TLK 48
MICROPROCESSOR-BASED DIGITAL ELECTRONIC REGULATOR

TECHNICAL DATA

CARATTERISTICHE MECCANICHE	
Housing	Self-extinguishing plastic, UL 94 V0
Dimensions	48x48 mm DIN – depth 98 mm
Weight	225 g approx.
Connections	2x1 mm^2 screw terminal block
Mounting	Flush in panel in 45,5x45,5 mm hole
Front panel protection	IP 54 mounted in panel with gasket
ELECTRICAL DATA	
Power supply	24, 115, 230 VAC +/-10%
AC Frequency	50 / 60 Hz
Power consumption	5 VA approx.
INPUT DATA	
Thermocouple	J, K, S – According to IEC 584-2 accuracy class 1 or 2
Thermoresistance	Pt 100 – According to IEC 751 accuracy class A or B
Infrared sensors	TECNOLOGIC IRS J and K
Thermistor	PTC KTY 81-121 (990 Ω at 25°C) ; NTC 103AT-2 (10 kΩ at 25°C)
Current input	0/4...20 mA
Voltage input	0…50 mV, 0…60 mV, 12…60 mV, 0/1…5 V, 0/2…10 V
Normalized signals input impedance	0/4…20 mA: 51 Ω mV and V: 1 MΩ
OUTPUT DATA	
Relay outputs	Up to 2 outputs SPST-NO (8 A-AC1, 3 A-AC3 / 250 VAC)
Voltage output for SSR driving	Up to 2 outputs : 8 mA at 8 VDC with protection against short circuits
Auxiliary power supply output	10 VDC / 20 mA max
FUNCTIONAL DATA	
Control	ON/OFF, Neutral Zone, PID single and double action programmable
Overall accuracy	+/-0.15% fs
Display resolution	According to the used probe 1/0,1/0,01/0,001
Measurement range	According to the used probe and to the measurement unit
Unit of measurement	°C - °F, programmable
Max. cold junction compensation drift	0.04°C/°C with operating temperature 0…50°C after warm-up of 20 min.
Measure sampling time	130 ms
Display	4 digit red h=12 mm
Parameters access	Protected by password
Operating temperature	0…55°C
Operating humidity	30…95 RH% without condensation

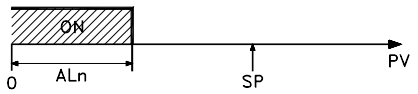
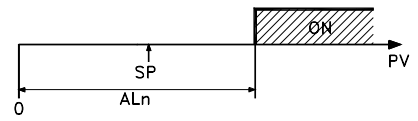
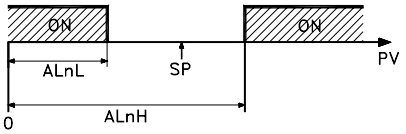
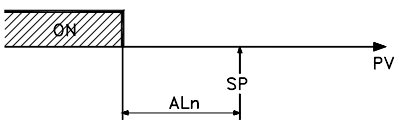
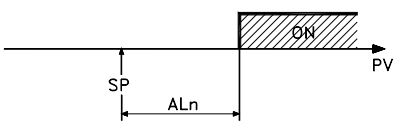
MEASUREMENT RANGE

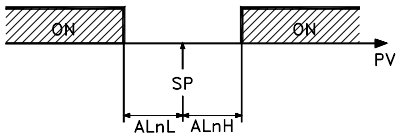
PROBE	RANGE 4 DIGIT	RANGE 4 DIGIT with D.P.
tc J SEnS = J	-160 ... 1000°C -256 … 1832°F	**---**
tc K SEnS = CrAl	-270 ... 1370°C -454 … 2498°F	**---**
tc S SEnS = S	-50 ... 1760°C -58 … 3200°F	**---**
Pt 100 SEnS = Pt1	-200 ... 850°C -328 … 1562°F	-199.9 … 850.0°C -199.9 … 999.9°F
PTC SEnS = Ptc	-55 ... 150°C -67 … 302°F	-55.0 … 150.0°C -58.0 … 999.9°F
NTC SEnS = ntc	-50 … 110°C -58 … 230°F	-50.0 … 110.0°C -58.0 … 230.0°F
0…50 mV SEnS = 0.50	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
0…20 mA SEnS = 0.20	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999

PROBE	RANGE 4 DIGIT	RANGE 4 DIGIT with D.P.
4…20 mA SEnS = 4.20	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
0…60 mV SEnS = 0.60	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
12…60 mV SEnS = 12.60	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
0…1V SEnS = 0.1	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
0…5 V SEnS = 0.5	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
1…5 V SEnS = 1.5	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
0…10 V SEnS = 0.10	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999
2…10 V SEnS = 2.10	-1999 ... 9999	-199.9 …999.9 -19.99 … 99.99 -1.999 … 9.999

ALARM OUTPUTS

The alarm functioning is depending on the Process Value and it's programmable through a 4 figures code; depending on the value of the suitable parameters, it's possible to have 6 different types of alarms :

	Alarm type	Alarm output
1	<u>Absolute Low alarm:</u> it's activated when the Process Value is lower than the alarm threshold	
2	<u>Absolute High alarm:</u> it's activated when the Process Value is higher than the alarm threshold	
3	<u>Absolute Low band alarm:</u> it's activated when the Process Value is lower than the low alarm threshold or higher than the high threshold alarm	
4	<u>Low Deviation alarm:</u> it's activated when the Process Value is lower than (SetP+ low threshold)	
5	<u>High Deviation alarm:</u> it's activated when the Process Value is higher than (SetP+ high threshold)	

6	Deviation band alarm: it's activated when the Process Value is lower than (SetP+low threshold) and higher than (SetP+ high threshold)	

Alarms hysteresis

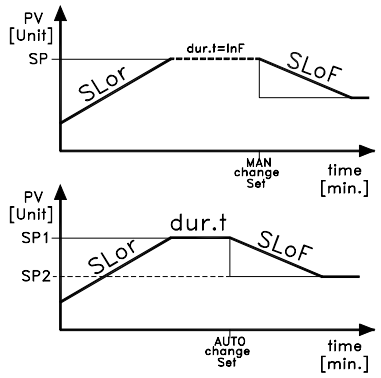
The alarms functioning is influenced by the hysteresis phenomenon which works asymmetrically. In case of low alarm, the alarm is activated when the Process Value goes under the threshold alarm and it's deactivated when the Process Value goes upper than the alarm threshold; in case of high alarm, it's viceversa.

LOOP BREAK alarm function

The LB alarm is needed to segnalise the interruption of the control loop, because of a thermocouple shortcircuit or inversion or interruption of the load.

RAMP FUNCTION

The function of ramp and fall it's needed to reach the Set Point value within a predefined time, which has to be programmed in advance and has to be necessarily longer than the one of the process controlled. The meaning of this function is not to place under thermical stress the treated materials. Once the instrument has reached the first Set Point (SP1) it's possible to have the automatic commutation on the second Set Point (SP2) after a programmed time, with a simple automatic cycle. That function is available for all the programmable control types.



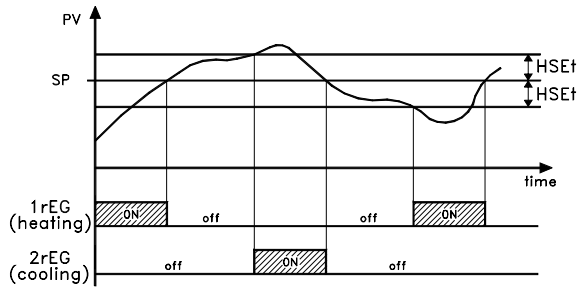
CONTROL MODE FEATURES

ON / OFF CONTROL

This control works on output 1rEG, depending on the Set Point, on the functioning mode and on the hysteresis programmed. The control is symmetrical or asymmetrical. Symmetrical means that the output is ON untill when the Process Value has reached (SP+hysteresis) or when has reached (SP-hysteresis).Asymmetrical means that the output is ON up to the reaching of the Set Point, to become again ON when it has reached (SP-hysteresis).

NEUTRAL ZONE CONTROL

This type of control concerns both outputs and it is used to control a plant which is equipped with a heating and a refrigerant element. This control works on the outputs depending on the measure, on the Set Point and on the hysteresis programmed.

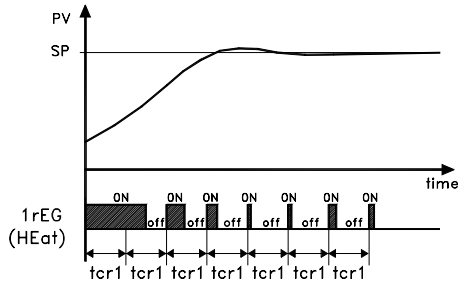


PID CONTROL

The PID control works with a particular algorithm with **two degrees of freedom** that optimises, in independent way, the features of the instrument, in case of process noises and Set Point variations.

PID CONTROL
Single action

The single action PID control works on the output 1rEG depending on the active Set Point, on the functioning mode and on the instrument's PID algorithm with two degress of freedom.



PID CONTROL
Double action

The double action PID is obtainable when 2 outputs are programmed respectively 1rEG and 2rEG and is used to control plants where there is an element which causes a positive increment (ex. Heating) and an element which causes a negative increment (ex. Cooling). This type of control works on the outputs 1rEG and 2rEG depending on the active Set Point and on the instrument's PID algorithm with two degrees of freedom.

PARAMETERS PROGRAMMING	PARAMETERS PROGRAMMING
Proportional band 0 … 9999	Proportional band 0 … 9999
Manual reset -100.0 … 100.0%	Manual reset -100.0 … 100.0%
Output 1rEG cycle time 0.1 … 130.0 s	Output 1rEG cycle time 0.1 … 130.0 s
Integral action time OFF … 9999 s	Output 2rEG cycle time 0.1 … 130.0 s
Derivative action time OFF … 9999 s	Integral action time OFF … 9999 s
Fuzzy Overshoot Control 0.00 … 2.00	Derivative action time OFF … 9999 s
	Fuzzy Overshoot Control 0.00 … 2.00
	Prat: Ratio between cooling power and heating power

The parameter Fuzzy Overshoot Control permits to avoid the variable overshoots at the start up of the process or at the changing of the Set Point.

AUTOTUNING FUNCTION

This function permits to automatically tune the PID parameters, after the Set Point programming. The calculated values are automatically stored, at the end of the Autotuning cycle, into the PID parameters. That function permits the PID parameters calculation through a tuning cycle FS type and, at the end of this operation, the parameters are stored into the instrument's memory and remain constants during the control. The Autotuning cycle duration has been limited at 12 hours maximum.

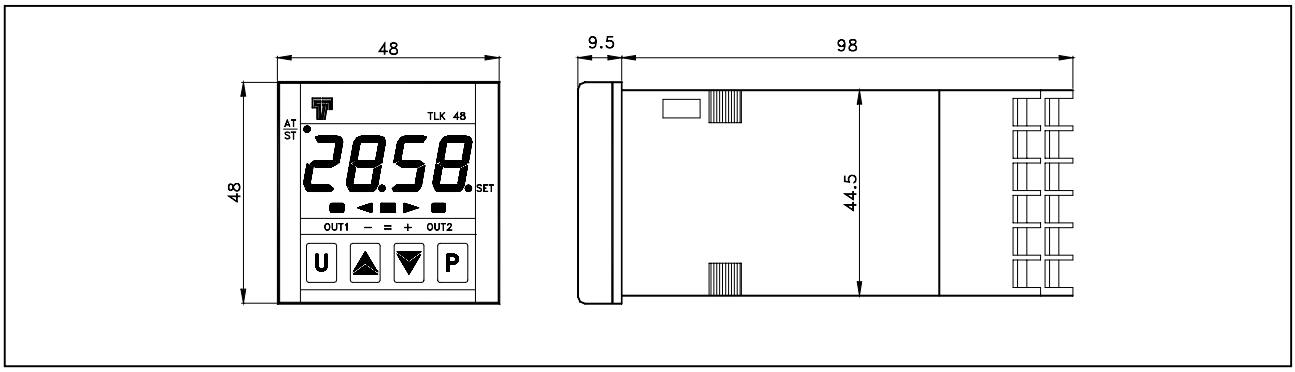
SELFTUNING FUNCTION

It's an algorithm that permits to calculate the PID parameters during the control. It has the meaning to correct the control errors caused by the process variations. It's type "**rule based TUNE-IN**" and automatically recognises the type of noise and works in order to optimise the control, reducing as much as possible the oscillations.

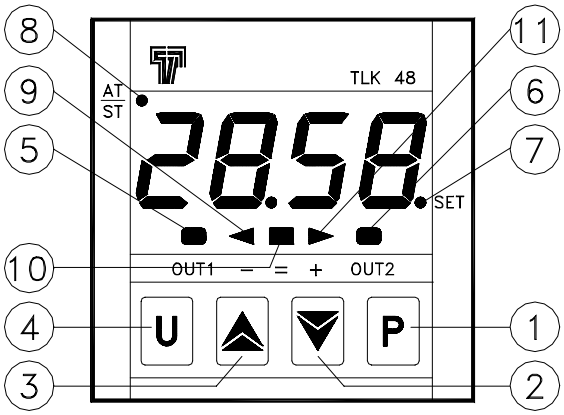
SOFT-START FUNCTION

That function is only workling with PID control and allows the limiting of the control power when the instrument is switched on, for a programmable time. This is useful when the actuator, driver by instrument, could be damaged by power too high supplied when the application is not yet in the normal rating. When the Soft-Start is active, it's not possibile to execute the Autotuning, because it may gives an excessive power.

MECHANICAL DIMENSIONS (mm)



FRONT PANEL DESCRIPTION



1 - Key P It's used to get into the parameters programming and to confirm the programmed parameter.

2 - Key DOWN In the programming phase, it decreases of one unit the figure on which it's located the slider. In the normal functioning, it visualises the current measured by input TA HB.

3 – Key UP In the programming phase, it increases of one unit the figure on which it's located the slider. In the normal functioning, it visualises the output control power.

4 – Key U Key with function programmable as: Activate Autotuning and Selftuning funcions, swap the instrument into manual control, aknowledge the alarm, change the active Set Point, deactivate the control.

7 – Led SET Lighted, it signalises the input in programmation mode.

8 - Led AT/ST If it's flashing, the instrument is executing the AUTO-TUNING. If it's permanently lighted the instrument is executing the SELF-TUNING.

9 - Led (-) Shift index It indicates that the process value is lower than as programmed Set.

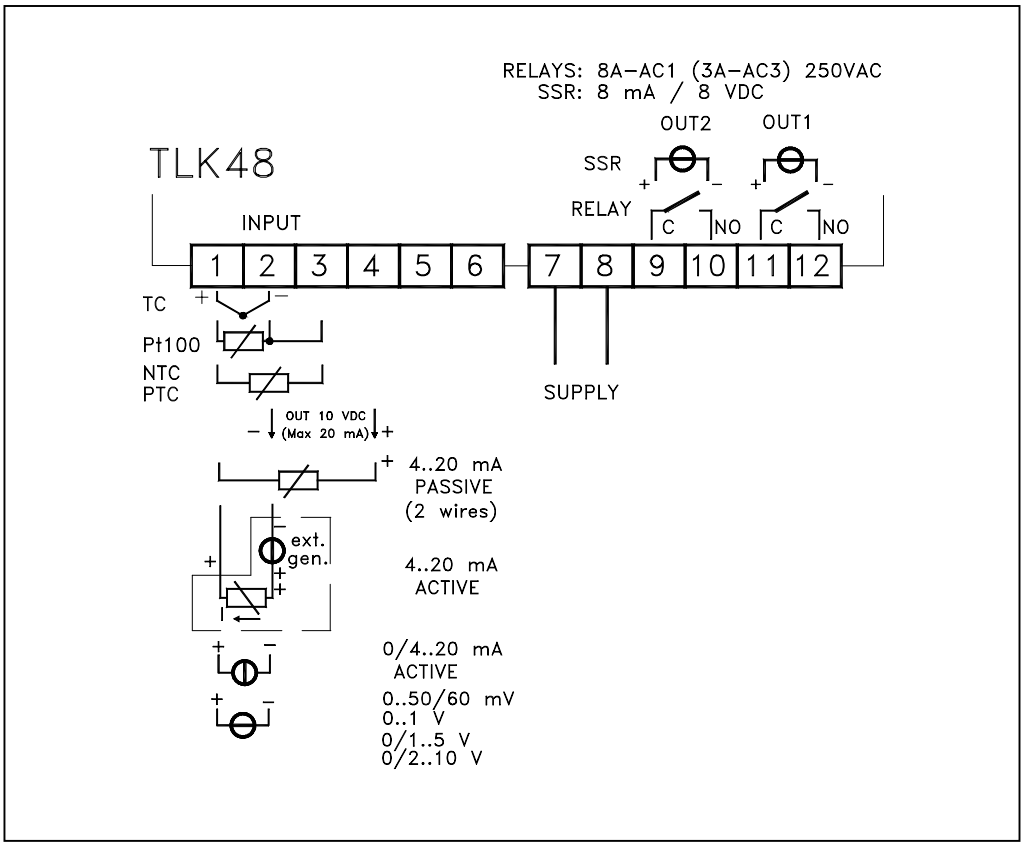
10 – Led (=) Shift index It indicates that the process value is within the programmed range.

5 – Led OUT1 Lighted, it signalises that output OUT1 is active.

6 – Led OUT2 Lighted, it signalises that output OUT2 is active.

11 – Led (+) Shift index It indicates that the process value is higher than as programmed Set.

CONNECTIONS DIAGRAM



CERTIFICATIONS AND CONFORMITY

▲ CE Conformity: CEE EMC 89/36 (EN 61326)
CEE LT 73/23 and 93/68 (EN 61010-1)

▲ UL CONFORMITY: File n. E 206847