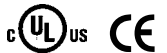


6060 Temperature and Process Controller

A Compact, Fully Featured, Single-Loop Controller for Demanding Applications



Small in size but packed with features and flexibility, the Chromalox 6060 single-loop temperature and process controller is a great choice for precise, cost-effective temperature control for a variety of applications simple and complex.

Features at a Glance

- 1/16 DIN
- Universal Input
- Supplemental Analog Input
- Up to 4 Digital Inputs
- 6 Outputs
- Heat/Cool Operation
- Built-In Transmitter Power Supply
- ModBus RTU/RS 485 Communications
- 2- and 3-Point Control
- Heater, Control Loop, and Sensor Alarms
- Self-Tuning Startup
- Capable of 16 Profiles, 16 Segments Each
- ChromaloxPro Configuration Software
- cULus, CE

Complex Temperature and Control Capability That's Powerful Yet Easy to Use

Features and Flexibility for a Sophisticated Level of Control

Among its many integrated features are two PID sets to ensure reliable control over a wide setpoint range and separate PID for heat and cool strategies for optimized control and stability. Extensive flexibility is offered with one universal input and one optional input, up to 4 digital inputs, 6 outputs, RS485 communications, and a built-in profiler capable of creating 16 profiles with up to 16 segments each. Manual control is enhanced by the ability to make frequently used functions available at a keystroke.

Capability and Convenience Further Enhanced by ChromaloxPro Configuration Software

ChromaloxPro™ configuration software is available to make parameter setup easier and faster. It also enables simulation to test the settings before applying them.

Applications

- Industrial Ovens and Furnaces
- Boiler and Steam Processes
- Heat Treatment
- Plastics, Extrusion, and Rubber
- Chiller and Refrigeration Systems
- Laboratory and Test Equipment
- Food and Beverage
- Packaging

Robust Control Functionality

A range of different temperature control functionality includes:

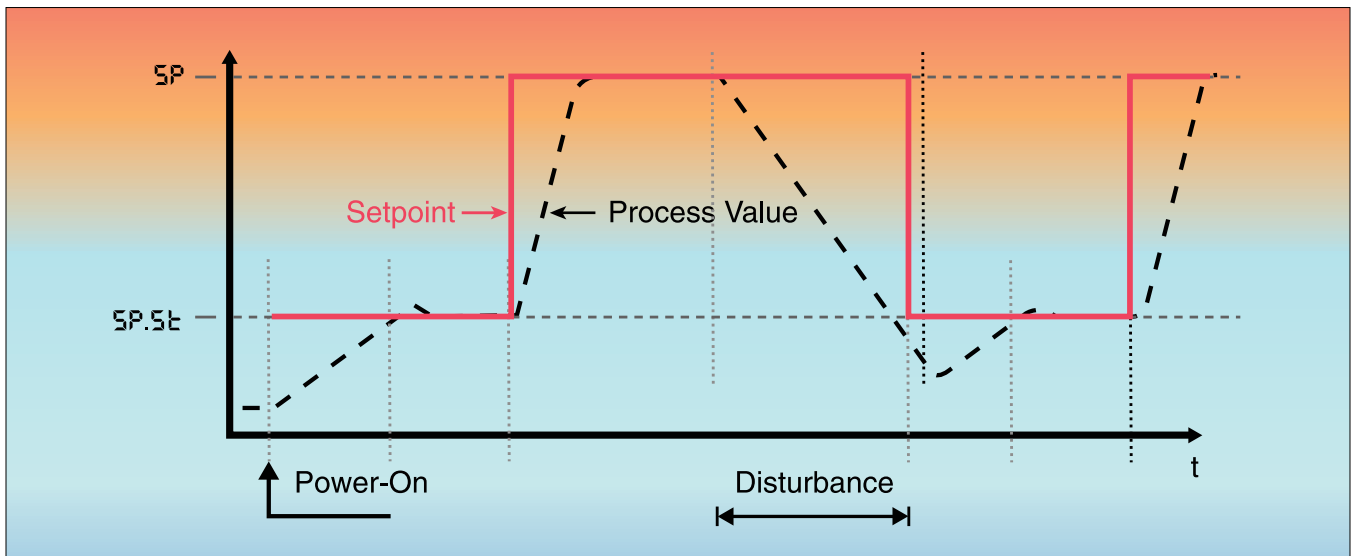
- On/Off
- PID Heat Only (2-point control)
- Heat/Cool (3-point control)
- VMD (3-point stepping control)

Non-linear cooling strategies are also available, which is especially popular for oil, water, and fan cooling applications.

Self-Tuning Ramps to Setpoint without Overshooting

Self-tuning during startup determines the optimum process parameters for rapid line-out to setpoint. At power on, changing a set value, or during an external disturbance, the controller uses a three-point controller configuration to make an adaptation attempt whereby the “cooling” parameters are determined separately. This ensures that performance is optimized to the process. Oscillation is not required and deviation of the process value is minimal.

Figure 1: Startup Circuit Function



Frequently Used Functions Available at the Push of a Key

Operation can be customized by configuring frequently used functions to be controlled by the F (function) key on the front panel. This simplifies manual operation and speeds up the management of the controller.

Special Functions for Even Greater Control

Startup Circuit Function for Slow Heat-Up

This function initially controls and stabilizes heat-up to a startup setpoint (SP.st) that is kept constant during a startup holding time. Subsequently the process is controlled to the main setpoint (SP). If a disturbance reduces the process value, the startup circuit is activated again.

This function is particularly useful for high-performance resistive heating elements with magnesium oxide (MgO) insulation. They must be heated slowly to remove any humidity, which improves heater performance. Using the startup circuit function can aid their lifetime.

Boost Function

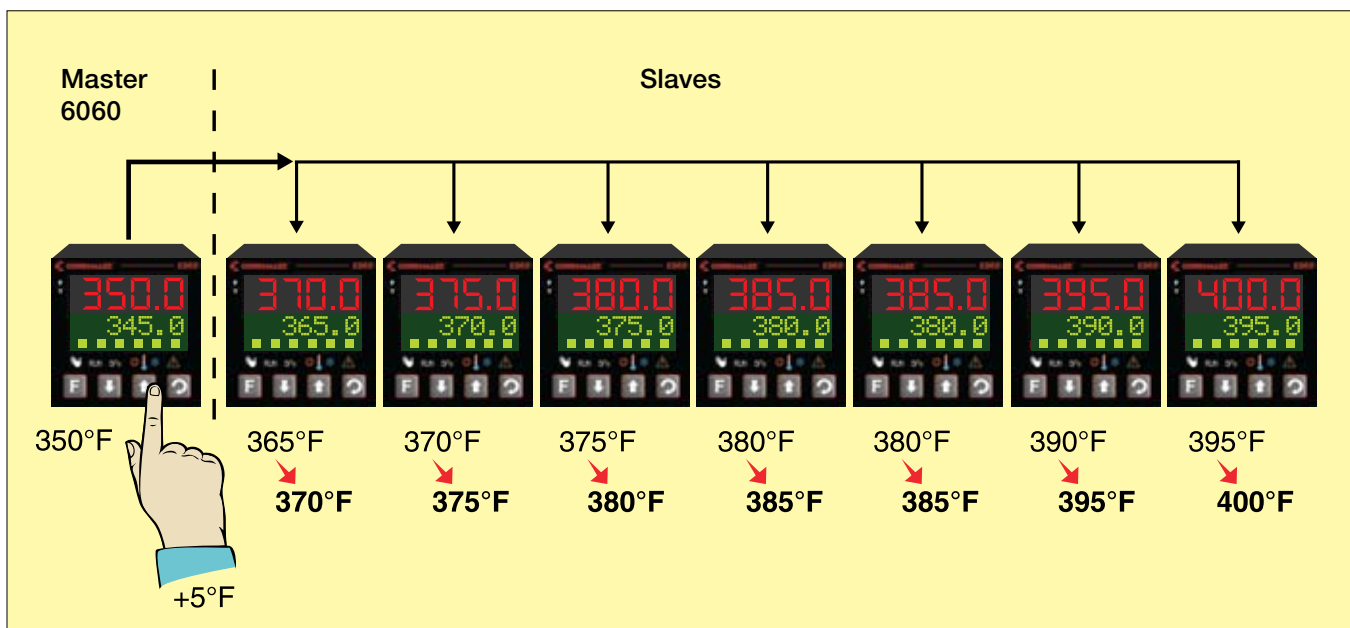
The boost function is for programming the controller to increase heat for a limited duration at startup or cyclically. This is ideal for processes where a short-term increase of heat is required to clear “frozen” material from clogged die nozzles for example.

ModBus Master Function

This function allows the Chromalox 6060 controller to serve as a master to other connected controllers acting as slaves, transmitting user-specified signals or parameters cyclically. Examples of possible applications include:

- Setpoint shifting relative to the setpoint adjusted in the slave
- Matching of control parameters, limit contacts, etc.
- Limiting the output value (override control)

Figure 2: ModBus Master Function



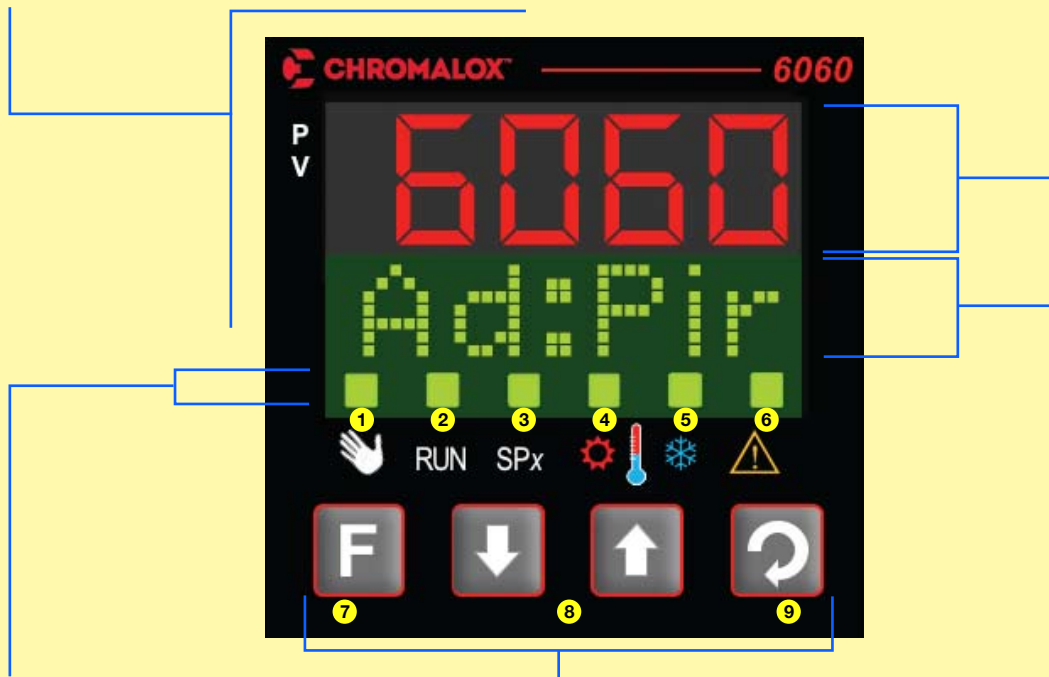
User Interface Designed for Ease of Use

Display

The Chromalox 6060 features a highly visible, red and green illuminated front panel display. The upper line is a large, red, 7-segment display while the lower line is a high-resolution green text display.

Process Value

The process value is always displayed in the upper display line. This includes the temperature program during normal operation or the program/segment execution time while in profiler mode.



Status Indicators

Six green LEDs indicate: ① manual mode active, ② timer or profiler active, ③ second setpoint or external setpoint active, ④ heat/valve open output active, ⑤ cool/valve close output active, ⑥ alarm condition present.

Setpoint/Status Value

The lower, high-resolution green text display shows the setpoint, controller output, profiler program/segment number, and ramp status.

Keypad

Four keypad switches are used to navigate the user menus and adjust parameter values: ⑦ FUNCTION key to alter or activate functions, ⑧ UP/DOWN keys to change setpoints or controller output value, ⑨ ENTER key to accept value and show next screen.

Front View



1.89 in.
(48 mm)

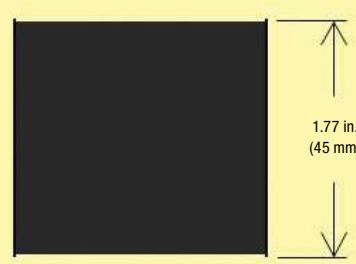
Side View



0.35 in.
(9 mm)

4.35 in.
(10 mm)

Panel Cutout



1.77 in.
(45 mm)

1.77 in.
(45 mm)

ChromaloxPro Configuration Software Makes It Easy to Set Up, Program, and Operate the 6060 Controller

ChromaloxPro configuration software allows users to set up and change parameter settings and access all menus quickly and safely from a PC using plain texts and a clear menu structure, and with online help. This makes it significantly easier and more convenient than using the interface buttons on the 1/16-DIN device.

Offline Simulation Reduces Risk

Simulate the process and test control settings in a virtual environment without interrupting ongoing operations or risking that incorrect settings might create a faulty situation. The system can even apply simulated disturbances. Once the simulated process is optimized, parameters can be loaded to the device.

Remote Management Increases Efficiency

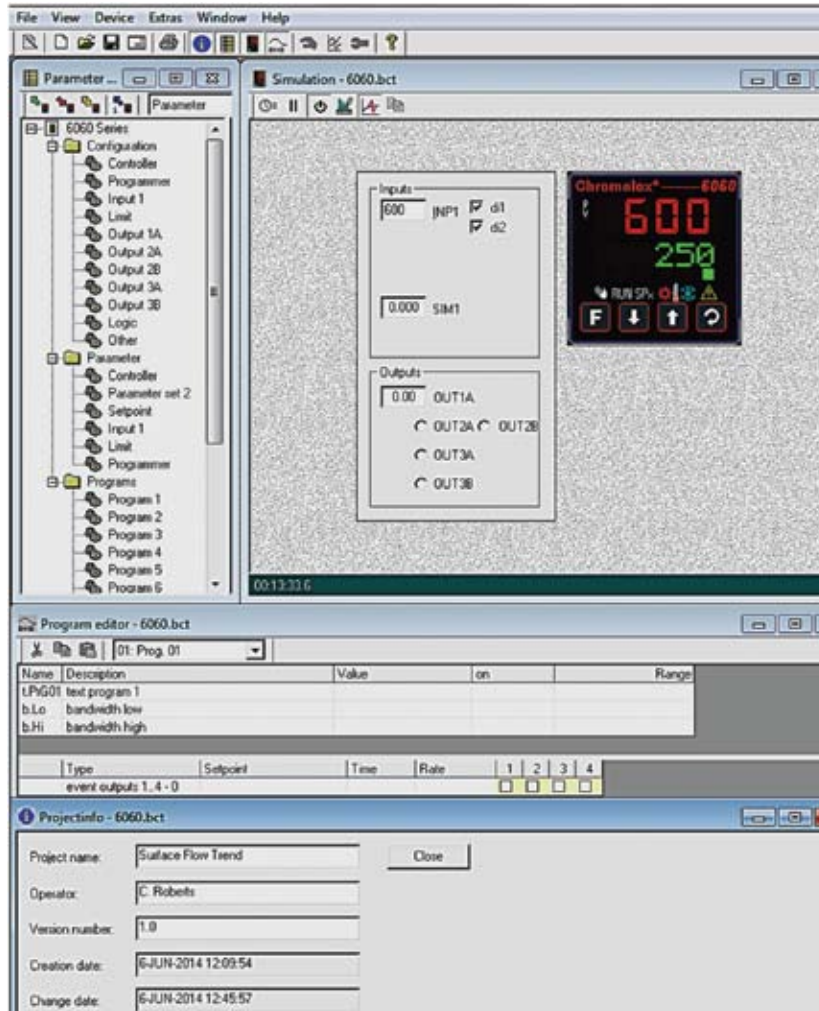
Processes may be monitored and adjusted remotely. This flexibility provides greater levels of process control as well as offering better visibility for improved management.

Download and Back-Up Settings

When switching to a previously run process configuration, settings can be quickly recalled from memory to eliminate re-entering. Process settings from one controller can be copied to another in seconds, saving valuable time in multi-controller setups.

Trend Viewing

Trend recording permits data from simulations to be displayed graphically in real time. Analog values are displayed as curves and digital data are shown in the format of a logic analyzer. Data can be stored in CSV format for later review.



Training Tools

The software makes it easy to familiarize operators with controller functionality.

Troubleshoot Remotely

Should technical support be needed, trend curves can be saved and transmitted by email so problems may be solved without a site visit.

Clone Other Devices

ChromaloxPro configuration software provides the ability to copy, edit, and save settings. This simplifies the setup process for multiple controllers.

Familiar Software Environment

Established Microsoft Windows* operating standards as well as familiar operating conventions and menu structures of Microsoft Office* programs provide a familiar and intuitive environment that promotes ease of use.

*Microsoft Windows and Microsoft Office are registered trademarks of Microsoft Corporation, Redmond, Washington

Specifications

| Inputs | |
|--|---|
| Process Value Input INP1 | |
| Resolution | >14 bit |
| Decimal point: | 0 to 3 decimals |
| Digital input filter: | Adjustable 0.0 to 9999 s |
| Scanning cycle: | 100 ms |
| Measured value correction: | 2-point or offset correction |
| Thermocouples | |
| Input resistance: | 1 M Ω |
| Effect of source resistance: | 1 V/ Ω |
| Cold-Junction Compensation | |
| Max. additional error: | <0.5 K |
| Sensor Break Monitoring | |
| Sensor current: | $\leq 1 \mu\text{A}$ |
| Configurable output action | |
| Resistance Thermometer | |
| Connection: | 2- or 3-wire |
| Lead resistance: | Max. 30 Ω |
| Input circuit monitor: | Break and short circuit |
| Current and Voltage Signals | |
| Span start, end of span: | Anywhere within measuring range |
| Scaling: | Selectable, 1999 to 9999 A |
| Linearization: | 16 segments, adaptable with ChromaloxPro software |
| Decimal point: | Adjustable |
| Input circuit monitor: | 12.5% below span start (2 mA, 1 V) |
| Resolution | >14 bit |
| Scanning cycle: | 100 ms |
| Accuracy: | 0.1% |
| Heating Current Measurement via Current Transformer | |
| Measuring range: | 0 to 30 mA ac |
| Scaling: | Adjustable -1999 to 0.000 to 9999 A |
| Accuracy: | Better than 0.25% |
| Current Measuring Range | |
| Input resistance: | $\sim 120 \Omega$ |
| Span: | 0 to 20 mA |
| Scaling: | -1999 to 9999A |
| Input circuit monitor: | 12,5% below span start (4 to 20 mA ± 2 mA) |
| Control Input DI1 & DI2 | |
| Configurable as direct or inverse switch or push-button | |
| Connection of a potential-free contact suitable for switching "dry" circuits | |
| Switched voltage: | 3.3 V |
| Switched current: | <10 mA |
| Control Inputs DI3 & DI4 (Option) | |
| Configurable as direct or inverse | |
| Nominal voltage: | 24 V dc, external Current sink (IEC 1131 Type 1) |
| Logic "0": | -3 to 5 V |
| Logic "1": | 15 to 30 V |
| Current requirement: | ~ 5 mA |

| Outputs | |
|--|--|
| Relay, Option 1-3 | |
| Contacts: | Potential free changeover |
| Max. contact rating: | 2 A @ 250 V 48 to 62 Hz |
| Min. contact rating: | 6 V, 1 mA |
| Duty cycle: | I = 1 A/2 A 250,000/150,000 @ 250 V resistive |
| Dual Relay, Option 2 | |
| Contacts: | 2 NO contacts with shared common |
| Max. contact rating: | 2 A @ 250 V, 48 to 62 Hz |
| Min. contact rating: | 6 V, 1 mA |
| Duty cycle | I = 1 A/2 A 500,000/150,000 @ 250 V resistive |
| SSR, Option 1-3 | |
| Voltage: | 10 V into 500 Ω min. |
| Dual SSR, Option 1-3 | |
| Voltage: | 10 V into 500 Ω min. |
| Linear DC Output Option 1 & 3, Current Output | |
| 0/4 mA to 20 mA, configurable | |
| Signal range: | 0 to ~ 22 mA |
| Load: | $\leq 500 \Omega$ |
| Load effect: | None |
| Resolution: | (0.1%) |
| Error: | (0.2%) |
| Linear DC Output Option 1 & 3, Voltage Output | |
| 0 to 10 V | |
| Signal range: | 0 to 11 V |
| Load: | $\geq 2 \text{ K}\Omega$ |
| Resolution: | $\leq 0.1\%$ |
| Error: | $\leq 0.2 \%$ |
| Serial Interface | |
| Physical: | RS485, at 1200, 2400, 4800, 9600, or 19200 bps |
| Protocol: | ModBus RTU |
| Communications: | RS485 Option 3 or A |
| Transmitter Supply | |
| Output: | 22 mA / ≥ 18 V |

| Power Supply | |
|--|------------------|
| AC Supply | |
| Voltage: | 90 to 260 Vac |
| Frequency: | 48 to 62 Hz |
| Power consumption: | ~7 VA |
| Universal Supply 24 V UC | |
| AC voltage: | 20.4 to 26.4 Vac |
| Frequency: | 48 to 62 Hz |
| DC voltage: | 18 to 31 Vdc |
| Power consumption: | ~7 VA (W) |
| Behavior with Power Failure | |
| Non-volatile storage of configuration, parameters and adjusted setpoints, and control mode in EEPROM | |

| Environmental | |
|--|-----------------------------|
| Protection Modes | |
| Front panel: | NEMA 4X, IEC IP 65 |
| Housing: | IP 20 |
| Terminals: | IP 20 |
| Permissible Temperatures | |
| For specified accuracy: | 32° to 140°F (0° to 60°C) |
| Warm-up time: | <15 minutes |
| Temperature effect: | <100 ppm/K |
| For storage: | -4° to 158°F (-20° to 70°C) |
| Humidity | |
| 75% yearly average, no condensation | |
| Electromagnetic Compatibility | |
| Complies with EN 61 326-1 (for continuous, non-attended operation) | |

Table 1, Thermocouple Measuring Ranges

| Description | | Measuring Range | | Accuracy | Resolution (Ø) |
|-------------|----------------|------------------|-----------------|----------|----------------|
| | | °F | °C | | |
| L | Fe-CuNi (DIN) | -148 to 1,652 | -100 to 900 | ≤2K | 0.1 K |
| J | Fe-CuNi | -148 to 2,192 | -100 to 1,200 | ≤2K | 0.1 K |
| K | NiCr-Ni | -148 to 2,462 | -100 to 1,350 | ≤2K | 0.2 K |
| N | Nicrosil/Nisil | -148 to 2,372 | -100 to 1,300 | ≤2K | 0.2 K |
| S | PtRh-Pt 10% | 32 to 3,200 | 0 to 1,760 | ≤2K | 0.2 K |
| R | PtRh-Pt 13% | 32 to 3,200 | 0 to 1,760 | ≤2K | 0.2 K |
| T | Cu-CuNi | -328 to 752 | -200 to 400 | ≤2K | 0.05 K |
| C | W5%Re-W26%Re | 32 to 4,199 | 0 to 2,315 | ≤2K | 0.4 K |
| D | W3%Re-W25%Re | 32 to 4,199 | 0 to 2,315 | ≤2K | 0.4 K |
| E | NiCr-CuNi | -148 to 1,832 | -100 to 1,000 | ≤2K | 0.1 K |
| B* | PtRh-Pt6% | 32(212) to 3,308 | 0(100) to 1,820 | ≤2K | 0.3 K |

*Specifications valid for 212°F (100°C).

Table 2, Resistance Thermometer Measuring Ranges

| Type | Measuring Current | Measuring Range | | Accuracy | Resolution (Ø) |
|---------------|-------------------|-----------------|-------------|----------|----------------|
| | | °F | °C | | |
| Pt100 | 0.2 mA | -140 to 212 | -200 to 100 | ≤1K | 0.1 K |
| Pt100 | | -140 to 1,562 | -200 to 850 | ≤1K | 0.1 K |
| Pt1000 | | -140 to 392 | -200 to 200 | ≤2K | 0.1 K |
| KTY 11-6* | | -58 to 302 | -50 to 150 | ≤2K | 0.05 K |
| Special | | 0 to 4500 | | ≤0.1% | 0.01% |
| Special | | 0 to 450 | | | |
| Potentiometer | | 0 to 160 | | | |
| Potentiometer | | 0 to 450 | | | |
| Potentiometer | | 0 to 1600 | | | |

*Or Special

Table 3, Current and Voltage Measuring Ranges

| Measuring Range | Input Resistance | Accuracy | Resolution (Ø) |
|-----------------|-----------------------------------|----------|----------------|
| 0 to 10 V | ~ 110 kΩ | ≤0.1% | 0.6 mV |
| 0 to 20 mA | 49 Ω (voltage requirement <2.5 V) | ≤0.1% | 1.5 µA |

Custom Ordering Information

Model 6060 **60 Series 1/16 DIN Temperature and Process Controller**

| Code | Base Option |
|------|---|
| P | Transmitter Power Supply |
| H | ¹ Heater Current (0-30 mA ac) / Remote Setpoint (0/4-20 mA dc) |
| Code | Output 1 |
| R | Relay (2 A Resistive at 240 Vac, SPDT, Form C) |
| S | SSR (0/10 Vdc, 500 Ω Minimum Load) |
| W | Dual SSR Output - Non Isolated, 0/10 Vdc, 500 Ω Minimum Load |
| A | Analog (Linear dc: 0-20 mA, 4-20 mA, 0-5 V, 0-10 V, 2-10 V) |
| Code | Output 2 |
| 0 | None |
| R | Relay (2 A resistive at 240 Vac, SPDT, Form C) |
| M | Dual Relay Output - 2 A, 240 Vac, Form A (X 2) |
| S | SSR (0/10 Vdc, 500 Ω Minimum Load) |
| W | Dual SSR Output - Non Isolated, 0/10 Vdc, 500 Ω Minimum Load |
| Code | Output 3 |
| 0 | None |
| R | Relay (2 A Resistive at 240 Vac, SPDT, Form C) |
| S | SSR (0/10 Vdc, 500 Ω Minimum Load) |
| W | Dual SSR Output - Non Isolated, 0/10 Vdc, 500 Ω Minimum Load |
| A | Analog (Linear dc: 0-20 mA, 4-20 mA, 0-5 V, 0-10 V, 2-10 V) |
| 1 | ² RS485 (ModBus/RTU) Digital Comms |
| Code | Feature Option A |
| 0 | None |
| 1 | ² RS485 (ModBus/RTU) Digital Comms |
| D | Dual Isolated Digital Input (TTL Input) |
| Code | Power Supply |
| 0 | 100-240 Vac |
| 1 | 24 Vac, 18-30 Vdc |

6060 - P W M A 0 0 **Typical Model Number**

Standard lead time for Non-Stocked Items is 15 days.

Order Table Notes

¹If choosing Heater Current Setup, this requires one (1) On/Off type Output from above (R, S, W, or M) and one (1) Current Transformer ordered separately (see below).

²Between Output 3 and Feature Option A, only one (1) RS485 ModBus Code may be selected.

Accessories

| Description | Part Number |
|---|-------------|
| Current Transformer for Heater Break Alarm (HBA): 0 - 25 A | 0149-50071 |
| Current Transformer for Heater Break Alarm (HBA): 0 - 50 A | 0149-50072 |
| Current Transformer for Heater Break Alarm (HBA): 0 - 100 A | 0149-50073 |
| ChromaloxPro Configuration Software | 0149-50061 |
| Cable Only for Configuration Software (Required 6060, 8060, 4060) | 0149-50084 |
| Adapter to Port Configuration Cable to Unit (Required on 6060 Only) | 0149-50085 |
| Snubber (0149-01305) | 314448 |

Stocked Items

| Model Number | PCN |
|--------------|--------|
| 6060-PSRA10 | 315002 |
| 6060-PRRR10 | 315010 |

Quick Start Manuals are shipped with the controller.

Full Installation & Instruction Manuals are available on-line at www.chromalox.com.



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