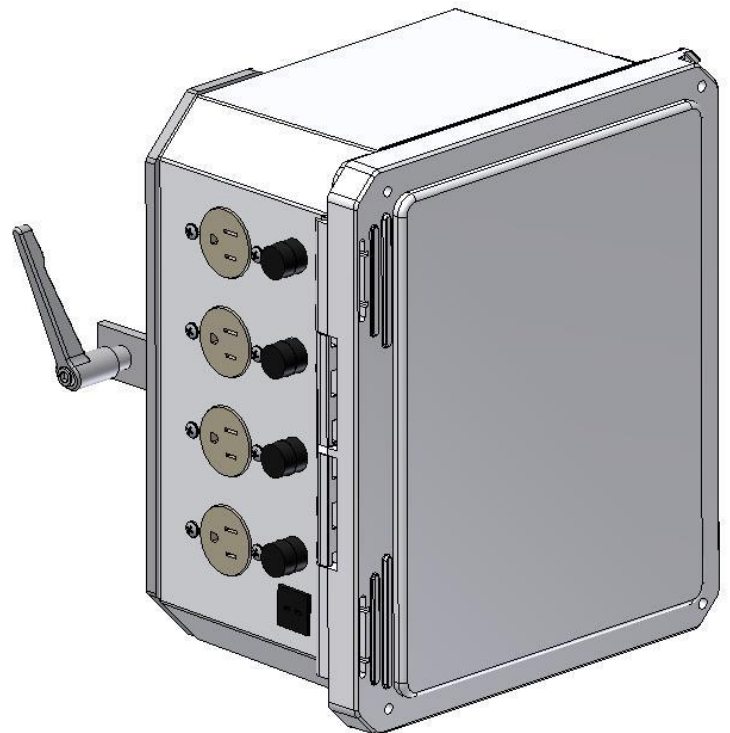
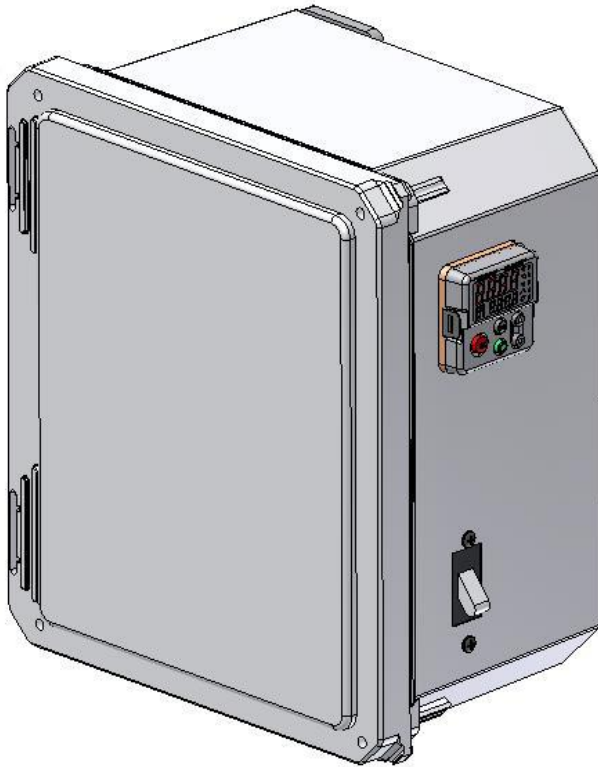


USER INSTRUCTIONS

CATALOG NO.: 13552-02





GENERAL DESCRIPTION:

The control package features (1) 1/16 DIN microprocessor-based Watlow PM Series control mounted in a fiberglass box that measures 10"x8"x6" deep. The control box is furnished with (4 -120 volt, 5-15R) receptacles to provide power to the heaters. The thermocouple input is located on same side of box as output receptacles for the process control. The toggle circuit breaker, 30A rated, is located below the process control. Input power (120V – 30 Amps) should be installed through the conduit fitting in the bottom of the control box. The control features an auto-tuning feature that allows automatic setting of control parameters with minimum user input. The control automatically sets the PID parameters through a "learning" band, reset/integral and rate/derivative. User-friendly features include automatic LED indicators to aid in monitoring and setup. The control will automatically store all information in a non-volatile memory.

The setpoint for the PM 1/16 DIN control can easily be changed by pressing the up/down arrow keys until the desired setpoint is achieved.

SPECIFICATIONS FOR PROCESS CONTROL

Manuals for the temperature control are located at the links below.

PM series control:

<http://www.watlow.com/downloads/en/manuals/EZ-PMExp%20Rev%20E%20PID.pdf>

Programmed values for the control are listed below. At any point the control doesn't work correctly validate that the values match programmed settings.

Operation Menu

Parameter	Parameter Name	Glas-col value	Default
Operation Page			
[AUt]	Autotune	Default	no
[C;M]	Control Mode Active	Default	AUto
[h;Pb]	Heat Proportional Band	Default	25.0 F or 14.0 C
[C;Pb]	Cool Proportional Band	Default	25.0 F or 14.0 C
[ti]	Time Integral	Default	180
[td]	Time Derivative	Default	0
[o;tb1]	Time Base Output 1	Default	1.0 or 20.0
[o;tb2]	Time Base Output 2	Default	1.0 or 20.0
[A;Lo]	Alarm Low Set Point	Default	32.0 F or 0.0 C
[A;hi]	Alarm High Set Point	Default	300.0 F or 150.0 C
[i;CA]	Calibration Offset	Default	0.0

Setup menu

Parameter	Parameter Name	Glas-Col Factory Setting	Default
Setup Page			
[LoC]	Lockout Menu	DEFAULT	5
[SEn]	Sensor Type	DEFAULT	tC
[Lin]	Linearization	J	J
[dEC]	Decimal	0	0
[C_F]	Display Units	C	F
[r;Lo]	Range Low	DEFAULT	0
[r;hi]	Range High	DEFAULT	9,999.00
[Fn1]	Function of Output 1	Heat	oFF
[o;ty]	Output Type	DEFAULT	voLt
[Fn2]	Function of Output 2	DEFAULT	oFF
[h;Ag]	Heat Algorithm	DEFAULT	PID
[hSC]	Hysteresis (Heat & Cool)	DEFAULT	3.0 F or 2.0 C
[C;Ag]	Cool Algorithm	DEFAULT	oFF
[A;ty]	Alarm Type	DEFAULT	oFF
[A;hy]	Alarm Hysteresis	DEFAULT	1
[A;LA]	Alarm Latching	DEFAULT	nLAt
[A;bL]	Alarm Blocking	DEFAULT	oFF
[A;Si]	Alarm Silencing	DEFAULT	oFF
[A;dSP]	Alarm Display	DEFAULT	on
[rP]	Ramp Action	DEFAULT	oFF
[r;rt]	Ramp Rate	DEFAULT	1
[o;hi1]	Power Scale Output High 1	DEFAULT	100
[o;hi2]	Power Scale Output High 2	DEFAULT	100
[PAr1]	Upper or Left Display	DEFAULT	AC.Pu
[PAr2]	Lower or Right Display	DEFAULT	AC.SP
[Ad;S]	Zone Address - Standard Bus Com	DEFAULT	1

Keys & Displays 16th DIN PID Controller

Zone Display:

When [ZonE] (found in the Factory Page) is set to on, indicates the controller zone.

1 to 9 = zones 1 to 9

R = zone 10

b = zone 11

C = zone 12

d = zone 13

E = zone 14

F = zone 15

h = zone 16

Lower Display:

Indicates the set point or output power value during operation, or the parameter whose value appears in the upper display.

A/M Key:

This key will toggle the control mode between the current value of the C.M prompt (Off, MAn, AUto) and Manual when the A/M button is pushed and held for 3 seconds.

Infinity Key:

Clears and Silences alarms, press to back up one level, or press and hold for two seconds to return to the Operations Menu.

Upper Display:

In the Operations Menu, displays the process value, otherwise displays the value of the parameter in the lower display.

Temperature Units Indicator

Lights:

Indicates whether the temperature is displayed in Fahrenheit or Celsius.

Output Activity:

Number lights indicate activity of outputs 1 and 2.

Percent Units Indicator:

Lights when the controller is displaying values as a percentage or when the open-loop set point is displayed.

Communications Activity:

Flashes when another device is communicating with this controller.

Up and Down Keys:

In the Operations Menu, adjusts the set point in the lower display. In other pages, changes the upper display to a higher or lower value, or changes a parameter selection.

Advance Key: ●
Advances through parameter prompts.



How to Setup and Operate

First, connect the heater load and the sensor to the load and sensor receptacles on the front panel. Next, plug the control line cord into an appropriate 3-wire grounded power receptacle. Turn the power switch to the "ON" position. Wait five seconds for the control unit to energize.

The control is shipped from the factory with the display reading in degrees C. If a display in degrees F is desirable, press the **UP/DOWN** arrow keys simultaneously for three seconds to access the Setup Page. Press the **Advance** key until the Celsius_Fahrenheit parameter [C-F] is shown in the lower display. Press the **UP** arrow key to change from C to F.

After changing the display, press the **Infinity** key to display the set point temperature and the process temperature (temperature at the sensor).

To begin the heating process, use the **Up/Down** arrow keys to enter the desired set point temperature. This is shown in the lower display. Auto-tuning is recommended in all applications. Auto-tuning allows the control to set the PID parameters without those parameters being manually entered/calculated by the user. It also minimizes the amount of temperature overshoot of the set point and decreases the time required for the process to stabilize. See page 8 for instruction on performing the auto-tune function.

It is recommended that the auto-tune feature be used every time the process temperature set point has been changed. If the process is being repeated, the parameters learned in the initial setup are stored in the memory of the control and the auto-tune process isn't required to be repeated in most applications.

Control mode operation

Manual operation provides direct (time proportioned % time) control from -100% to 100%. A negative value is allowed only when Ot 1=Cool. Automatic operation provides sensory feedback ON/OFF or PID control. When the operation transfers from automatic to manual operation, the power level from automatic operation is retained and restored to the previous set point.

The % LED indicates manual operation. The LED is on when in Manual operation and off when in AUTO operation. When the LED is flashing, press the **Infinity** key again within 5 seconds to complete the change in operation. If the sensor is open and LOC=0, 1 or 2, the control switches to Manual operation if the output was stable before the break occurred.

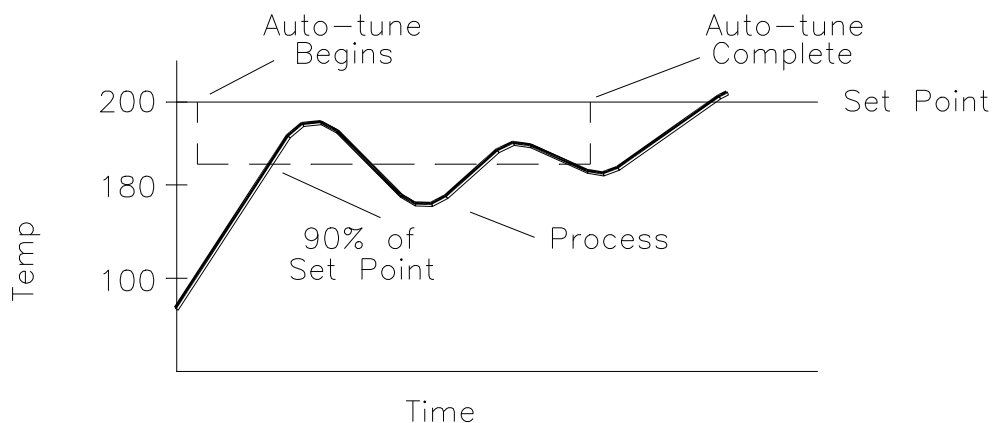
Tuning-Automatic

It is recommended that auto-tuning be used each time a new process is initiated. If the process is being duplicated, the parameters learned in the initial auto tune setup are stored in the memory of the control and the auto-tune procedure isn't required in most applications.

Auto-tuning: This control can automatically tune the PID parameters to fit the characteristics of your particular thermal system.

Auto-tune can only be used when Output 1 setting is hEAt and heat algorithm (h.Ag, page 5) is set for PID mode. The heat algorithm setting is set for PID from the factory. When the auto-tune sequence has started, the lower display will flash between tun1-attn and the main operation screen.

Changing the set point, while in auto-tune mode, will not change the set point value. The displayed value will change but the control has locked in the original set point value till the auto tune in complete or has been turned off by the user. Once the control has finished "learning" the system, it returns to standard PID control with the values automatically set. Auto-tuning is complete within 80 minutes. In order for the control to successfully complete auto-tune, the process must cross the 90% set point value four times within 80 minutes after auto-tune has started. If this does not happen within the 80 minute time limit, Pb1 remains at 0 and the control will operate with the factory default PID values.



To start auto-tuning:

1. Set the set point value with the arrow keys to the desired temperature of operation.
2. Press the **Advance** key until the Aut prompt appears in the lower display.
3. Change the parameter to **YES** with the arrow keys.

4. Press the **Infinity** key to display the set point and sensor temperatures. While the control is in the auto-tuning mode, the display will alternate between the set point and the "Aut" prompt. When tuning is complete, the lower display indicates only the set point.
5. When tuning is complete, the lower display indicates setpoint only and Aut reverts to OFF. The control installs appropriate PID tuning parameters and retains them in the non-volatile memory.




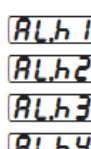



*To abort auto-tuning, the operator must reset Aut to OFF. Auto-tuning may also be aborted by cycling power off and on. In all cases, aborting auto-tuning restores all original factory default values.



Temperature overshoot

In most cases this is due to a small sample size being heated with a high wattage heater. The control is set at the factory with the Power Scale High Output 1 (o.hi1) setting with a value of 100. This value can be adjusted in the setup menu, setup menu setting o.hi1. If excessive temperature overshoot is occurring, adjust the value to 50 and start the heating process from ambient room temperature. If more than desired temperature overshoot is still occurring, decrease to a lower value and repeat heating process from ambient room temperature. If the process temperature doesn't achieve the set point temperature or takes more than desired amount of time to reach set point temperature, increase the power scale high output 1 value. This process can take several value changes to obtain proper temperature control with your particular application setup. It is recommended to initiate the Auto-Tune process again after the proper power scale high output 1 value has been determined for your application.

Error Code Definitions and Actions

Indication	Description	Possible Causes	Corrective Action
 Error Input	Sensor does not provide a valid signal to controller	Sensor improperly wired or open, Incorrect setting or sensor type, or Calibration corrupt	Correct wiring or replace sensor, Match setting to sensor, or Check calibration of controller
 Autotuning 1	Controller is auto-tuning the control loop	User started the auto-tune function	Wait until auto-tune completes or disable auto-tune feature
 Ramping 1	Controller is ramping to new set point	Ramping feature is activated	Disable ramping feature if not required
 Alarm High   	Sensor input above high alarm set point	Temperature is greater than alarm set point	Over temperature, or Set alarm source to proper setting



GLOSSARY

Automatic prompts: Data entry points where a microprocessor-based control "prompts" or asks the operator for information input.

Auto-tune: Automatically tunes the parameters to fit the characteristics of your particular thermal system.

Cold junction compensation: Electronic means to compensate for the effect temperature at the cold junction.

Cycle time: The time necessary to complete a full On-through-Off period in a time proportioning control system.

Derivative/Rate: Anticipatory action that senses the rate of change of the process, and compensates to minimize overshoot and undershoot.

Default parameters: The parameters (programmed instructions) permanently stored in microprocessor software to provide the data base.

Droop: Difference in temperature between set point and stabilized process temperature.

Hysteresis: In On/Off control, the temperature change necessary to change the output from On to full Off.

Input (sensor): Process variable information being supplied to the instrument.

Integral/Reset: Control action that automatically eliminates offset, or "droop", between set point and actual process temperature.

Offset: Adjustment to actual input temperature and to the temperature valves the control uses for display and control.

ON/OFF control: Control of temperature about a set point by turning the output full On below set point and full Off above set point.

Output: Action in response to difference between set point and process variable.

Overshoot: Condition where temperature exceeds stepping due to initial power up or process changes.

Parameter: a physical property whose value determines the response of a electronic control to given inputs.

PID: Proportioning control with auto-reset and rate.

Process variable: Thermal system element to be regulated, such as time, temperature, relative humidity, etc.

Proportional band: Span of temperature about the set point where time proportional control action takes place.

Set point: Intended value of the process variable.

Thermal system: A regulated environment consisting of a heat source, heat transfer medium, sensing device and a process variable control.



Thermocouple: Temperature sensing device that is constructed of two dissimilar metals wherein a measurable, predicative voltage is generated corresponding to temperature.

Thermocouple break protection: Fail-safe operation that assures output shutdown upon an open thermocouple condition.

Time Proportioning Control: Action which varies the amount of ON and OFF time when "close" to the set point (within the proportional band). This variance is proportional to the difference between the set point and the actual process temperature.

Maintenance:

The control box should be protected from spills, mechanical damage and corrosive atmospheres so far as possible. Any spills should be cleaned quickly and any damage should be repaired immediately.

Spare Parts:

Spare parts are generally available from the factory. Consult Ace Glass for part numbers and pricing.

Limited Warranty:

Ace Glass warrants products of its manufacture to be free from defects in material and workmanship **for one year** and agrees to repair or replace without charge any products found defective upon examination at the factory. With proper care and operation, Ace Glass products will give long and efficient service. Chemical spillage, overheating, overloading and general misuse will greatly reduce the service life. Ace Glass is not responsible for damage to apparatus due to improper installation or through attempts to operate the apparatus beyond its rated capacity, intentional or otherwise. Normally expendable parts are not covered by this warranty.

In the event of an incident due to a defective replacement component, Ace Glass will accept responsibility only if the component was defective from the outset. Ace Glass reserves the right to deny responsibility for the incident if the user fails to comply with any instructions provided by using spare parts, which are not guaranteed.

Ace Glass reserves the right to update, and or change designs with no prior notification.

APART FROM SUCH WRITTEN STATEMENT OF WARRANTY, THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY WHICH EXTEND BEYOND THE DESCRIPTION OF THE PRODUCTS ON THE FACE HEREOF.

Ace Glass products are intended only for legal and legitimate purposes in commercial, laboratory and industrial settings. Ace Glass reserves the right to make product refinements without prior notice.

Returns:

Call or fax Customer Service for a Return Goods Authorization (RGA) number before returning a product.