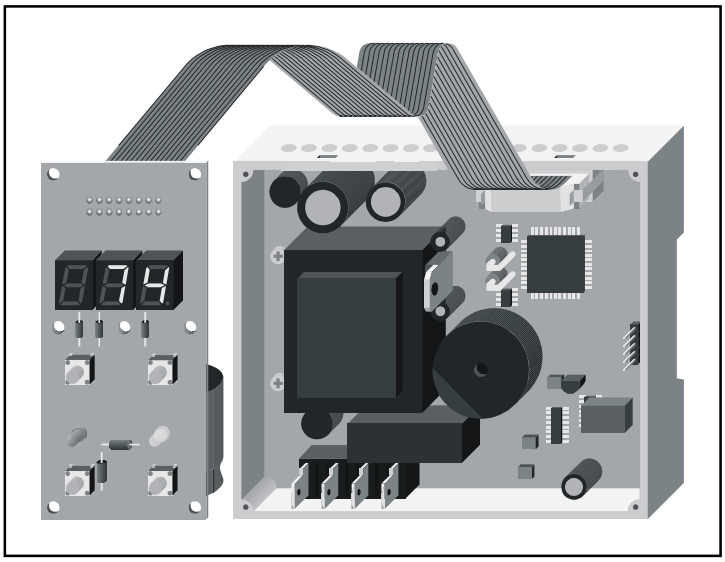


ELECTRONIC CONTROL UNIT
for gas or electric deep fryer

EC 8-256

TECHNICAL SPECIFICATION

- *** Dimensions: 42 x 90 mm (user interface) and 105 x 90,5 mm (power module).**
- *** Power supply: 230 Vac (standard).**
- *** Buzzer for signals and alarm intervention.**
- *** Access to parameter configuration controlled by password.**
- *** Personalised configuration programmable by key-board or Personal Computer.**
- *** 3 configurable operating modes.**
- *** P.I.D. temperature control during "main control" phase.**
- *** 3 digit display, height 12,5 mm.**
- *** 1 output relay, 6 A @ 250 Vac.**
- *** 1 temperature alarm completely configurable.**

The EC 8-256 electronic control unit has been specifically designed for the control of gas or electric deep fryer. It is composed of a power and a keyboard, which are connected by a 16-pole cable.
The unit input can be used with "J" (Iron-Constantan) or "K" (Chrome-Alumel) type thermocouples depending on factory settings.
The oil average temperature control is divided in three phases:
"**pre-heat**" **(melting)**, when the unit output is energised with cyclic control until a temperature threshold is reached (this threshold can be set by parameter configuration); this operation with reduced power at start-up avoids fast temperature increases and facilitates the melting of fat used for frying
"**conservation**", when constant oil temperature is maintained; in this phase it is possible to maintain the temperature of melted oil before frying, and to avoid the fat becoming dense again
"**main control**", when a P.I.D. temperature control (Proportional, Integral and Derivative) is active until the required temperature is reached; in the last two phases an LED indication is available when the oil temperature approaches the required value, and the buzzer gives a specific signal when such value has been reached.
The unit can be used for the control of both electric and gas deep fryer. The set of parameters that is specific for each type of deep fryer can be easily set by a dipswitch located at the back of the keyboard.
An analogue memory, which is standard supply for this device, allows maintaining the temperature control in the event of short power supply failures. In this case the unit will start again and revert to the same operating condition that it had before the failure.
The output is a NO relay that can drive a maximum of 6 A @ 250 Vac. All connections are made by robust 6,3 mm faston type connectors (for the probe, the power supply and the output).
A buzzer and a flashing indicator have been included to warn to the user in the event of irregular operating conditions: probe failure, data memory failure and temperature measurement outside the probe operating range.
The unit is also provided with a temperature alarm that can be disabled, and that can be configured is six operating modes: in the event of alarm intervention the buzzer gives an intermittent signal while the display shows the warning label "AL1" alternated with the temperature measurement.

OPERATION

Analogue memory; available parameter:b0

An analogue memory is provided for the unit to maintain temperature control in the event of short power supplly failure; in this case the unit will start and revert to the same operating condition that it had before the failure.
During "**START**" mode, when the unit switches off and again because of power supply failure, if the time between off and on is less than the protection time than the unit will switch on and revert to the operating conditions and settings that had been stored in memory before it had switched off.
Vice-versa, if the time between off and on is longer than the protection time, at switch on the unit automatically changes to "STOP" mode (output non active), the buzzer gives an intermittent signal while the display shows the label "**PF**" alternated with the temperature measurement.
It is possible to exit this alarm condition by pressing the **START/STOP** key for more than one second; the unit will then revert to the same operating condition thai it had before the failure.

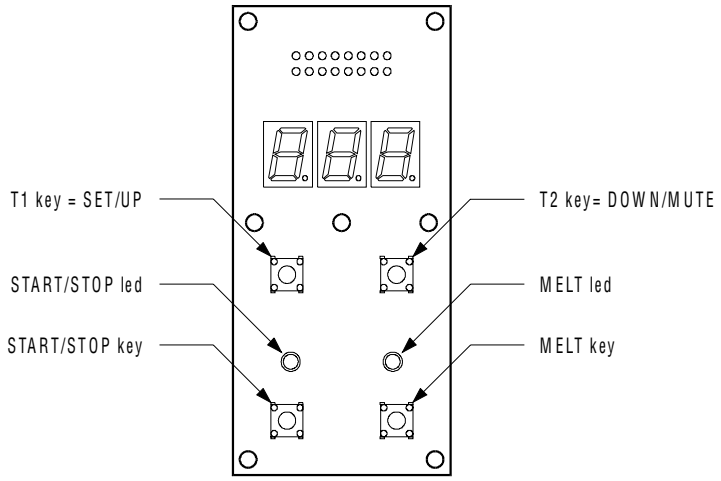


Fig. 1 - User interface

Pre-heat (melting); available parameters: b1, b2, b5, b6, b7

The "pre-heat" function is included to avoid fast temperature increases in the deep fryer oil sump at unit start up and to facilitate the melting of the fat used for frying.
During this phase the output is energised with cyclic control until the temperature threshold Melt is reached (parameter b2); parameters b5 and b6 can be used to set the duration of this part-load cycle and the percentage of cycle time when the output must be energised.

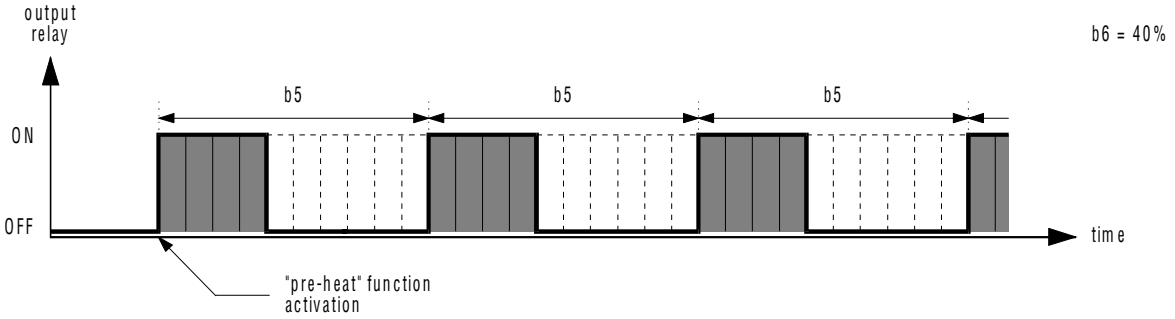


Fig. 2 - Output relay operation during "pre-heat" function

During "**STOP**" status, the "pre-heat" function can be activated by pressing the START/STOP key for more than one second if the probe temperature measurement is lower than threshold Melt (parameter b2) and:

- paramerter b1 is set to 1
- funtion "**conservation**" has been selected during "**STOP**" status by pressing the MELT key for more than one second; in this way the unit is also set to switch automatically to "**conservation**" after the "**pre-heat**" phase has been completed (this situation is indicated by MELT LED being switched on during "**STOP**" status).

If these two conditions are not satisfied, pressing the START/STOP key for more that one second during "**STOP**" status will immediately activate the P.I.D. temperature control unit the required temperature has been reached. Then, when the MELT key is pressed for more than one second, the P.I.D. control is terminated, the "**preriscaldo**" function starts and the unit is set to switch automatically to "**conservation**" phase after "**pre-heat**".
During "**pre-heat**" function, the START/STOP LED flashes to indicate that tempeature control is active; the MELT LED flasches only when the unit is set to switch automatically to "**conservation**" phase at the and of the function.

It i possible to terminate a function by:

- pressing START/STOP key for more than one second; in this way the control unit is forced to "**STOP**" status
- pressing the MELT key for more than ine second, if the control unit is set to switch automatically to "**conservation**" phase at the end of the function; in this way the P.I.D. control will become active until the required temperature has been reached.

The function will be automatically terminated when the Melt threshold has been reached.

Conservation (to maintain a constant oil temperature). Available parameters: b2, b3, b4, b7, P0, PI, Pb, Pc, Pd.

The "**conservation**" function enables the unit to maintain the oil temperature at the Melt setpoint to avoid the fat becoming dense again before frying; a P.I.D. temperature control is active during this phase.

The "**conservation**" phase can be activated:

- by pressing the MELT key for more than one second during **STOP** status or "**pre-heat**" function; in both cases the control unit will automatically switch to "**conservation**" at the end of a "**pre-heat**" phase.
- by pressing the MELT key for more than one second during "**main control**" function; in this case the unit will continue the P.I.D. temperature control to reach the Melt threshold instead of the standard operating setpoint, and then it will automatically switch to "**conservation**" function.
- automatically at the end of a "**pre-heat**" phase.

When the control unit terminates the "**pre-heat**" to start the "**conservation**" phase, the buzzer gives a specific signal for the time set by parameter b7 (it is necessary to restart the control unit to enable this function after the Melt threshold has been changed). As soon as the temperature measurement is higher than the Melt threshold, the MELT LED will remain lit for the duration of the "**conservation**" phase.

Parameter b3 is used to define a temperature band for the Melt threshold: when the temperature measurement is within this band, the START/STOP LED, which had been flashing until then, will be lit to indicate that the oil temperature is approaching the desired value. Parameter b4 can be used to delay the flashing of the START/STOP LED that indicates that the temperature measurement is no longer within the band set by parameter b3.

It is possible to terminate the "**conservation**" phase and start the "**main control**" phase by pressing the MELT key for more than one second. If the control unit has not been set to switch to "**conservation**" after a "**pre-heat**" phase has been completed, then it will automatically switch to "**main control**" when the Melt threshold has been reached.

Main control. Available parameters: r1, r2, b3, b4, b7, P0, PI, Pb, Pc, Pd.

The "**main control**" function is used to increase the oil temperature to the desired value in the deep fryer sump with the accuracy of P.I.D. control.

The control unit switches to this function in the following cases:

- when a "**conservation**" phase has terminated.
- by pressing the START key for more than one second when the unit is in "**STOP**" status and a "**pre-heat**" or "**conservation**" function has not been set.
- when a "**pre-heat**" function has terminated and a "conservation" function has not been set.

When the control unit switches to "**main control**" phase, the MELT LED turns off and the START/STOP LED remains lid for the time set by parameter b4. As soon as the temperature measurement has reached the setpoint, the buzzer gives a specific signal for the time set by parameter b7 (it is necessary to restart the control unit to enable this function after the setpoint has been changed).

Like in the case of "**conservation**" phase, parameter b3 is used to define a temperature band for the main control setpoint: when the temperature measurement is within this band, the START/STOP LED, which had been flashing until then, will be lit to indicate that the oil temperature is approaching the desired value. Parameter b4 can be used to delay the flashing of the START/STOP LED that indicates that the temperature measurement is no longer within the band set by parameter b3, which accounts for small temporary temperature differences like for instance when the basket is dipped into the boiling oil.

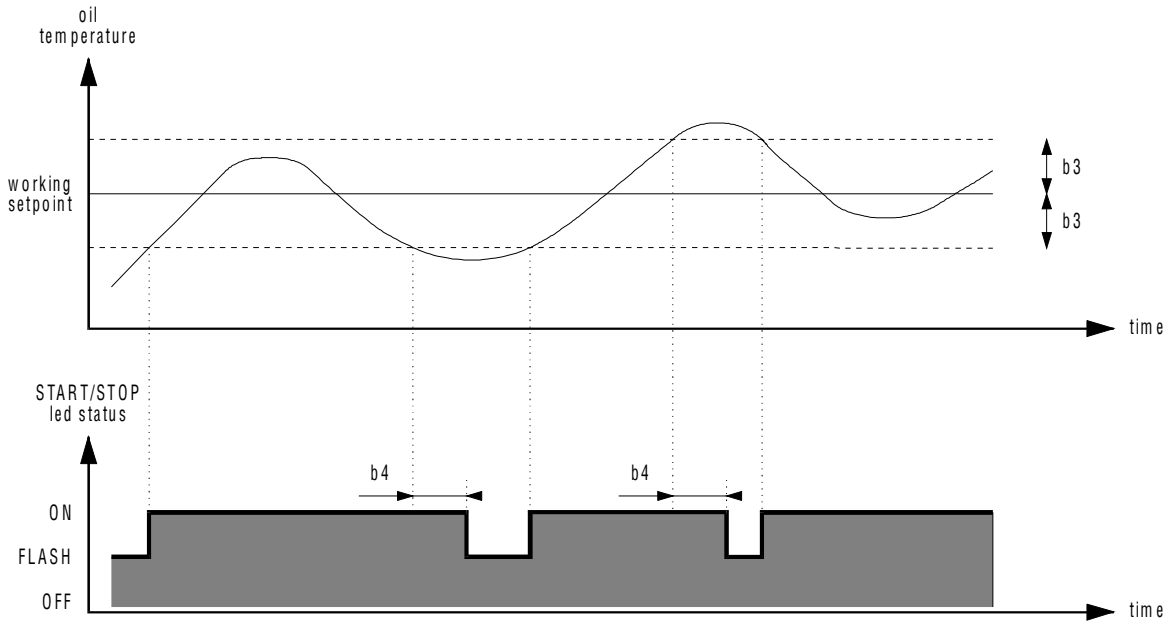


Fig. 3 - START/STOP LED status durin "**main control**" function

INSTALLATION

Refer to the following diagrams for a correct installation.
Make sure that the operating conditions (power supply, ambient temperature and humidity) are within the limits approved for device operation. Do not overload the output relay beyond maximum limits.

CAUTION: the unit is not designed to provide protection against overload: the output must be provided with adequate protection. Power supply protection is provided by a fuse included in the unit.

CONFIGURATION

Two levels of configuration are available (level 2 is protected by password):

Level 1

Press	T1	and	T2			simultaneously for more than 4 sec.: label "PA" is displayed.
Press	T1	or	T2			to select a Level 1 parameter to be modified.
Press	MELT	and	T1	or	T2	to change the setting of a selected parameter.

Level 2

From Level 1

Press	T1	or	T2			to select parameter "PA".
Press	MELT	and	T1	or	T2	to set value "-19".
Press	T1	and	T2			simultaneously for more than 4 sec.: the first Level 2 parameter is displayed.
Press	T1	or	T2			to select a Level 2 parameter to be modified.
Press	MELT	and	T1	or	T2	to change the setting of a selected parameter.

To exit the configuration mode

Press	T1	and	T2			simultaneously for more than 4 sec.; or do not operate the keyboard for at least 50 sec. (exit due to time-out); otherwise switch off and on again the unit after approximately 1 second from the last change.

To select the required set of parameters

The unit can be used for the control of both electric and gas deep fryer; the set of parameters which is specific for each type of deep fryer can be easily set by a dipswitch located at the back of the keyboard.

A **B**

A = to store the set of parameters of column ST1 in page 5.
B = to store the set of parameters of column ST2 in page 5. It is necessary to restart the control unit after the dipswitch has been changed to enable the new setting.

OPERATING TEMPERATURE SETTING

When the unit is not in use the temperature measurement is displayed.
Press and release the T1 key to display the present setpoint value: the LED on the right below the display flashes to indicate that a procedure to change the setpoint value has been initiated; to change the value, press the T1 or T2 key within 4 seconds from pressing the T1 key.
To exit this procedure do not operate the keyboard for more than 4 seconds (exit due to time-out), or switch off and on again the unit after approximately 1 second from the last change, otherwise press and release the MELT or the START/STOP key.
When an alarm is present, the buzzer can be turned off by pressing the T2 key.

The temperature setpoint can be selected within the limits set by parameter r1 and r2.

SIGNALS AND ALARMS

Label "**E0**" flashing on the display and buzzer with intermittent signal indicate one of the following failure modes: wrong type of probe, probe or probe connection failure, temperature measurement outside the measurement range. Check the value set for parameter /0, the connection between the probe and the unit and check for the correct probe operation (the output is not active).
Label "**E2**" flashing on the display and buzzer with intermittent signal indicate a failure in the configuration data memory. Switch the unit off and on again (the output is not active).
Label "**EOC**" flashing on the display and buzzer with intermittent signal indicate a failure in the circuit for cold-junction compensation (the output is not active).
Label "**PF**" being displayed alternated with the correct temperature value, buzzer with intermittent signal and the unit having automatically switched to "**STOP**" status indicate that a long power supply failure has occurred during "**START**" status. Press the START/STOP key for more than 1 second to restart the unit in the same condition that it had before the failure.
Label "**AL1**" being displayed alternated with the correct temperature value and buzzer with intermittent signal indicate that the temperature measurement is outside the limit set by parameter A1.

CONFIGURATION PARAMETERS

	PARAMETER CODE		DESCRIPTION	MIN.	MAX.	U.M.	ST. 1	ST. 2
(1)	PA	Password		-99	100	——	——	
	/	PROBE						
	/0	type of probe	10=TC “J”; 11=TC “K”	10	11	——	*	
(1)	/1	calibration (measurement offset)		-10	+10	°C	+2	
	/2	digital filter (response time)0=0s; 1=0,4s; 2=1,2s; 3=2,8s; 4=6s; 5=12,4s; 6=25,2s		0	6	——	3	
	r	TEMPERATURE CONTROL						
	r1	minimum available setpoint		0	+999	°C	0	
	r2	maximum available setpoint		0	+999	°C	+195	
	b	DEEP FRIER CONTROL						
(2)	b0	auto-restart function	0=YES; 1=NO	0	1	——	0	
	b1	enable pre-heat from start	0=NO; 1=YES	0	1	——	1	
	b2	Melt threshold		0	+999	°C	+100	
	b3	differential band for temperature inside range		+1	+25	°C	+5	
	b4	time-out for temperature inside range		0	120	sec.	20	
	b5	pre-heat cycle time		0	120	sec.	40	
	b6	pre-heat on-time		0	100	%	15	
(3)	b7	buzzer on-time		-1	120	sec.	5	
	P	P.I.D. CONTROL						
	P0	control band offset		-99	+99	°C	-40	-35
	PI	integral time constant		0	999	sec.	75	100
	Pb	proportional band		+1	+250	°C	35	
	Pc	P.I.D. cycle time		1	120	sec.	40	60
	Pd	derivative time constant		0	250	sec.	25	35
	A	ALARM						
	A0	alarm hysteresis (differential)		+1	+99	°C	+1	
	A1	alarm setpoint		-99	+999	°C	0	
	A3	alarm delay time at unit start up		0	999	min.	0	
	A4	alarm type		see TABLE 1		——	1	
	L	NETWORK CONNECTION						
	L1	unit address		1	15	——	1	
	L2	unit group		0	7	——	0	
	L3	link time-out		2	250	——	0	
	L4	baud rate 0=1200; 1=2400; 2=4800; 3=9600		0	3	baud	1	

Note

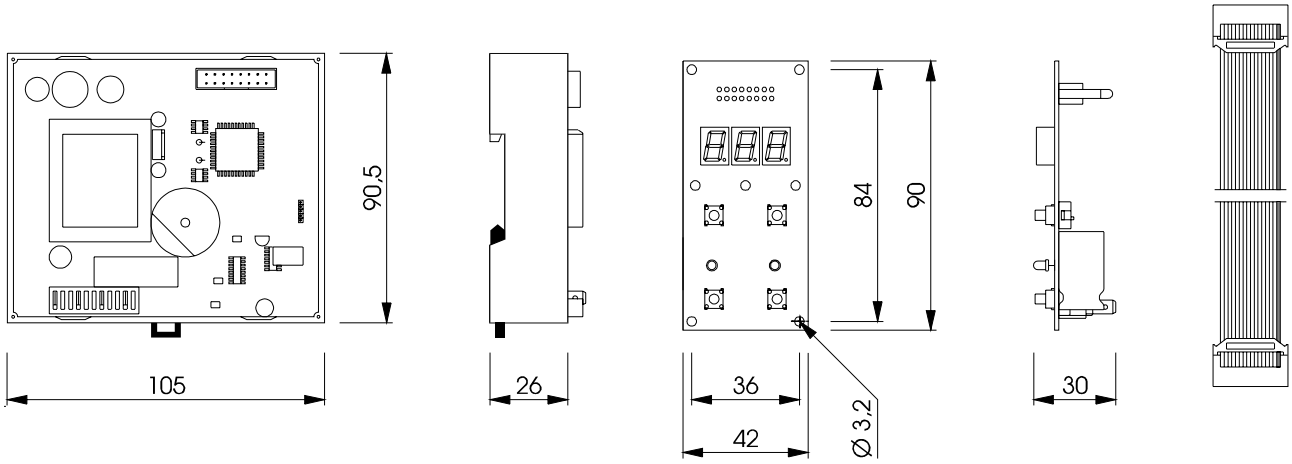
(*) = it depends on input type; the parameter must be set according to hardware factory setting.
(1) = configuration parameter present at Level 1.
(2) = this parameter controls the device operation at switch on after a power supply failure during “**START**” status: if this parameter is set to 0, the operation of the control unit depends on the duration of power supply failure (see section “**OPERATION**”); vice-versa, if the parameter is set to 1, the control unit restarts in “**START**” status.
(3) = this parameter defines the buzzer signal duration when the Melt threshold or the operating setpoint has been reached: if it is set to 0 there is no buzzer signal; vice-versa, if it is set to –1 the buzzer signal continues until it is manually switched off.

TABLE 1

parameter A4	alarm type
1	alarm disabled
2	low temperature (absolute) alarm
3	high temperature (absolute) alarm
4	low temperature (to setpoint reference) alarm
5	high temperature (to setpoint reference) alarm
6	low temperature (to setpoint reference) alarm with autom. calc. of new values and reset
7	high temperature (to setpoint reference) alarm with autom. calc. of new values and reset

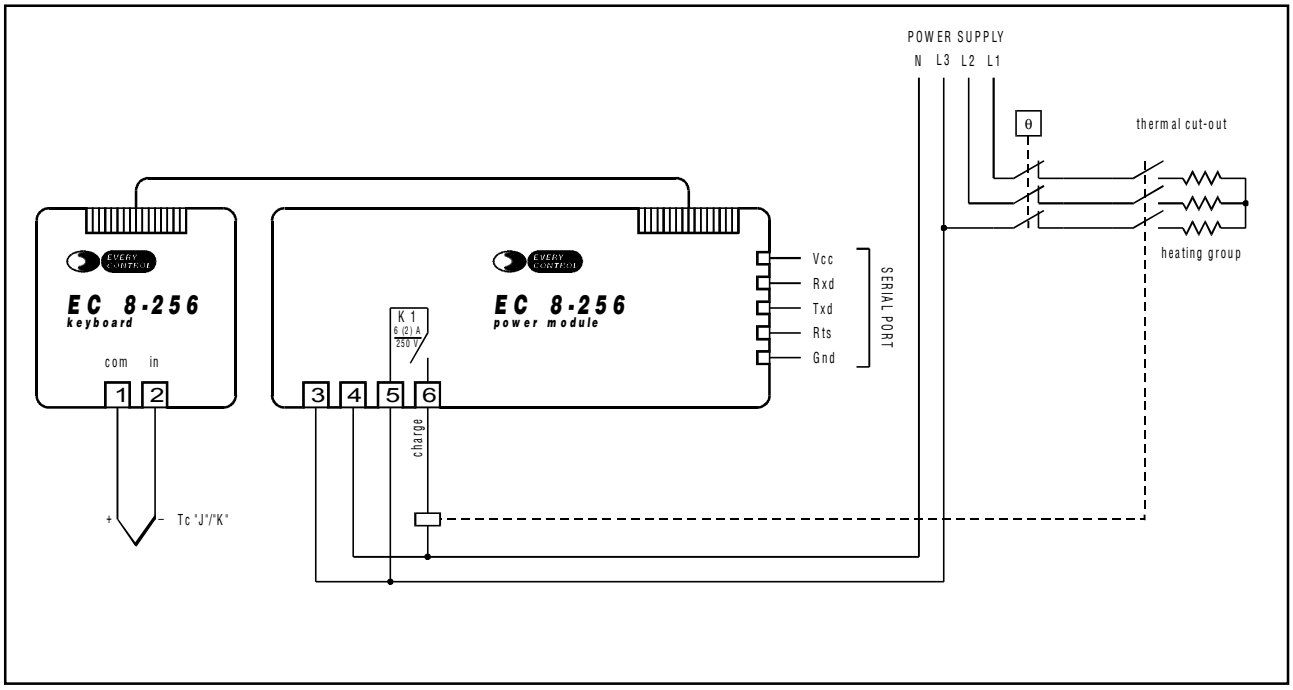
DIMENSIONAL DATA

Mesure en mm.



ELECTRICAL CONNECTIONS

Example of tipical application.



MECHANICAL AND ELECTRICAL SPECIFICATIONS

Box: plastic (PPO), white colour, self-extinguishing according to UL94 V-0 (power module).

Dimensions: 42 x 90 x 30 mm (user interface); 105 x 90,5 x 26 mm (power module).

Installation: with spacers (user interface); with OMEGA rail (power module).

Ambient temperature: from 0 to +60 °C.

Humidity: 10 ... 90% without condensation.

Connections: 6.3 x 0.5 mm Faston type connectors.

Power supply: 230 Vac 50-60 Hz (standard); others available on request.

Measurement input: 1, which can be configured for "J" o "K" type thermocouples.

Digital input: 1, to select the required set of parameters.

Measurement range: from -99 to +700 °C ("J" type thermocouple); from -99 to +999 °C ("K" type thermocouple).

Control range setting: from 0 to +999 °C.

Display: 3 digit display; LED for the indication of the operating status.

Accuracy: 1 °C.

Buzzer for alarm indication: included.

Output: SPST relay, 6 A 250 Vac (K 1).

Serial link for data transfer: TTL with EVCOBUS protocol (standard).

1 '96

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