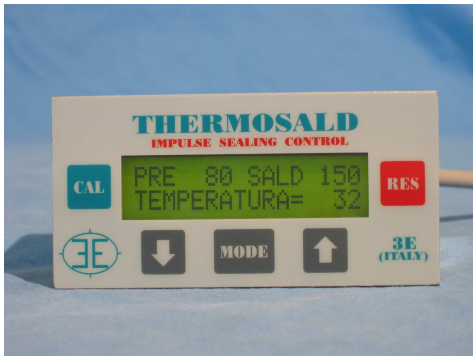
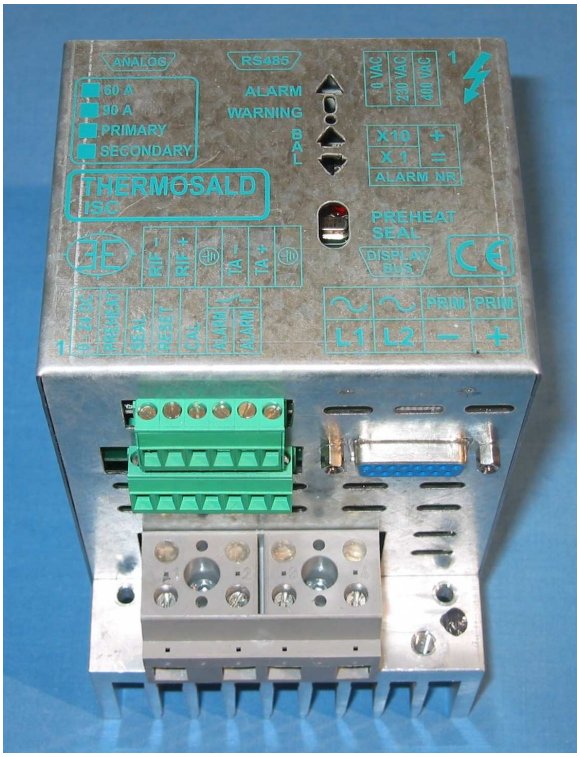
TEMPERATURE CONTROLLER FOR IMPULSE SEALING

THERMOSALD
ISC
MODULAR SYSTEM





- **AUTOMATIC CALIBRATION**
- **ANALISYS ON LINE OF BAND CHARACTERISTICS**
-
- **DIAGNOSTIC PANEL WITH 6 LANGUAGES**
- **CAN BUS INTERFACE (OPTIONAL)**
- **PROFIBUS INTERFACE (OPTIONAL)**
- **RS 485 INTERFACE (OPTIONAL)**
- **WORKING WITH POTENTIOMETER**
-
- **BURN IN OF SEALING BAND**

QUICK START

3E S.r.l. - **Via del Maccabreccia 37/a - 40012 LIPPO DI CALDERARA (BOLOGNA)**
Tel. ++39 051 6466225-228 **e-Mail: mail@3e3e3e.com**
Fax ++39 051 6426252 **web site: www.3e3e3e.com**

0 WARNINGS

THIS BOOK IS SUPPLIED WITH OUR PRODUCT AND DESCRIBES THE FUNDAMENTAL FUNCTIONS

EMPLOY QUALIFIED AND WELL-TRAINED PERSONNEL, FAMILIAR WITH THE TECHNOLOGY USED TO INSTALL OR MAINTENANCE THE EQUIPMENT, CONSULTING MAINTENANCE & OPERATIONS MANUAL.

0.1 SAFETY PRECAUTIONS

- Never use the equipment in explosive atmospheres or with explosive materials.
- Never use the equipment with flammable material without first taking the required safety precautions.
- Operate the equipment by following the instructions contained in this MAINTENANCE & OPERATIONS MANUAL before doing an installation.
- Never turn on the temperature controller power circuit when the safety guards are open.
- Do not use the temperature controller for tasks other than those it is designed for i.e to control the temperature of bands or wires for industrial-grade sealing. Contact our engineering department for information regarding specific applications.
- Do not deliver electrical power to the temperature controller if the protective cover has been removed for special servicing on the electronic system.
- Employ qualified and well-trained personnel familiar with the technology used, to install and use the equipment.
- Grounding the thermoregulator by yellow-green cable connected to the predisposed screw and by 4 fixing screw.
- Use bands or wires having an adequate positive temperature coefficient (> 1 x 10E-3)
- When the machine is running under normal conditions, make sure the heat sink of the controller does not exceed 60°C . If this happens, increase heat sink ventilation or contact our engineering department.

2 WIRING DIAGRAM AND DIMENSIONS

2.1 LIST OF CHANGE-OVER SIGNALS

CN1	**POWER TERMINAL BLOCK (SWITCH ON SECONDARY)**	
PIN1	ALTERNATING CURRENT SUPPLY	(4 - 10 sq.mm)
PIN2	ALTERNATING CURRENT SUPPLY	(4 - 10 sq.mm)
PIN3	BAND -	(4 - 10 sq.mm)
PIN4	BAND +	(4 - 10 sq.mm)

NOTE 1: Power supply and control circuit supply with the same phase
NOTE 2: Twist power cable

CN1	**POWER TERMINAL BLOCK (SWITCH ON PRIMARY)**	
PIN1	ALTERNATING CURRENT SUPPLY (230Vac)	(4 - 10 sq.mm)
PIN2		(4 - 10 sq.mm)
PIN3	CONNECT TO 0 VOLTS ON THE SECONDARY OF THE POWER TRANSFORMER TO CONTROL LEAKAGE CURRENT TO GROUND	(4 - 10 sq.mm)
PIN4	ALTERNATING CURRENT SUPPLY (230Vac)	(4 - 10 sq.mm)

NOTE 1: Power supply and control circuit supply with the same phase
NOTE 2: Twist power cable

CN2	**CONTROL CIRCUIT SUPPLY TERMINAL BLOCK**	
PIN 1	400 Vac (0.1A absorption, max)	(1sq.mm)
PIN 2	230 Vac (0.1A absorption, max)	(1sq.mm)
PIN 3	0 Vac (0.1A absorption, max)	(1sq.mm)

NOTE 1: Power supply and control circuit supply with the same phase

CN3	**CONTROLS TERMINAL BLOCK**	
PIN1	COMMON 0 V PLC (24V DC)	(1 sq.mm)
PIN2	IN PRE-HEAT SIGNAL FROM PLC, 24V DC (0V DC) (12 mA absorption, max)	(1 sq.mm)
PIN3	IN SEALING SIGNAL FROM PLC, 24V DC (0V DC) (12 mA absorption, max)	(1 sq.mm)
PIN4	IN RESET SIGNAL FROM PLC, 24V DC (0V DC) (12 mA absorption, max)	(1 sq.mm)
PIN5	IN CALIBRATING SIGNAL FROM PLC, 24V DC (0V DC) (12 mA absorption, max)	(1 sq.mm)
PIN6	OUT SEALING FAULT (CONTACT N.C.) $\cos\Phi = 1$ 250V 8A	(1 sq.mm)
PIN7	OUT SEALING FAULT (CONTACT N.C.) $\cos\Phi = 0.4$ 250V 5A	(1 sq.mm)

CN4	DISPLAY PANEL CONNECTOR (15 PIN FEMALE)		
PIN1	+5Vcc	Screened	(0,25mmq)
PIN2	0 V	Screened	(0,25mmq)
PIN3	SPI-SDO	Screened	(0,25mmq)
PIN4	SPI-SCK	Screened	(0,25mmq)
PIN5	SPI-SDI	Screened	(0,25mmq)
PIN6			
PIN7			
PIN8			
PIN9	SPI-SS	Screened	(0,25mmq)
PIN10	RESERVED	Screened	(0,25mmq)
PIN11	RESERVED	Screened	(0,25mmq)
PIN12	RESERVED	Screened	(0,25mmq)
PIN13	RESERVED	Screened	(0,25mmq)
PIN14			
PIN15			

NOTE 1: The cable termoregulator-panel must be screened, pin to pin connected - Max Mt 15.

CN5	RS 485 SERIAL INTERFACE CONNECTOR (9 PIN FEMALE)		
PIN3	Channel B+	Screened	(0,25mmq)
PIN8	Channel A-	Screened	(0,25mmq)

NOTE 1: Twist the cables

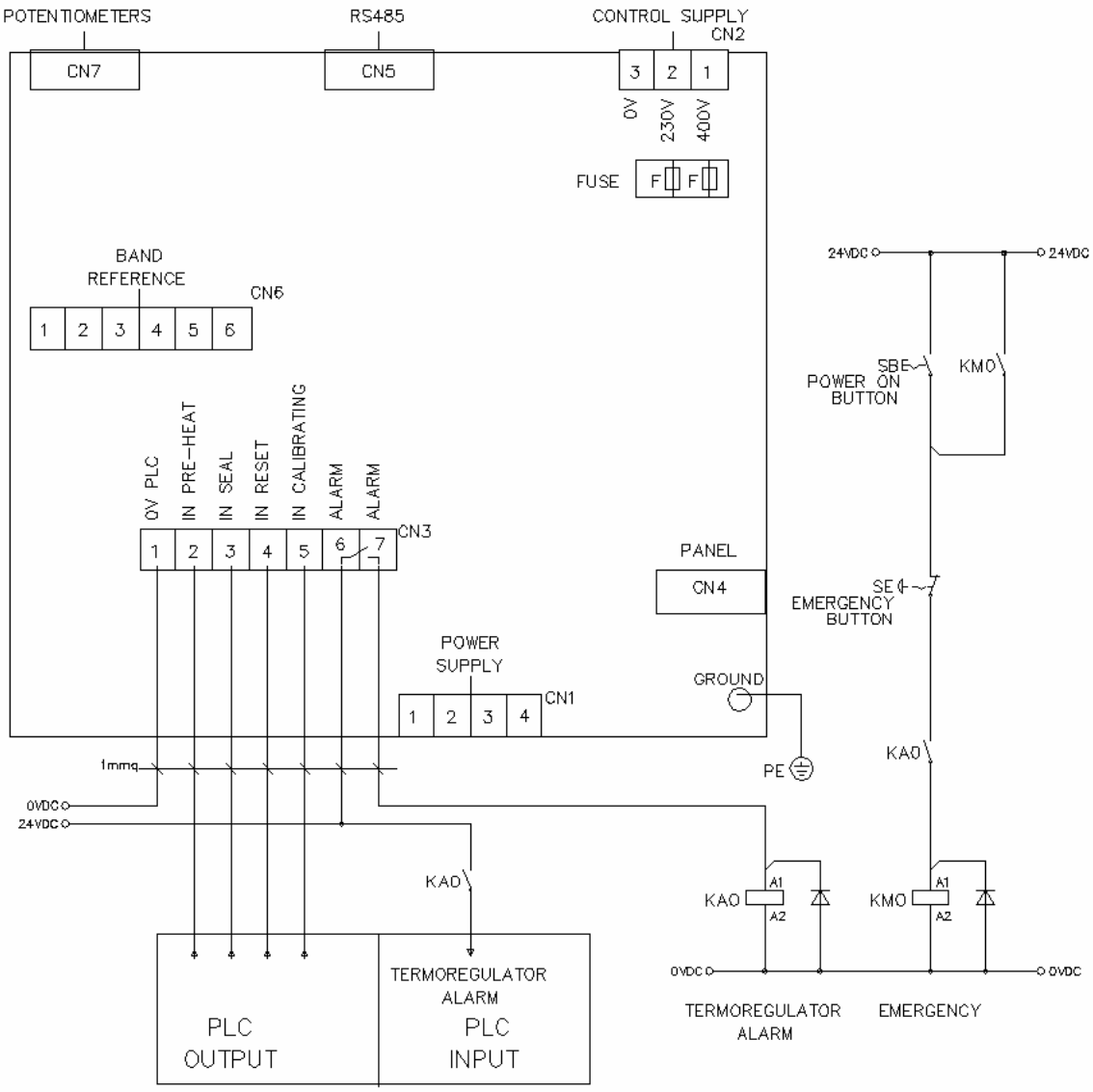
CN6	REFERENCE TERMINAL BLOCK	
PIN1	SEALING BAND REFERENCE REF-	(0,5mmq)
PIN2	SEALING BAND REFERENCE REF+	(0,5mmq)
PIN3	SCREEN REFERENCE CABLE REF 0 (Don't connect on machine side)	(1mmq)
PIN4	REFERENCE TA-	(0,5mmq)
PIN5	REFERENCE TA+	(0,5mmq)
PIN6	SCREEN TA CABLE TA0 (Don't connect on machine side)	(1mmq)

NOTE 1: Twist cables or better use cable TWINAX IBM (Ns. cod. 3esd0066)

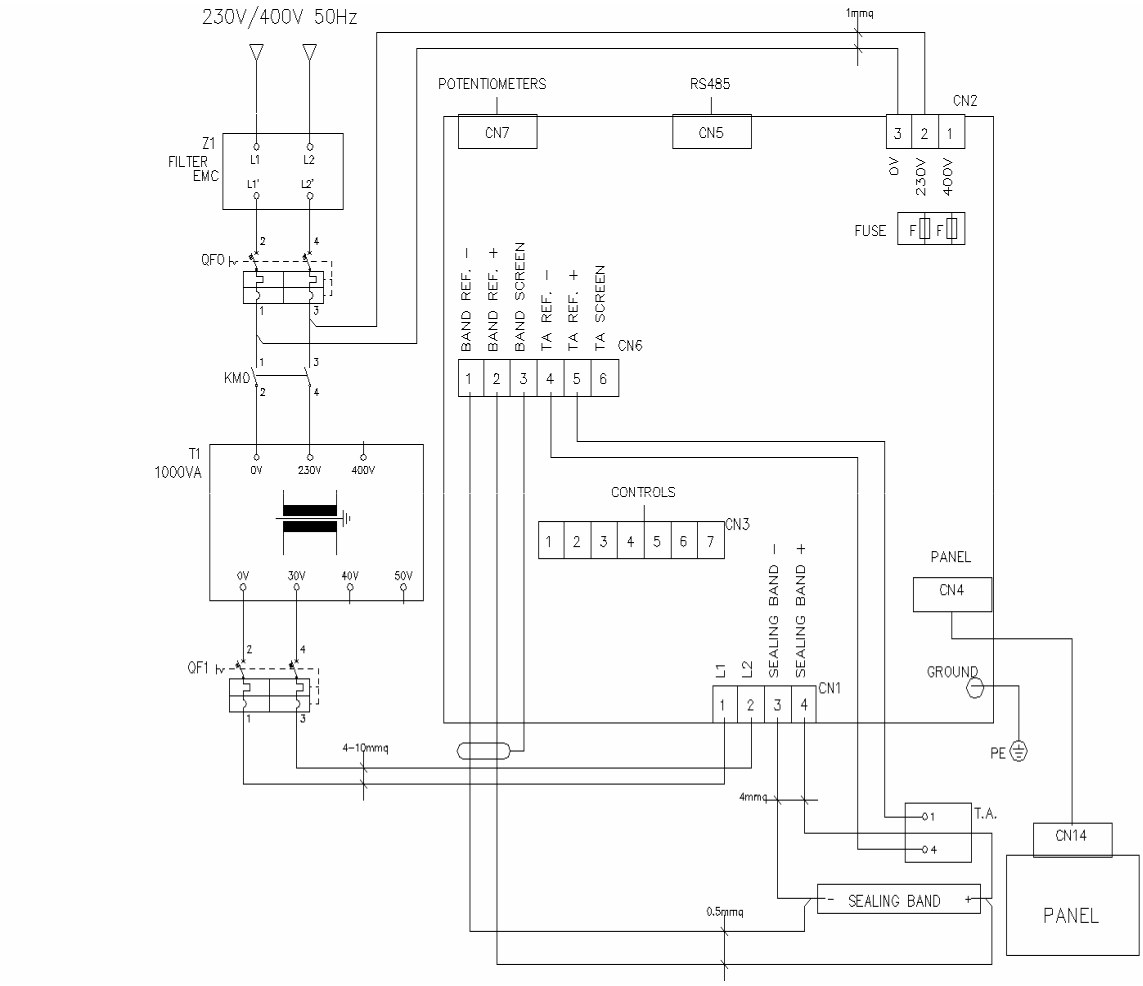
CN7	POTENTIOMETER CONNECTOR (9 PIN MALE)		
PIN1	PRE-HEAT POTENTIOMETER +4,58V	Screened	(0,25mmq)
PIN2	PRE-HEAT POTENTIOMETER RIF+	Screened	(0,25mmq)
PIN3	PRE-HEAT POTENTIOMETER 0V	Screened	(0,25mmq)
PIN4	Connect PIN3 to PIN4	Screened	(0,25mmq)
PIN5			
PIN6	SEAL POTENTIOMETER +4,58V	Screened	(0,25mmq)
PIN7	SEAL POTENTIOMETER RIF+	Screened	(0,25mmq)
PIN8	SEAL POTENTIOMETER 0V	Screened	(0,25mmq)
PIN9	Connect PIN 8 to PIN9	Screened	(0,25mmq)

NOTE 1: If conneted to PLC analog output use PIN2,PIN3,PIN7,PIN8 and leave free PIN4-PIN9
NOTE 2: Twist cables or better use cable TWINAX IBM (Ns. cod. 3esd0066)

2.2 ELECTRIC DRAW - DIGITAL CONNECTIONS

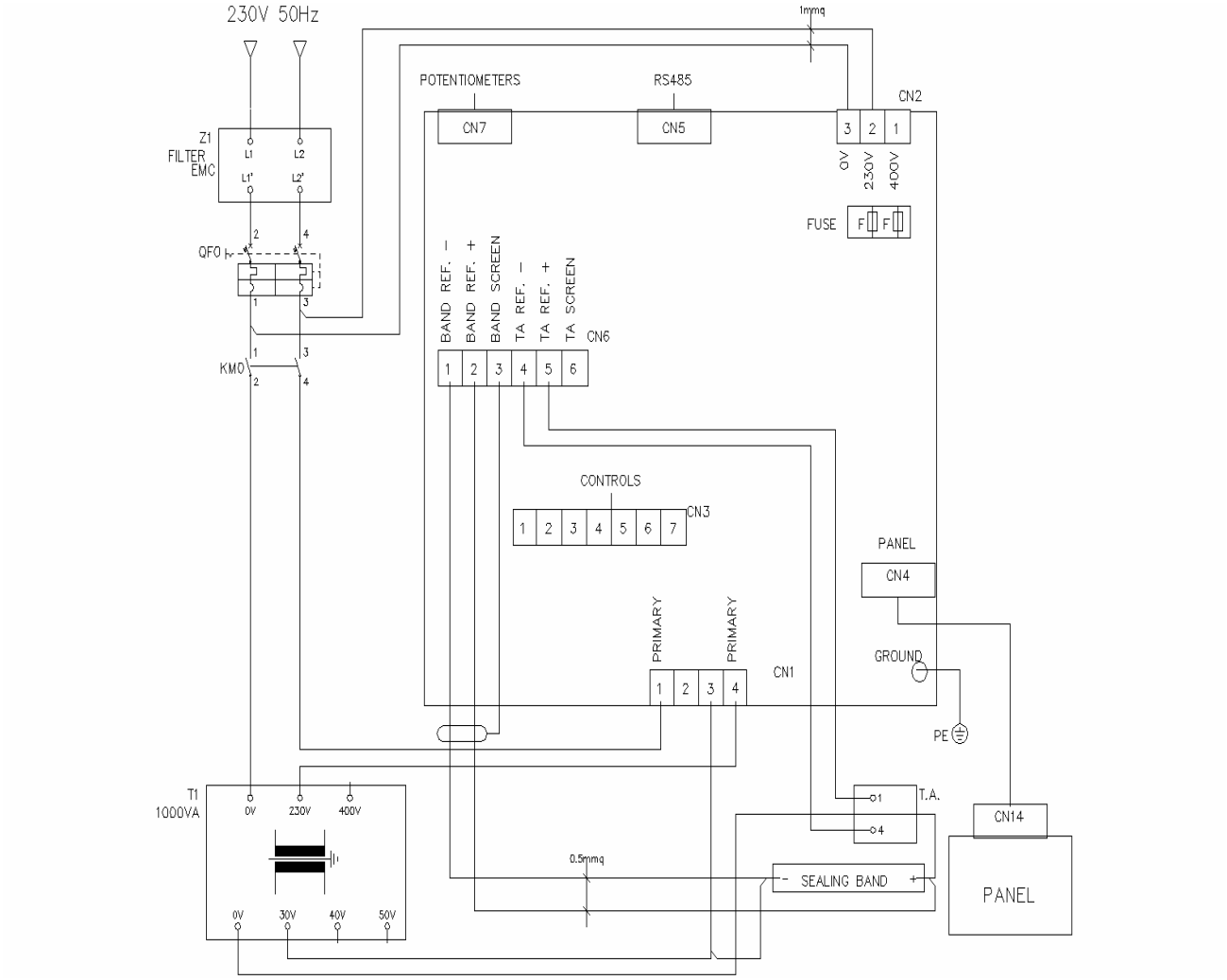


2.2 ELECTRIC DRAW – POWER CONNECTIONS (CONTROL OF THE SECONDARY)



NOTE -
Power supply (CN1/1 e CN1/2) must be with the same phase as control supply (CN2/3 e CN2/2).
Ground screw must be connected to the ground of machine, with the cable jellow green section > = power cable section.
Twist power cable, twist TA cable
Twist and screen sealing reference cable

2.2 ELECTRIC DRAW - POWER CONNECTIONS (CONTROL OF THE PRIMARY)



NOTE -
Power supply (CN1/1 e CN1/4) must be with the same phase as control supply (CN2/3 e CN2/2).
Ground screw must be connected to the ground of machine, with the cable jellow green section > = power cable section.
Twist power cable, twist TA cable
Twist and screen sealing reference cable

- **CHAMFERED SPECIAL ALLOY ELEMENTS RESISTANCES CHART**

Band width (mm)	Band thickness (mm)	Specific resistance R0 Ω / mt
1.5	0.3	1.67
2	0.25	1.59
3	0.1	2.95
3	0.15	1.95
3	0.2	1.50
3	0.25	1.27
4	0.15	1.40
4	0.25	0.96
5	0.2	0.8
5	0.25	0.69
6	0.1	1.6
6	0.2	0.72
8	0.1	1.2
8	0.2	0.51

- **T-SHAPE SPECIAL ALLOY ELEMENTS RESISTANCES CHART**

Band width (mm)	Band thickness (mm)	Specific resistance R0 Ω / mt
2.8	0.3	0.9
4	0.3	0.6

- **BEADED SPECIAL ALLOY ELEMENTS RESISTANCES CHART**

Band width (mm)	Band thickness (mm)	Specific resistance R0 Ω / mt
4	0.15	1.4
4	0.25	0.9
6	0.15	0.99
6	0.25	0.6

- **CONCAVE SPECIAL ALLOY ELEMENTS RESISTANCES CHART**

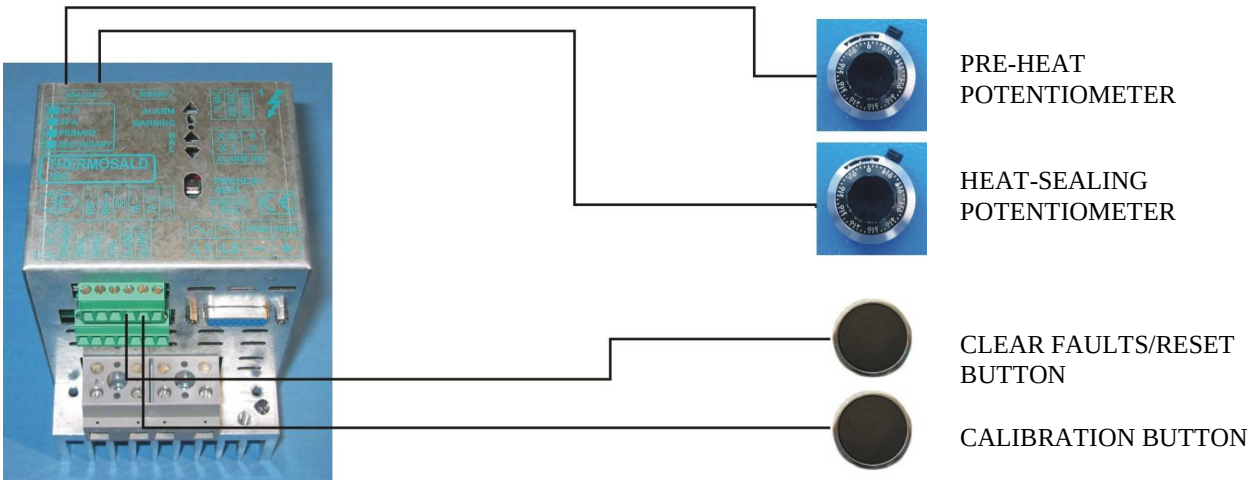
Band width (mm)	Band thickness (mm)	Specific resistance R0 Ω / mt
2.8	0.3	0.9

4 STURT UP

4.1 - STURT UP PROCEDURES – INSPECTING THE SYSTEM AND THE PARTS USED

Stage 1 – In order to properly set up the system, read the instructions given in paragraph 4.8 THEORETIC CALCULATIONS AND DIAGNOSTIC PROCEDURES and 4.9 SETUP PROCEDURES WITH THE AID OF THE MULTI-LINGUAL CONTROL PANEL
Stage 2 – Switch over to Low Voltage mode for power transformer outputs up to 10 Volt
Select Standard mode for power transformer outputs from 11 to 99 V.
Switch to High Voltage mode for power transformer outputs from 100 to 140 V.
Select Primary or Secondary mode for pulsed currents up to 100 Amps
Select Primary mode for pulsed currents from 100 A to 300 A.
Stage 3 – Make the system has been contructed in an workmanshiplike manner.
Stage 4 – For any further information, call 3E – ENGINEERING DEPARTMENT.

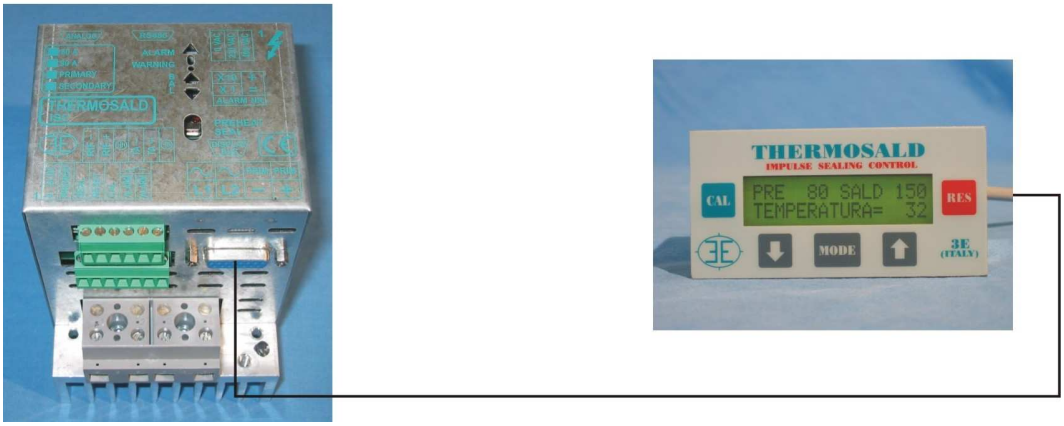
4.2 - PUTTING THE SYSTEM INTO SERVICE – BASIC SETUP (+RS485 OPTION)



Step 1 – Calibrate the system after performing the steps indicated in paragraph 4.1.
Step 2 – The machine should be at ambient temperature
Step 3 – The pre-heat and heat-sealing controls should be inactivated
Step 4 – Power up the temperature controller
Step 5 – In the event of faults (the Red ALARM Led lights up), follow the instructions given on the temperature regulator and put the faults right as required (the id. number of the fault can be found by multiplying the pulses emitted by the green Balance Led by 10 (e.g. 9 pulses= 90) + the pulses of the red Balance Led by the units (e.g. 10 pulses =0)
Step 6 – Calibrate the system. Keep the external CALIBRATION button pressed for 3 seconds and wait (the four LEDS on the system go on flashing as long as the the instrument is being calibrated).
Step 7 – The system is ready to start cycling as soon as the calibration procedure has been completed. Set the Heat-Sealing and Pre-Heat temperature by using the respective potentiometers (30 degrees/turn)

WARNING – If calibration problems arise, perform a MASTER RESET procedure starting from stage 5 (to perform the MASTER RESET procedure, keep the external RESET + CALIBRATION buttons pressed for 6 seconds; the 4 Leds on the equipment stay on for 3 seconds).

STURT UP THE SISTEM INTO SERVICE – BASIC SETUP – MULTI-LINGUAL CONTROL PANEL (+RS485 OPTION)



Step 1 – Carry out the calibration procedure after performing the steps indicated in paragraph 4.1.
Step 2 – Make sure the machine is at ambient temperature
Step 3 – The Pre-Heat and Heat-Sealing controls should be inactivated.
Step 4 – Power up the temperature controller
Step 5 – In the event of faults (the Red ALARM LED on the temperature controller comes on), follow the instructions given on the control panel and put the faults right as required (the number of the fault occured is displayed on the control panel along with the relevant description in one of the 6 languages provided).
Step 6 – Calibration: keep the CAL button on the multi-lingual control panel pressed for 3 seconds as indicated in the illustration below, Figure 3 (the four LEDS on the equipment go on flashing as long as calibration is being performed).
NOTE: For further calibration procedures, press buttons CAL+MODE+CAL on the multi-lingual panel in the order given . Also refer to the illustration below, Figures 1+2+3:

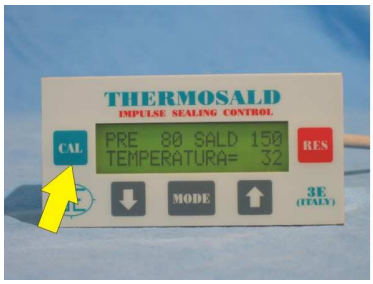


Figure 1

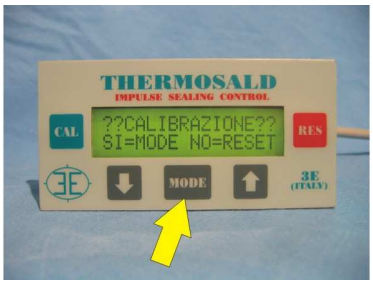


Figure 2

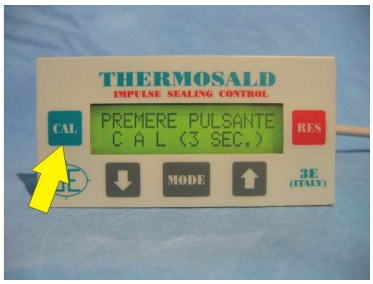


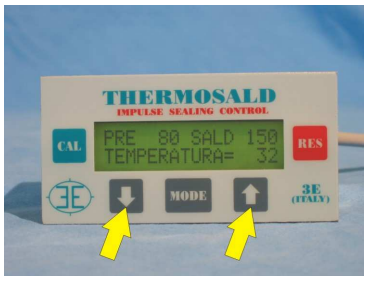
Figure 3

NOTE: Calibration can be carried out from the "outside" as described in paragraph 4.2 with the basic setup.

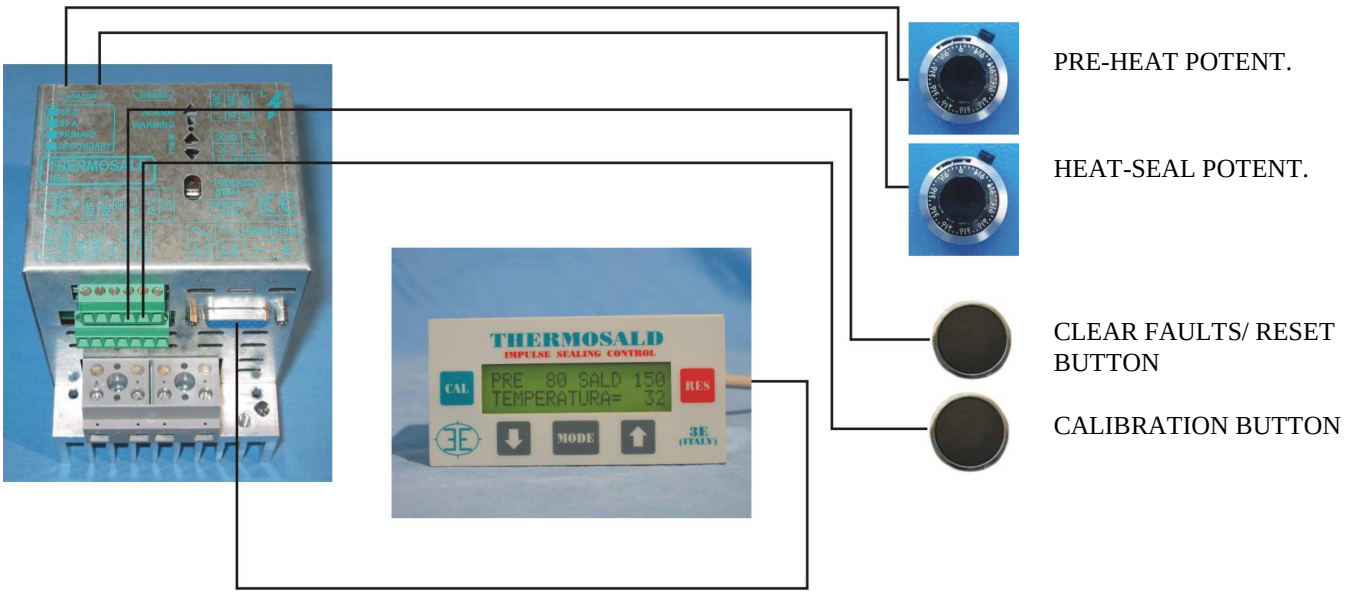
Step 7 – The system is ready to cycle once the calibration procedure has been carried out. Set the Pre-Heat and Heat-Sealing temperatures (press the MODE+MODE button in the sequence given to access the TEMPERATURE submenu - refer to paragraph 4.7).

Step 8 – To go back to the initial display, press the RES button and follow the instructions given.

NOTE – If calibration problems arise, perform a MASTER RESET procedure starting from stage 5.
To perform a MASTER RESET procedure, use either of the two modes below:
mode 1 – Keep the ARROW DOWN + ARROW UP buttons pressed for 6 seconds.
mode 2 - Keep the external RESET+CALIBRATION buttons pressed for 6 seconds.
The four LEDS on the equipment stay on for 3 seconds

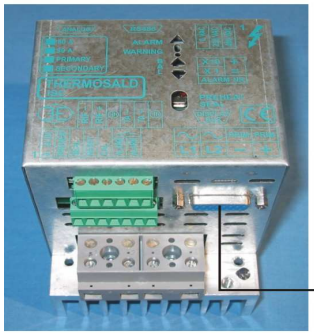


4.4 - PUTTING THE SYSTEM INTO SERVICE – BASIC SETUP + MULTI-LINGUAL PANEL + POTENTIOMETERS (+RS485 OPTION)



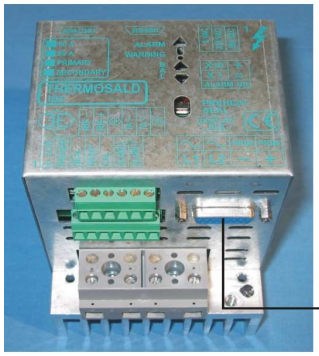
NOTE 1: Perform the same operations as those described in paragraph 4.3 above.
NOTE 2: To enable the potentiometers, change the MACHINE DATA items = 1, Potentiometers + display.
NOTE 3: Set the maximum pre-heat and heat-seal temperatures by using the control panel. To step them down, adjust the analog inputs (potentiometer setting: 30 degrees/turn; analog input settings: 13 mV/degree).

4.5 - BASIC SETUP + CAN BUS (PRELIMINARY STAGES)



CAN BUS

4.6 - BASIC SETUP + PROFIBUS (PRELIMINARY STAGES)

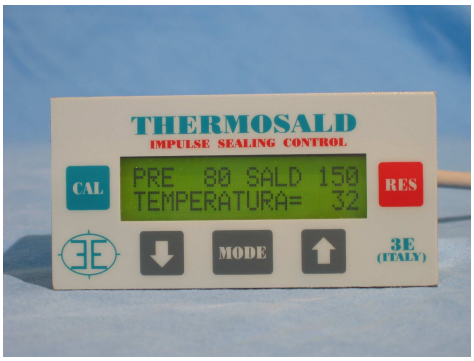


PROFIBUS

4.7 - OPERATING THE MULTI-LINGUAL CONTROL PANEL

NOTe: The user can go back to the initial display from any video pages by pressing the RES button several times.

INITIAL DISPLAY	LEVEL 1



NOTe: To scroll the sub-menus, press buttons MODE+ARROW DOWN or ARROW UP in the order given.

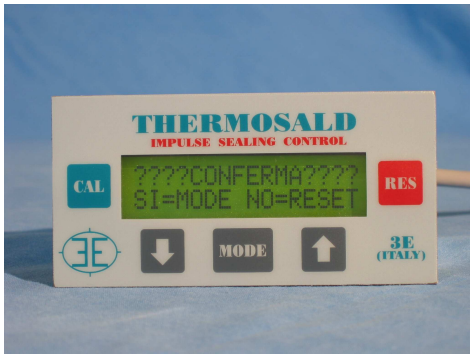
TEMPERATURE SUBMENU	LEVEL 2
DIAGNOSTIC SUBMENU	LEVEL 2
EMERGENCY TEST SUBMENU	LEVEL 2
BURN-IN SUBMENU	LEVEL 2
DATA SETTING SUBMENU	LEVEL 2
MACHINE DATA SUBMENU	LEVEL 2
INFORMATION SUBMENU	LEVEL 2

NOTE: Press buttons MODE+ARROW DOWN or ARROW UP to access any submenu or parameter.

NOTE: To alter any parameter displayed, proceed as follow:
Press the MODE button to switch over to modification mode: ? 080
Press the ARROW UP button to alter any data item: ? 081
Press the MODE button to quit the modification mode: = 081

NOTE: Before saving any changes made, the system prompts the user to confirm the entry:

????ENTER????
YES=MODE NO=RES
Select YES to confirm, NO to restore the earlier data



4.8 - THEORETICAL CALCULATIONS AND DIAGNOSTIC PROCEDURES WITH THE AID OF THE DATA INPUT PANEL

1) Access the DIAGNOSTIC – THEORETICAL CALCULATION submenu.
2) Enter the data that concern the shape of the strip: length, width, cross-section, number of strips in series, number of strips in parallel.
3) Enter the data and quit.

DIAGNOSTIC

1) Select the DIAGNOSTIC – ANALISYS submenu.
2) Scroll the diagnostic video-pages by using the ARROW UP – DOWN buttons. These pages contain the electrical specifications that concern the sealing strip: maximum effective currents, resistance, full-wave effective currents, full-wave effective power.
3) Each video page indicates 3 values that relate to the same variable under different conditions i.e.: THEORETICAL VALUES, CALIBRATION SETTINGS, REAL TIME VALUE, in particular:

PAGE 1: IMAX=
I0= I=

Where IMAX stands for the maximum pulsed effective currents of the temperature controller, I0 represents the full-wave effective current for calibration and I is the actual full-wave effective current

PAGE 2: R THEORETICAL =
R0= R=

Where R THEORETICAL stands for the theoretical resistance of the temperature controller, R0 is the calibration resistance and R represents the actual resistance.

PAGE 3: I THEORETICAL =
I0= I=

PAGE 4: V THEORETICAL =
V0= V=

PAGE 5: P THEORETICAL =
P0= P=

4) Particularlty useful information on the system conditions can be obtained by comparing the three variables so that any malfunctioning and diagnostic problems can be dealt with remotely.

4.9 - SETUP PROCEDURES WITH THE AID OF THE CONTROL PANEL

1) Enter the theoretical values (see paragraph 4.8 above)
2) Access the DIAGNOSTIC – ANALYSIS submenu (see paragraph 4.8 above)
3) Read the **effective pulsed voltage of the strip, THEORETICAL V**.
4) Set the transformer secondary voltage allowing for a multiplication coefficient of 1.5 – 2 for pulsed operation and a coefficient of 1.5 for continuous operation:
   transformer V = strip V x multiplication coefficient (1.5 - 2), select the nearest one.

4.10 - SETUP PROCEDURES WITHOUT USING THE CONTROL PANEL – MANUAL MODE

Calculating total resistance:
R strip=specific resistance[Ohm/m] x strip length[m]
Calculating the strip cross-section S:
Strip cross-section S[mm^2]=strip length[mm] x strip thickness[mm]
Calculating the theoretical pulsed heating currents I:
I heating=strip cross-section S[mm^2] x 30[Amp/ mm^2]
Calculating the effective pulsed voltage applied to the strip:
V strip=R strip x I heating
Calculating the transformer secondary voltage allowing for a multiplication coefficient of 1.5 – 2 to increase the sealing speed under pulsed operating conditions and coefficient 1 for continuous operation:
V transformer= V strip x multiplication coefficient (1.5 - 2)
(select the nearest one)

ANNEX D – FAULT AND WARNINGS LIST (CAUSES – REMEDIES)

NOTE - To reset every alarm give external reset command or press reset button RES on the panel

NOTE – when an alarm happens, on the thermoregulator the led red of alarm light; it's possible to know the number of alarm reading the multilanguage panel or reading the number of lightening of led red and green:
ALARM NUMBER = NR. IMPULSES OF LED GREEN x 10 + NR.IMPULSES LED RED

WARNING - ALARM CAUSES
Remedies

ALARM A TERMOREGULATOR OFF AND DISPLAY OFF
Verify power, Logic supply fault, call the supplying builder.

ALARM B TERMOREGULATOR WITH LED OFF AND DISPLAY ON
Circuit of synchronisme fault, call the supplying builder.

ALARM C TERMOREGULATOR WITH LED ON AND DISPLAY ON AND INDICATION "3E SRL + THERMOSALD"
Verify cable connection display

F06 DISPLAY EEPROM FLASH WRITE
Switch off and switch on the equipment and call the supplier

F07 A/D CONVERTER
Switch off and switch on the equipment and call the supplier

F08 INTERNAL TRASMISSION I2C-X
Switch off and switch on the equipment

F09 INTERNAL TRASMISSION I2C-EEPR
Switch off and switch on the equipment and verify parameters

F19 RS485 MASTER - CHECKSUM ERROR
Verify checksum selection on the Master or Slave

F20 RS485 SLAVE - CHECKSUM ERROR
Verify checksum selection on the Master or Slave

F21 RS485 SLAVE - OE ERROR-OVERRUN
Following data arrived before reading the previous

F22 RS485 SLAVE - FE ERROR-FRAME ERROR
Data stop bit not arrived

F23 RS485 MASTER – NO ANSWER FROM SLAVE
After a Master calling no answer received from the slave

F24 RS485 SLAVE – TOO DATA REQUESTED FROM MASTER OR WRONG ADDRESS
Master ha s requested to the slave too many data or a wrong address

F25 RS485 SLAVE – BUFFER FULL
Slave Buffer is full because of too many data trasmitted or too frequently trasmitted

F26 RS485 MASTER - OE ERROR-OVERRUN
Following data arrived before reading the previous

F27 RS485 MASTER - FE ERROR-FRAME ERROR
Data stop bit not arrived

F28 RS485 MASTER - TOO DATA REQUESTED FROM SLAVE OR WRONG ADDRESS
Slave ha s requested to the master too many data or a wrong address

F29 RS485 MASTER - BUFFER FULL
Master Buffer is full because of too many data trasmitted from the slave

F33 NO VOLTAGE ON POWER TRASFORMER
Verify power on CN1/L1,L2, verify power trasformer circuit

F34 DON'T USE

F35 CALIBRATION REQUEST

Used in distance control RS485

F36 **CALIBRATING IN PROGRESS**
Used in distance control RS485 to know when calibrating end.

F38 **THE MACHINE IS WAITING A COOLING DOWN DURING A CALIBRATION PROCEDURE**
Wait please

F46 **NO CURRENT SIGNAL**
Verify sealing band connection,TA connection

F47 **TA SIGNAL WRONG TURNED**
TurnTA connection

F48 **PRE-HEATING POTENZIOMETER NO CONNECTED OR CABLES BROKEN**
Verify pre-heating potenziometer connections and cables

F49 **SEALING POTENZIOMETER NO CONNECTED OR CABLES BROKEN**
Verify sealing potenziometer connections and cables

F51 **WIPER-I**
Switch off and switch on the thermoregulator; if problem persist call the supplying

F52 **WIPER-V**
Switch off and switch on the thermoregulator; if problem persist call the supplying

F53 **WIPER-VGROSS**
Switch off and switch on the thermoregulator; if problem persist call the supplying

F54 **WIPER-VFINE**
Switch off and switch on the thermoregulator; if problem persist call the supplying

F60 **RESET WITH CALIBRATING IN PROCESS**
Repeat the calibrating

F61 **BALANCE UNSUCCESSFULL**
Repeat the calibrating

F62 **BALANCE V UNSUCCESSFULL**
Repeat the calibrating

F63 **BALANCE VGROSS UNSUCCESSFULL**
Repeat the calibrating

F64 **BALANCE VFINE UNSUCCESSFULL**
Repeat the calibrating

F65 **BALANCE UNSUCCESSFULL**
Repeat the calibrating

F66 **MAIN PHASE SYNCHRONISM**
Reset the thermoregulator if problem persist call the supplying

F69 **CURRENT TO GROUND**
Verify sealing bands in the machine touch ground.

F71 **FAULT HARDWARE –15V INTERNAL**
Reset the thermoregulator; if problem persist call the supplying

F72 **FAULT HARDWARE +15V INTERNAL**
Reset the thermoregulator; if problem persist call the supplying

F73 **FAULT HARDWARE +5V INTERNAL REFERENCE**
Reset the thermoregulator; if problem persist call the supplying

F76 **IREAD TOO HIGH**
Verify if short circuit on the seals

F78 **THERMOREGULATOR NOT CALIBRATED**
Do a calibrating

F79 **FAULT OF EMERGENCY CIRCUIT**
Verify contactor power, verify emergency chain

F081 **FAULT HARDWARE - CHECK-SUM**
Data in the eeprom wrong, pay much attention please
Press button RES, verify TEMPERATURE, SETTING, MACHINE, DATA;
call the builder

F082 **LOGIC SUPPLY (CN2) AND POWER SUPPLY (CN1) HAVE DIFFERENT PHASES**
Verify that the supplies have the same fase

F083 **REFERENCE CABLE WRONG TURNED**
Turn reference cable: (CN1/3 WITH CN6/1 - CN1/4 WITH CN6/2)

F085 **SEALING TIME HIGHER THEN MACHINE DATA "SEALING TIME"**
Increase machine data sealing time (If 0 the controll is off).

F089 **BAND BROKEN IF THE BANDS ARE PARALLEL CONNECTED**
Verify the bands.

F090 **SHORT CIRCUIT BETWEEN THE BANDS OR BETWEEN A BAND AND GROUND IN THE CASE OF HIGH CURRENT**
Verify bands, verify power connection between thermoregulator and bands

F092 **POWER PART FAILURE**
Reset the thermoregulator; if problem persist call the supplying

F093 **BAND BROKEN DURING A SEAL**
Verify power on the transformer, Verify voltage on CN/1 CN/2 connector, verify breaking of power cables, verify breaking of bands.

F094 **REFERENCE SIGNAL CABLE FROM BANDS IS INTERRUPTED**
Verify the connection of reference signal cable from band (CN6/1 - CN6/2)

F095 **MAIN SUPPLY SYNCRONISM DOES NOT MUCH MACHINE REQUIREMENTS**
Internal hardware problem, call the supplying builder

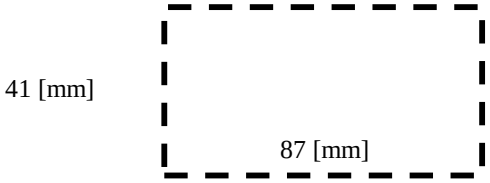
F096 **FAULT V-I TOO HIGH**
Saturation of the voltage circuit, verify connection, probable break of one seal, if seals in parallel.

F097 **PARTIAL SHORT CIRCUIT BETWEEN THE BANDS**
Verify bands into machine probably not perfectly isolated.
If the problem persist repeat burn-in procedure or do calibrating.
To reduce the problems increase machine data partial short circuit

F099 **FAULT GENERIC**
call the builder

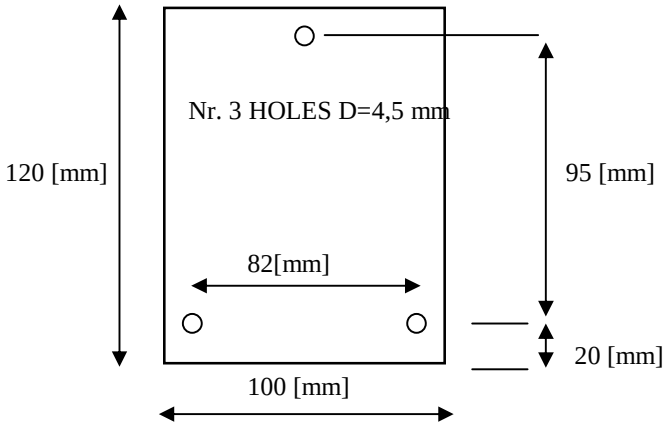
ANNEX E – MECHANICAL DIMENSIONS

PANEL BORING (DIGITAL PANEL 96x48 – BACK DIMENSION 86x40.5)



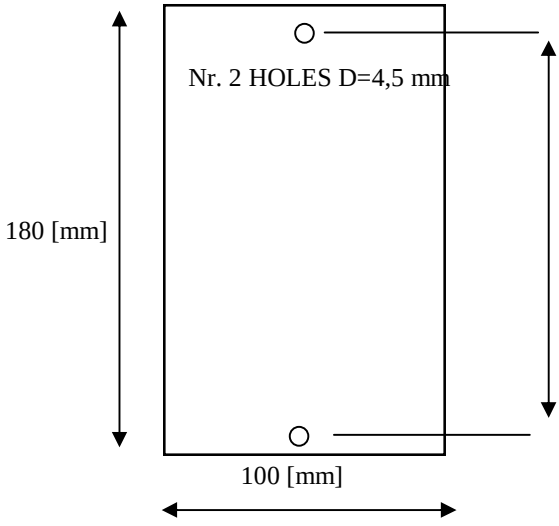
H=55+CONNECTION [mm]

TOP VIEW TERMOREGULATOR 60 AMPERE + 90 AMPERE
AND HOLES FOR PANEL MOUNTING



H=145 [mm]

TOP VIEW TERMOREGULATOR 90 AMPERE (OBSOLETE)
AND HOLES FOR PANEL MOUNTING



H=145 [mm]