IMO

48 x 24mm 4-Digit Display PID Temperature Controller

FCL

48 x 24mm PID temperature controller with autotune and remote second setpoint selection option

- Multi-sensor thermocouple and Pt100 input model
- 4-20mA input model
- Relay, voltage pulse, analogue 4-20mA or 0-10VDC output
- 12-function temperature alarm with variable delayed action
- Alarm hysteresis is adjustable from 0.0 to 100.0˚C or ˚F
- Loop break alarm to detect insufficient temperature rise within a set time
- Alarm output energised/de-energised selection
- Programmable ramp-rate control
- Autotune threshold adjustment
- 3 levels of keypad security locking
- Adjustable setpoint limits
- % output power display
- Adjustable PV filter to slow down response if required
- Fully adjustable output power limit
- RS232C or RS485 communications option
- IP54 protection

Options and ordering codes

FCL-13A – R / M SM 100-240VAC

- **FCL-13A** – 48 x 24mm PID temperature controller with one alarm
- **R** – Relay output
- **S** – Signal voltage for SSR
- **A** – Current output
- **V** – Analogue voltage 0-10VDC
- **M** – T/C+ Pt100 input
- **A** – 4-20mA input
- **100-240VAC** – 100-240VAC supply
- **24VAC/DC** – 24VAC/DC supply

Options

- **SM** – Remote 2nd setpoint
- **C** – With RS232C
- **C5** – With RS485
- **–** – Without options

PRICE INFORMATION AND ORDERING

Please note: Option SM cannot be supplied simultaneously with options C or C5

Also available: Heater burnout alarm – cannot be supplied simultaneously with SM, C or C5, or with 4-20mA or 0-10V output models

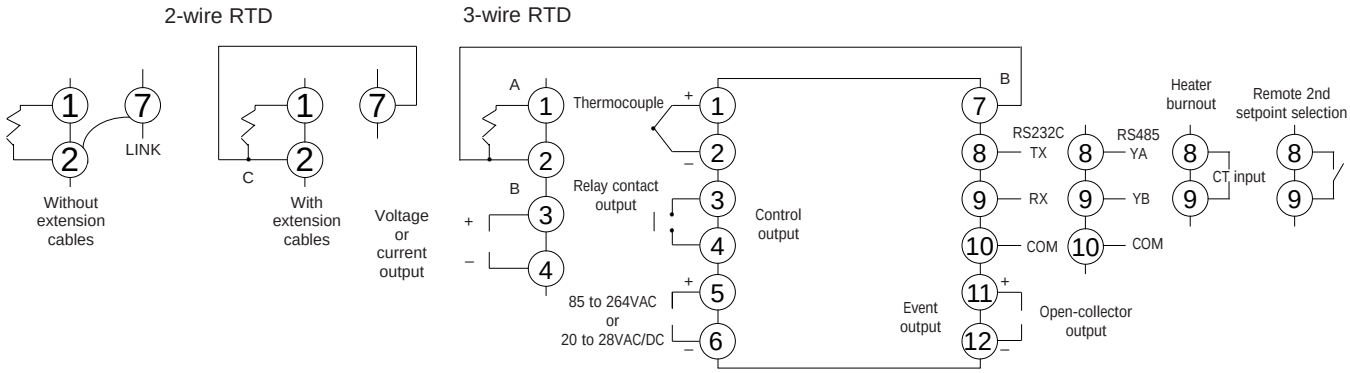
Specifications

Input type	K-thermocouple	J-thermocouple	E-thermocouple	PL-II thermocouple	N-thermocouple	DIN Pt100 RTD	DIN Pt100 RTD	J Pt100 RTD	J Pt100 RTD
Rated scale	0 to 1370˚C	0 to 1000˚C	0 to 800˚C	0 to 1390˚C	0 to 1300˚C	–199.9 to 850.0˚C	–200 to 850˚C	–199.9 to 500.0˚C	–200 to 500˚C
Sensor resistance	100Ω or less					10Ω per wire or less			
Accuracy	±0.3% of full scale ± 1 digit					±0.2% of full scale ±1 digit			
Display	4-digit red LED, 8mm high								
Control action	User-selectable: PID with autotune, PD, On/Off								
Proportional band	0 to rated scale maximum value. Factory set to 10˚C (20˚F)								
Integral time	1 to 3600 secs (off when set to 0), Factory set to 200 secs								
Derivative time	1 to 3600 secs (off when set to 0), Factory set to 50 secs								
Anti-reset windup	Automatic in PID modes								
Reset range in PD action	Within the proportional band								
Hysteresis in On/Off action	0.1 to 100.0˚C (˚F)								
Proportional cycle	1 to 120 seconds, Relay output type: Factory set to 30 secs; Signal voltage type: Factory set to 3 secs								
Output: relay types	SPNO: 250V, 3A resistive load; 250V, 1A inductive load, cos ø = 0.4								
Output: signal voltage types	12VDC +2VDC/–0VDC 40mA, short-circuit protected								
Output: analogue types	4 to 20mA DC - max. load resistance 500Ω, 0-10VDC – output impedance 500Ω								
Temperature alarm	Open collector output 24VDC 0.1A maximum								
Loop break alarm time	0 to 200 minutes selectable								
Loop break alarm temperature	0 to 100˚C selectable (˚F)								
Delayed action alarm time	0 to 9999 secs								
Rising/falling rate setting	0 to 9999˚C/minute selectable								
Temperature alarms action	ON/OFF action, hysteresis 0.1 to 100.0˚C (˚F), Factory set to 1.0˚C (˚F)								
High limit alarm (1)	Deviation from SV: scale span value to + scale span value								
Low limit alarm (1)	Deviation from SV: scale span value to + scale span value								
High/low limits alarm (1)	Deviation from SV: 1 to scale span value								
High/low limit range alarm (1)	Deviation from SV: 1 to scale span value								
Absolute value (process) alarm (1)	Input range minimum value to input range maximum value								
Absolute (process) reverse alarm (1)	Input range minimum value to input range maximum value								
Sensor correction (input shift)	–100.0 to 100.0˚C (˚F), Factory set to 0.0˚C (˚F)								
Sensor break protection	Upscale: Control output off								
Supply voltage	85 to 264VAC 50/60Hz (100-240 VAC+10%–15%); 20 to 28 VDC/AC 50/60Hz								
Power consumption	15VA approx.								
Ambient temperature	0 to 50˚C								
Ambient humidity	35 to 85% r.h. (non-condensing)								
Insulation resistance (2)	>10MΩ at 500VDC								
Mounting	Flush								
Front panel	Membrane sheet keyboard, IP54								
Weight	100g approx								
Case material	Light grey polycarbonate, flame retardant and self-extinguishing								

(1) All alarm types can be programmed to operate with or without 'standby' function

(2) Do not apply voltage between sensor input terminals and control output terminals of FCL-13A-A, FCL-13A-S and FCL-13A-V models

Wiring connections



Notes:
- For ease of connection, especially when using cable trunking, all the terminals are designed to accept wires from the left (when looking from the rear of the unit).
- If using a pre-wired, 2-wire Pt100 RTD, without connecting extension cables, a link should be added between terminals 2 and 7. If using extension cables, a third wire should be added from point C, one of the joins, as in the diagram above and all three wires should be the same gauge and length. If a simple link is added between terminals 2 and 7 in this case, no compensation for lead length will be applied.
- As there is no fuse inside the temperature controller, it is recommended that one is provided in the external wiring to the power supply terminals.
- The sensor wires should not be run adjacent to an AC power supply or the wires to the power supply terminals.
- When using the relay contact output version it is recommended to provide an auxiliary relay to protect the contacts of the temperature controller's built-in relay, even if the intended load capacity is smaller than that of the built-in contacts.

Features

3 Levels of Keypad Security Locking

To prevent unauthorised modifications to the programming, one of three levels of keypad security locking can be set, to give partial or no access to change the parameters:

Level 1 – No setting values can be changed.
Level 2 – Only the setpoint can be changed, all others are locked.
Level 3 – All setting values can be changed temporarily. When the power is turned off and on again, all settings return to their former values.

Adjustable Setpoint Limits

The setpoint can normally be programmed within the full range which varies according to the chosen sensor, e.g. 0 to +1370˚C for type K thermocouples. The upper and lower limits can be restricted to prevent unauthorised or accidental changes beyond these points, e.g. a restriction of 420 to 430 could be applied.

% Output Power Display

The FCL normally shows the actual process temperature or the required setpoint on the display, but can be programmed to show the equivalent output power in % if required with a resolution of 0.1%. The decimal point flashes as a reminder that it is not a setpoint. This value reflects the ON time of proportional control as a percentage of the total cycle time for the relay and voltage output models, or the mA output as a percentage of full scale for the current output model.

Auto-tune Threshold Adjustment

The P, I and D values can be manually set through the front keypad or the autotune can be activated to calculate and program them automatically, together with the ARW. The FCL has several pre-programmed algorithms within its microprocessor and chooses the most suitable one to calculate the values according to when the autotune is activated.
For example, if autotune is started when the system is first turned on, an algorithm is chosen to set the P, I and D values that give the minimum overshoot. If the autotune is started when approximately level control is achieved, a different algorithm is chosen to ensure that the most accurate, stable temperature is maintained. The autotune is activated through the front keypad. The levels at which the choice of algorithm is decided can be adjusted according to the application to ensure the best autotune is achieved for the process.

Event Output

This is an open-collector output (24VDC 0.1A maximum), which can be user-selected as a 12-function alarm or a loop-break alarm (or a heater burnout alarm if this option is purchased).

Features (continued)

Alarm Output Energised/De-energised Selection

The event output can be programmed for normally off (turning on for an alarm condition) or normally on (turning off for alarm).

The normally on mode is suitable for fail safe applications (in the event of power failure), as the alarm condition is the same as that for power failure.

The normally off mode is suitable for standard applications where the output is required to turn on when an alarm occurs.

Loop Break Alarm

This is a programmable alarm of temperature rise or fall against time. The time setting is 0 to 200 minutes and the temperature span is 0 to 100˚C (0.0 to 100.0˚C for ranges with a decimal point). If the PV does not rise by the span or greater within the set time after the output power reaches 100% (or does not fall by the span or greater within the set time after the output power falls to 0%), then the alarm is activated.

This can be used to check that: • mobile infra-red heaters are placed close enough to the target.
• multiple element heaters are all functioning.

Delayed Action Alarm

The alarm can be set as a delayed type. The time is adjustable from 0 to 9999 seconds. If short transient alarm conditions occur, they will be ignored, unless they exist for at least the set time.

Wide Alarm Setting Adjustment

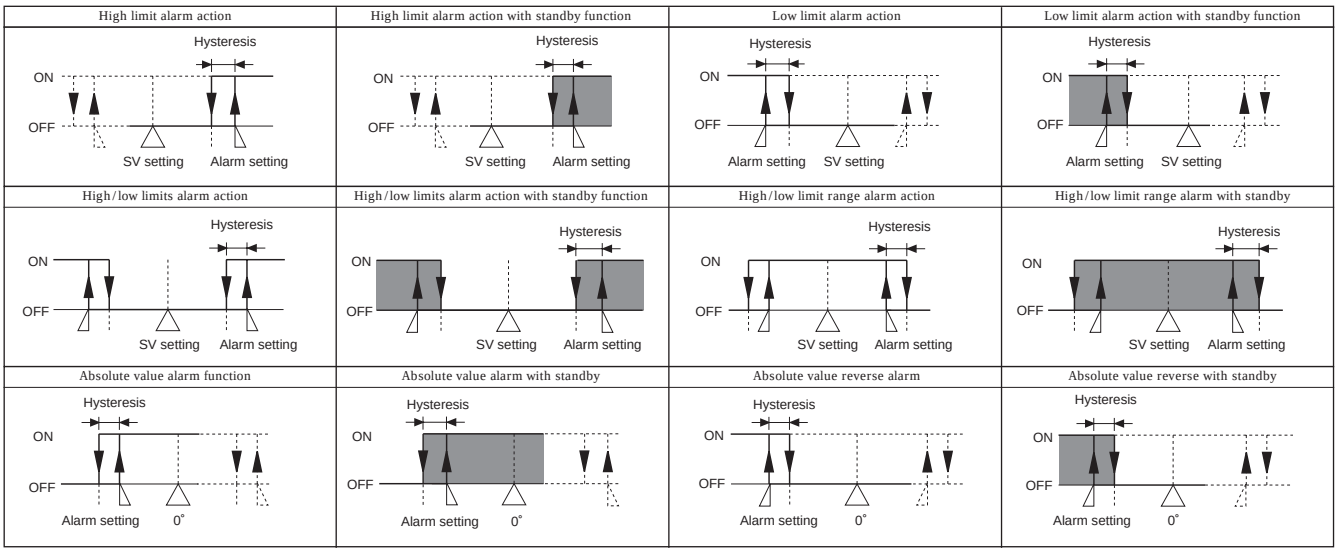
The setting values of the two alarms are programmed independently and are variable over the full scale span, e.g. for type K thermocouples:

Deviation alarms ±1370˚C or ±2500˚F
Absolute alarms 0 to +1370˚C or 0 to +2500˚F

Adjustable Alarm Hysteresis

The hysteresis between the points at which the alarm turns on and resets can be adjusted in 0.1˚C or ˚F increments between 0.1 and 100.0˚C or ˚F.

Alarm – Programmable With 12 Functions



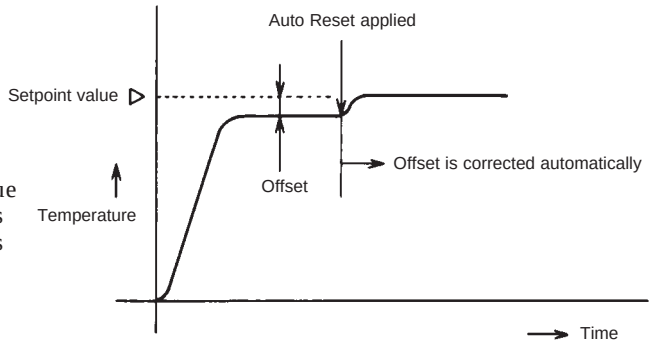
In ▭ parts, the standby function operates.

The first eight alarm types are deviation alarms. The alarm turns on if the PV (Process variable) deviates from the SV (Setpoint value) by the amount programmed in the alarm, e.g. if a High Limit Alarm is set at 10˚C and SV = 40˚C, the alarm turns on when PV rises above 50˚C. If the alarm is set at –10˚C and SV = 40˚C, the alarm turns on when PV rises above 30˚C.
In the four absolute alarms, the actual value of alarm required is programmed, e.g. to alarm at PV=50˚C, the alarm should be set at 50˚C.
The standby function prevents the alarm from registering if an alarm condition exists when power is initially applied to the controller. This also happens if the setpoint value, SV, is changed to a level which places the current PV into an alarm. When PV has moved out of the alarm level into the normal control area, then any further alarms will be registered.

Features (continued)

Auto Reset in PD Control

If the FCL is set for PD control action, a reset function is available to correct the inherent offset associated with this form of control.



Wide Adjustment of P, I and D Values

P – Proportional Band	0 to full scale value
I – Integral time	1 to 3600 seconds
D – Derivative time	1 to 3600 seconds

Fully Variable Proportional Cycle

Proportional Cycle	1 to 120 seconds

Remote Second Setpoint Selection

If this option is purchased with the FCL, a second setpoint can be selected by shorting the appropriate two terminals on the rear of the instrument.

This can be useful for processes that need to heat to a specific level and then cool to a second setting or pre-heat to one level before final heating to a higher setting.

Main Setting Value Rising and Falling Rates

The rising and falling rates can be independently programmed to ensure that the rise or fall is controlled linearly. In this way, the temperature can be increased at a controlled rate for more delicate applications.

This applies when the power is turned on, i.e. the first temperature rise and also if the setpoint is changed to another value.

Control Output Off

If the control is required to stop, or one of several FCL models in a process is not used, the control action can be turned off, with the PV display showing 'OFF' as a clear indication. This setting is retained, even if power is turned off and on again, until it is cancelled.

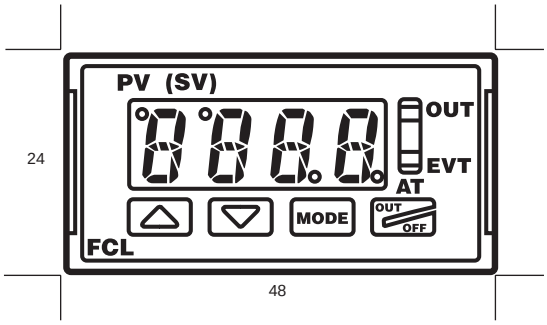
Sensor Correction (Input Shift)

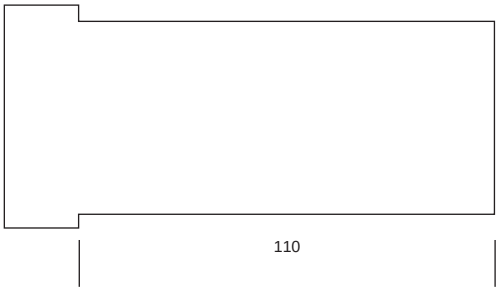
This function can be used when a sensor cannot be located at the ideal position for control and is placed where the temperature may deviate from that in the ideal position. Also, when using several temperature controllers, this function can be used to correct the apparent temperature difference due to the tolerances of the sensors and the controllers.

PV Filter Time Constant Setting

If the PV is found to fluctuate due to external disturbances to systems with short time constants then the PV filter feature of the FCL can be used to slow down the response of the whole system (not just the display).

Dimensions (mm)





PRICE INFORMATION AND ORDERING