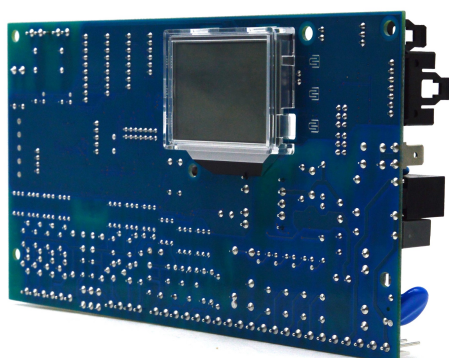
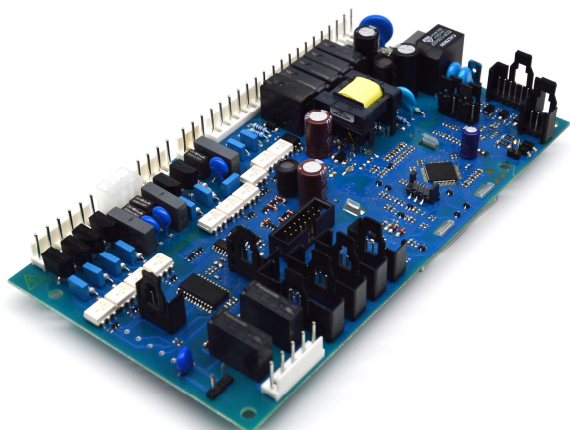


ELECTRIKA 1960

DIGITAL ELECTRONIC CONTROL BOARD FOR ELECTRIC COOKING AND ELECTRIC HEATING SYSTEMS



DESCRIPTION

The Electrika 1960 board was designed to be used in a wide range of equipment that uses electricity as energy source to produce heat.

For example, in high-power cooking systems, the high number of electrical resistances that can drive via Triacs, makes it the ideal choice for managing excellent heat modulation.

In heating systems, the various relay outputs allow you to manage the activation of many actuators with a single control unit as required in modern hybrid systems equipped with a heat pump, solar thermal and photovoltaic. As for the inputs, the NTC, PT100, PT1000 probes, flow sensors, pressure sensors, hall sensors, 0-10V signals are just some of the inputs that the board can process.

The Electrika board also can interact with external devices, through its two RS485 buses, OpenTherm slave bus or I²C communication.

As HMI you can choose between various LCD displays that can be connected via a flat cable to the appropriate connector or the on-board LCD display and related silicone rubber keys, or the BTtouch smart display with CapSense technology and customizable dot matrix screen.

The panoramic of devices that the board can control is completed by a bipolar 24VDC stepper motor and an asynchronous fan with phase cut modulation complete with snubber.

TECHNICAL FEATURES

- Compliant to 2014/35/EU LVD and 2014/30/EU EMC directives.
- Working temperature: $-20 \div +60$ °C.
- Weight max: 250g.
- Board dimensions: 200 x 105 x 35^(*) mm.
(*) maximum height depends on the mounted components

POWER SUPPLY

- Input voltage: 230V_{AC}; Range: $-15\% \div +10\%$; Frequency: 50/60 Hz.
- Power supplier with high efficient Switching AC/DC 230V_{AC}/24V_{DC}; Output power: 12,5W; Output current 0,5A;
- Insulation and voltage class: SELV reinforced insulation 4KV.
- Protection fuse: 3,15A
- Power supplier DC/DC 24V_{DC}/5V_{DC} Switching; Output current 1A.

TYPE OF BOARD CONNECTOR

- High voltage 230V_{AC}: type Conexcon series 5084 o Molex series 2599.
- Low voltage 24V_{DC}, 5V_{DC}: type Lumberg series MSF.
- Screw terminal block for thermostats and switchers.
- Three-phase input: type Molex series Mini-Fit 5566, 2x3 poles.
- Programming connector: type Lumberg series MICS/PICOFLEX smd 6 poles
- Connector for stepper motor: type JST 5 poles PA-F series

INPUTS

The electronic board allows high flexibility to read the inputs, managing up to 14 inputs which can be configured as analog or digital. Below a list of manageable devices:

Analog inputs:

- NTC probes
- PTC probes
- PT1000 probes
- PT100 probes
- 0÷10V signals
- Pressure transducers and flow rate transducers
- 4 Jumpers to select the board configurations

Digital input:

- Digital flow rate transducer
- Safety thermostat (high voltage 230V_{AC})
- Switchers
- Hall sensors

OUTPUTS

Output loads:

- 1 relay SPST (Single Pole Single Throw) 230V_{AC} filtered
- 1 relay SPDT (Single Pole Double Throw) 230V_{AC} filtered
- 5 relays dry contact (Single Pole Single Throw)
- 4 outputs PWM +5V_{DC}
- Stepper motor +24V_{DC}, bipolar half bridge

Outputs heating elements for TRIACS:

The outputs with triacs command can be distributed on a three-phase line (R, S, T, N) or on a single-phase line (L, N), for example:

- 10 outputs triac (single-phase)
Or
- 4 outputs phase R (three-phase)
- 3 outputs phase S (three-phase)
- 3 outputs phase T (three-phase)

INTERFACE COMMUNICATIONS

- OpenTherm communication compatible for connection with chronothermostat
- 2 serial communications which can be configured as UART (to connect the BTtouch interface or to connect a PC through a dedicated cable) or RS-485 (to connection a bus)
- External display BRAHMA LCD
- Display BRAHMA on-board and 6 silicon keys

INSTALLATION DIRECTIONS

- The applicable national and European standards (ex. EN60335-1, EN60335-2-102) related to the electrical safety must be respected.
- Before starting the system check the wiring carefully. Wrong connections can damage the controllers and compromise the plant safety.
- Avoid putting control signals cables close to power cables.
- Avoid exposure to dripping water.

- The system can be mounted in any position.

BOARD CONNECTIONS

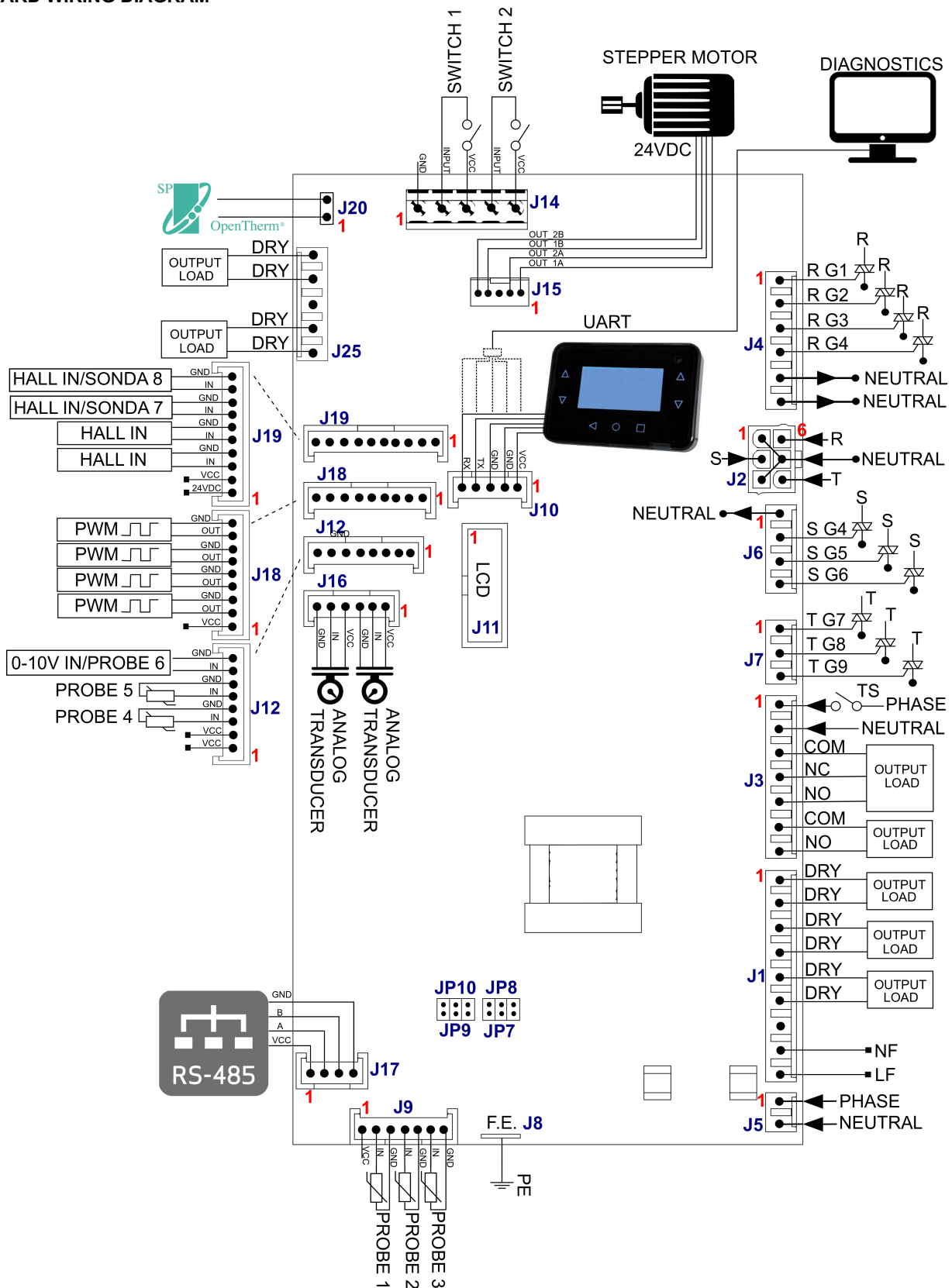
Abbreviations legend

Abbr.	Abbreviation meaning
PHASE	Phase 230 V _{AC}
NEUTRAL	Neutral 230 V _{AC}
PE	Safety ground point present on the application
F.E.	Functional earth derived from the safety earth point of the application
DRY	Output dry contact
R G n°	Phase R command gate triac n°
S G n°	Phase S command gate triac n°
T G n°	Phase T command gate triac n°
R	Phase R power supply
S	Phase S power supply
T	Phase T power supply
UART	Universal Asynchronous Receiver Transmitter communication
LF	Output 230V _{AC} phase filtered
NF	Output 230V _{AC} neutral filtered
NC	Output 230V _{AC} , relay (SPDT) normal closed
NO	Output 230V _{AC} , relay (SPST o SPDT) normal open
COM	Common terminal 230V _{AC} , relay control (SPST o SPDT)
GND	Common low voltage
VCC	Power supply +5V _{DC}
24 _{DC}	Power supply +24V _{DC}

Legend devices

Device	Device meaning
TS	Safety thermostat external (oven, boiler)
SWITCH	Switcher or thermostat ON/OFF
PROBE	Temperature probe (type NTC, PTC, PT100, PT1000)
ANALOG TRANSDUCER	Transducer with analogic output (water pressure switches, flow transducers)
0-10V IN	Reading input 0÷10V signal generated by an external device (typically PLC)
HALL IN	Reading input of a variable frequency signal (typically generated by a hall sensor)
PWM	Pulse Width Modulation output (to drive pumps and fans by PWM)
OUTPUT LOAD	Output 230V _{AC} generic (valves, motors, circulators)
DIAGNOSTICS	Diagnostic terminal (PC, Notebook)
STEPPER MOTOR	Stepper motor 24V _{DC}

BOARD WIRING DIAGRAM



Note: The scheme proposes only a possible inputs and outputs realization, in particular the Triacs mounted externally are shown. In the case of single-phase equipments, it is necessary to lead the only phase **F** to input pins 2, 4 and 6 of the J2 connector.

HIGH VOLTAGE CONNECTIONS 230V_{AC}

J4 – Connector polarized Conexcon-5084, 6 poles

Function	Pin	Maximum load
Output command gate TRIAC R1	1 (*1) (*2)	These outputs must be used exclusively to drive the gate command (G) of external triacs (example STM type BTA40-xxxxxx)
Output command gate TRIAC R2	2 (*2)	
Output command gate TRIAC R3	3 (*2)	
Output command gate TRIAC R4	4 (*2)	
Output Neutral power supply Triacs command	5	
Output Neutral power supply Triacs command	6	

Note:

(*1) Alternatively, a Triac can be mounted on the board, complete with a snubber circuit, capable of driving a maximum power load of 350W, with phase cut modulation to control asynchronous electric motors (only Pin 1).

(*2) Alternatively, it is possible to mount on a Triac board capable of driving loads of maximum power 75W.

J2 – Connector Mini-Fit, 6 poles

Function	Pin	Maximum load
Input Neutral three phase (Alternatively Neutral single phase)	1	/
Input phase S (Alternatively Line single phase)	2	
Input Neutral three phase (Alternatively Neutral single phase)	3	
Input phase T (Alternatively Line single phase)	4	
Input Neutral three phase (Alternatively Neutral single phase)	5	
Input phase R (Alternatively Line single phase)	6	

J6 – Connector polarized Conexcon-5084, 4 poles

Function	Pin	Maximum load
Output Neutral power supply Triacs command	1	These outputs must be used exclusively to drive the gate command (G) of external triacs (example STM type BTA40-xxxxxx)
Output command gate TRIAC S1 (*2)	2	
Output command gate TRIAC S2 (*2)	3	
Output command gate TRIAC S3 (*2)	4	

Note:

(*2) Alternatively, it is possible to mount on a Triac board capable of driving loads of maximum power 75W.

J7 – Connector polarized Conexcon-5084, 3 poles

Function	Pin	Maximum load
Output command gate TRIAC T1	1	These outputs must be used exclusively to drive the gate command (G) of external triacs (example STM type BTA40-xxxxxx)
Output command gate TRIAC T2	2	
Output command gate TRIAC T3	3	

J3 – Connector polarized Conexcon-5084, 7 poles

Function	Pin	Maximum load
Input optoisolated 230V _{AC} (safety thermostat or sync phase cut)	1	/
	2	
Output Neutral filtered load	3	0,5 A, cos φ > 0,4 (*3)
Output command relay 230V _{AC} SPDT (N.C.)	4	
Output command relay 230V _{AC} SPDT (N.O.)	5	
Output Neutral filtered load	6	0,5 A, cos φ > 0,4 (*3)
Output command relay 230V _{AC} SPST (N.O.)	7	

J1 – Connector polarized Conexcon-5084, 9 poles		
Function	Pin	Maximum load
Output command relay dry contact 230V _{AC} SPST (N.O.)	1	0,5 A, cos φ > 0,4
	2	
Output command relay dry contact 230V _{AC} SPST (N.O.)	3	0,5 A, cos φ > 0,4
	4	
Output command relay dry contact 230V _{AC} SPST (N.O.)	5	0,5 A, cos φ > 0,4
	6	
Not used	7	/
Output Neutral filtered 230V _{AC}	8	(*3)
Output Neutral filtered 230V _{AC}	9	

Note:

(*3) Line and Neutral outputs filtered by a mains filter mounted on the board. The sum of the currents taken from connectors J3 (pin3-4-5), J3 (pin 6-7) and J1 (pin 8-9) must not exceed 1A cos φ > 0.4 due to the limitation dictated by the traces and by the mains filter mounted on board.

J5 – Connector polarized Conexcon-5084, 2 poles		
Function	Pin	Maximum load
Input Phase 230 V _{AC} board power supply	1	/
Input Neutral 230 V _{AC} board power supply	2	

J8 – Connector fast-on a 1 pole		
Function	Pin	Maximum load
Functional earth connection	1	/

J25– Connector polarized Conexcon-5084, 5 poles		
Function	Pin	Maximum load
Output command relay dry contact 230V _{AC} SPST (N.O.)	1	0,5 A, cos φ > 0,4
	2	
Not used	3	/
Output command relay dry contact 230V _{AC} SPST (N.O.)	4	0,5 A, cos φ > 0,4
	5	

LOW VOLTAGE CONNECTIONS +24V_{DC}, +5V_{DC}

J9 – Connector LUMBERG MSF 9 poles (temperature probes)		
Function	Pin	Typology
+5V _{DC}	1	Power supply
Temperature probe	2	Analog input
GND	3	Reference
Temperature probe	4	Analog input
GND	5	Reference
Temperature probe	6	Analog input
GND	7	Reference

J17 – Connector LUMBERG MSF 4 poles (connection RS-485)		
Function	Pin	Typology
+5V	1	Power supply
RS485 line A	2	Communication
RS485 line B	3	Communication
GND	4	Reference

JP7 – JP8 – JP9 – JP10 - Jumper 2 positions (rapid selection for system options)		
Function	Pin	Typology
Jumper 1 (JP7)	1-2-3	Input
Jumper 2 (JP6)	1-2-3	Input
Jumper 3 (JP9)	1-2-3	Input
Jumper 4 (JP10)	1-2-3	Input

J13 – Connector MICS/ Picoflex 6 poles (microcontroller programming)		
Function	Pin	Typology
Programming MCU	1-6	I/O

J16 – Connector LUMBERG MSF 6 poles (analog sensor)		
Function	Pin	Typology
+5V	1	Power supply
Signal transducer	2	Analog input
GND	3	Reference
+5V	4	Power supply
Signal transducer	5	Analog input
GND	6	Reference

J12 – Connector LUMBERG MSF 8 poles (probes analog inputs)		
Function	Pin	Typology
+5V	1	Power supply
+5V	2	Power supply
Temperature probe PT1000	3	Analogue input
GND	4	Reference
Temperature probe	5	Analogue input
GND	6	Reference
Analog signal 0 ÷ 10V	7	Analogue input
GND	8	Reference

J18 – Connector LUMBERG MSF 9 poles (comandi PWM)		
Function	Pin	Typology
+5V	1	Power supply
PWM command	2	Output PWM +5V _{DC}
GND	3	Reference
PWM command	4	Output PWM +5V _{DC}
GND	5	Reference
PWM command	6	Output PWM +5V _{DC}
GND	7	Reference
PWM command	8	Output PWM +5V _{DC}
GND	9	Reference

J19 – Connector LUMBERG MSF 10 poles (digital and analog inputs)		
Function	Pin	Typology
+24V	1	Power supply
+5V	2	Power supply
Hall signal input	3	Digital input
GND	4	Reference
Hall signal input	5	Digital input
GND	6	Reference
Analog input	7	Digital input
GND	8	Reference
Analog input	9	Digital input
GND	10	Reference

J14 – Connector 5 poles (thermostat input)		
Function	Pin	Typology
GND	1	Reference
Input room thermostat	2	Digital input
+5V _{DC}	3	Power supply
Input room thermostat	4	Digital input
+5V _{DC}	5	Power supply

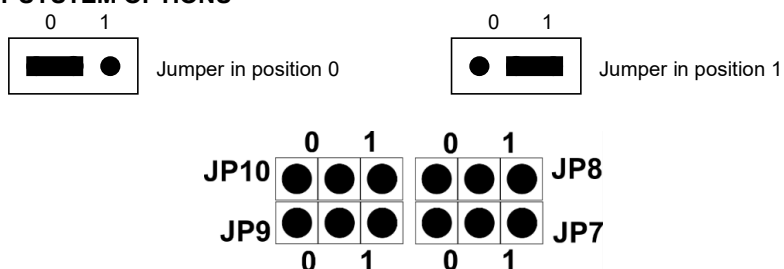
J20 – Connector 2 poles extractable (communication OpenTherm)		
Function	Pin	Typology
OpenTherm signal	1	Input/output OpenTherm
GND	2	Reference

J10 – Connector LUMBERG MSF 5 poles (communication UART / display graphic BTouch Brahma / RS-485 communication)		
Function	Pin	Typology
+5V	1	Power supply
GND	2	Reference
GND	3	Reference
TX UART (or RS485 line A)	4	Transmission
RX UART (or RS485 line B)	5	Receiving

J11 – Connector 7x2 poles (display LCD4 BRAHMA optional)		
Function	Pin	Typology
Communication	1-14	I2C interface with display

J15 – Connector JST 5 poles PA-F series (stepper motor +24V_{DC})		
Function	Pin	Load
Output signal 1A +24V	1	300 mA
Output signal 2A +24V	2	
No connected	3	
Output signal 1B +24V	4	
Output signal 2B +24V	5	

JUMPERS TO SELECT SYSTEM OPTIONS



Warning: Move jumpers with the board not powered

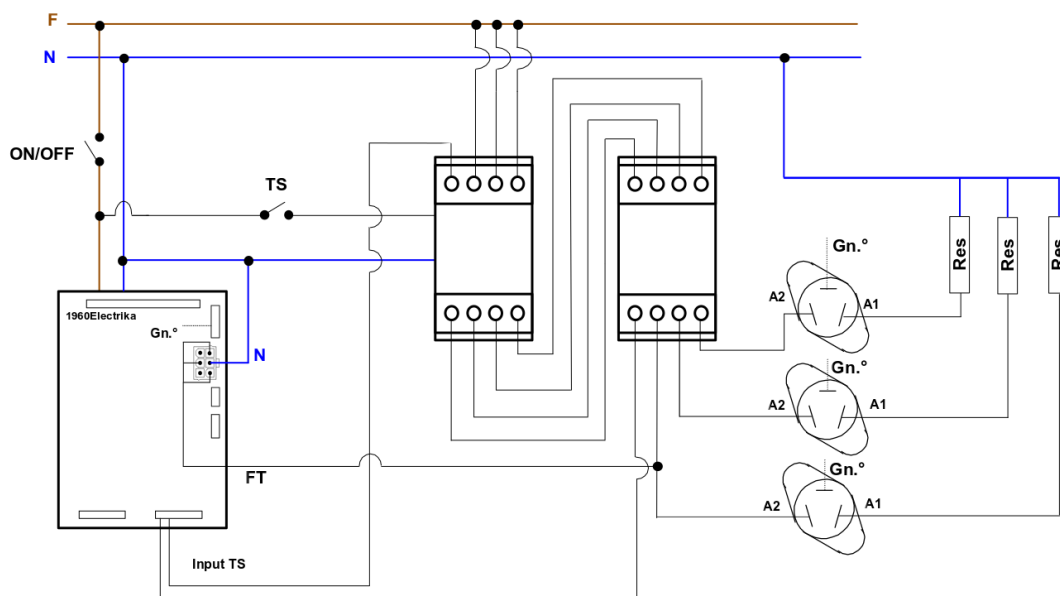
SYSTEM WIRING DIAGRAMS

Legend

Abbreviation	Meaning Abbreviation
F	Phase 230 V _{AC}
N	Neutral 230 V _{AC}
PE	Safety ground point present on the application
F.E.	Functional earth derived from the safety earth point of the application
R	Phase R (three-phase)
S	Phase S (three-phase)
T	Phase T (three-phase)
TS	Safety thermostat
FT	Phase sectioned by device control
ON/OFF	Main switch on the boiler (also cuts-off power supply of the board)
Res	Resistive element
A1	Anode contact 1 triac
A2	Anode contact 2 triac
Gn.°	Gate triac n°

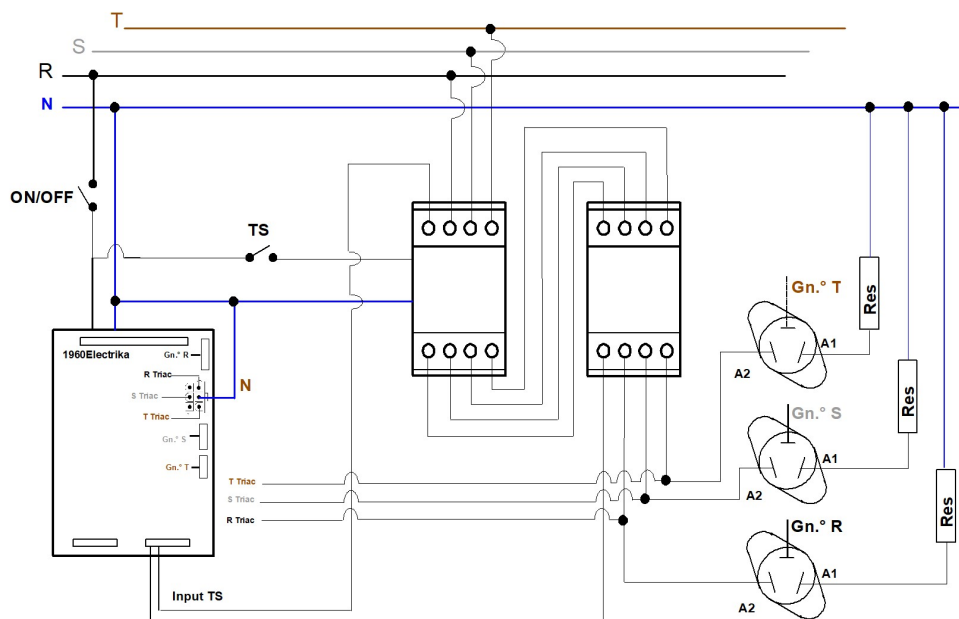
SINGLE-PHASE

Example of board connection to the single-phase electrical power and external power Triacs. The board can drive up to 10 external Triacs or 6 on-board Triacs. The proposed scheme illustrates a possible realization that uses two contactors for safety element. In case of overtemperature, the intervention of the TS causes the opening of the power supply circuit of all the Triacs.



THREE-PHASE

Example of board connection to the three-phase electric power, with distribution of the three-phase lines T, S, R allowing an excellent balance of loads on the lines.



MANAGEMENT OF HEATING POWER RESISTIVE ELEMENTS

DISTRIBUTION OF HEATING ELEMENTS

Legend

Phase T	Phase S	Phase R
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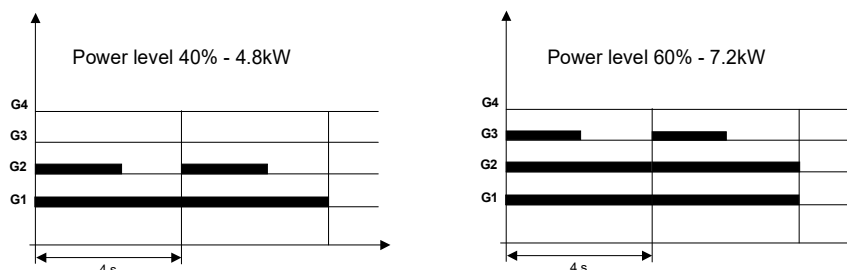
Configuration	Tot. Triac Number	Total KW	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
			T_1 KW	S_1 KW	R_1 KW	T_2 KW	S_2 KW	R_2 KW	T_3 KW	S_3 KW	R_3 KW	R_4 KW
Config. 1	3 Triacs	6	2	2	2							
Config. 2	6 Triacs	12	2	2	2	2	2	2				
Config. 3	9 Triacs	18	2	2	2	2	2	2	2	2	2	
Config. 4	10 Triacs	30	3	3	3	3	3	3	3	3	3	3

The proposed table only illustrates the possible balanced power distributions on the various Triacs in the case of a three-phase power supply.

POWER MODULATION

The commands G1 a Gn n max = 9 (n max = 10 if boiler double exchanger), are activated depending on level of power request. The activation of every command is partialised in an interval of 4 seconds. More power is requested more the command is activated in this interval. The power in heating state or sanitary state is calculated by PID algorithm.

Following two examples for powers equal to 40% and 60% of total power 12Kw and 4 commands G1, G2 G3 and G4.

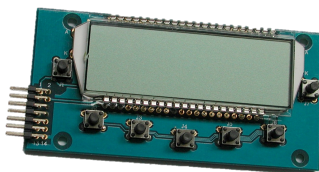


COMMANDS ROTATION AND PROGRESSIVE LOADS ATTIVATION

The switch-on order of the Triacs G1 - Gn-1 commands is rotated every hour in order to uniformly distribute the use of all the heating elements over time. To prevent voltage surges in the network, the Triacs controls are switched on gradually with an interval of 4 seconds.

REMOTE CONTROLLERS

DISPLAY LCD4



Upon request, different versions of panels can be connected via I²C bus.

BTOUCH CONTROL PANEL



HMI with CapSense technology and customizable dot matrix screen. For further information on the functions of the BTouch panel, please refer to the relative technical specifications, code **NTC 30123**, downloadable from the website www.brahma.it.

REMOTE CONTROLLER KRONOS OT11



The compatible OpenTherm remote control becomes the master of the entire system, therefore almost all the functions such as the setting of the heating and domestic hot water setpoints or the management of the system status can be directly performed by it in relation to the type of application on which the main board is used. Through the remote controller it is possible to reset (RESET) the system from the lockout state. By using the TSP "Transparent Parameters Menu", it is also possible to modify the boiler parameters described in the following chapter. For further information on the functions and visualization of the Kronos OT11 chronothermostat, see the related technical note, code **NTC 21689**, downloadable from the website www.brahma.it.

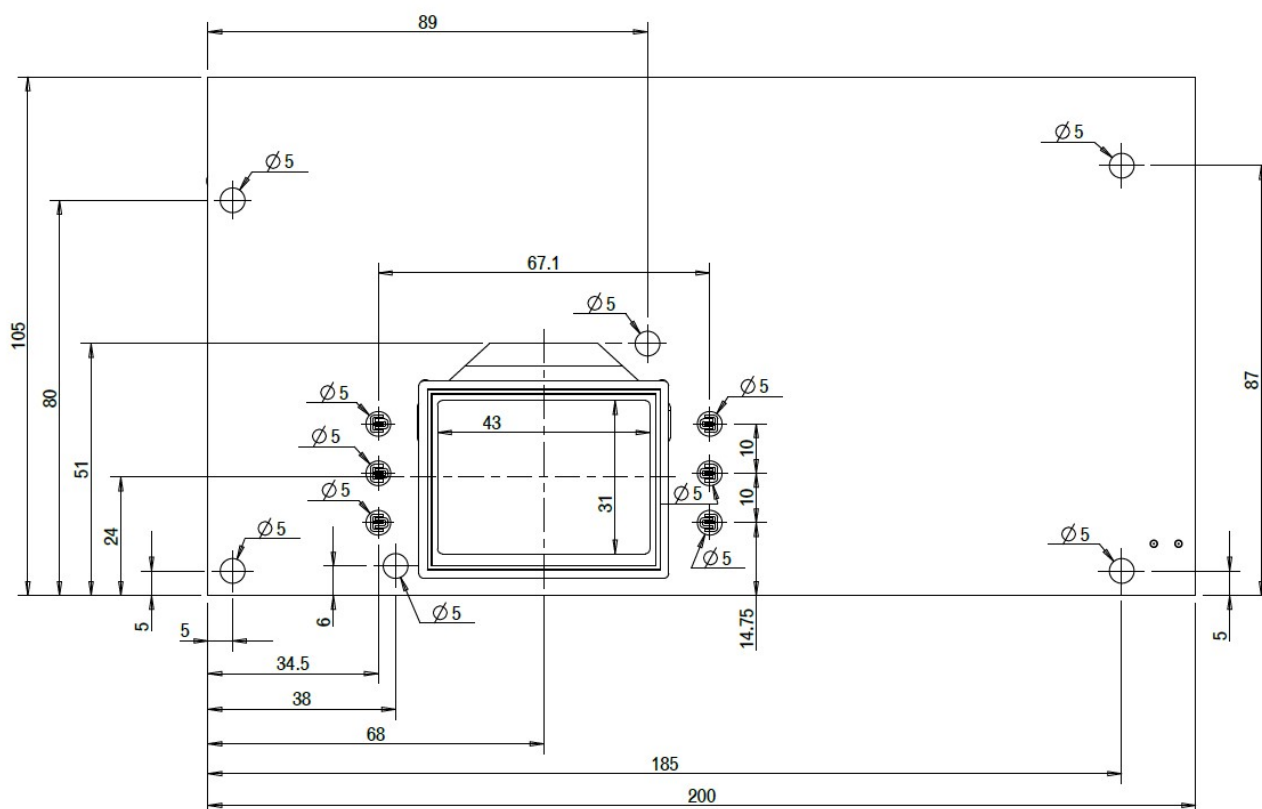
LABELING AND PLAN CODE

Label	Description
	ELECTRIKA 1960. XX1. 00

DOCUMENT'S REVISION

Index of document's revision	Description of revision
39154_r00	First emission 17/05/2021

DIMENSIONS AND FIXING HOLES



DISPOSAL NOTES

The unit contains electrical and electronic components and may not be disposed of together with household waste. Local and currently valid legislation must be observed.

ATTENTION → Company BRAHMA S.p.A. takes no responsibility for any damage resulting from customer's tampering with the device

BRAHMA S.p.A.

Via del Pontiere, 31
37045 Legnago (VR)
Tel. +39 0442 635211 - Telefax +39 0442 25683
<http://www.brahma.it>
E-mail: brahma@brahma.it