

## LTR-5 INSTRUCTIONS 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

- Setpoint button.
- Decrease button.
- Increase button.
- Exit / Stand-by button.

### INDICATIONS

**OUT1** Thermostat output

### 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 pressing 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.
- 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:

<b>OFF</b>	Controller in stand-by	<b>E1</b>	In tuning: timeout1 error
<b>OR</b>	Probe T1 overrange or failure	<b>E2</b>	In tuning: timeout2 error
<b>TUN / 5.4</b>	Controller in autotuning	<b>E3</b>	In tuning: overrange error

#### SETPOINT (display and modification of desired temperature value)

- press button for at least half second, to display the setpoint value.
- By keeping button pressed, use button or to set the desired value (adjustment is within the minimum **SPL** and the maximum **SPH** limit).
- When button is released, the new value is stored.

#### STAND-BY

Button , when pressed for 3 seconds, allows the controller to be put on a standby or output control to be resumed (with **SB**=YES only).

#### CONTROLLER AUTOTUNING IN PID MODE

##### Before starting

- Adjust the setpoint **1SP** to the desired value.
- Set **1Y**=PID.
- Make sure that the **1PB** value matches the desired control mode (**1PB**<0 for heating; **1PB**>0 for refrigeration).

##### Start autotuning

- Keep buttons + pressed for 3 seconds. **1CT** blinks on the display.
- With + or + set the cycle time in order to define the dynamic of the process to be controlled.
- To start autotuning press + or wait for 30 seconds. To abort the autotuning function, press .

##### During autotuning

- During the entire autotuning phase, the display alternates with the actual temperature measured.
- In case of power failure, when power is resumed, after the initial autotest phase, the controller resumes the autotuning function.
- To abort the autotuning, without modifying the previous control parameters, keep button pressed for 3 seconds.
- After the autotuning has taken place successfully, the controller updates the control parameters and start to control.

##### 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.

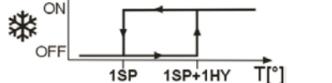
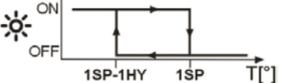
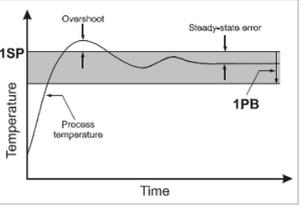
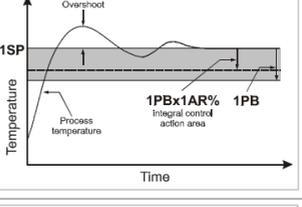
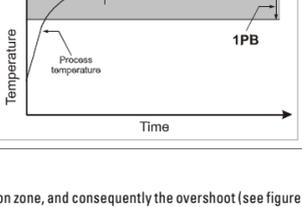
##### RECALIBRATION

- Have a precision reference thermometer or a calibrator to hand.
- Ensure that **OS1**=0 and **SIM**=0.
- Switch the controller off then on again.
- During the auto-test phase, press buttons + , and keep them pressed till the controller shows **OAD**.
- With buttons and select **OAD** or **SAD**: **OAD** allows a calibration of 0, inserting a constant correction over the whole scale of measurement. **SAD** allows a calibration of the top part of the measurement scale with a proportional correction between the calibration point and 0.

- Press to display the value and then use + or to make the read value coincide with the value measured by the reference instrument.
- Exit from calibration by pressing button .

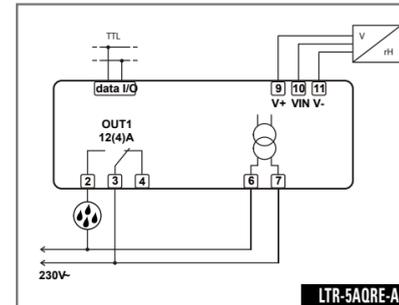
### CONFIGURATION PARAMETERS

- Setup menu is accessed by pressing buttons + for 5 seconds.
- With button or select the parameter to be modified.
- Press button to display the value.
- By keeping button pressed, use button or to set the desired value.
- When button is released, the newly programmed value is stored and the following parameter is displayed.
- To exit from the setup, press button or wait for 30 seconds.

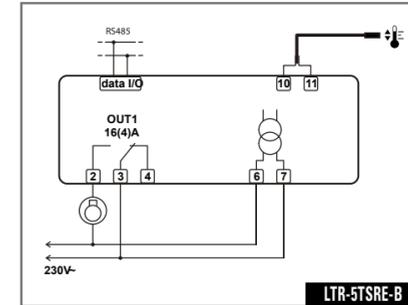
PAR	RANGE	DESCRIPTION
<b>SCL</b>	1°C; 2°C; °F	Readout scale. 1°C : measuring range -50/-19.9 ... 99.9/150°C for LTR-5T -40/-19.9 ... 99.9/125°C for LTR-5C 0.0 ... 99.9 %r.H. for LTR-5A 2°C : measuring range -50 ... 150°C for LTR-5T -40 ... 125°C for LTR-5C 00 ... 99 %r.H. for LTR-5A °F : measuring range -60 ... 300°F for LTR-5T -40 ... 250°F for LTR-5C  Caution: upon changing the SCL value, it is then <b>absolutely</b> necessary to re-configure the parameters relevant to the absolute and relative temperatures ( <b>SPL</b> , <b>SPH</b> , <b>1SP</b> , <b>1HY</b> , etc..).
<b>SPL</b>	-50..SPH	Minimum limit for <b>1SP</b> setting
<b>SPH</b>	SPL..150°	Maximum limit for <b>1SP</b> setting
<b>1SP</b>	SPL... SPH	Setpoint (value to be maintained in the room).
<b>1Y</b>	HY / PID	Control mode. With <b>1Y</b> =HY you select control with hysteresis: parameters <b>1HY</b> and <b>1CT</b> are used. With <b>1Y</b> =PID you select a Proportional-Integral-Derivative control mode: parameters <b>1PB</b> , <b>1IT</b> , <b>1DT</b> , <b>1AR</b> , <b>1CT</b> will be used.
<b>1HY</b>	-19.9...19.9°C	Thermostat differential [control with hysteresis]. Set <b>1HY</b> on a value greater than zero to make the output work in refrigerating mode, vice versa set on a value lower than zero to make the output work in heating mode. With <b>1HY</b> =0 the output is always off.    Fig. 1a. ON/OFF refrigerating control ( <b>1Y</b> =HY, <b>1HY</b> >0)      Fig. 1b. ON/OFF heating control ( <b>1Y</b> =HY, <b>1HY</b> <0)
<b>1PB</b>	-19.9...19.9°C	Proportional band [PID control]. Set <b>1PB</b> on a value greater than zero to make the output work in refrigerating mode, vice versa set on a value lower than zero to make the output work in heating mode. With <b>1PB</b> =0 the output is always off.  With a proportional controller, the temperature is controlled by varying the time of activation of the output. The nearer the temperature to set point, 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 the set point.  
<b>1IT</b>	0...999s	Integral action time [PID control].  The steady-state error is cancelled by inserting an integral action into the control system. The integral action time, determines the speed with which the steady-state temperature is achieved, but a high speed ( <b>1IT</b> low) may be the cause of overshoot and instability in the response. With <b>1IT</b> =0 the integral control is disabled.  
<b>1DT</b>	0...999s	Derivative action time [PID control].  Response overshoot in a system controlled by a Proportional-Derivative controller may be reduced by inserting a derivative action in the control. A high derivative action ( <b>1DT</b> high) makes the system very sensitive to small temperature variations and causes instability. With <b>1DT</b> =0 the derivative control is disabled.  
<b>1AR</b>	0...100%	Reset of integral action time referred to <b>1PB</b> [PID control].  Decreasing the parameter <b>1AR</b> reduces the integral control action zone, and consequently the overshoot (see figure on paragraph <b>1IT</b> ).
<b>1CT</b>	0...255s	Cycle time. In the ON/OFF control ( <b>1Y</b> =HY), after the output has switched on or off, it will remain in the new state for a minimum time of <b>1CT</b> seconds, regardless of the temperature value. In the PID control ( <b>1Y</b> =PID), the cycle time is the period of time in which the output completes a cycle (Time ON + Time OFF). The faster the system to be controlled reacts to temperature changes, the smaller the cycle time should be, in order to obtain a greater temperature stability and less sensitivity to load variations.
<b>1PF</b>	ON / OFF	Output state in case of probe failure.

<b>BAU</b>	NON / SBY	With <b>BAU</b> =SBY, the stand-by button is enabled.
<b>SIM</b>	0...100	Display slowdown.
<b>OS1</b>	-12.5..12.5°C	Probe T1 offset.
<b>ADR</b>	1...255	LTR-5 address for PC communication.

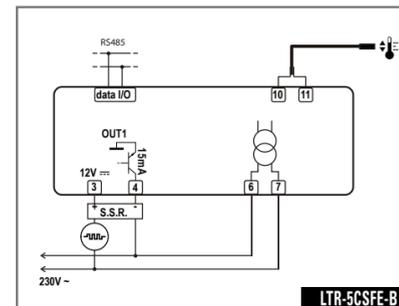
### WIRING DIAGRAMS



LTR-5AORE-A



LTR-5TSRE-B



LTR-5CSFE-B

### TECHNICAL DATA

**Power supply**  
LTR-5...D 12Vac±10%, 50/60Hz, 2W  
LTR-5...E 230Vac±10%, 50/60Hz, 2W  
LTR-5...U 115Vac±10%, 50/60Hz, 2W

**Relay outputs (LTR-5..R.)**  
LTR-5.SR.. OUT1 16(4)A  
LTR-5.QR.. OUT1 12(4)A

**SSR drive (LTR-5..F.)**  
OUT1 15mA 12Vdc

**Inputs**  
LTR-5A...: 0-1V  
LTR-5C...: NTC 10KΩ@25°C, part No. LAE SN4...  
LTR-5T...: PTC 1000Ω@25°C, part No. LAE ST1...

**Measuring Range**  
LTR-5A...: 0...99%r.H.  
LTR-5C...: -40...125°C  
LTR-5T...: -50...150°C

**Measuring accuracy**  
LTR-5A...: <±0.7%r.H. in the measuring range  
LTR-5C...: <±0.3°C -40...100°C; ±1°C out of that range  
LTR-5T...: <±0.3°C -50...140°C; ±1°C out of that range

**Operating conditions**  
-10 ... +50°C; 15...80% r.H.

**CE (Reference Norms)**  
EN60730-1; EN60730-2-9;  
EN55022 (Class B);  
EN55082-1

**Front protection**  
IP55



VIA PADOVA, 25  
31046 ODERZO /TV /ITALY  
TEL. +39 - 0422 815320  
FAX +39 - 0422 814073  
www.lae-electronic.com  
E-mail: sales@lae-electronic.com