

2132 and 2116 PID Temperature Controllers

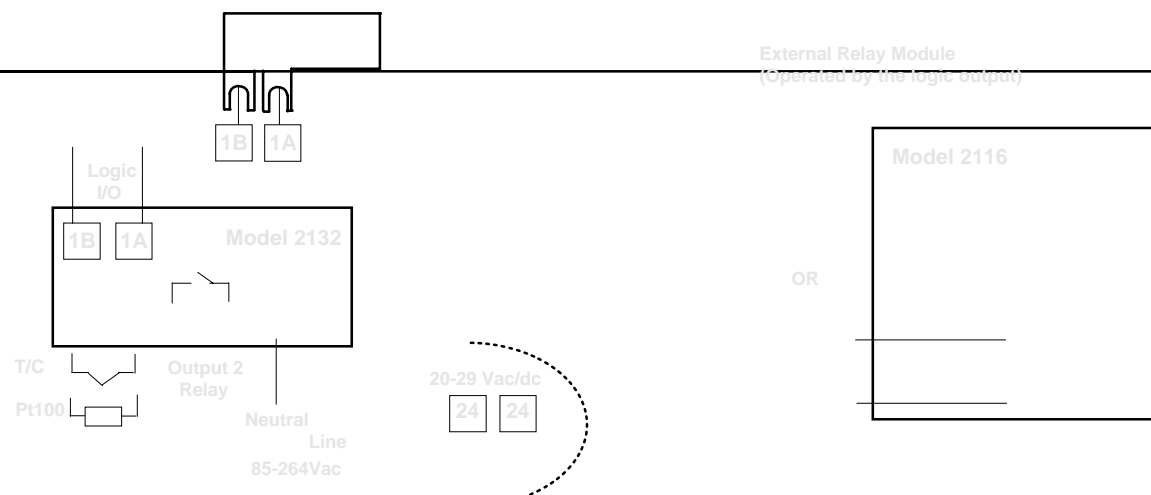
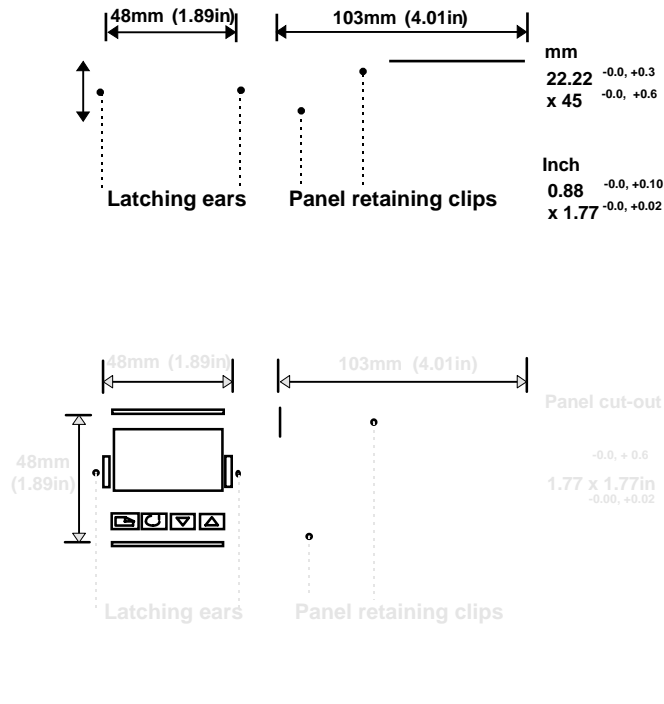
Installing and Operating Instructions



Thank you for choosing the 2132 or 2116 Temperature Controller. Supplied in 1/32 and 1/16 DIN panel sizes they are designed for accurate, stable control of ovens, chillers, sterilisers and other heating and cooling processes. Two outputs are configurable for heating, cooling and alarms.

DIMENSIONS AND INSTALLATION

Model 2132



Typical Wiring Diagram

OPERATION

Switch on the controller. Following a 3 second self-test sequence, you will see the display shown below. It is called the HOME display.

TO ADJUST THE REQUIRED TEMPERATURE (SETPOINT)



Press and release quickly the

OP1 illuminates when the logic output is ON (normally heating).

OP2 illuminates when the relay output is ON (normally cooling or alarm).

If OP1 or OP2 are configured as alarm outputs (instead of heating and cooling), they will flash when a new 'unacknowledged' alarm occurs and go steady when the alarm is acknowledged but still true.

TO ACKNOWLEDGE A NEW ALARM

Press  and  together. This will also reset any latched alarms that are no longer true.

ALARM MESSAGES

If an alarm occurs a message will be flashed in the display. This alternates with the measured temperature as shown below:





All of the possible messages are shown in this table.

Possible messages	
-F5H	Alarm - Full Scale High
-F5L	Alarm - Full Scale Low
-dEU	Alarm - Deviation
-dHi	Alarm - Deviation High
-dLo	Alarm - Deviation Low
Sbr	Sensor Break
Lbr	Loop Break
LdF	Load Fail
End	End of Timing
In place of the dash the alarm number is shown - Alarm 1 or 2 or 3.	

PARAMETER LISTS

Parameter Tables

	Home List	Adjustable Range	Default setting	Customer setting
<i>OP</i>	<u>O</u> utput <u>P</u> ower demand in %	-100 = max cooling, 100.0 = max heating.		
<i>w.SP</i>	<u>W</u> orking <u>S</u> etpoint	Only appears when setpoint rate limit enabled	Read only	Read only
<i>m-A</i>	<u>M</u> anual/ <u>A</u> uto Select	<i>Auto</i> <u>A</u> utomatic control selected <i>mAn</i> <u>M</u> anual standby selected	<i>Auto</i>	

<i>d, SP</i>	Home <u>D</u> isplay Options	<i>Std</i>	<u>S</u> tandard - Shows the process value with the setpoint accessed by pressing the  and  buttons.	<i>Std</i>
		<i>OP</i>	Displays the output power - for use as a manual station. (Only applies to software version 1.4)	
		<i>nonE</i>	Blank Display (only alarm messages flashed)	
		<i>PV</i>	Displays the <u>P</u> rocess <u>V</u> alue only	
		<i>AL SP</i>	Displays the <u>A</u> larm 2 <u>S</u> etpoint only	
		<i>PuRL</i>	Displays the <u>P</u> rocess <u>V</u> alue with <u>A</u> larm 2 Setpoint accessed by the  and  buttons	

Parameter	Adjustable Range	Default Setting	Customer setting
...e page 10)	OFF or on	OFF	
...ulation (when	OFF or on	OFF	
Parameter	Adjustable Range	Default Setting	Customer setting
	1 to 999.9 display units	20	
	OFF to 9999 seconds	360	
	OFF to 9999 seconds	60	
	- 100 to 100.0 %	0.0	





Lcb Low Cutback

Auto to 999.9 display units

Auto

TO HIDE, REVEAL AND PROMOTE PARAMETERS

TO USE THE TIMER


- Press  until you reach the *SP* list
- Press  until you reach the *Em.OP* parameter
- Press  or  to select the timer operating mode, *OPt. 1* to *OPt. 5* as follows:

OPt. 1 - Mode 1, Dwell and Switch Off

In reset

In reset, you can switch between automatic control and standby mode, using the parameter *m-R* in the HOME list. The controller is supplied with the *m-R* parameter hidden. You must first reveal it. See 'To Hide, Reveal and Promote Parameters'.

The *Promote* option

Up to twelve commonly used parameters can be 'promoted' into the HOME list. This will give the operator quick access to them by simply pressing the  button. This feature, used in combination with 'hide' and 'read only', allows you to organise the way in which you want your controller formatted.

The parameter *Emr* will now appear in the HOME list. Repeat the procedure for any other parameters you wish to promote.

To remove a parameter go to *Edit* level, select the parameter from the relevant list and change the choice from *Prom* back to *Alter*, *Read* or *Hide*.

Returning to Operator level

Repeat the above procedure for all the parameters you wish to hide, promote, or make read-only then return to operator level:

'Automatic control' means control at setpoint, with heating (and cooling) being applied.

'Standby mode' means: the controller is in manual with zero output power. See 'Warning!' on Page 3.

During Running

The controller will always switch to automatic control. Heating until you reach the *PLLS* list heading. Press **Example:**

OPT.3 - Mode 3, Time from Cold and Switch Off

This is the same as mode 1 except that the timer will start counting down immediately without waiting for the temperature to reach setpoint.

OPT.4 Mode 4, Time from Cold No Switch Off

This is the same as mode 2 except that the timer will start counting down without waiting for the controller to reach setpoint.

OPT.5 Mode 5, Delayed Switch On

This mode applies a time delay before turning on the heating (or cooling). When the timer is started, the controller will always switch to standby mode and start counting down. When the timer has timed out, the controller will switch into automatic control, apply heating (or cooling) and control indefinitely at the setpoint.

or

CONFIGURING THE CONTROLLER

Select configuration level to change: •The type of control •The display units •The input sensor type • The scaling of linear inputs •The alarm configuration • The passwords.

To select configuration level

Instrument Configuration

Inst	Instrument Configuration	Options	Description
unit	Display <u>units</u>	°C °F °K none	Centigrade Fahrenheit Kelvin None
DECP	<u>Decimal places</u> in display	none one two	None One Two
CTRL	<u>Control type</u>	PID On/Off AL	PID Control On/off Control Converts the controller to an <u>alarm</u> unit
ACT	Control <u>action</u>	reverse direct	Reverse (normal action for temperature control)

Relay and Logic input/output Configuration

Note: The logic I/O can be configured as an output or a contact closure input for alarm acknowledge, keylock, or timer run/reset.

RR	Relay output	Options	Meaning
IR	Logic I/O		
id	Identity of output	rELY LOG	Relay Logic
Func	Function	dIG HEAT COOL	Digital (alarm) output Heating output Cooling output
	These functions are only appear for the logic I/O	SSr.1 Ac.AL Loc.b rrES	PDSIO mode 1 Alarm Acknowledge Keylock digital input Run/reset timer
d,GF	Digital output functions See below: " To Operate the relay or logic output from an alarm or digital function"	nOch CLr 1FSL 2FSL 3FSL nw * Sbr * Lbr * LdF *	No change Clear all alarms Alarm 1 (See note 1) Alarm 2 (See note 1) Alarm 3 (See note 1) New alarm Sensor break alarm Loop break alarm

AUTOMATIC TUNING

In PID control, the output from the controller is the sum of three terms: **Proportional**, **Integral** and **Derivative**. These three terms deliver just the right amount of power to hold the temperature at setpoint without oscillation. For stable control, the PID values must be 'tuned' to the characteristics of the process being controlled. In the 2132 and 2116 this is done automatically using advanced tuning techniques.

Automatic tuning is performed by switching the output of the controller On and Off to induce an oscillation in the measured temperature. From the amplitude and period of the oscillation, the PID values, shown in the table below, are calculated.

Parameter	Display	Meaning or Function
Proportional band	Pb	The bandwidth in °C or °F over which the output power is proportioned between minimum and maximum.
Integral time	ti	Determines the time taken by the controller to remove steady-state error signals.
Derivative time	td	Determines how strongly the controller will react to the rate-of-change of temperature.
Low cutback	Lcb	The number of °C or °F below setpoint at which the controller will cutback the output power to prevent overshoot on heat up.
High Cutback	Hcb	The number of °C or °F above setpoint at which the controller will increase the output power to prevent undershoot on cool down.
Relative cool gain	rELC	Only present if cooling has been configured. Sets the cooling proportional band by dividing the Pb value by the rELC value.

If the process cannot tolerate 100% heating or cooling during tuning, the power can be restricted by the heating and cooling limits in the Output list. However, the measured value *must* oscillate to some degree for the tuner to determine values. Tuning is normally performed only once during the initial commissioning of the process. However, if the process under control subsequently becomes unstable (because its characteristics have changed), you can re-tune again at any time. It is best to tune starting with the process at ambient temperature. This allows the tuner to calculate more accurately.

Heating and Cooling Output Cycle Times

Before commencing a tuning cycle, set the values of CYC.H (heating output cycle time) and CYC.C (cooling output cycle time) in the OP (output) list.

For a logic heating output (switching a SSR), set CYC.H to 1.0 sec.

For a relay output, set CYC.H to 20.0 sec.

For a logic cooling output used to control a solenoid valve, set CYC.C to 5.0 sec.

Tuning procedure

1. Set the setpoint to the value at which you will normally operate the process.
2. In the 'Atun' list, select 'tunE' and set it to 'on'
3. Press the Page and Scroll buttons together to return to the HOME display. The display will flash 'tunE' to indicate that tuning is in progress.
4. The controller will induce an oscillation in the temperature by turning the heating on and then off.
5. After two cycles of oscillation the tuning will be completed and the tuner will switch itself off.
6. The controller will then calculate the tuning parameters and resume normal control action.

If you want 'Proportional only' or Propotl theoTji~/F5 1 Tfi~27 Ttrol ac424 Tci~-0.0ontr8 Tci~0T 'Proportional onuldTfi~1.306r16.1867 6r~-0.0008 60.04 6

ORDERING CODE

The controller is supplied configured according to the ordering code shown below.

Model number	Function	Supply voltage	Manual	Output 1 (Logic)	Output 2 (Relay)	Sensor input	Setpoint min	Setpoint max	Units	External relay module	Input adaptor
2132 2116											

TECHNICAL SPECIFICATION

Panel sealing	IP65 (EN 60529), or 4X (NEMA 250)
Operating ambients	0 to 55°

