102H	Calibration temperature [°C]
259	0103H	Degrees unit of measure on panel
260	0104H	Temperature Burn-in [°C] (Not active on versions V7 and from versions V9)
261	0105H	Heating Time Burn-in [s]

		(Not active on versions V7 and from versions V9)
262	0106H	Max Sealing Temperature [°C]
263	0107H	Max Sealing Time [ms x 100]
264	0108H	Cooling gradient during balancing [°C/10sec]
265	0109H	Warning time [s]
266	010AH	Sealing temperature increase [°C]
267	010BH	Increase No. of Seals
268	010CH	Latch temperature at end of seal 1s
269	010DH	Pre-heating temperature [°C]
270	010EH	Sealing temperature [°C]
271	010FH	Free - do not use
272	0110H	RS485 Stop Bit
273	0111H	Power timeout [ms/100]
274	0112H	MODBUS RS485 Idle Char
275	0113H	Max phase T [us]
276	0114H	PLC program 1 Bar closing timeout [ms x 10]
277	0115H	PLC program 1 Closed bar command activation delay pre-heating [ms x 10]
278	0116H	PLC program 1 Sealing time [ms x 10]
279	0117H	PLC program 1 Cooling time after end of seal [ms x 10]
280	0118H	PLC program 1 Closed bar time after end of seal [ms x 10]
281	0119H	Temperature setting on page 1
282	011AH	Sealing band length threshold for alarm 69 grounded sealing band [%] (On SCR models and on HF models from versions V7.3.16)
283	011BH	Current loop value setting (Not active on versions V7 and from versions V9)
284	011CH	Time increase to reset [s]
BANK 02		
512	0200H	Release software major (ASCII)
513	0201H	Release software minor (ASCII)
514	0202H	Ohm x mm²/mt x 1000
515	0203H	Sealing band length [mm]
516	0204H	Sealing band thickness [mm x 100]
517	0205H	Wire diameter [mm x 100]
518	0206H	Sealing band width [mm x 10]
519	0207H	Amperes/mm²
520	0208H	Number of parallel sealing bands
521	0209H	Number of sealing bands in series
522	020AH	Duty cycle x 10 (Read only on versions V7 and from versions V9)
523	020BH	Theoretical full-wave effective I [A]
524	020CH	Theoretical R [ohm x 100]
525	020DH	Theoretical full-wave effective V [V]
526	020EH	Theoretical full-wave effective P [VA]
527	020FH	First calibration full wave effective I0 [A]
528	0210H	First calibration R0 [ohm x100]

529	0211H	First calibration full wave effective V0 [V]
530	0212H	First calibration full wave effective P0 [VA]
531	0213H	Maximum full-wave effective I for alarm 90 [A]
532	0214H	Temperature hot calibration [°C] (On versions V7 and from versions V10)
533	0215H	Probe tolerance temperature hot calibration [°C]. (On versions V7 and from versions V10)
534	0216H	Probe accuracy tolerance hot calibration [°C]. (On versions V7 and from versions V10)
535	0217H	Stabilization time hot calibration [s] (On versions V7 and from versions V10)
536	0218H	Delta coefficient hot calibration [PPM] (On versions V7 and from versions V10)
537	0219H	Free - do not use
538	021AH	Max period offset [us]
539	021BH	Max retries period reset
540	021CH	Speed factor x 10
BANK 03		
768	0300H	Current temperature [°C]
769	0301H	Alarm/warning number
770	0302H	Full-wave effective I [A]
771	0303H	R [ohm x100]
772	0304H	Full-wave effective V [V]
773	0305H	Full-wave effective P [VA]
774	0306H	Thermoregulator status
775	0307H	I2T effective I [A] (Not active on versions V7 and from versions V9)
776	0308H	Temperature probe active
777	0309H	Bar probe temperature [°C]
778	030AH	Full working conditions %
779	030BH	Permanent backup when changing configuration from bus (On versions V7 and from versions V9)
780	030CH	T500 option (On versions V7 and from versions V9)
781	030DH	Maximum temperature and temperature coefficient fixed parameters option (On versions V7 and from versions V9)
782	030EH	Power off threshold [%] (On versions V7 and from versions V9)
783	030FH	Current leakage to ground alarm 70 [mA] (Up to versions V7.3.15)
BANCO 04		
1024	400H	First COPRO calibration full wave effective I0 (A) (From versions V10)
1025	401H	First COPRO calibration R0 (ohm x100) (From versions V10)
1026	402H	First COPRO calibration full wave effective V0 (V) (From versions V10)
1027	403H	First COPRO calibration full wave effective P0 (VA) (From versions V10)
1028	404H	Last calibration full wave effective I0 (A)

		(From versions V10)
1029	405H	Last calibration R0 (ohm x100) (From versions V10)
1030	406H	Last calibration full wave effective V0 (V) (From versions V10)
1031	407H	Last calibration full wave effective P0 (VA) (From versions V10)
1032	408H	Last COPRO calibration full wave effective I0 (A) (From versions V10)
1033	409H	Last COPRO calibration R0 (ohm x100) (From versions V10)
1034	40AH	Last COPRO calibration full wave effective V0 (V) (From versions V10)
1035	40BH	Last COPRO calibration full wave effective P0 (VA) (From versions V10)
1036	40CH	Reserved (From versions V10)
1037	40DH	Reserved (From versions V10)
1038	40EH	Reserved (From versions V10)
1039	40FH	Reserved (From versions V10)
1040	410H	Reserved (From versions V10)
1041	411H	Reserved (From versions V10)
1042	412H	Reserved (From versions V10)
1043	413H	Reserved (From versions V10)
1044	414H	Reserved (From versions V10)
1045	415H	RS485 Master Timeout [s] (From versions V10)
1046	416H	Current alarm (From versions V10)
1047	417H	Current warning (From versions V10)
1048	418H	Number of writes in permanent memory from power-on (On versions V7 and from versions V9. From versions V10 also on fieldbus)
1049	419H	No-load power supply voltage [V x 100] (On versions V7 and from versions V9. From versions V10 also on fieldbus)
1050	41AH	Load power supply voltage [V x 100] (On versions V7 and from versions V9. From versions V10 also on fieldbus)
1051	41BH	Sealing band leakage full wave effective I threshold for alarm 70 grounded sealing band [mA] (Only on HF models up to version V7.3.15)
1052	41CH	PLC Program 1 Bar max opening time [ms x 10]

		(From versions V9. From versions V10 also on fieldbus)
1053	41DH	Coprocessor present (From versions V9)

6.4.2 PROFIBUS V5 data exchange areas

For detailed information on the use of the exchange areas, see chapter 6.6 - Communication protocols.

6.4.2.1 PLC MASTER ► THERMOSALD SLAVE

OUTPUT	Byte/Word	Description	Notes
00	B	Code	03: read 06: write
01	W	ID (Byte High)	For the list of possible values, see par.. 5.3.
		ID (Byte Low)	
02	W	Value (Byte High)	With write command 06, it allows you to send to the thermoregulator the new value of the variable specified by ID.
		Value (Byte Low)	
03	W	Commands word (Byte High)	See 6.6.3.2 - Commands word
		Commands word (Byte Low)	

6.4.2.2 PLC MASTER ◄ THERMOSALD SLAVE

INPUT	Byte/Word	Description	Notes
00	B	Code echo	Echo of the sent Code. It allows you to check that the thermoregulator has properly received the read or write command.
01	W	ID echo (Byte High)	Echo of the sent ID. It allows you to check that the thermoregulator has properly received the ID.
		ID echo (Byte Low)	
02	W	Value echo (Byte High)	Echo of the sent value. When reading, it returns the current value of the variable. When writing, it allows you to check that the thermoregulator has properly received the new value of the variable.
		Value echo (Byte Low)	
03	W	Current temperature (°C) (Byte High, ID 768)	This part of the exchange area contains direct access to the values of some commonly used variables. For the detailed information about the variables, see par. 5.3.
		Current temperature (°C) (Byte Low, ID 768)	
04	W	Alarm/warning number (Byte High, ID 769)	
		Alarm/warning number (Byte Low, ID 769)	
05	B	Thermoregulator status	

		(ID 774)	
06	B	Reserved.	
07	B	Reserved.	

6.4.3 PROFINET V5data exchange areas

For detailed information on the use of the exchange areas, see chapter 6.6 - Communication protocols.

6.4.3.1 PLC MASTER ► THERMOSALD SLAVE

OUTPUT	Byte/Word	Description	Notes
00	B	Code	03: read 06: write
01	W	ID (Byte High)	For the list of possible values, see par. 5.3.
		ID (Byte Low)	
02	W	Value (Byte High)	With write command 06, it allows you to send to the thermoregulator the new value of the variable specified by ID.
		Value (Byte Low)	
03	W	Commands word (Byte High)	See 6.6.3.2 - Commands word
		Commands word (Byte Low)	

6.4.3.2 PLC MASTER ◄ THERMOSALD SLAVE

INPUT	Byte/Word	Description	Notes
00	B	Code echo	Echo of the sent Code. It allows you to check that the thermoregulator has properly received the read or write command.
01	W	ID echo (Byte High)	Echo of the sent ID. It allows you to check that the thermoregulator has properly received the ID.
		ID echo (Byte Low)	
02	W	Value echo (Byte High)	Echo of the sent value. When reading, it returns the current value of the variable. When writing, it allows you to check that the thermoregulator has properly received the new value of the variable.
		Value echo (Byte Low)	
03	W	Current temperature (°C) (Byte High, ID 768)	This part of the exchange area contains direct access to the values of some commonly used variables. For the detailed information about the variables, see par. 5.3.
		Current temperature (°C) (Byte Low, ID 768)	
04	W	Alarm/warning number (Byte High, ID 769)	
		Alarm/warning number (Byte Low, ID 769)	
05	B	Thermoregulator status (ID 774)	

06	W	Full-wave effective I (A) (Byte High, ID 770)	
		Full-wave effective I (A) (Byte Low, ID 770)	
07	W	R (ohm x100) (Byte High, ID 771)	
		R (ohm x100) (Byte Low, ID 771)	
08	W	Full-wave effective V (V) (Byte High, ID 772)	
		Full-wave effective V (V) (Byte Low, ID 772)	
09	W	Full-wave effective P (VA) (Byte High, ID 773)	
		Full-wave effective P (VA) (Byte Low, ID 773)	
10	W	Full working conditions % (Byte High, ID 778)	
		Full working conditions % (Byte Low, ID 778)	
11	W	First calibration full wave effective I0 (A) (Byte High, ID 527)	
		First calibration full wave effective I0 (A) (Byte Low, ID 527)	
12	W	First calibration R0 (ohm x100) (Byte High, ID 528)	
		First calibration R0 (ohm x100) (Byte Low, ID 528)	
13	W	First calibration full wave effective V0 (V) (Byte High, ID 529)	
		First calibration full wave effective V0 (V) (Byte Low, ID 529)	
14	W	First calibration full wave effective P0 (VA) (Byte High, ID 530)	
		First calibration full wave effective P0 (VA) (Byte Low, ID 530)	
15	W	Calibration temperature (°C) (Byte High, ID 258)	
		Calibration temperature (°C) (Byte Low, ID 258)	
16	W	Max seal. temperature (°C)	

		(Byte High, ID 262)	
		Max seal. temperature (°C) (Byte Low, ID 262)	
17	W	Preheating temperature setting (°C) (Byte High, ID 269)	
		Preheating temperature setting (°C) (Byte Low, ID 269)	
18	W	Sealing temperature setting (°C) (Byte High, ID 270)	
		Sealing temperature setting (°C) (Byte Low, ID 270)	

6.4.4 ETHERNET/IP V5 data exchange areas

For detailed information on the use of the exchange areas, see chapter 6.6 - Communication protocols.

6.4.4.1 PLC MASTER ► THERMOSALD SLAVE

OUTPUT	Byte/Word	Description	Notes
00	W	Code	03: read 06: write
01	W	ID	For the list of possible values, see par.. 5.3.
02	W	Value	With write command 06, it allows you to send to the thermoregulator the new value of the variable specified by ID.
03	W	Commands word	See 6.6.3.2 - Commands word

6.4.4.2 PLC MASTER ◄ THERMOSALD SLAVE

INPUT	Byte/Word	Description	Notes
00	W	Code echo	Echo of the sent Code. It allows you to check that the thermoregulator has properly received the read or write command.
01	W	ID echo	Echo of the sent ID. It allows you to check that the thermoregulator has properly received the ID.
02	W	Value echo	Echo of the sent value. When reading, it returns the current value of the variable. When writing, it allows you to check that the thermoregulator has properly received the new value of the variable.
03	W	Current temperature (°C) (ID 768)	This part of the exchange area contains direct access to the values of some commonly used variables. For the detailed information about the variables, see par. 5.3.
04	W	Alarm/warning number (ID 769)	
05	W	Thermoregulator status (ID 774)	
06	W	Full-wave effective I (A) (ID 770)	
07	W	R (ohm x100) (ID 771)	
08	W	Full-wave effective V (V) (ID 772)	
09	W	Full-wave effective P (VA) (ID 773)	
10	W	Full working conditions %	

		(ID 778)	
11	W	First calibration full wave effective I0 (A) (ID 527)	
12	W	First calibration R0 (ohm x100) (ID 528)	
13	W	First calibration full wave effective V0 (V) (ID 529)	
14	W	First calibration full wave effective P0 (VA) (ID 530)	
15	W	Calibration temperature (°C) (ID 258)	
16	W	Max seal. temperature (°C) (ID 262)	
17	W	Preheating temperature setting (°C) (ID 269)	
18	W	Sealing temperature setting (°C) (ID 270)	

6.4.5 POWERLINK V5 data exchange areas

For detailed information on the use of the exchange areas, see chapter 6.6 - Communication protocols.

6.4.5.1 PLC MASTER ► THERMOSALD SLAVE

OUTPUT	Byte/Word	Description	Notes
00	W	Code	03: read 06: write
01	W	ID	For the list of possible values, see par. 5.3.
02	W	Value	With write command 06, it allows you to send to the thermoregulator the new value of the variable specified by ID.
03	W	Commands word	See 6.6.3.2 - Commands word

6.4.5.2 PLC MASTER ◄ THERMOSALD SLAVE

INPUT	Byte/Word	Description	Notes
00	W	Code echo	Echo of the sent Code. It allows you to check that the thermoregulator has properly received the read or write command.
01	W	ID echo	Echo of the sent ID. It allows you to check that the thermoregulator has properly received the ID.
02	W	Value echo	Echo of the sent value. When reading, it returns the current value of the variable. When writing, it allows you to check that the thermoregulator has properly received the new value of the variable.
03	W	Current temperature (°C) (ID 768)	This part of the exchange area contains direct access to the values of some commonly used variables. For the detailed information about the variables, see par. 5.3.
04	W	Alarm/warning number (ID 769)	
05	W	Thermoregulator status (ID 774)	
06	W	Full-wave effective I (A) (ID 770)	
07	W	R (ohm x100) (ID 771)	
08	W	Full-wave effective V (V) (ID 772)	
09	W	Full-wave effective P (VA) (ID 773)	
10	W	Full working conditions %	

		(ID 778)	
11	W	First calibration full wave effective I0 (A) (ID 527)	
12	W	First calibration R0 (ohm x100) (ID 528)	
13	W	First calibration full wave effective V0 (V) (ID 529)	
14	W	First calibration full wave effective P0 (VA) (ID 530)	
15	W	Calibration temperature (°C) (ID 258)	
16	W	Max seal. temperature (°C) (ID 262)	
17	W	Preheating temperature setting (°C) (ID 269)	
18	W	Sealing temperature setting (°C) (ID 270)	

6.4.6 MODBUS/TCP data exchange areas

For detailed information on the use of the exchange areas, see chapter 6.6 - Communication protocols.

6.4.6.1 PLC MASTER ► THERMOSALD SLAVE

OUTPUT	Byte/Word	Description	Notes
00	W	Code	03: read 06: write
01	W	ID	For the list of possible values, see par. 5.3.
02	W	Value	With write command 06, it allows you to send to the thermoregulator the new value of the variable specified by ID.
03	W	Commands word	See 6.6.3.2 - Commands word

6.4.6.2 PLC MASTER ◄ THERMOSALD SLAVE

INPUT	Byte/Word	Description	Notes
2048	W	Code echo	Echo of the sent Code. It allows you to check that the thermoregulator has properly received the read or write command.
2049	W	ID echo	Echo of the sent ID. It allows you to check that the thermoregulator has properly received the ID.
2050	W	Value echo	Echo of the sent value. When reading, it returns the current value of the variable. When writing, it allows you to check that the thermoregulator has properly received the new value of the variable.
2051	W	Current temperature (°C) (ID 768)	This part of the exchange area contains direct access to the values of some commonly used variables. For the detailed information about the variables, see par. 5.3.
2052	W	Alarm/warning number (ID 769)	
2053	W	Thermoregulator status (ID 774)	
2054	W	Full-wave effective I (A) (ID 770)	
2055	W	R (ohm x100) (ID 771)	
2056	W	Full-wave effective V (V) (ID 772)	
2057	W	Full-wave effective P (VA) (ID 773)	
2058	W	Full working conditions %	

		(ID 778)	
2059	W	First calibration full wave effective I0 (A) (ID 527)	
2060	W	First calibration R0 (ohm x100) (ID 528)	
2061	W	First calibration full wave effective V0 (V) (ID 529)	
2062	W	First calibration full wave effective P0 (VA) (ID 530)	
2063	W	Calibration temperature (°C) (ID 258)	
2064	W	Max seal. temperature (°C) (ID 262)	
2065	W	Preheating temperature setting (°C) (ID 269)	
2066	W	Sealing temperature setting (°C) (ID 270)	

6.4.7 ETHERCAT data exchange areas

For detailed information on the use of the exchange areas, see chapter 6.6 - Communication protocols.

6.4.7.1 PLC MASTER ► THERMOSALD SLAVE

OUTPUT	Byte/Word	Description	Notes
00	W	Code	03: read 06: write
01	W	ID	For the list of possible values, see par. 5.3.
02	W	Value	With write command 06, it allows you to send to the thermoregulator the new value of the variable specified by ID.
03	W	Commands word	See 6.6.3.2 - Commands word

6.4.7.2 PLC MASTER ◄ THERMOSALD SLAVE

INPUT	Byte/Word	Description	Notes
00	W	Code echo	Echo of the sent Code. It allows you to check that the thermoregulator has properly received the read or write command.
01	W	ID echo	Echo of the sent ID. It allows you to check that the thermoregulator has properly received the ID.
02	W	Value echo	Echo of the sent value. When reading, it returns the current value of the variable. When writing, it allows you to check that the thermoregulator has properly received the new value of the variable.
03	W	Current temperature (°C) (ID 768)	This part of the exchange area contains direct access to the values of some commonly used variables. For the detailed information about the variables, see par. 5.3.
04	W	Alarm/warning number (ID 769)	
05	W	Thermoregulator status (ID 774)	
06	W	Full-wave effective I (A) (ID 770)	
07	W	R (ohm x100) (ID 771)	
08	W	Full-wave effective V (V) (ID 772)	
09	W	Full-wave effective P (VA) (ID 773)	
10	W	Full working conditions %	

		(ID 778)	
11	W	First calibration full wave effective I0 (A) (ID 527)	
12	W	First calibration R0 (ohm x100) (ID 528)	
13	W	First calibration full wave effective V0 (V) (ID 529)	
14	W	First calibration full wave effective P0 (VA) (ID 530)	
15	W	Calibration temperature (°C) (ID 258)	
16	W	Max seal. temperature (°C) (ID 262)	
17	W	Preheating temperature setting (°C) (ID 269)	
18	W	Sealing temperature setting (°C) (ID 270)	

6.5 COMMISSIONING

6.5.1 RS485

According to the RS485 MODBUS RTU standard, data exchange is immediate; it is sufficient to connect the communication cable with a SUPERVISOR equipped with the standard RS485 MODBUS RTU interface and set the communication parameters to make data exchange immediately operative.

Proceed as follows to connect to the thermoregulator:

1. Connect the RS485 cable (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
2. Set the thermoregulator address: Supervisor can address one unit at a time through the specific address or write to all units together with address 0=broadcasting (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
3. Set the stop bit (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
4. Power on the thermoregulator.
5. Set the thermoregulator's default parameters on the supervisor:
   Baudrate: 9600 baud
   Parity: none
   Data bit: 8
   Stop Bit: previously set value.
   Idle char: 10 ms x 2 = 20 ms

The supervisor can change thermoregulator transmission parameters: with regard to values that can be specified, see par. 5.3.16.

6.5.2 PROFIBUS

Proceed as follows to connect to the thermoregulator:

1. Connect the Profibus cable (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
2. Set the thermoregulator address (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
3. Power on the thermoregulator
4. Download the appropriate GSD archive, e.g. "*Thermosald ISX BUS Profibus GSD V5.zip*", from website www.3e3e3e.com.
5. Extract the contents of the archive and install the 3E__0C4E.gsd and 3E__0C4E.bmp GSD files in the PROFIBUS configuration tool being used. Select the Thermosald module.

6.5.3 PROFINET

Proceed as follows to connect to the thermoregulator:

- Connect the Ethernet cable to one of the two Ethernet connectors available on the thermoregulator.
- Download the appropriate GSDML archive, e.g. "*Thermosald ISX BUS Profinet GSDML V5.zip*" from website www.3e3e3e.com.
- Extract the contents of the archive and install the GSDML file in the PROFINET configuration tool being used.

6.5.3.1 Software change of device name and IP address

The thermoregulator leaves the factory with unprogrammed IP address and PROFINET name; these parameters can be set later by the master via software.
Alternatively, there are some ad hoc applications, such as the Proneta tool distributed by Siemens (www.siemens.com), which allow the Profinet parameters of the device to be configured using a PC.

6.5.4 ETHERNET/IP

Proceed as follows to connect to the thermoregulator:

1. Connect the Ethernet cable to one of the two Ethernet connectors available on the thermoregulator (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
2. Set the thermoregulator IP address (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
3. Power on the thermoregulator.
4. Download the appropriate EDS archive, e.g. "*Thermosald ISX BUS Ethernet/IP EDS V5.zip*", from website www.3e3e3e.com.
5. Extract the contents of the archive and install the EDS file in the Ethernet/IP configuration tool being used.
6. Assign a size of 8 bytes (4 words) to the output (PLC Master output -> Thermosald Slave).
7. Assign a size of 38 bytes (19 words) to the input (Thermosald Slave -> PLC Master input).

6.5.4.1 Tools not compatible with the EDS interchange format

If the tool does not support the EDS interchange format, proceed as follows:

- No. of instances: 2.
- Input instance (Thermosald Slave -> PLC Master): ID:100, Size:38 bytes, Ownership:Exclusive, Priority:Scheduled, Connection:Point to Point, Use Run Idle:False.
- Output instance (PLC Master -> Thermosald Slave): ID:150, Size:8 bytes, Ownership:Exclusive, Priority:Scheduled, Connection:Point to Point, Use Run Idle:True.

6.5.4.2 Software change of IP address

The thermoregulator leaves the factory with address 192.168.0.55 and netmask 255.255.255.0. The IP address and the netmask can be set by the master via software.
Alternatively, the easiest way to configure the network parameters is via the web page of the device (see 6.7.1 - Changing the IP address).
There are also some ad hoc applications such as HMS Anybus "IP Config". For the download of this tool, refer to the HMS Anybus website (www.anybus.com).

6.5.4.3 Installations

Thermosald has already been successfully integrated into various systems including Omron, Yaskawa, Beckhoff, Rockwell, Hilscher.

6.5.5 Powerlink

Proceed as follows to connect to the thermoregulator:

1. Connect the Ethernet cable to one of the two Ethernet connectors available on the thermoregulator (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
2. Check the address of the thermoregulator (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
3. Power on the thermoregulator.
4. Download the appropriate XDD archive, e.g. "*Thermosald ISX BUS Powerlink XDD V5.zip*", from website www.3e3e3e.com.
5. Extract the contents of the archive and install the XDD file in the Powerlink configuration tool being used.

6.5.5.1 Software change of IP address

The thermoregulator leaves the factory with IP address and netmask not programmed. The IP address and the netmask can be set via software using some ad hoc applications such as HMS Anybus "IP Config". For the download of this tool, refer to the HMS Anybus website (www.anybus.com).

6.5.5.2 Installations

Thermosald has already been successfully integrated into various systems including B&R.

6.5.6 MODBUS TCP

Proceed as follows to connect to the thermoregulator:

1. Connect the Ethernet cable to one of the two Ethernet connectors available on the thermoregulator (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
2. Set the thermoregulator IP address (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
3. Power on the thermoregulator.

6.5.6.1 Software change of IP address

The thermoregulator leaves the factory with address 192.168.0.55 and netmask 255.255.255.0. The IP address and the netmask can be set by the master via software.
Alternatively, the easiest way to configure the network parameters is via the web page of the device (see 6.7.1 - Changing the IP address).
There are some ad hoc applications, such as HMS Anybus “IP Config”. For the download of this tool, refer to the HMS Anybus website (www.anybus.com).

6.5.7 ETHERCAT

Proceed as follows to connect to the thermoregulator:

1. Connect the Ethernet cable to one of the two Ethernet connectors available on the thermoregulator (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
2. Check the address del thermoregulator (see chapter 6.2 - CONNECTIONS AND DIP SWITCHES).
3. Power on the thermoregulator.
4. Download the archive containing the appropriate interchange file, "*Thermosald ISX EtherCAT_ESI_5_1_0.zip*", from website www.3e3e3e.com.
5. Extract the contents of the archive and install the ESI file in the catalog of the Ethercat configuration tool being used.
6. Proceed with the configuration of the Ethercat network by importing the newly installed device from the catalog.

6.5.7.1 Software change of IP address

The thermoregulator leaves the factory with IP address and netmask not programmed. The IP address and the netmask can be set via software using some ad hoc applications such as HMS Anybus "IP Config". For the download of this tool, refer to the HMS Anybus website (www.anybus.com).

6.5.7.2 Installations

Thermosald has already been successfully integrated into various systems including Beckhoff, Hilscher.

6.6 Communication protocols

The interaction scenarios between the master supervisor and the thermoregulator are essentially two:

- Variables read/write. For the complete list of all the variables, refer to par. 5.3.
- Commands activation/deactivation. For the complete list of all the commands, refer to par. 5.3.26 and to par. 6.6.3.2.

6.6.1 Reading and writing variables (MODBUS RTU RS485 V5 HALF DUPLEX)

Each byte contained in the telegrams is encoded in binary format.

6.6.1.1 Command code 03: read of 1 or n registers

This command allows the supervisor to read 1 or n registers

Query (**PLC MASTER ► THERMOSALD SLAVE**):

SlAdd	03	AddHi	AddLo	NPoHi	NPoLo	BCC	BCC

Response (**PLC MASTER ◄ THERMOSALD SLAVE**):

SlAdd	03	ByteC	DataHi	DataLo	…	DataHi	DataLo	…	BCC	BCC

6.6.1.2 Command code 06: write of 1 register

This command allows the supervisor to write 1 register

Query (**PLC MASTER ► THERMOSALD SLAVE**):

SlAdd	06	AddHi	AddLo	DataHi	DataLo	BCC	BCC

Response (**PLC MASTER ◄ THERMOSALD SLAVE**):

SlAdd	06	AddHi	AddLo	DataHi	DataLo	BCC	BCC

AddHi: Address (Byte High).
AddLo: Address (Byte Low).
NPoHi: not used
NPoLo: number of variables required starting from Address (for details of banks containing variables, see par. 6.4.1).
DataHi: Datum (Byte High)
DataLo: Datum (Byte Low)
ByteC: number of received data bytes (maximum value: 2 * *NPoLo*).
BCC: Cyclical Redundancy Check (CRC)

6.6.1.3 Command code 16: write of 1 or n registers

For safety reasons do not use the Modbus 16 command to write the temperature Coefficient (see par. 5.3.6**).**

If using a Proface panel, program 1-1286 in order to address 0-1285.

6.6.2 Reading and writing variables with 3 (read) and 6 (write) commands sequence on DATA EXCHANGE AREA (all buses except MODBUS RTU RS485 V5 HALF DUPLEX)

Read command 3: write the identifier of the variable to read on the ***ID*** output (for the complete list of all variables, see par. 5.3) and then code 3 on the ***Code*** output; the thermoregulator responds on the ***Code echo*** input with code 3, on the ***ID echo*** input with the echo of the requested identifier, on the ***Value echo*** input with the value of the variable whose reading has been requested.
To complete the reading command, the ***Code*** output must be set to value 0 again.

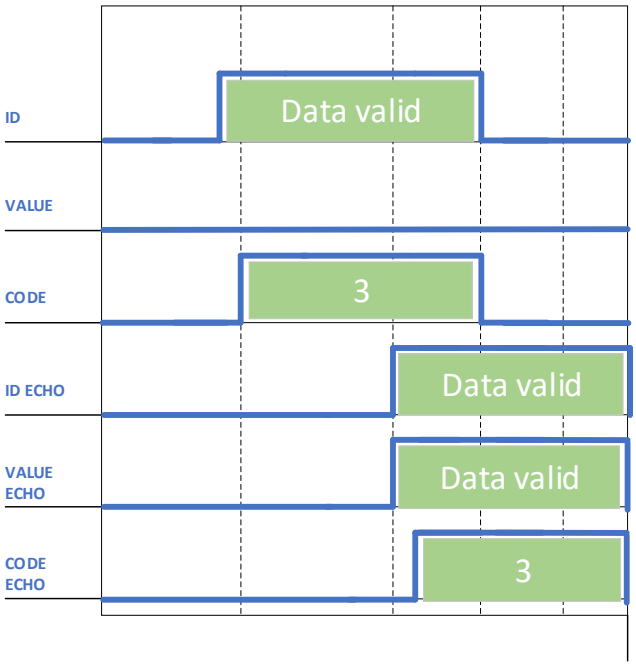


Figure 23 - Command 3

Write command 6: write the identifier of the variable to write on the ***ID*** output (for the complete list of all variables, see par. 5.3), the value of the variable to write on the ***Value*** output and then code 6 on the ***Code*** output; the thermoregulator responds on the ***Code echo*** input with code 6, on the ***ID echo*** input with the echo of the requested identifier, on the ***Value echo*** input with the value of the variable whose writing has been requested. The activation of a command matches exactly with the writing of a variable whose address is 0505H (1285 decimal) and whose value depends on the command you want to activate or deactivate (for the complete list of all commands see par. 5.3.26 and par. 6.6.3.2).
To complete the write command you need to set the ***Code*** output to value 0 again.

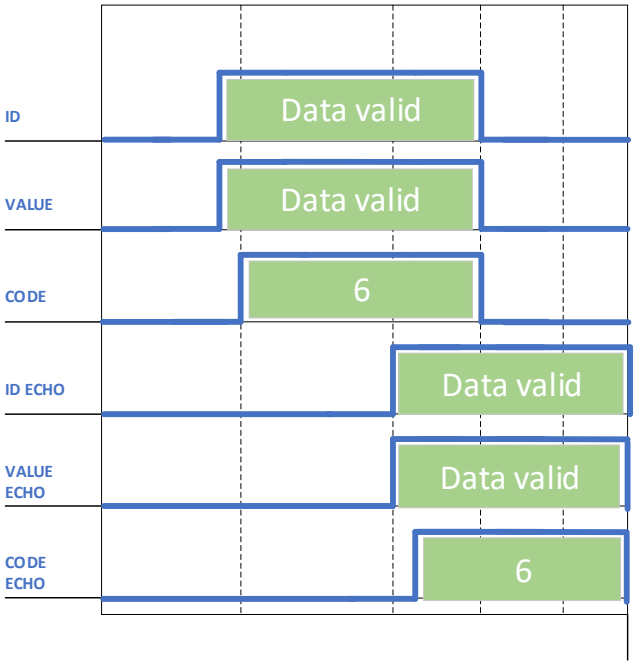


Figure 24 - Command 6

Avoid continuous write commands because they may damage the thermoregulator's internal Eeprom. Also see par. 5.3.22.

For the detailed information about the byte sizes of ***Code***, ***Code echo, ID, ID echo, Value, Value echo,*** refer to the exchange areas of the specific fieldbus (see par. 6.4.2 and following paragraphs).

6.6.3 Runtime data and Commands word on DATA EXCHANGE AREA (all buses except MODBUS RTU RS485 V5 HALF DUPLEX)

6.6.3.1 Runtime data

The thermoregulator provides some commonly used runtime data on the master entry exchange area. For the detailed information about the runtime data available on the specific fieldbus, see the description of the specific exchange area (see par. 6.4.2 and following paragraphs).

6.6.3.2 Commands word

The Commands word is available on the output exchange area from the master to the thermoregulator (see par. 6.4.2 and following paragraphs). You can activate the thermoregulator commands by setting the single bits of this word. It is advisable to use this option instead of the command management based on the 0505H writing (1285 decimal) because it is simpler and more performing.

COMMANDS WORD	BIT	Description
BYTE HIGH	7	Regulator on (level) (Versions V7 and from versions V10)
	6	Reserved
	5	Reserved
	4	Hot calibration (impulse > 50ms) (Versions V7 and from versions V10)
	3	Master reset (impulse > 50ms)
	2	Current loop on (level) (Not active on versions V7 and from versions V9)
	1	Sealing on (level)
	0	Pre-heating on (level)
BYTE LOW	7	Save calibration data (impulse > 50ms)
	6	Emergency test (impulse > 50ms)
	5	Burn-in off (impulse > 50ms) (Not active on versions V7 and from versions V9)
	4	Burn-in on (impulse > 50ms) (Not active on versions V7 and from versions V9)
	3	Read data from eeprom (Not active from version V5.1)
	2	Save data to eeprom (Not active from version V5.1)
	1	Calibration (impulse > 50ms)
	0	Alarm reset (impulse > 50ms)

6.7 Web page of the slave device

If the specific fieldbus envisages the IP level, the device provides a web page from which you can configure the network parameters and monitor the information in the input data exchange area coming from Thermosald. To access the web page of the device, simply type the IP address of the thermoregulator into the browser. To do this, it is suggested to connect directly point to point the PC with the thermoregulator and assign the PC an IP address in the same class as the thermoregulator.
If for example the thermoregulator's address is 192.168.0.55, for the PC you can use any address of the 192.168.0.X type, different from 192.168.0.55 and from the broadcast address 192.168.0.255.

6.7.1 Changing the IP address

Once you have entered the IP address of the thermoregulator into your browser, select the "Network interface" link and then “Network configuration” link. From this link you will be able to change the IP address and subnet mask as shown in Figure 25.

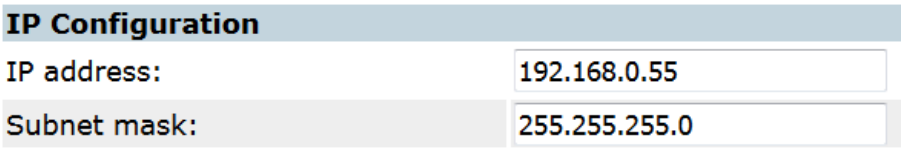


Figure 25

6.7.2 Monitoring the input exchange area from the thermoregulator

Once you have entered in the IP address of the thermoregulator in your browser, select the "Parameter data" link. From this link you will be able to view the status of the input exchange area from the device as shown in Figure 26. Data are updated through the browser refresh.

Parameter data

Number of parameters per page: 100 Set

#	Parameter	Value
1	Code	0
2	Address	0
3	Data	0
4	Command	0
5	Code Echo	0
6	Address Echo	0
7	Data	0
8	Run Time Temperature	0
9	Run Time Alarm	33
10	Run Time State	0
11	Run Time-I eff.	0
12	Run Time-Resistance (R x 100)	0
13	Run Time-V eff.	0
14	Run Time-P eff.	0
15	Steady work.cond. %	0
16	Calibration-I eff.	0
17	Calibr.-Resistance (R x 100)	0
18	Calibration-V eff.	0
19	Calibration-P eff.	0
20	Calibration-Temp.	30
21	Max weld Temp.	250
22	Set pre-heat Temp.	100
23	Set weld Temp.	150

Figure 26

7 COPROCESSOR

Models equipped with coprocessors implement hardware and software redundancy on maximum temperature control.

They are extremely reliable products, built with the following features:

- 2 independent circuits for reading the current of the sealing band
- 2 independent circuits for reading the voltage of the sealing band
- 2 independent control circuits, microprocessor + coprocessor
- 2 independent probes for precise calibration
- 1 power supply controlled by the 2 microprocessors
- 1 alarm output contact to secure the power circuit
  NOTE: for applications where it is necessary to duplicate the alarm output contact as well, you can use the alarm information coming from the fieldbus that the PLC can use with an external contact.

For applications where very narrow temperature tolerances are required, refer to chapter 5.3.8.

8 COMMISSIONING

Before starting a COMMISSIONING procedure you should carefully have read chapter 2 - SAFETY WARNINGS AND CERTIFICATIONS

The commissioning procedure is used to set the thermoregulator to full operating condition.

Before starting a commissioning procedure, it is advisable to have available the TECHNICAL REPORT of the application (see par. 3.5 - APPLICATION DEFINITION AND TECHNICAL REPORT).

During commissioning, on models where it is possible, you should compare the values of the TECHNICAL ANALYSIS (see par. 5.3.12) with those of the TECHNICAL REPORT and note down their values.

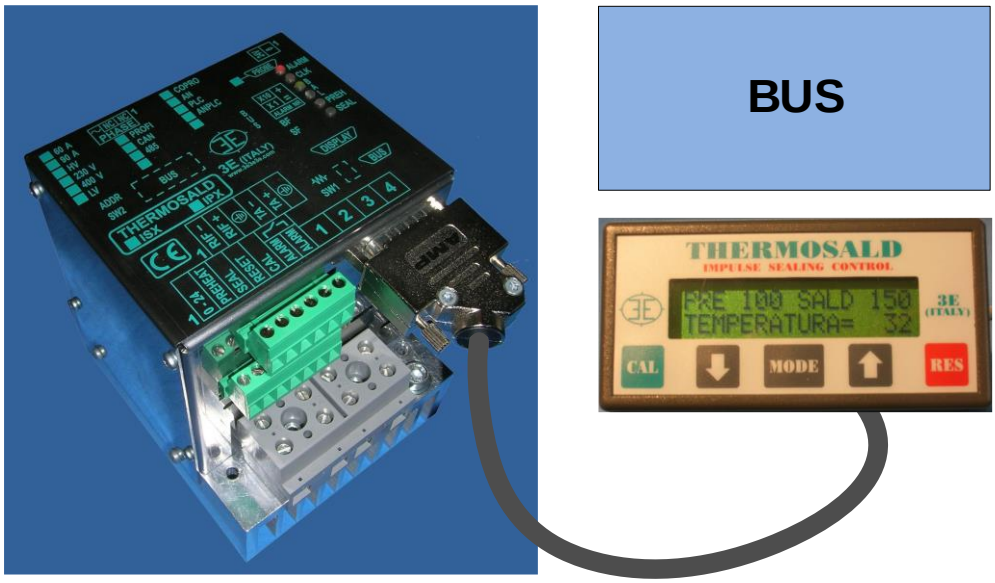
At the end of the commissioning procedure, on the models where it is possible, you should take note of the EDITED PARAMETERS and file them together with the TECHNICAL REPORT and the TECHNICAL ANALYSIS.

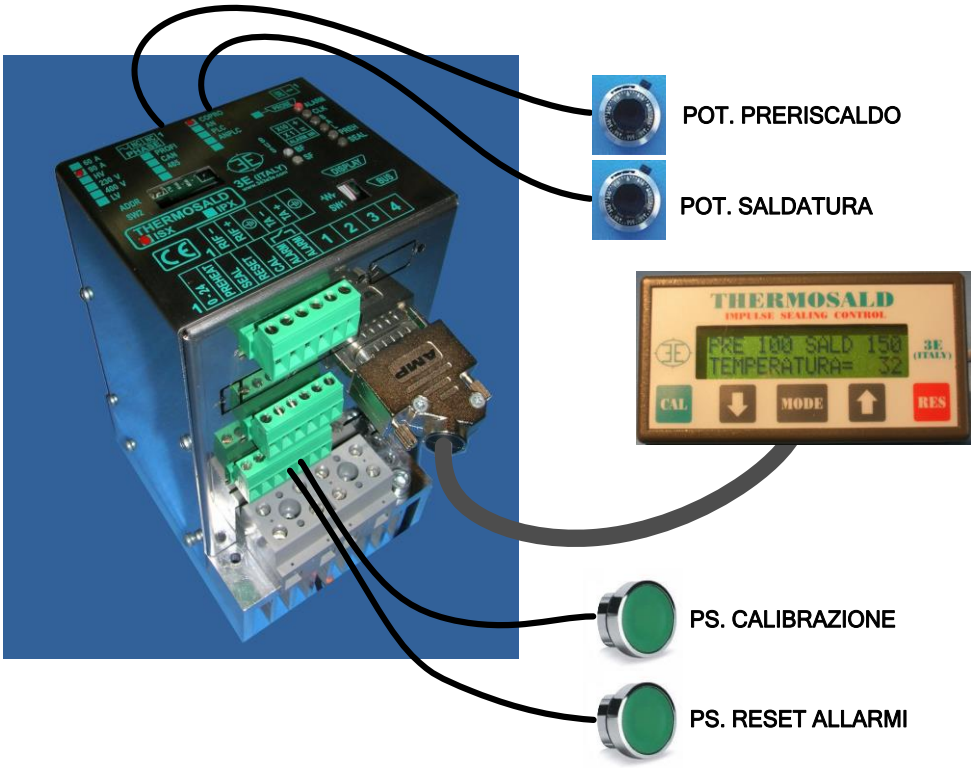
During steady operating conditions, make sure that heat-sink temperature does not exceed 60°C.

8.1 COMMISSIONING INSTRUCTIONS

The following paragraphs list the steps to be followed to put the thermoregulator into service, divided by product type.

8.1.1 THERMOSALD ISX SCR, ISX SCR HP and ISX HF (multilingual panel or fieldbus)





1. The thermoregulator leaves the factory in MASTER RESET condition (see par. 5.3.2). You can reset this condition at any time by means of the digital signals on the connector, the panel or the fieldbus (see par. 5.3.3). 5.3.3).

2. Check that there aren't any alarms before starting the commissioning or during the procedure. This check can be carried out using the LEDs on the device, the panel or

the fieldbus (see par. 5.3.1 and 5.3.2). To solve an alarm, see ANNEX D - LIST OF ALARMS AND MESSAGES (CAUSES - REMEDIES).

3. Check that the machine is in the powered-off status and that the preheating and sealing controls are off: the thermoregulator triggers warning status 33. This check can be carried out using the LEDs on the device, the panel or the fieldbus (see par. 5.3.1 and 5.3.2).

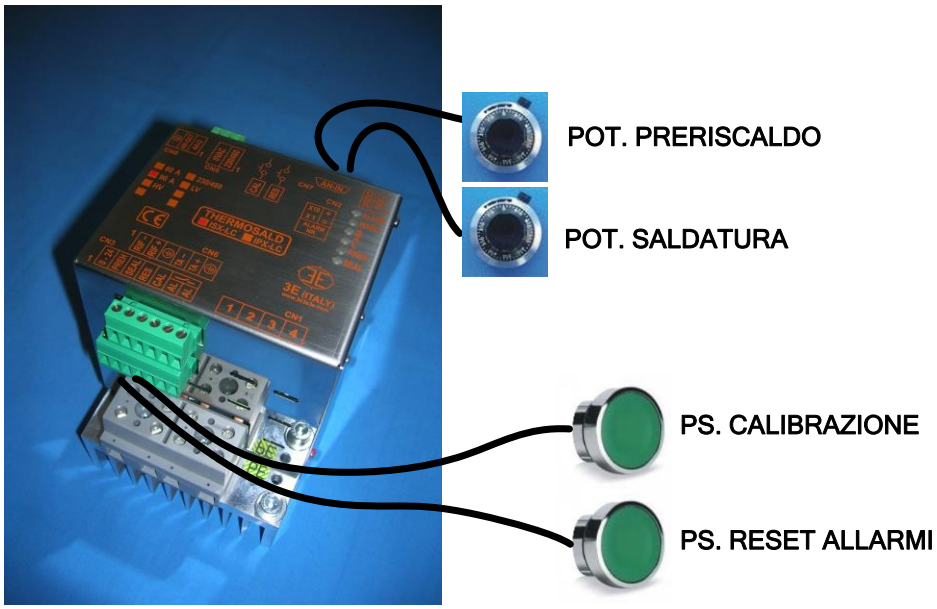
4. Switch on power: the thermoregulator switches to awaiting calibration status. This check can be carried out using the LEDs on the device (also see par. 5.3.5), the panel or the fieldbus (see par. 5.3.1, 5.3.2 and 5.3.5).

5. The machine must be at room temperature.

6. Start the calibration procedure through the signal on the connector, the panel or the fieldbus. Calibration progress can be monitored using the LEDs on the device, the panel or the fieldbus (see par. 5.3.2 and 5.3.5).

When calibration is complete, the machine is able to show the current temperature on the sealing band (see par. 5.3.8) and is ready to operate; set the desired preheating and sealing temperatures via the panel or fieldbus and activate the relevant commands via the signals present on the connector, the panel or the fieldbus (see par. 5.3.9). Before setting the operating temperatures, see par. 8.2. For any further information on how to set the sealing cycle, refer to
ANNEX A - SEALING CYCLE.

8.1.2 THERMOSALD ISX LOW COST



1. The thermoregulator leaves the factory in MASTER RESET condition (see par. 5.3.2). You can restore this condition at any time by means of the digital signals on the connector (see par. 5.3.3).

2. Check that there aren't any alarms before starting the commissioning or during the procedure. The number of any alarm can be retrieved by reading the analog output or through the LEDs on the device (see par. 5.3.1 and 5.3.18). To solve an alarm, see ANNEX D - LIST OF ALARMS AND MESSAGES (CAUSES - REMEDIES).

3. Check that the machine is in the powered-off status and that the preheating and sealing controls are off: the thermoregulator triggers warning status 33. This check can be carried out using the LEDs on the device (see par. 5.3.1).

4. Switch on power: the thermoregulator switches to awaiting calibration status. This check can be carried out using the LEDs on the device (see par. 5.3.1 and 5.3.5).

5. The machine must be at room temperature.

7. Start the calibration using the signal on the connector. Calibration progress can be monitored using the LEDs on the device (see par. 5.3.5).

When calibration is complete, the machine is able to show the current temperature on the sealing band (see par. 5.3.8 and 5.3.18) and is ready to operate. Set the desired preheating and sealing temperatures via the analog inputs (see par. 5.3.17) and activate the relating commands through the signals on the connector (see par. 5.3.9). Before setting the operating temperatures, see par. 8.2. For any further information on how to set the sealing cycle, refer to ANNEX A - SEALING CYCLE.

8.2 Temperature problems related to burning-in of some materials

Once some materials are brought back to room temperature after the first heating, show a variation in balancing temperature for reasons related to their molecular structure.

If possible, use sealing elements either made from materials not subject to this type of problem or already stabilized. For further information, contact the 3E Sales Office.

If using non-stabilized materials, you should perform some heating and cooling cycles as follows:

1. Heat the sealing element to the optimal sealing temperature for a few seconds.
2. Wait for the sealing element to cool down until the surrounding environment is stabilized.
3. If the balancing temperature is lower than the calibration temperature (this condition can be verified by checking the LEDs on the unit, the display, the fieldbus or the analog output), perform a new calibration and start again from step 1. When the balancing temperature is greater than or equal to the calibration temperature, go to step 4.
4. In models equipped with panel or fieldbus, save calibration data in order to set the values of the last calibration as official first calibration data (see par. 5.3.5).

9 MAINTENANCE

Before starting a MAINTENANCE intervention you should carefully have read chapter 2 - SAFETY WARNINGS AND CERTIFICATIONS

9.1 MAINTENANCE INSTRUCTIONS

9.1.1 REPLACING THE SEALING ELEMENTS WHILE THE MACHINE IS COLD

(Bars at room temperature - scheduled intervention)

1) Remove the preheating and sealing controls, switch off the power and let the sealing bars cool down.
2) Mount the new sealing elements with adequate accuracy, making sure that the connections are optimal.
3) Perform a new calibration while power is on.

9.1.2 REPLACING THE SEALING ELEMENTS WHILE THE MACHINE IS HOT

(Bars at working temperature - rapid intervention)

Not to be performed. Refer to par. 9.1.1.

9.1.3 CHANGING THE TYPE OF SEALING ELEMENT

1) Clear the preheating and sealing commands, switch off power, let the sealing bars cool down.
2) Mount the new sealing elements.
3) Perform a new calibration with power off. See par. 5.3.5.

9.1.4 THERMOREGULATOR MAINTENANCE

To be scheduled with periodic interventions according to the working environment.

1) Check that all connection terminals are properly screwed in place.
2) Check the proper operation of the safety alarm output contact: using the emergency test command (see par. 5.3.4).
3) Check that the balancing temperature does not fluctuate more than ±1 degree.

9.1.5 SEALING BAR MAINTENANCE

To be scheduled with periodic interventions according to the working environment.

1) Check that the feedback reference terminals and the power terminals are well screwed in place.
2) Check that the terminals of the sealing element are in a state of excellent conductivity, and that there is no oxidation or bad contact: otherwise, perform thorough maintenance.
3) Check the insulating material supports of the sealing element and the Teflon.
4) Check that any copper plating on the sealing elements is not worn.
5) Check that the sealing element is not about to break down. If this is the case, replace it in order to avoid breakage during work and possible sparks.

10 THERMOREGULATOR AND PANELTECHNICAL DATA

CONTROL POWER SUPPLY (See CN2 par. 4.2.3)	24 VDC +/- 20% (0.5A max absorption) Opto isolated both from internal 0V and ground.
POWER SUPPLY (See CN1 par. 4.2.1 and 4.2.2)	**HF Models** DC POWER SUPPLY UNIT 10V-70V 2V–10V (LOW VOLTAGE OPTION) **SCR, SCR HP and LOW COST SCR Models** POWER TRANSFORMER SECONDARY WINDING MAINS FREQUENCY: 50–60Hz with automatic recognition 10V-140V 4V–10V (LOW VOLTAGE OPTION)
SEALING BAND REFERENCES (See CN6 par. 4.2.6)	1mA max
A.T. REFERENCES (See CN6 par. 4.2.6)	**SCR, SCR HP and LOW COST SCR Models** 400mA max
PULSED SEALING BAND SHORT-CIRCUIT CURRENT	**SCR, SCR HP and LOW COST SCR Models** 400A max **HF H10 Models** 120A max **HF H20 Models** 240A max
RMS CURRENT	**SCR and LOW COST SCR Models** 40A max **SCR HP Models** 100A max **HF Models** 20A max
DIGITAL INPUTS (See CN3 and CN12 par. 4.2.4 and 4.2.10)	10 mA max @ 0/24 VDC
DIGITAL OUTPUTS (See CN12 par. 4.2.10)	500 mA max @ 24V

EMERGENCY ALARM CONTACT (See CN3 par. 4.2.4)	1A @ 24 V
ANALOG INPUTS (See CN7 par. 4.2.7)	1mA max @ 0-5VDC 1mA max @ 0-10VDC (10V ANALOG OPTION)
ANALOG OUTPUT (See CN8 par. 4.2.8)	5mA max @ 0-5VDC
repetitiveness	≅ +/- 1 °C
WORKING ENVIRONMENT TEMPERATURE	-20°C to +50°C
WORKING ENVIRONMENT HUMIDITY	<50%
THERMOREGULATOR PROTECTION	IP20
PANEL PROTECTION	IP44 (IP65 with option)
THERMOREGULATOR WEIGHT	**3 levels** 1.5 Kg (SCR, SCR HP, LOW COST SCR Models) 1.3 Kg (HF Models) **4 levels** 1.6 Kg (SCR, SCR HP Models) 1.4 Kg (HF Models) **5 levels** 1.7 Kg (SCR, SCR HP Models) 1.5 Kg (HF Models)
PANEL WEIGHT	0.15 Kg
MAX DISTANCE BETWEEN THERMOREGULATOR AND SEALING ELEMENT	See par. 4.3.7
MAX DISTANCE BETWEEN THERMOREGULATOR AND PANEL	See par. 4.1.5

11 ORDERING DATA

11.1 ORDERING CODES

The following paragraphs list the models of the most common thermoregulators divided by type: SCR Models starting from par. 11.1.1, HF Models starting from par. 11.1.7, Low Cost SCR Models to par. 11.1.12.
Due to Thermosald's high level of in-house engineering, it is generally possible to request the addition of options with the following criteria in mind:

- THE LOW VOLTAGE OPTION can be applied to all models
- THE COPROCESSOR OPTION can be combined with any FIELDBUS OPTION
- The temperature PROBE OPTION can be applied to all SCR and HF models, except the LOW COST SCR models
- THE T500 OPTION can be applied to all models
- THE WARNING 3S OPTION can be applied to all models
- OPTIONS with limited maximum temperature and limited or fixed coefficient can be applied to all models.

Following the list of the models are the codes of other items auxiliary to the thermoregulator, which may be necessary or optional, depending on the model chosen (see par. 11.1.13).

11.1.1 SCR Models

- Impulse thermoregulator
- 3 levels
- Transformer SECONDARY winding power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES103S09V9	ISX 3L SCR 90A V9	V9
3ES103S09V9_00001	ISX 3L SCR 90A V9 PROBE	V9 Set-up for 1 temperature probe
3ES103S09V9_00004	ISX 3L SCR 90A V9 LV	V9 Low Voltage
3ES103S09V9_00010	ISX 3L SCR 90A V9 T500	V9 Max temperature 500°C
3ES103S09V8_00011	ISX 3L SCR 90A V9 LV T500	V9 Low Voltage Max temperature 500°C
...	...	...

11.1.2 SCR Models with Analog option

- Impulse thermoregulator
- 4 levels
- Transformer SECONDARY winding power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104S09V9_AN	ISX 4L SCR 90A V9 AN	V9 2 analog inputs + 1 analog output
3ES104S09V9_AN10V	ISX 4L SCR 90A V9 AN10V	V9 2 10V analog inputs + 1 analog output
...	...	...

11.1.3 SCR Models with option PLC

- Impulse thermoregulator
- 4 levels
- Transformer SECONDARY winding power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104S09V9_PLC	ISX 4L SCR 90A V9 PLC	V9 PLC
...	...	...

11.1.4 SCR Models with COPROCESSOR OPTION

- Impulse thermoregulator with COPROCESSOR, redundant, max reliability
- 4 levels
- Transformer SECONDARY WINDING power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104S09V9_CO	ISX 4L SCR 90A V9 CO	V9
3ES104S09V9_CO_00001	ISX 4L SCR 90A V9 CO PROBES	V9 Set-up for 2 temperature probes
3ES104S09V9_CO_00002	ISX 4L SCR 90A V9 CO PROBES T180 C900	V9 Set-up for 2 temperature probes Max limited temperature (180°C) Fixed temperature coefficient (900 PPM)
...	...	...

11.1.5 SCR Models with FIELDBUS OPTION

- Impulse thermoregulator
- 4 levels
- Transformer SECONDARY winding power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104S09V9_BU001	ISX 4L SCR 90A V9 RS485 V5	V9 RS485 V5
3ES104S09V9_BU002	ISX 4L SCR 90A V9 PROFIBUS V5	V9 PROFIBUS V5
3ES104S09V9_BU003 + 3EPE0041A1	ISX 4L SCR 90A V9 AB PROFINET V5 + HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE
3ES104S09V9_BU004 + 3EPE0042A1	ISX 4L SCR 90A V9 AB ETH-IP V5 + HMS ANYBUS-COMPACTCOM M30-ETHERNET/IP 2 PORTS CODE AB6224	V9 ETHERNET/IP V5 BUILT-IN HMS MODULE
3ES104S09V9_BU005 + 3EPE0084A1	ISX 4L SCR 90A V9 AB MODBUS/TCP V5 + HMS ANYBUS-COMPACTCOM M40-MODBUS/TCP 2 PORTS CODE AB6603	V9 MODBUS/TCP V5 BUILT-IN HMS MODULE
3ES104S09V9_BU006 + 3EPE0085A1	ISX 4L SCR 90A V9 AB ETHERCAT V5 + HMS ANYBUS-COMPACTCOM M40-ETHERCAT 2 PORTS CODE AB6607	V9 ETHERCAT V5 BUILT-IN HMS MODULE
3ES104S09V9_BU007 + 3EPE0046A1	ISX 4L SCR 90A V9 AB POWERLINK V5 + HMS ANYBUS-COMPACTCOM M40-POWERLINK 2 PORTS CODE AB6611	V9 POWERLINK V5 BUILT-IN HMS MODULE
3ES104S09V9_BU008	ISX 4L SCR 90A V9 AB B40 PROFINET V5	V9 PROFINET V5 BUILT-IN HMS B40 MODULE
3ES104S09V9_BU009	ISX 4L SCR 90A V9 AB B40 ETH-IP V5	V9 ETHERNET/IP V5 BUILT-IN HMS B40 MODULE
3ES104S09V9_BU010	ISX 4L SCR 90A V9 AB B40 MODBUS/TCP V5	V9 MODBUS/TCP V5 BUILT-IN HMS B40 MODULE
3ES104S09V9_BU011	ISX 4L SCR 90A V9 AB B40 ETHERCAT V5	V9 ETHERCAT V5 BUILT-IN HMS B40 MODULE
3ES104S09V9_BU012	ISX 4L SCR 90A V9 AB B40 POWERLINK V5	V9 POWERLINK V5 BUILT-IN HMS B40 MODULE
…	…	…

11.1.6 SCR Models with COPROCESSOR OPTION and FIELDBUS OPTION

- Impulse thermoregulator with COPROCESSOR, redundant, max reliability
- 5 levels
- Transformer SECONDARY winding power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES105S09V9_COBU003 + 3EPE0041A1	ISX 5L SCR 90A V9 CO AB PROFINET V5 + HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE
3ES105S09V9_COBU003_00135 + 3EPE0041A1	ISX 5L SCR 90A V9 CO AB PROFINET V5 PROBES TM135 CM1210 HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE Set-up for 2 temperature probes Max limited temperature (135°C) Limited temperature coefficient (1210 PPM)
3ES105S09V9_COBU003_00200 + 3EPE0041A1	ISX 5L SCR 90A V9 CO AB PROFINET V5 PROBES TM200 CM1210 + HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE Set-up for 2 temperature probes Max limited temperature (200°C) Limited temperature coefficient (1210 PPM)
3ES105S09V9_COBU003_00003 + 3EPE0041A1	ISX 5L SCR 90A V9 CO AB PROFINET V5 PROBES T180 C900 + HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE Set-up for 2 temperature probes Max limited temperature (180°C) Fixed temperature coefficient (900 PPM)
...	...	...
3ES105S09V9_COBU008	ISX 5L SCR 90A V9 CO AB B40 PROFINET V5	V9 PROFINET V5 BUILT-IN HMS B40 MODULE
...	...	...

11.1.7 SCR HP Models

All SCR models (see par. 11.1.1) can be ordered also in the SCR HP (“High Power”) version.

Unlike standard SCR models, change **S09** to **SHP** within the code, as shown in the following table.

- Impulse thermoregulator
- 3 levels
- Transformer SECONDARY winding power supply
- SCR HP 120 Ampere

ITEM NUMBER	DESCRIPTION	Detailed information
3ES103SHPV9	ISX 3L SCR HP120A V9	V9
...	...	...

11.1.8 HF Models

- Impulse thermoregulator
- 3 levels
- DC power supply
- MOS 100 Amperes (H10 Models), MOS 200 Amperes (H20 Models)

ITEM NUMBER	DESCRIPTION	Detailed information
3ES103H10V9	ISX 3L HF 100A V9	V9 Standard Voltage
...	...	...

11.1.9 HF Models with COPROCESSOR OPTION

- Impulse thermoregulator with COPROCESSOR, redundant, max reliability
- 4 levels
- DC power supply
- MOS 100 Amperes (H10 Models), MOS 200 Amperes (H20 Models)

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104H10V9_CO	ISX 4L HF 100A V9 CO	V9
3ES104 H10V9_CO_00001	ISX 4L HF 100A V9 CO PROBES	V9 Set-up for 2 temperature probes
...	...	...

11.1.10 ISX HF Models with FIELDBUS OPTION

- Impulse thermoregulator
- 4 levels
- DC power supply
- MOS 100 Amperes (H10 Models), MOS 200 Amperes (H20 Models)

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104H10V9_BU001	ISX 4L HF 100A V9 RS485 V5	V9 RS485 V5
3ES104H10V9_BU002	ISX 4L HF 100A V9 PROFIBUS V5	V9 PROFIBUS V5
3ES104H10V9_BU003 + 3EPE0041A1	ISX 4L HF 100A V9 AB PROFINET V5 + HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE
3ES104H10V9_BU004 + 3EPE0042A1	ISX 4L HF 100A V9 AB ETH-IP V5 + HMS ANYBUS-COMPACTCOM M30-ETHERNET/IP 2 PORTS CODE AB6224	V9 ETHERNET/IP V5 BUILT-IN HMS MODULE
3ES104H10V9_BU005 + 3EPE0084A1	ISX 4L HF 100A V9 AB MODBUS/TCP V5 + HMS ANYBUS-COMPACTCOM M40-MODBUS/TCP 2 PORTS CODE AB6603	V9 MODBUS/TCP V5 BUILT-IN HMS MODULE
3ES104H10V9_BU006 + 3EPE0085A1	ISX 4L SCR 90A V9 AB ETHERCAT V5 + HMS ANYBUS-COMPACTCOM M40-ETHERCAT 2 PORTS CODE AB6607	V9 ETHERCAT V5 BUILT-IN HMS MODULE
3ES104H10V9_BU007 + 3EPE0046A1	ISX 4L HF 100A V9 AB POWERLINK V5 + HMS ANYBUS-COMPACTCOM M40-POWERLINK 2 PORTS CODE AB6611	V9 POWERLINK V5 BUILT-IN HMS MODULE
3ES104H10V9_BU008	ISX 4L HF 100A V9 AB B40 PROFINET V5	V9 PROFINET V5 BUILT-IN HMS B40 MODULE
3ES104H10V9_BU009	ISX 4L HF 100A V9 AB B40 ETH-IP V5	V9 ETHERNET/IP V5 BUILT-IN HMS B40 MODULE
3ES104H10V9_BU010	ISX 4L HF 100A V9 AB B40 MODBUS/TCP V5	V9 MODBUS/TCP V5 BUILT-IN HMS B40 MODULE
3ES104H10V9_BU011	ISX 4L HF 100A V9 AB B40 ETHERCAT V5	V9 ETHERCAT V5 BUILT-IN HMS B40 MODULE
3ES104H10V9_BU012	ISX 4L HF 100A V9 AB B40 POWERLINK V5	V9 POWERLINK V5 BUILT-IN HMS B40 MODULE
...	...	...

11.1.11 HF Models with COPROCESSOR OPTION and FIELDBUS OPTION

- Impulse thermoregulator with COPROCESSOR, redundant, max reliability
- 5 levels
- DC power supply
- MOS 100 Amperes (H10 Models), MOS 200 Amperes (H20 Models)

ITEM NUMBER	DESCRIPTION	Detailed information
3ES105H10V9_COBU003 + 3EPE0041A1	ISX 5L HF 100A V9 CO AB PROFINET V5 + HMS ANYBUS-COMPACTCOM M30-PROFINET IO 2 PORTS CODE AB6221	V9 PROFINET V5 BUILT-IN HMS MODULE
…	…	…
3ES105H10V9_COBU008	ISX 5L HF 100A V9 CO AB B40 PROFINET V5	V9 PROFINET V5 BUILT-IN HMS B40 MODULE
…	…	…

11.1.12 Models LOW COST SCR

- Impulse thermoregulator
- 4 levels
- Transformer SECONDARY winding power supply
- SCR 90 Amperes

ITEM NUMBER	DESCRIPTION	Detailed information
3ES104S09V9_LC	ISX 4L SCR 90A V9 LOW COST	V9 2 analog inputs + 1 analog output
3ES104S09V9_LC10V	ISX 4L SCR 90A V9 LOW COST 10V	V9 2 10V analog inputs + 1 analog output
3ES104S09V9_LCC	ISX 4L SCR 90A V9 LOW COST COMPACT	V9 2 10V analog inputs + 1 analog output Built-in potentiometer
…	…	…

11.1.13 Accessories

ITEM NUMBER	DESCRIPTION	Detailed information
3ES109B1	THERMOSALD ISX – PRECISION SENSOR 3MT CABLE	Temperature probe
3ES108V9	ISX MULTILINGUAL PANEL V9	
3ES108Z=IP65	THERMOSALD ISX - IP65 PANEL OPTION	
3ES080A001/1	THERMOSALD PANEL CABLE 1	
3ES080A001/3	THERMOSALD PANEL CABLE 3	
3ES080A001/5	THERMOSALD PANEL CABLE 5	
3ES080A001/10	THERMOSALD PANEL CABLE 10	
3ES080A001/20	THERMOSALD PANEL CABLE 20	
3ES080A002	THERMOSALD AMPEROMETRIC TRANSFORMER	Only for SCR models Models with COPROCESSOR option require two amperometric transformers

11.1.14 Adaptation Kit for previous machines

A 24V power supply is required to replace a previous machine. For SCR, PWM and UPSCR models, an electrical adaptation kit and frame are available as listed in the following table.

ITEM NUMBER	DESCRIPTION
3EPE0043A1	THERMOSALD ISX - ADAPTER KIT FOR UPSCR
3EPE0044A1	THERMOSALD ISX ANALOG/ISX-LC - ADAPTER KIT FOR PWM/SCR
3EPE0045A1	THERMOSALD ISX WITHOUT ANALOG - ADAPTER KIT FOR PWM/SCR
3ES108Z=ISX-UPSCR	THERMOSALD ISX – ISX PANEL FRAME OPTION ON UPSCR TEMPLATE
3EA0013	POWER SUPPLY VIN=230-500 VAC VOUT=24 VDC CABUR CSW121C
3EA0014	POWER SUPPLY VIN=230-500 VAC VOUT=24 VDC SIEMENS 6EP1333-3BA10

11.1.15 Sealing bars, terminals, wiring accessories

3E can supply different types of bars, sealing terminals and accessories for general wiring. For further information, please contact 3E Sales Office.

Here are some examples:

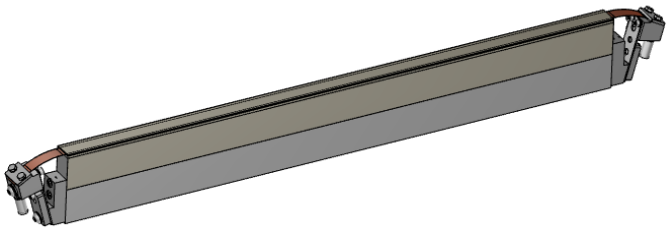


Figure 27 - Sealing bar

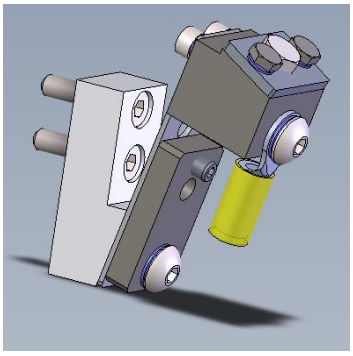


Figure 28 – Terminal

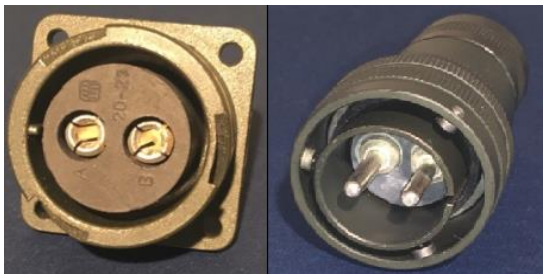


Figure 29 – Power connectors

Figure 30 – Potentiometer and cap

11.1.16 Power transformer and DC power supply unit

3E can supply the power transformer or the DC power supply unit.
In order to choose the correct model, contact 3E Sales Office (see par. 4.3.3).

11.1.17 Consumable materials

3E can supply sealing bands, straps and sealing wires with different profiles and also copper-plated, silver-plated, nickel-plated or Teflon-plated, according to specific drawings In addition, Teflon and non-conductors with different profiles, also according to specific drawings.
For further information, please contact 3E Sales Office.

Here are some examples:

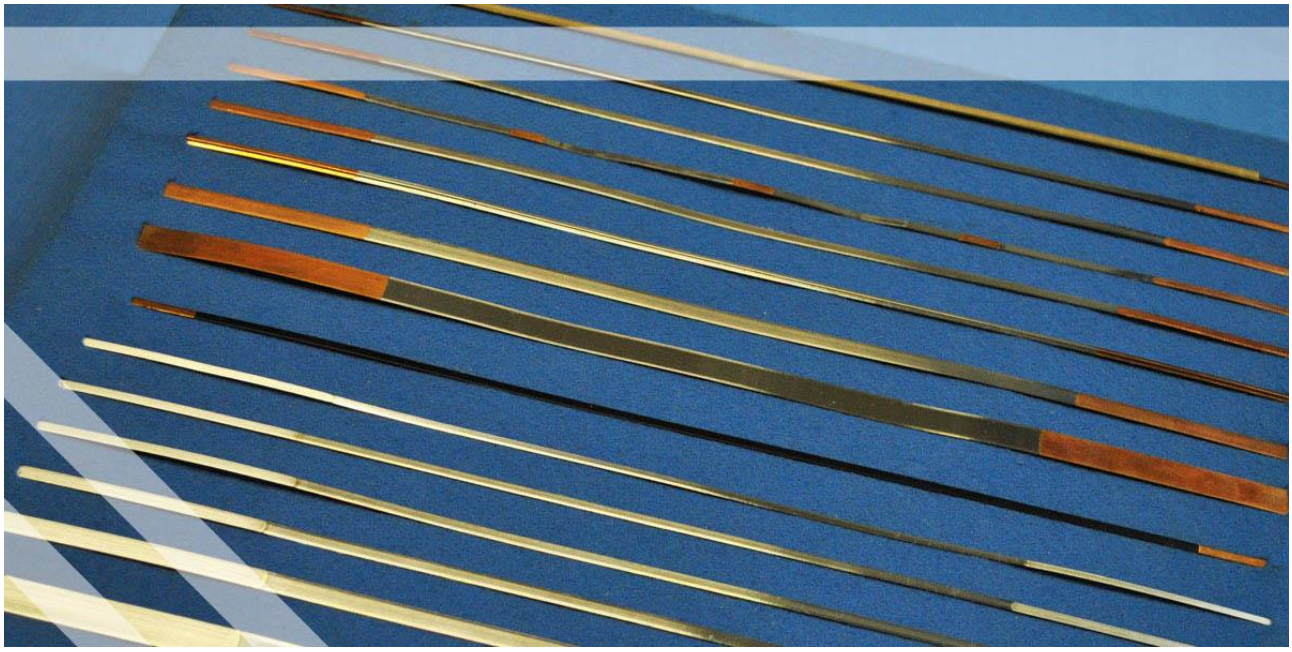


Figure 31 - Coppered, silver-plated and nickel-plated sealing bands

Figure 32 - Sealing bands with eyelets

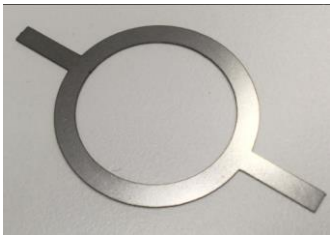


Figure 33 - Sealing elements according to drawing

Figure 34 – Sealing straps

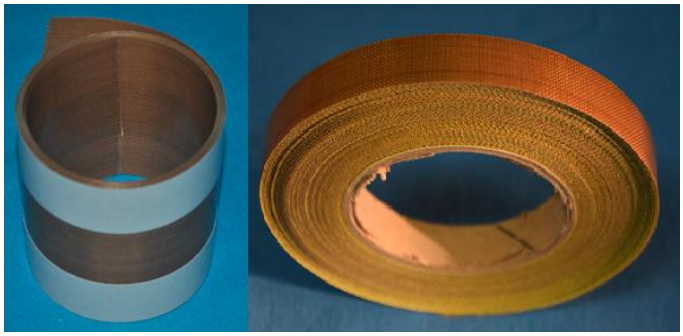


Figure 35 – Teflon

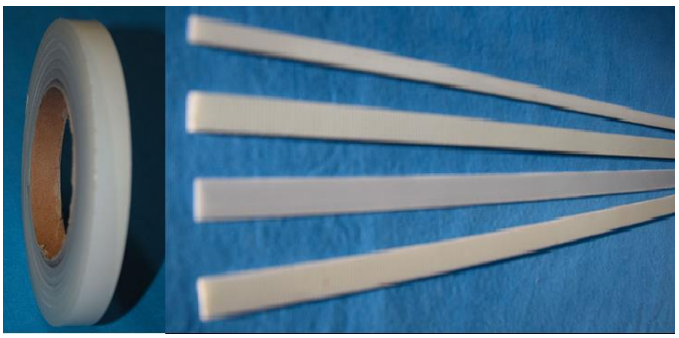


Figure 36 - Non-conductors

11.1.18 Manuals

All manuals in different languages can be downloaded from the 3E website www.3e3e3e.com.

11.1.19 Interchange files for models with FIELDBUS OPTION

ITEM NUMBER	DESCRIPTION
3ES100_BUS_GSD_V5	Thermosald ISX BUS Profibus GSD V5
3ES100_BUS_GSDML_V5	Thermosald ISX BUS Profinet GSDML V5
3ES100_BUS_EDS_V5	Thermosald ISX BUS Ethernet/IP EDS V5
3ES100_BUS_ESI_V5_1_0	Thermosald ISX BUS ETHERCAT ESI V5.1.0
3ES100_BUS_XDD_V5_1_0	Thermosald ISX BUS POWERLINK XDD V5.1.0

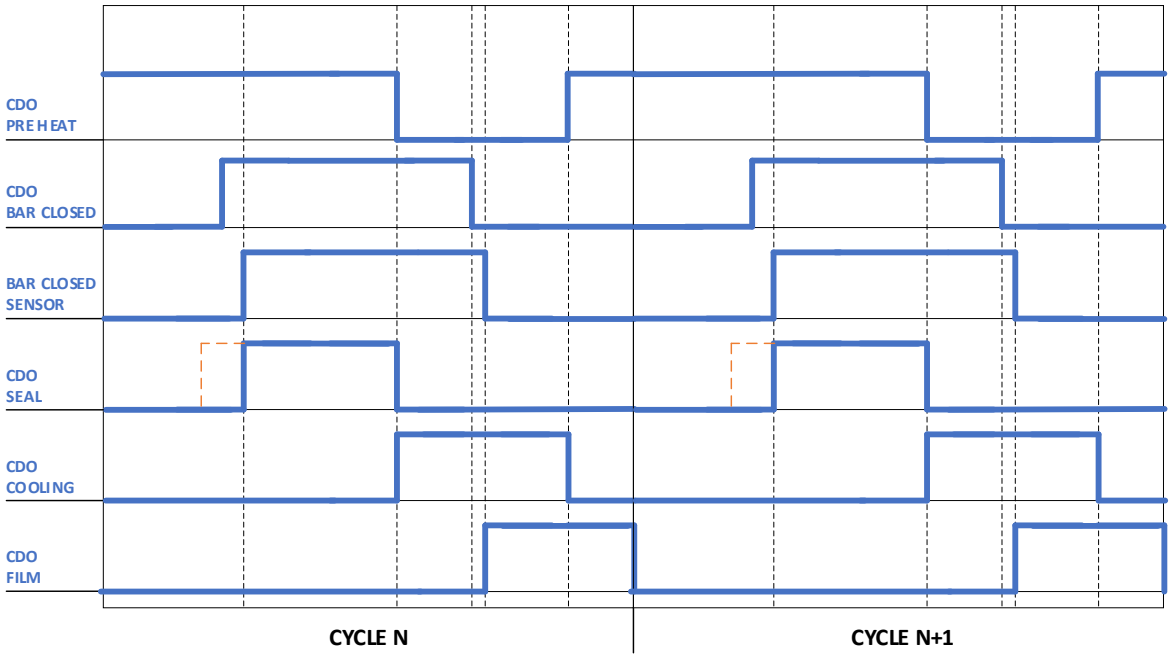
11.2 IDENTIFICATION

The thermoregulator and the multilingual panel are labeled with a serial number that uniquely identifies the product and contains year, month of production and progressive number as in the following example:

S.N.= 20011234

ANNEX A - SEALING CYCLE

N.B. - the suggested sealing cycle is only an example and should not be considered strictly a usage diagram. Experience has shown that timeframes must be modified according to the specific application, i.e. materials, dimensions, times, etc.
For further information, please contact 3E Sales Office.



PRE-HEAT CMD	Pre-heating command.
CLOSED BAR CMD	Closed bar command.
CLOSED BAR SENSOR	Closed bar sensor.
SEAL CMD	Sealing command. To ensure optimal sealing repetitiveness, you should synchronize command activation with activation of the closed bar sensor, which should always be used in applications using pneumatic bars. In some applications you may consider anticipating the sealing command as shown in the figure by the orange hatching, but be careful in any case since the pressure of the bar favors uniform distribution of temperature in all points.
COOLING CMD	Cooling command.
FILM CMD	Film feed command.

ANNEX D - LIST OF ALARMS AND MESSAGES (CAUSES - REMEDIES)

For details on alarms and warnings, their management and resetting, refer to par. 5.3.1.

NOTE 1: If the thermoregulator and the panel are completely off, check the 24V power supply.

NOTE 2: If the thermoregulator and the panel are on, and “3E s.r.l. THERMOSALD” remains displayed on the panel, check the display connection cable.

ALARM	DESCRIPTION	REMEDY
F001	EEPROM WRITING INTERRUPTED	Turn the device off and back on again and contact 3E Technical Support.
F002	EEPROM WRITING WITH PREVIOUS OPERATION IN PROGRESS	Turn the device off and back on again and contact 3E Technical Support.
F003	EEPROM WRITING WITH DEFECTIVE EEPROM	Turn the device off and back on again and contact 3E Technical Support.
F004	INDEX CORRUPT SOFTWARE STRUCTURE READ-WRITE EEPROM	Turn the device off and back on again and contact 3E Technical Support.
F006	PANEL FLASH EEPROM WRITE – Not Used	Turn the device off and back on again and contact 3E Technical Support.
F007 (Absent from versions V10)	A/D CONVERTER - CONVERTER WRITE ERROR	Turn the device off and back on again and contact 3E Technical Support.
F008	INTERNAL I2C-X TRANSMISSION	Turn the device off and back on again and contact 3E Technical Support.
F009 (Not active)	-	-
F010 (Absent from versions V10)	A/D CONVERTER-CHANNEL SELECTION ERROR	Turn the device off and back on again and contact 3E Technical Support.
F011	COPROCESSOR SELECTOR ON WITH COPRO CARD NOT ACTIVE OR SEL. OFF WITH COPRO CARD ACTIVE	Turn the device off and back on again and contact 3E Technical Support.
F012	INTERNAL BUS CARD TRANSMISSION	Turn the device off and back on again and contact 3E Technical

		Support.
F013	INTERNAL COPROCESSOR CARD TRANSMISSION	Turn the device off and back on again and contact 3E Technical Support.
F014 (Absent on versions V9, active from versions V10, for previous versions refer to the specific manual)	COMMAND NOT PROVIDED	Check that the value of the command written to address 1285 (0505H) is allowed.
F015 (Not active)	-	-
F016 (From versions V10)	PARAMETER WRITING FAILED.	Check that the requested address matches a writable parameter and that the desired value is allowed.
F017 (From versions V10)	VARIABLE READING FAILED.	Check that the requested address exists and that the number of consecutive data to be read does not exceed the length of the bank.
W018	FIELDBUS – CMD UNKNOWN	Check that Modbus master is sending the allowed Modbus command codes: 3,6,16.
W019 (Not active)	-	-
W020	MODBUS RS485 SLAVE - CHECKSUM ERROR	Checksum error on Modbus packet.
W021	MODBUS RS485 SLAVE - OVERRUN ERROR	A datum reached the RS485 port before the previous one was run.
W022	MODBUS RS485 SLAVE - FRAME ERROR	The stop bit has not arrived.
F023 (Not active)	-	-
W024	RS485 SLAVE - TOO MUCH DATA REQUESTED BY MASTER OR WRONG DATA ADDRESS	<u>Modbus RTU RS485 bus</u> Reading (Modbus command 3) or writing (Modbus commands 6 and 16) a non-existing register or inconsistent command 16 package. Other Buses

		Read or write of a non-existing parameter
W025	RS485 SLAVE - BUFFER FULL	The RS485 port buffer is full because too much data has been sent or transmissions are too frequent.
F026 (Not active)	-	-
F027 (Not active)	-	-
F028 (Not active)	-	-
F029	INCONSISTENT PROBES BALANCING	Base and coprocessor balancing temperatures are not consistent (see par. 5.3.7). Check the temperature probes. If the problem persists, contact 3E Technical Support.
W031 (On versions V7 and from versions V10)	WARNING REGOLATORE OFF	Enable the regulator through the "Regulator enabled" parameter or activate the regulator via the fieldbus through the "Regulator enable" command.
W032	WARNING: WAITING FOR CALIBRATION POWER	Switch on power.
W033	WARNING: POWER TRANSFORMER VOLTAGE FAILURE OR SEALING BAND NOT CONNECTED	Check the CN1 connector. Check power transformer circuit or power supply unit.
F034 (Not active)	-	-
F035 (Not active)	-	-
F036 (Not active)	-	-
F037	EXTERNAL TEMPERATURE PROBE NOT ACTIVE	Check temperature probe connection and "Temperature probe enable" parameter.
W038	WARNING: Wait for machine to cool at Calibration REQUEST	To perform a calibration operation, you must wait for stable temperature of the sealing bar.
W039	WARNING: Sealing temperature not reached	No power for first seal: increase sealing time or ramp parameter.

		Sealing command activated and deactivated with set point minor than current temperature.
F040 (On versions V7 and from versions V10)	CALIBRATION WITH REGULATOR OFF	Activate the "Regulator on" command or enable the "Regulator enabled" parameter. Then activate the calibration command again.
F041 (Not active)	-	-
F042 (On versions V7 and from versions V10)	HOT CALIBRATION WITH PROBE DISABLED	Enable the temperature probe.
F043 (From versions V10)	BUS NOT RECEIVING FROM MASTER	Reset the device; if the problem persists, contact 3E Technical Support.
F044	MOS SHORT CIRCUIT ALARM	Check the wiring of the sealing element. Reset the device; if the problem persists, contact 3E Technical Support.
F045	CLOSED SEALING BAR SENSOR	Bar closed sensor not present in the presence of the bar closed command or bar closed sensor present in the absence of the bar closed command. Check CN12/Pin2 and CN12/Pin11 connections, PLC parameters (see 5.3.19).
F046	NO CURRENT SIGNAL or FOR REVERSED A.T. LOW CURRENTS	Check A.T. connection. Check connections of sealing band power cables. Check CN1 connector.
F047	REVERSED A.T. SIGNAL	Reverse the A.T. connection. Check CN6/4-5 connection and not CN6/5-6.
F048	PREHEATING POTENTIOMETER NOT	Check preheating

	CONNECTED OR CABLE INTERRUPTION	potentiometer connections.
F049	SEALING POTENTIOMETER NOT CONNECTED OR CABLE INTERRUPTION	Check sealing potentiometer connections.
W050	POWER-ON THRESHOLD TOO LOW	Decrease the value of parameter “Power off threshold [%]”.
F051	WIPER-IGROSS	Carry out master reset and calibration. If the problem persists, contact 3E Technical Support.
F052	WIPER-VGROSS	See F51.
F053	WIPER-IFINE	See F51.
F054	WIPER-VFINE	See F51.
F055	POWER SYNCHRONISM FAULT	Contact 3E Technical Support to increase the “Max phase T [us]” parameter.
F056	MAX PHASE T TOO HIGH	Decrease the value of the “Max phase T [us]” parameter.
W057	SECONDARY PHASE SHIFT DUE TO SHORT CIRCUIT	Check short circuit presence on sealing band or between sealing band and ground. Check the quality of the power chain wiring between Thermosald and heating elements. Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support to increase the Max period Phase Shift [us] parameter.
F058	SECONDARY PHASE SHIFT DUE TO SHORT CIRCUIT	Check short circuit presence on sealing band or between sealing band and ground.

		Check the quality of the power chain wiring between Thermosald and heating elements. Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support to increase the Max period Phase Shift [us] parameter Contact 3E Technical Support to increase the “Max retries period reset” parameter.
F059 (Alarm from versions V9, previously a Warning)	MAINS SINE WAVE PERIOD TOO SHORT	Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check the integrity of the circuit for earth leakage measurement: see the steps for internal resistance measurement described in F069. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support to increase the “Max phase T [us]” parameter. Contact 3E Technical Support to increase the “Max retries

		period reset” parameter.
F060	RESET WITH CALIBRATION IN PROGRESS	Reset the alarm and repeat calibration
F061	IGROSS BALANCING FAILED	Check that the CN1 terminal strip is tight and that its signals are connected correctly. Check that the sealing band references are not connected together. Check the connection with the power transformer or power supply unit. Check that the sealing element and the transformer or power supply unit are consistent with the data indicated on the application's technical report. Repeat the calibration.
F062	VGROSS BALANCING FAILED	See F61.
F063	IFINE BALANCING FAILED	See F61.
F064	VFINE BALANCING FAILED	See F61.
F065	SUPERFINE BALANCING FAILED	See F61.
W066	MAINS SINE WAVE PERIOD TOO SHORT	Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check the integrity of the circuit for earth leakage measurement: see the steps for internal resistance measurement described in F069. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support to increase the “Max phase T [us]” parameter.
F067	TEMPERATURE>MAX TEMPERATURE	Check sealing band

	(FOR 600MS)	connections. Check pre-heating temperature and sealing temperature. Check the max temperature parameter. Check A.T.
F068	TEMPERATURE>MAX TEMPERATURE+10 DEGREES (FOR 100MS)	See F67.
F069 (On HF models active from V7.3.16)	GROUNDED SEALING BAND - SEALING BAND LENGTH PERCENTAGE	Check the sealing band in the machine or the connections of the sealing band, probably grounded. NOTE: since the thermoregulator is grounded with a ground screw, in order to check it with an electrical instrument you must first disconnect the wires from the sealing band. Avoid disabling this alarm because you may damage the protection circuit.  **To identify the point on the sealing element where there is a short circuit to ground, simply jump CN1/2 and the ground screw on the heat-sink. You should be careful because the circuit used by the alarm is excluded and sparks may occur in the machine. Then, in case of dangerous voltages, risk of electric shock can be present.** If the problem persists disconnect all the wires and measure the resistance between CN1/3 and the earth

		screw: for correct resistance value refer to paragraph 4.1.3. In case values do not match maybe the internal circuit is damaged: check power supply on CN1/1 and CN1/2 comes from a power secondary insulated from the earth and the alarm was not disabled.
F070 (Not active from V7.3.16)	GROUNDED SEALING BAND – CURRENT LEAKAGE	Check the sealing band in the machine or the sealing band connections, probably grounded. NOTE: since the thermoregulator is grounded with a ground screw, in order to check it with an electrical instrument you must first disconnect the wires from the sealing band.  **You can disable the alarm to identify the point on the sealing element where there is a short circuit to ground. Be careful as sparks may occur in the machine. Then, in case of dangerous voltages, risk of electric shock can be present.** If the problem persists disconnect all the wires and measure the resistance between CN1/3 and the earth screw: for correct resistance value refer to paragraph 4.1.4. In case values do not match maybe the internal circuit is damaged: check power supply on CN1/1 and CN1/2 comes from a power secondary insulated from the earth and the alarm was not disabled.
F071	HARDWARE FAILURE – BREAKDOWN OF +/–15V INTERNAL ANALOG	Reset the device; if the problem persists, contact 3E Technical

	VOLTAGE	Support
F072	HARDWARE FAILURE – BREAKDOWN OF +/-5V INTERNAL ANALOG VOLTAGE	Reset the device; if the problem persists, contact 3E Technical Support
F073	HARDWARE FAILURE – BREAKDOWN OF +5V REFERENCE	Reset the device; if the problem persists, contact 3E Technical Support
F074	INTERNAL TEMPERATURE PROBE – HEAT-SINK TEMPERATURE TOO HIGH	Check fans operation (SCR HP models) Let the device cool down and reset the alarm If the problem persists, contact 3E Technical Support
W075	POWER SYNCHRONISM FAULT	Check possible unintended switching on pre heating or sealing commands (up to V8 versions). Contact 3E Technical Support to increase the “Max phase T [us]” parameter.
F076	IREAD TOO HIGH	Check if there is a short circuit on the sealing bands Check if larger sealing bands have been mounted: in this case, cut power, start calibration, wait for Warning 32 and switch on power again. For models with coprocessor option check A.T. references are properly connected.
F077 (Not active)	-	-
F078	DEVICE NOT CALIBRATED	Perform automatic calibration without pre-heating or sealing command.
F079	EMERGENCY CIRCUIT FAULT	Check power contactor, check emergency chain.
F080	BACKFIRE TIMER CHECK	Reset the device; if the problem persists, contact 3E Technical Support
F081	HARDWARE FAILURE - EEPROM READING CHECKSUM ALARM	Inconsistent data found on eeprom: contact 3E Technical Support.
F082	-	-

(Not active)		
F083	REFERENCE CABLES REVERSED WITH RESPECT TO POWER CABLES Internal -15V power supply	Check for reversed reference cables: CN1/3 corresponds to CN6/1, CN1/4 corresponds to CN6/2.
F084 (On versions V7 and from versions V10)	REGULATOR OFF	Clear the pre-heating or sealing command.
F085	SEALING TIME LONGER THAN SEALING TIME MACHINE DATUM	Check the sealing time set on the PLC. If need be, adjust the “Max Sealing Time [ms x 100]” parameter (see par. 5.3.25).
F087 (On versions V7 and from versions V10)	HOT CALIBRATION FAILED: COEFFICIENT TOO LOW	Check that the temperature probe is properly installed.
F088 (On versions V7 and from versions V10)	HOT CALIBRATION FAILED: COEFFICIENT TOO HIGH	Check that the temperature probe is properly installed.
F089	BREAKING OF A SEALING BAND IN THE EVENT OF SEALING BANDS CONNECTED IN PARALLEL	Check the sealing elements.
F090	SHORT CIRCUIT BETWEEN SEALING BANDS OR BETWEEN SEALING BANDS AND GROUND	Check the sealing elements. Check the power wiring between the thermoregulator and the sealing bands. <u>SCR Models</u> Check A.T. connection at CN6/4-5 and not CN6/5-6. <u>SCR Models</u> Check input CN6/4-CN6/5 10 ohm.

		For models with coprocessor option check A.T. references are properly connected.
F091 (Not active)	-	-
F092	POWER COMPONENT FAULTY	Reset the device; if the problem persists, contact 3E Technical Support. Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check connection of CN6/2 REF+. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support to increase the “Max phase T [us]” parameter.
F093	NO CURRENT ON THE SEALING BAND DURING SEALING	Check the power transformer. Check sealing band interruption. Check power cables interruption. Check the lack of sealing command with power off.
F094	REFERENCE CABLE INTERRUPTION	Check the CN6/1 - CN6/2 reference cables.
F095 (Not active)	-	-
F096	V-IST TOO HIGH	Voltage circuit saturation; check the system for probable breakage of a sealing band if sealing band is connected in parallel.

		Check if the secondary winding voltage of the transformer or of the power supply unit has been increased: in this case cut power, start calibration, wait for Warning 32 and restore power. Otherwise contact 3E Technical Support to decrease the value of the Calibration level [%] parameter.
F097	PARTIAL SHORT CIRCUIT	Check the sealing bands in the machine - probably not properly insulated. If the sealing band is correctly insulated and the problem persists, let the machine cool down and carry out a calibration: pay attention to the machine's behavior during the next work phases. Otherwise contact 3E Technical Support to raise the value of the "Partial short circuit factor (x10)" parameter (see par. 5.3.25).
F098	POWER COMPONENT FAULTY ON PHASE 1	Reset the device; if the problem persists, contact 3E Technical Support. Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support to increase the “Max phase T [us]” parameter.
F099	UNKNOWN ALARM	Contact 3E Technical Support.

F100 (Not active)	-	-
F101	COPROCESSOR EEPROM WRITING INTERRUPTED	See F001.
F102	COPROCESSOR EEPROM WRITING WITH PREVIOUS OPERATION IN PROGRESS	See F002.
F103	COPROCESSOR EEPROM WRITING WITH FAULTY EEPROM	See F003.
F104	INDEX CORRUPT SOFTWARE STRUCTURE EEPROM READ-WRITE	See F004.
F107	COPROCESSOR A/D CONVERTER-CONVERTER WRITE ERROR	See F007.
F108	I2C-X INTERNAL TRANSMISSION COPROCESSOR	See F008.
F109 (Not active)	-	-
F110	COPROCESSOR A/D CONVERTER-CHANNEL SELECTION ERROR	See F010.
F129	INCONSISTENT PROBES BALANCING	See F029.
W132	WARNING: WAITING FOR POWER DURING COPROCESSOR CALIBRATION	See W032.
W133	COPROCESSOR WARNING: POWER TRANSFORMER VOLTAGE FAILURE OR SEALING BAND NOT CONNECTED	See W033.
F134 (Not active)	-	-
F137	COPROCESSOR EXTERNAL TEMPERATURE PROBE NOT ACTIVE	See F037.
W138	WARNING: WAIT FOR MACHINE TO COOL	See W038.
F143 (Not active)	-	-
F144 (For previous versions, consult the specific manual)	MOS SHORT CIRCUIT ALARM	See F044.
F145 (Not active)	-	-

F146	COPROCESSOR NO CURRENT SIGNAL	See F046.
F147	COPROCESSOR REVERSED A.T. SIGNAL	See F047. Coprocessor CN6 connector.
W150	POWER ON THRESHOLD TOO LOW	See W050.
F151	COPROCESSOR WIPER-IGROSS	See F051.
F152	COPROCESSOR WIPER-VGROSS	See F052.
F153	COPROCESSOR WIPER-IFINE	See F053.
F154	COPROCESSOR WIPER-VFINE	See F054.
W157	SECONDARY PHASE SHIFT DUE TO SHORT CIRCUIT	See W057.
F158	SECONDARY PHASE SHIFT DUE TO SHORT CIRCUIT	See F058.
F159 (Alarm from versions V9, previously a Warning)	MAINS SINE WAVE PERIOD TOO SHORT	See F059
F160	COPROCESSOR RESET WITH CALIBRATION IN PROGRESS	See F060.
F161	COPROCESSOR IGROSS BALANCING FAILED	See F061.
F162	COPROCESSOR VGROSS BALANCING FAILED	See F062.
F163	COPROCESSOR IFINE BALANCING FAILED	See F063.
F164	COPROCESSOR VFINE BALANCING FAILED	See F064.
F165	COPROCESSOR SUPERFINE BALANCING FAILED	See F065.
W166	MAINS SINE WAVE PERIOD TOO SHORT	See W066
F167	COPROCESSOR TEMPERATURE > MAX TEMPERATURE (FOR 600MS)	See F067.
F168	COPROCESSOR TEMPERATURE > MAX TEMPERATURE+10 DEGREES (FOR 100MS)	See F068.
F169 (On HF models active from V7.3.16)	COPROCESSOR GROUND CURRENT	See F069.
F170 (For	CURRENT TO GROUND ALARM	See F070.

previous versions, consult the specific manual) (Not active from V7.3.16)		
F171	COPROCESSOR HARDWARE FAILURE – BREAKDOWN OF +/–15V INTERNAL ANALOG VOLTAGE	See F071.
F172	COPROCESSOR HARDWARE FAILURE – BREAKDOWN OF +/-5V INTERNAL ANALOG VOLTAGE	See F072.
F173	COPROCESSOR HARDWARE FAILURE – BREAKDOWN OF +5V REFERENCE	See F073.
F174	COPROCESSOR TEMPERATURE INTERNAL PROBE – HEAT-SINK TEMPERATURE TOO HIGH	See F074.
W175	COPROCESSOR WARNING: INTERRUPT FIRE LOCK	See W075.
F176	COPROCESSOR IREAD TOO HIGH	See F076.
F178	COPROCESSOR NOT CALIBRATED	See F078.
F179	COPROCESSOR IS NOT RECEIVING INTERNAL DATA BUS TRANSMISSION FROM MASTER	Reset the device; if the problem persists, contact 3E Technical Support.
F180 (Not active from V9.0.4)	-	-
F181	COPROCESSOR - CHECKSUM ALARM – INCONSISTENT DATA ON EEPROM	See F081.
F182 (Not active from V5.1)	-	-
F183	COPROCESSOR REFERENCE CABLES REVERSED WITH RESPECT TO POWER CABLES	See F083. Coprocessor CN6 connector.
F184	COPROCESSOR SEALING COMMAND INCONSISTENT WITH BASE (INTERNAL CHECK)	Power off the device and then back on again; if the problem persists, contact 3E Technical Support (Coprocessor does not receive CO_SALD_IN_ACT from base)
F185	-	-

(Not active from V5.1)		
F186 (Not active)	-	-
F187	COPROCESSOR PHASE 2 READING BASE OUT OF RANGE	Contact 3E Technical Support.
F190	COPROCESSOR SHORT CIRCUIT BETWEEN SEALING BANDS OR BETWEEN SEALING BANDS AND GROUND	See F090.
F191 (Not active)	-	-
F192 (For previous versions, consult the specific manual)	POWER COMPONENT FAULTY	See F092.
F193	COPROCESSOR NO CURRENT ON SEALING BAND DURING SEALING	See F093.
F194	COPROCESSOR REFERENCE CABLE INTERRUPTION	See F094. Coprocessor CN6 connector.
F195	COPROCESSOR NO READING FROM BASE	Check the quality of the power chain wiring between power transformer and Thermosald. Check the quality of the power transformer primary wiring. Check the quality of the electricity grid: - absence of harmonics - absence of loss of voltage Contact 3E Technical Support.
F196	COPROCESSOR V-IST TOO HIGH	See F096.
F197	COPROCESSOR PARTIAL SHORT CIRCUIT BETWEEN SEALING BANDS	See F097.
F198	POWER COMPONENT FAULTY ON PHASE 1	See F098.
F199	COPROCESSOR UNKNOWN ALARM	See F099.

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ANNEX E - MECHANICAL DIMENSIONS

DIGITAL PANEL 96x48 - REAR DIMENSIONS 90.5x44.5
DEPTH = 73mm + 52mm Connector

DRILLING TEMPLATE

NOTE: with IP65 protection, code 3ES108Z=IP65, the drilling template must be 94mm x 47mm. The maximum outside dimension is 102mm x 54mm.

THERMOREGULATOR DIMENSIONS (SCR MODELS)

The measurements in Figure 37 are expressed in mm.

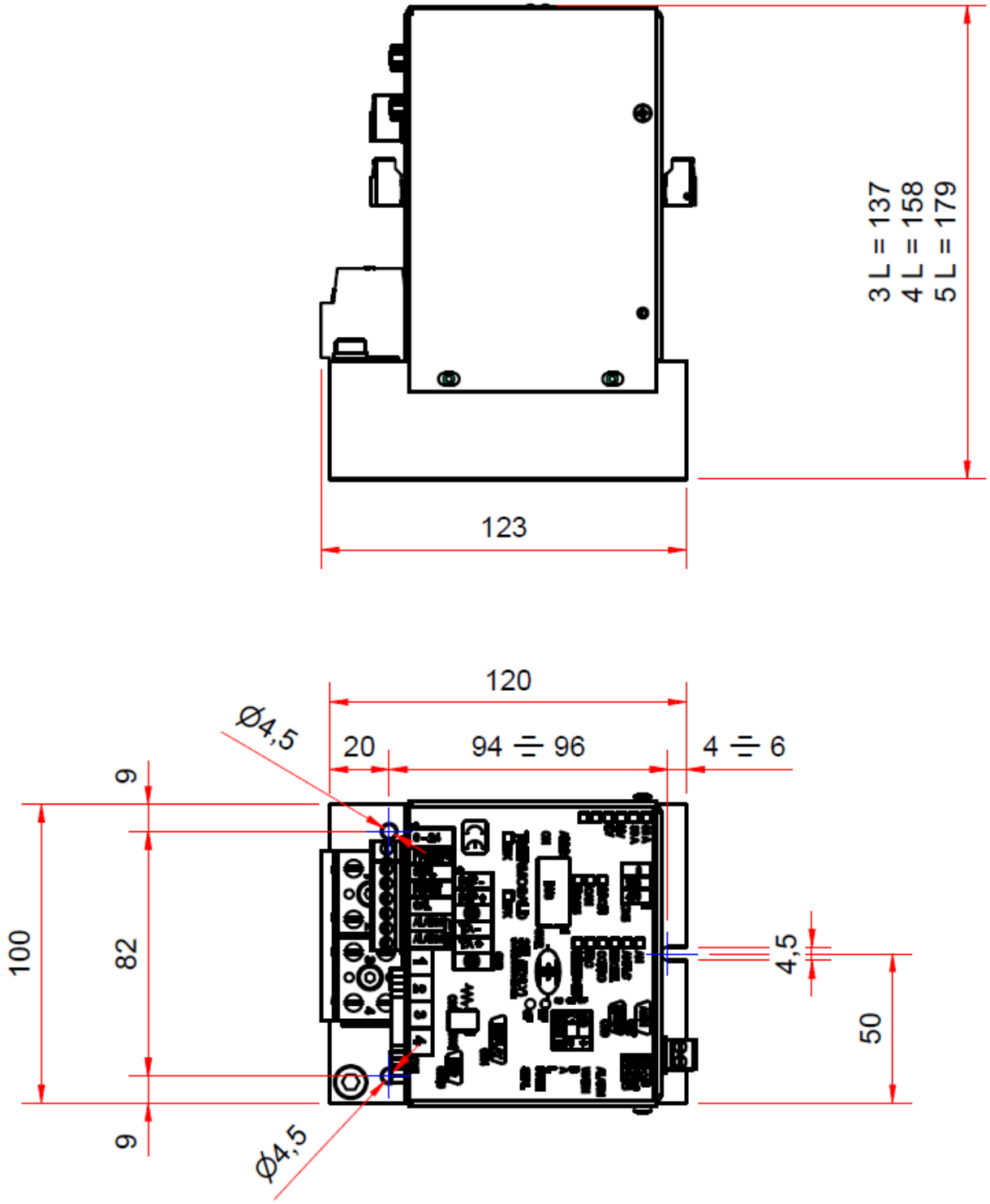


Figure 37

DIMENSIONI TERMOREGOLATORE (MODELLI SCR HP)

The measurements in Figure 38 are expressed in mm.

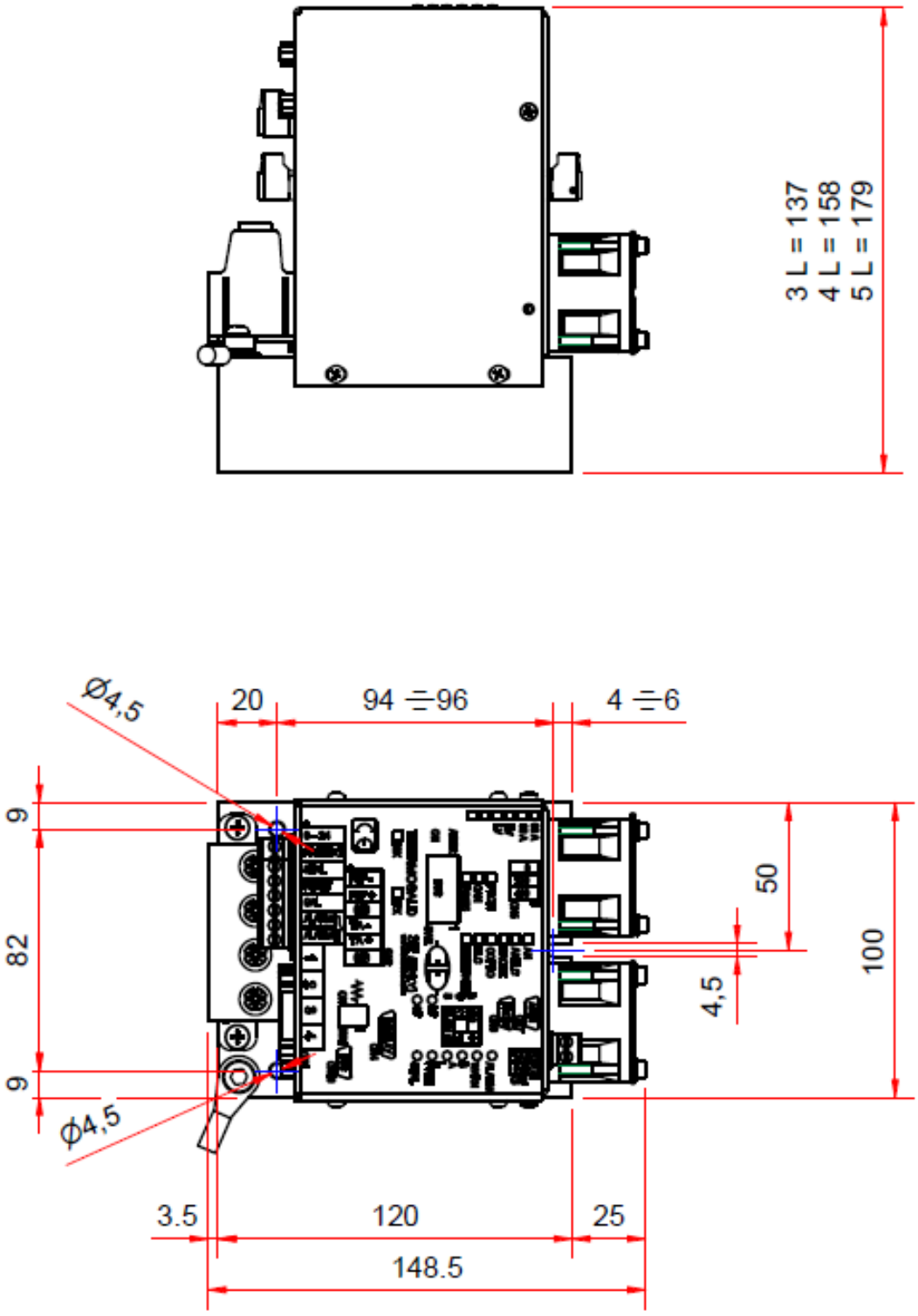


Figure 38

THERMOREGULATOR DIMENSIONS (HF MODELS)

The measurements in Figure 39 are expressed in mm.

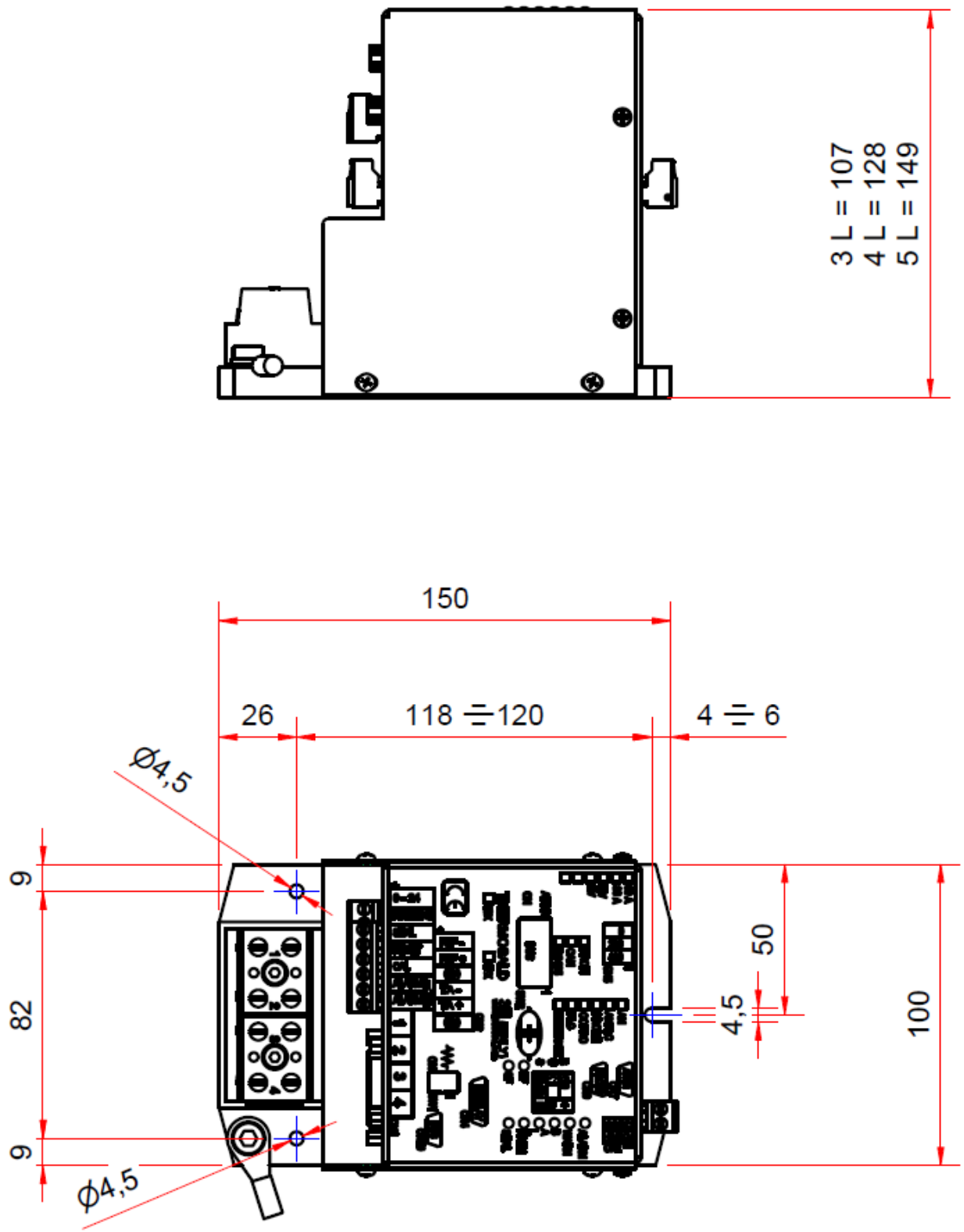
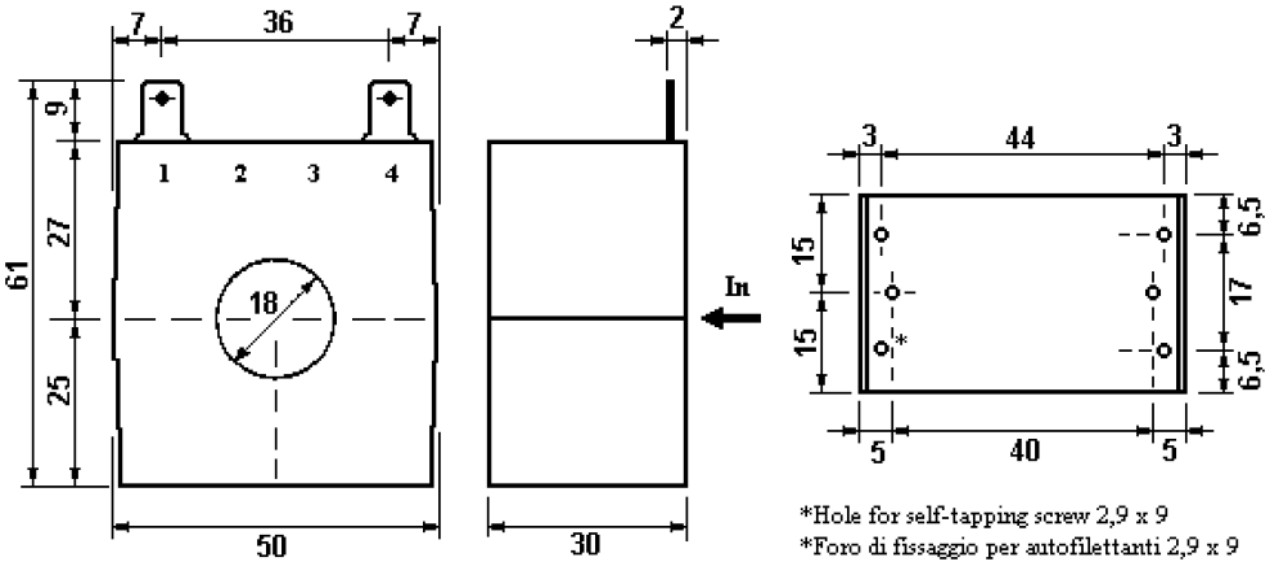


Figure 39

AMPEROMETRIC TRANSFORMER



Values in mm - Misure espresse in mm

Figure 40

TEMPERATURE PROBE

The measurements in Figure 41 are expressed in mm.

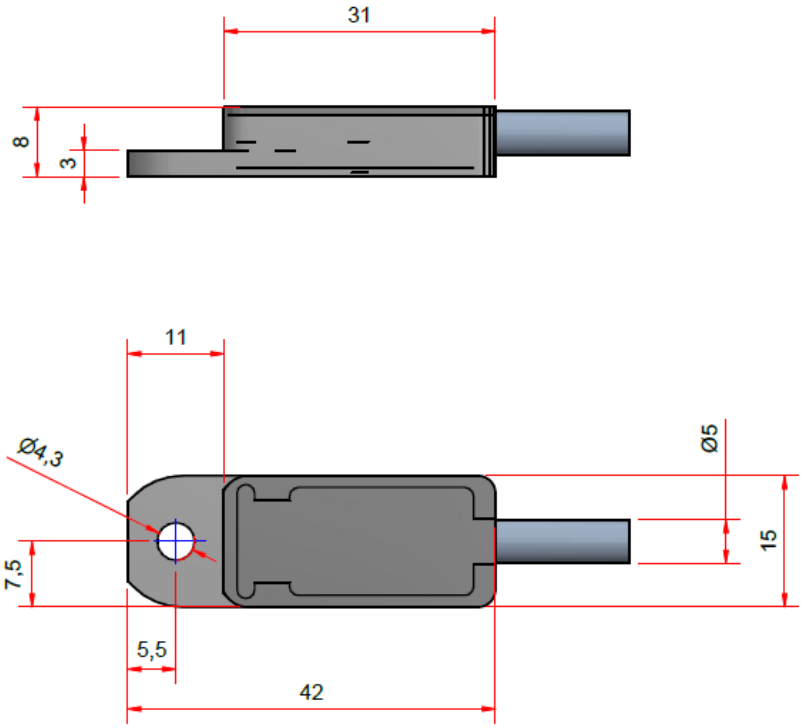


Figure 41