

Table 3. Self Tuning (Auto Tuning) Error Codes

Error Code	Reason	Corrective Action
ES.1	P and PD control was selected	For auto tuning, PI or PID control is required. Ti parameter must be greater than zero.
ES.2	Setpoint value is incorrect	Change Setpoint value or St.I & St.H settings
ES.3	auto tuning interrupted due to 1.Enter key was pressed, 2.Control Run/Stop function 3.Timer setting	Control Run/Stop function should be set to run.Check the timer function settings.
ES.4	The maximal duration time of auto-	Check if the temperature sensor is correctly placed and if the set point value is not set too higher for the given object.
ES.5	The waiting time for switching was exceeded	
ES.6	The measuring input range was exceeded.	Check sensor connections. Do not allow that an over-regulation could cause the exceeding of the input measuring range.
ES.0	Very non-linear object, making impossible to obtain correct PID parameter values, or noises have occurred.	Carry out the auto-tuning again. If that does not help, select manually PID parameters.

7.2.2 Tuning of PID parameter in case of a dissatisfying control

The best way to select PID parameters is to change the value a twice higher or a twice lower. During changes, one must respect following principles:

Table 4. Tuning PID Parameter

Controlled Quantity	↑ - Increase ↓ - Decrease			
	P	PD	PI	PID
Oscillations	Pb ↑	Pb ↑ td ↓	Pb ↑ ti ↑	Pb ↑ ti ↑ td ↓
Over-regulations	Pb ↑	Pb ↑ td ↑	Pb ↑ ti ↑	Pb ↑ ti ↑ td ↑
Instability		Pb ↓ td ↓		Pb ↓ td ↓
Slow jump response	Pb ↓	Pb ↓	ti ↓	Pb ↓ ti ↓

8. Alarms

Controller provides seven alarm types one of which can be assigned to any output. The alarm configuration requires the selection of the alarm type through setting out 1, out 2 parameters on the suitable type of alarm. Available types of alarms are given on following figure.

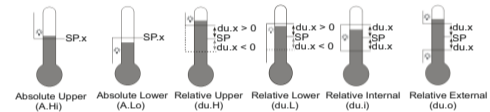


Fig 2. Types of alarms

Note:- x signifies 1, 2 i.e output 1 or output 2 Alarm.

The set point value for absolute alarms is the value defined by the SP.1 / SP.2 parameter. For relative alarms, it is the deviation from the set point value in the main channel - du.1 / du.2 parameter. The alarm hysteresis, i.e. the zone around the set point value, in which the output state is not changed, is defined by the Hy.1 / Hy.2 parameter. Hysteresis is applied to both the side of the set point value as hysteresis/ 2.

9. Timer Function

When reaching the set point temperature (SP) the timer begins the countdown of the time defined by the time parameter. After counting down to zero, the timer alarm is set, which remains active till the moment of the timer erasing. To activate the timer function, one must set the parameter tmr. To indicate the alarm state on an output, one of the outputs out1, out2 should be set to AL.tr. The timer status/ residual time is displayed with the mark "t" on the first position. To display it, one must press the Enter key till the moment of its appearance on the display (acc. to the fig. 3) The return to the set point value display is set by the manufacturer on 60 sec, but can be changed.

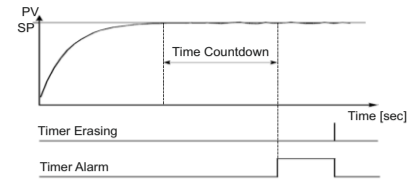


Fig 3. Principle of timer operation

Status	Description	Signaling
Timer stopped		t---
Starting of the timer	- Temperature over SP - Press the Down key	Residual time in minutes e.g. (t 2 9 . 9)
Pause of the timer	Press the Down key	Flickering residual time in minutes
End of the countdown	Reaching zero by the timer	t E n
Timer Reset	During the countdown : - Press Down key and Up key After the countdown end : - Press the Up key	

9.1 Tolerance band (t.bd)

This is the band around the set-point in which timer starts running automatically when the process value has reached a tolerance band. When Tolerance band is enable the timer starts only if process value is in tolerance band. When process value jumps outside the tolerance band, timer will pause & it automatically starts running when the process value comes within the tolerance band. If the Tolerance band is set to zero, this function is disabled.

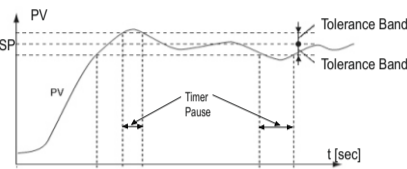


Fig 4. Timer operation with Tolerance Band

9.2 Timer Functions(tmr)

Timer Output can be assigned to following soft function to take action when the timer countdown is completed.

- 1. OFF:** Timer Function is disable.
- 2. non:** Timer Function is enable but the output of timer is not assigned to any of the soft features.
- 3.StP:** Control output is stopped when the timer countdown is completed.(only when one of the output is control)
- 4. tun:** Start the auto tuning when the timer countdown is completed.(only when one of the output is PID control & auto tuning function is enable & control output is set to RUN)
- 5.St.C:** Cancel auto tuning when the timer countdown is completed.(only when one of the output is PID control & the meter is in the auto tuning mode & control output is set to RUN)
- 6.Hnd:** Jump to Manual mode when the timer countdown is completed.(only when one of the output is control)

10. ADDITIONAL FUNCTIONS

10.1 Control Signal Monitoring

The control signal is displayed with the mark "h" on the first position. The accessibility of the control signal depends on the suitable controller configuration. To display the control signal, one must press the Enter key till the moment of its appearance on the display. The return to the set point value display is set by the manufacturer on 60 sec. but it can be changed.

10.2 Manual Control

The input to the manual control mode follows after holding down the Enter key during the control signal monitor screen display. The manual control is signaled by blinking of h symbol. The controller interrupts the automatic control and begins the manual control of the output. The control signal value is on the display, preceded by the symbol "h" for the main channel. Down key and Up key serve to change the control signal. The exit to the normal working mode follows after the simultaneous pressure of Down key and Up key. At set on-off control on the output 1 (parameter Pb=0), one can set the control signal on 0% or 100% of the power, however when the Pb parameter is higher than zero, one can set the control signal on any value from the range 0...100%. For 100% value "h.on" is shown on display screen.

10.3 Digital Filter

In case when the measured value is unstable, one can switch a programmed low-pass filter on. One must set the lowest possible time constant at which the measured value is stable. A high time constant can cause control instability. The time constant of the filter (FLT) can be set from 0.0 sec. up to 99.9 seconds.

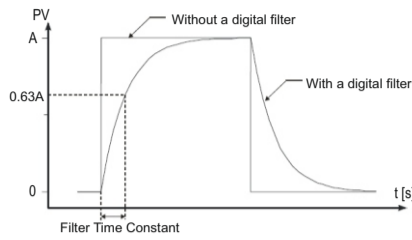


Fig 5.Time characteristic of the filter

Table 6 . Error Signaling

Error Code	Reason	Procedure
---	Down overflow of the range limit or lack of RTD	Check, if input signal values are situated in the appropriate range – if yes, check if there is no short circuit in the thermoresistor or the thermocouple is connected inversely.
---	Upper overflow of the range limit or break in the sensor circuit	Check, if input signal values are situated in the appropriate range – if yes, check if there is no break in the sensor circuit.

Table 7 . Controller Error

Error Code	Reason	Procedure
E r A	Input discalibrated	Connect the controller supply again and if that is not effective, contact the nearest service shop.
E r E	Configuration parameters checksum error	

11. Technical Data

Input signals :

Symbol	Input / Sensor	Min	Max
pt1	Resistance thermometer Pt100	-199 °C/°F	850 °C (999°F)
t-J	Thermocouple of J type	-100 °C (-148 °F)	999 °C/°F
t-I	Thermocouple of T type	-100 °C (-148 °F)	400 °C (752 °F)
t-K	Thermocouple of K type	-100 °C (-148 °F)	999 °C/°F
t-S	Thermocouple of S type	0 °C (32 °F)	999 °C/°F
t-R	Thermocouple of R type	0 °C (32 °F)	999 °C/°F

Measurement time 0.2 sec

Resolution 1°C

Auxiliary Supply

- Higher Aux 60 V - 280 V AC/DC
- Higher Aux supply frequency 45 to 65 Hz range
- Higher Aux Nominal Value 230 V AC/DC 50/60 Hz for AC

VA Burden

- Auxiliary Supply Burden : < 6 VA approx

Types of Outputs :

- Relay Contact SPDT-NO/NC, rated load: 10A @ 250 VAC / 30 VDC
- SSR Drive Output(optional) 12 VDC, maximum load capacity: 40mA

Accuracy :

- Reference Conditions 23 °C
- RTD 0.1 % of range ± 1°C
- Thermocouple 0.25 % of range ± 1°C (0.5 % of range for R, S) ± 1°C

Influence of Variations :

- Temperature Coefficient 0.025 % / Deg

Applicable Standards :

- EMC IEC 61326 - 1 : 2012
- Safety IEC 61010- 1- 2010, Permanently Connected Use IEC 60529
- IP for water and dust 2
- Pollution degree II
- Installation Category II

Isolation :

- Protective Class 2
- High Voltage Test Input+Output +Aux Vs Surface 2.2 kV RMS, 50Hz, 1min
- Input+SSR Vs Relay Output 1.5 kV RMS, 50Hz, 1min
- Aux Vs Remaining circuit 2.2 kV RMS, 50Hz, 1min

Dimensions and Weight

- Bezel size 48 mm X 48 mm (DIN 43718)
- Panel Cutout 45+0.6mm X 45+0.6mm
- Weight Approx. 0.3 Kg

Additional Error

- (Cold junction compensation for thermocouple) < 3 °C

Environmental :

- Operating Temperature -10 °C to +55 °C
- Storage Temperature -30 °C to +80 °C
- Relative Humidity 0 ... 90 %RH (non condensing)
- Warm up time 20 min
- Shock Half sine wave, Peak acceleration 30g, (300 m/s²), duration 18ms
- Vibration 10 ... 150 ...10 Hz, 0.15 mm amplitude
- No. of sweep cycles 10 per axis
- Enclosure IP 54 (front face)
- Altitude 2000 m max
- Location Indoor Use

Note : Variation due to influence quantity is 100% of Class index.

Meaning of Symbols

- ⚠ Warning concerning a point of danger (Attention: Observed Documentation)
- ~ AC / DC voltage

Note:-

RISHABH INSTRUMENT PVT LTD
F-31, M.I.D.C Satpur, Nashik 422007 , India
Tel: +91 253 2262162, 2202202
Fax: +91 253 2351004
Email: marketing@rishabh.co.in
www.rishabh.co.in