AC2-5 INSTRUCTION FOR USE

Thank you for having chosen a LAE electronic product. Before installing the instrument, please read these instructions carefully to ensure maximum performance and safety.

DESCRIPTION

Fig.1 - Front panel

INDICATION

1 = *Channel 1 output*

2 = *Channel 2 output*

℃℉ = *View in °C or °F*

= *Alarm*

= *Tap*

= *Hold*

INSTALLATION

- Insert the controller through a hole measuring 71x29 mm;
- Make sure that electrical connections comply with the paragraph “wiring diagrams”. To reduce the effects of electromagnetic disturbance, keep the sensor and signal cables well separate from the power wires.
- Fix the controller to the panel by means of the suitable clips, by pressingly gently; if fitted, check that the rubber gasket adheres to the panel perfectly, in order to prevent debris and moisture infiltration to the back of the instrument.
- ATTENTION: during the setup of the controller, please make sure that the parameter INP matches the sensor used, as indicated in the table “input specifications”.
- Place the probe T1 inside the room in a point that truly represents the temperature of the stored product.

OPERATION

DISPLAY

During normal operation, the display shows either the temperature measured or one of the following indications:

-	Controller in stand-by	Alr	Digital input alarm
or	Probe T1 overrange or failure	E1	In tuning: timeout1 error
hi	Room high temperature alarm	E2	In tuning: timeout2 error
Lo	Room low temperature alarm	E3	In tuning: overrange error
hc	Condenser high temperature	tun xx.x	Controller in autotuning

SETTING

Setpoint: display and modification	Standby (SB=YES)
-30 → 1″ → (or) → 1SP / 2SP → - 10 (Set)	-30 → 3″ → 1″ blink -
Confirm / Next / Previous / Discard	Confirm / Increase / Decrease / Discard

Info items	Navigation
t1 Instant probe 1 temperature	-30 → 1″ → inF → t1
thi Maximum temperature recorded	Display value / Next / Previous / Exit
tlo Minimum temperature recorded	
Loc Keypad state lock	
tun Auto-tuning	
PSd Configuration menu password	

Keypad Lock

Loc → YES / no → Confirm / Discard

Reset temperature recorded

thi or tlo → RESET → rSt → Confirm / Discard

Menu access/autotuning

PSd or tun → 000 → Confirm / Increase / Decrease / Discard

*Configuration access [PSD] is 123

*Tuning access [TUN] is 321

Autotuning

CONDITION
1CM = PID
1CH = configured
1SP = configured

tct → Confirm / Discard → 001 → Confirm / Increase / Decrease / Discard → 1″ blink tun → 3″ Exit

Errors

If the autotuning function failed, the display shows an error code:

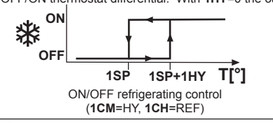
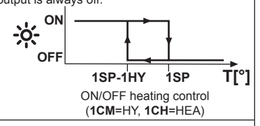
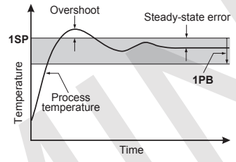
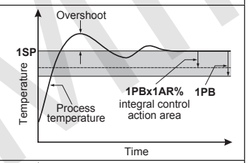
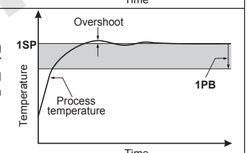
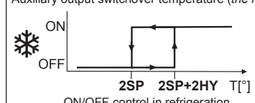
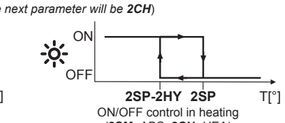
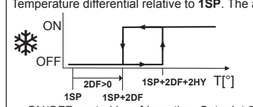
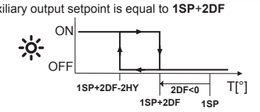
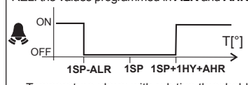
- E1 timeout1 error: the controller could not bring the temperature within the proportional band. Increase **1SP** in case of heating control, vice versa, decrease **1SP** in case of refrigerating control and re-start the process.
- E2 timeout2 error: the autotuning has not ended within the maximum time allowed (1000 cycle times). Re-start the autotuning process and set a longer cycle time **1CT**.
- E3 temperature overrange: check that the error was not caused by a probe malfunction, then decrease **1SP** in case of heating control, vice versa increase **1SP** in case of refrigerating control and then re-start the process.

- To eliminate the error indication and return to the normal mode, press button ✖.

Control improvement

- To reduce overshoot, reduce the integral action reset **1AR**
- To increase the response speed of the system, reduce the proportional band **1PB**. Caution: doing this makes the system less stable.
- To reduce swings in steady-state temperature, increase the integral action time **1IT**; system stability is thus increased, although its response speed is decreased.
- To increase the speed of response to the variations in temperature, increase the derivative action time **1DT**. Caution: a high value makes the system sensitive to small variations and it may be a source of instability.

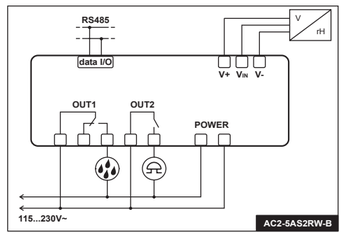
CONFIGURATION PARAMETERS

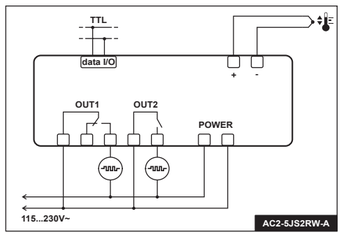
	PAR	RANGE	DESCRIPTION
	SCL	1°C; 2°C; °F	Readout scale (see table of input specifications) *Caution: upon changing the **SCL** value, it is then <u>absolutely</u> necessary to reconfigure the parameters relevant to the absolute and relative temperatures (**SPL**, **SPH**, **1SP**, **1HY** etc..)*
	SPL	-50°...SPH	Minimum limit for **1SP** setting
	SPH	SPL...150°	Maximum limit for **1SP** setting.
	1SP	SPL... SPH	Setpoint (value to be maintained in the room).
	1CM	HY; PID	Control mode. With **1CM**=HY you select control with hysteresis: parameters **1HY**, **1T0** and **1T1** are used. With **1CM**=PID you select a Proportional-Integral-Derivative control mode: parameters **1PB**, **1IT**, **1DT**, **1AR**, **1CT** will be used
	1CH	REF; HEA	Refrigerating (REF) or Heating (HEA) control mode.
1CM=HY	**1HY**	0...19.9°	OFF/ON thermostat differential. With **1HY**=0 the output is always off.  ON/OFF refrigerating control (**1CM**=HY, **1CH**=REF)  ON/OFF heating control (**1CM**=HY, **1CH**=HEA)
	1T0	0...30min	Minimum off time. After output 1 has been turned off, it remains inactive for **1T0** minutes regardless of the temperature value measured.
	1T1	0...30min	Minimum on time. (*the following parameter will be **1PF***). After output 1 has been turned on, it remains active for **1T1** minutes regardless of the temperature value measured.
1CM=PID	**1PB**	0...19.9°	Proportional bandwidth. Temperature control takes place by changing the ON time of the output: the closer the temperature to the setpoint, the less time of activation. A small proportional band increases the promptness of response of the system to temperature variations, but tends to make it less stable. A purely proportional control stabilises the temperature within the proportional band but does not cancel the deviation from setpoint. With **1PB**=0 the output is always off. 
	1IT	0...999s	Integral action time. The steady-state error is cancelled by inserting an integral action. The integral action time, determines the speed with which the steady-state temperature is achieved, but a high speed (**1IT** low) may be the cause of overshoot and instability in the response. With **1IT**=0 the integral control is disabled. 
	1DT	0...999s	Derivative action time. Response overshoot may be reduced by inserting a derivative Action. A high derivative action (**1DT** high) makes the system very sensitive to small temperature variations and causes instability. With **1DT**=0 the derivative control is disabled. 
	1AR	0...100%	Reset of integral action time referred to **1PB** Decreasing the parameter **1AR** reduces the integral control action zone, and consequently the overshoot (see figure on paragraph **1IT**).
	1CT	1...255s	Cycle time. It’s the period in which the output ON time changes. The quicker the system to be controlled reacts to temperature variations, the smaller the cycle time must be, in order to obtain higher temperature stability and less sensitivity to load variations.
	1PF	ON/OFF	Output state in case of probe failure.
	OAU	NON; THR; AL0; AL1	AUX output operation. NON : output disabled (always off). (*the next parameter will be **ATM***) THR: output programmed for second thermostat control (*the next parameter will be **2SM***). AL0: contacts open when an alarm condition occurs (*the next parameter will be **ATM***). AL1: contacts make when an alarm condition occurs (*the next parameter will be **ATM***).
OAU=THR	**2SM**	ABS; REL	Setpoint 2 mode. Channel 2 setpoint may be absolute (**2SM**=ABS), or a differential relative to setpoint 1 (**2SM**=REL)
2SM=ABS	**2SP**	SPL...SPH	Auxiliary output switchover temperature (*the next parameter will be **2CH***)  ON/OFF control in refrigeration (**2SM**=ABS, **2CH**=REF)  ON/OFF control in heating (**2SM**=ABS, **2CH**=HEA)
2SM=REL	**2DF**	-19.9...19.9°	Temperature differential relative to **1SP**. The auxiliary output setpoint is equal to **1SP**+**2DF**  ON/OFF control in refrigeration. Setpoint 2 relative to setpoint 1 (**OAU**=THR, **2CH**=REF)  ON/OFF control in heating. Setpoint 2 relative to setpoint 1 (**OAU**=THR, **2CH**=HEA)
OAU=THR	**2CH**	REF; HEA	Refrigerating control (REF) or heating control mode (HEA) for the auxiliary output.
	2HY	0...19.9°	Differential of thermostat 2. With **2HY**=0 the auxiliary output always remains off.
	2T0	0...30min	Minimum off time. After output 2 has been turned off, it remains inactive for **2T0** minutes regardless of the temperature value measured.
	2T1	0...30min	Minimum on time. After output 2 has been turned on, it remains active for **2T1** minutes regardless of the temperature value measured.
	2PF	ON/OFF	Auxiliary output state in case of probe failure.
	ATM	NON; ABS; REL	Alarm threshold management. NON: all temperature alarms are inhibited (*the following parameter will be **SB***). ABS: the values programmed in **ALA** and **AHA** represent the real alarm thresholds. REL: the values programmed in **ALR** and **AHR** are alarm differentials referred to **1SP** and **1SP**+**1HY**.  Temperature alarm with relative thresholds, refrigerating control (**ATM**=REL, **1CH**=REF)  Temperature alarm with relative thresholds, heating control (**ATM**=REL, **1CH**=HEA).
ATM=ABS	**ALA**	-50°...AHA	Low temperature alarm threshold.
	AHA	ALA...150°	High temperature alarm threshold.
ATM=REL	**ALR**	-12.0...0°	Low temperature alarm differential. With **ALR**=0 the low temperature alarm is excluded
	AHR	0...12.0°	High temperature alarm differential. With **AHR**=0 the high temperature alarm is excluded
	ATD	0...120min	Delay before alarm temperature warning.
	SB	NO/YES	Stand-by button enabling.
	INP	0mA/4mA, T1/T2 ST1/SN4	Sensor input selection (see table of input specifications). *In the models AC2-5A..., AC2-5J..., AC2-5T... only.*
	RLO	-19.9...RHI	Minimum range value (*in the models AC2-5A…, AC2-5I… only*) **RLO** takes the minimum value measured by the transmitter (i.e. the value matching 0V, 0/4mA).
	RHI	RLO...99.9	Maximum range value (*in the models AC2-5A…, AC2-5I… only*) **RHI** takes the maximum value measured by the transmitter (i.e. the value matching 1V, 20mA)
	OS1	-12.5...12.5°	Probe T1 offset.
	TLD	1...30min	Delay for minimum temperature (TLO) and maximum temperature (THI) logging.
	SIM	0...100	Display slowdown
	ADR	1...255	AC1-5 address for PC communication
	PRT	ASC; RTU	ASCII and RTU Modbus protocol selection

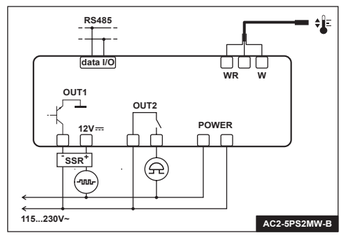
INPUT SPECIFICATIONS

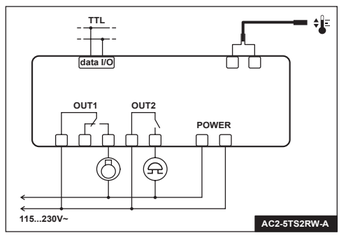
MODEL	INPUT		RANGE [MEASUREMENT ACCURACY]		
			SCL=1°C	SCL=2°C	SCL=°F
AC2-5A...	0÷1V		RLO÷RHI [< ± 3mV]		---
AC2-5I...	INP = 0mA	0÷20mA	RLO÷RHI [< ± 0.2mA]		---
	INP = 4mA	4÷20mA			
AC2-5J...	INP=T1	TC “J”	---	-50÷750°C [< ±3°C]	-60÷999°F [< ±5°F]
	INP=T2	TC “K”	---	-50÷999°C [< ±3°C]	
AC2-5P...	PT100		-50/-19.9÷99.9/150°C [< ±0.3°C]	-100÷850°C [<±1°C(-50÷850°), ±2°C]	-150÷999°F [<±2°F(-60÷999°), ±4°F]
AC2-5T...	INP=ST1	LAE ST1..	-50/-19.9 ÷ 99.9/150°C [<±0.3°C(-30÷130°),±1°C]	-50 ÷ 150°C [<±0.3°C(-30÷130°), ±1°C]	-60 ÷ 300°F [< ±0.6°F(-20÷260°),±2°F]
	INP=SN4	LAE SN4..	-40/-19.9 ÷ 99.9/125°C [<±0.3°C(-40÷100°),±1°C]	-40 ÷ 125°C [<±0.3°C(-40÷100°),±1°C]	-40 ÷ 260°F [<±0.6°F(-40÷210°), ±2°F]

WIRING DIAGRAMS









TECHNICAL DATA

Power supply
AC2-5...D 12Vac/dc ±10%, 2W
AC2-5...W 110 - 230Vac±10%, 50/60Hz, 2W

Relay outputs (AC2-5..R..)
OUT1 3,6 FLA, 21,6 LRA 240Vac - 12A resistive
OUT2 1 FLA, 6 LRA, 240V - 7A resistive

SSR drive (AC2-5..M..)
OUT1 15mA 12Vdc

Inputs
see table of input specifications

Measurement range
see table of input specifications

Measurement accuracy
see table of input specifications

Operating conditions
-10 … +50°C; 15%...80% U.R.

CE (Reference Norms)
EN60730-1; EN60730-2-9;
EN55022 (Class B); EN50082-1

Front protection
IP55

LAE ELECTRONIC
Via Padova, 25 - 31046 Oderzo (TV) ITALY
Tel. +39 0422 815320 Fax +39 0422 814073
www.lae-electronic.com
sales@lae-electronic.com