

Watlow

12001 Lackland Rd.

St. Louis, MO 63146 US

Phone: 800-928-5692 • Fax: 314-878-6814

Email: inquiry@watlow.com • Website: <http://www.watlow.com>

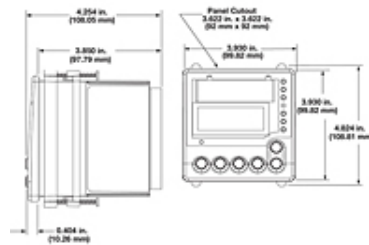
SERIES F4 Process

The SERIES F4 1/4 DIN temperature process controller offers performance features to meet a wide range of industrial processing needs. The F4 process controller is ideal for semiconductor manufacturing equipment, plastic processing and packaging equipment and industrial process control applications.

This controller features a four line, high definition LCD interface display, in addition to an information key that enables easy set up and control operation, minimizing the chance for error. Its 16-bit microprocessor ensures accuracy and delivers performance advantages you can count on from a Watlow controller.

Four digital inputs remotely modify controller operation or enable display of pre-defined operator messages. Advanced features include cascade, ratio, differential, duplex slide wire and retransmit options.

Serial communication and dual alarm relays are included in the base unit. The SERIES F4 is packaged with a NEMA 4X front face to withstand harsh environments and a four-inch (101.6 mm) deep case with removable connectors for wiring convenience. It is manufactured by Watlow, ISO 9001 registered and protected by a three-year warranty.



Dimension Specifications

- Width x height x depth
3.93 in. x 3.93 in. x 3.85 in. panel mount
(99 mm x 99 mm x 97 mm)

· [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#) · [<HIDE>](#)

Guided set-up

- Removes "guess work" from the set-up process
- Saves time by reducing programming errors

High definition four-line LCD display

- Simplifies set up process and operations
- Quickly and easily identifies process, alarm and set point values

Information "I" Key

- Displays essential elements from the user manual on board

Customized menuing

- Quickly displays up to 16 parameters
- Allows users to create custom messaging and easily identify key events or alarms

High performance 16-bit microprocessor

- Provides precise process control with 20Hz update rate on input 1. (10Hz on inputs 2 and 3)
- Calibration accuracy of ± 0.1 percent of span

Universal input

- Embedded software provides application versatility
- Eliminates the need for dip switches

Modbus® communications ready

- Equipped to handle RS232 or EIA485 communications

The SERIES F4 temperature process controller with a single channel PID controller supports either closed or open loop operation. The design utilizes the latest technology to meet complex processing needs while maintaining an easily understood operator interface.

Full, non-abbreviated parameter choices are displayed using a four line, high-definition LCD interface display that is back lit for wide angle viewing. Firmware guides the operator through parameter choices for feature configuration. An information key (I) provides the operator with detailed help information regarding the parameter or feature being configured. The main page menu can be programmed to display output power through 16 control variables including: bar graphs, set points and operating ranges. Up to four programmable messages can be activated remotely to inform the operator that the process requires attention.

Five sets of PID values can be auto-tuned to support varying system reactions over the complete operating range. Up to 10 offset points can be programmed to compensate for differences between the actual process value and sensor readings caused by sensor placement.

Up to three universal analog inputs are configured through software to support thermocouples, RTDs and process (voltage/current) sensors. Auxiliary inputs 2 and 3 can function as a remote set point input, sources for retransmission or as the outer loop for cascade operation.

Four inputs are programmable and can remotely modify controller operation and display pre-programmed messages on the operations display.

Heat/cool or reverse/direct action is supported. Time based outputs can be configured for variable burst fire or a cycle time can be selected. On-off boost heat or boost cool operation is also supported. Boost operation is enabled based on load power requirements.

Two alarms are included in the base unit and can be programmed as process, deviation or rate.

Both EIA 232 and EIA 485 communications are included in the base unit. The SERIES F4 operates via the Modbus® RTU protocol and responds to requests for information only when queried. Baud rate selections are 9600 or 19200.

Up to two optional programmable voltage or current signal retransmit outputs are supported. Retransmit sources include up to three process variables; set point and output percent power.

An enhanced operation option for the SERIES F4 process controller includes additional universal analog inputs (inputs 2 and 3) and enhanced firmware to support several features that utilize the two additional inputs. The enhanced control option can be configured to support cascade control, differential control, ratio control and slide wire valve control. The enhanced control option can also alternate between control inputs, display up to three process variables and support remote set point operation.

In this sample application, the SERIES F4 process controller uses the enhanced cascade control feature to heat lube oil to 51.6°C (125°F). Cascade control is a control strategy in which one control loop provides the set point for another loop. It allows the process or part temperature to be reached quickly while minimizing overshoot. Cascade is used to optimize thermal system performance with long lag times. Input 3 measures the lube oil temperature before it leaves the tank. Input 1 measures the heater temperature. The input 3 process value is compared to the set point which generates an internal set point used to control the heater.

Dimension Specifications

- Width x height x depth 3.93 in. x 3.93 in. x 3.85 in. panel mount (99 mm x 99 mm x 97 mm)

Universal Analog Inputs 1 (2 and 3 optional)

- Update rates, IN1 = 20Hz, IN2 and IN3 = 10Hz

Thermocouple

- Type J, K, T, N, C (W5), E, Pt 2, D (W3), B, R, S

RTD

- 2- or 3-wire platinum, 100, 500, or 1K Ω
- JIS or DIN curves, 1.0 or 0.1 indication

Process

- Input resolution \approx 50,000 bits at full scale
- Range selectable: 0-10VDC, 0-5VDC, 1-5VDC, 0-50mV, 0-20mA, 4-20mA
- Voltage input impedance 20K Ω
- Current input impedance 100 Ω

Digital Inputs (4)

- Update rate = 10Hz
- Contact or dc voltage; 36VDC max
- 10K Ω input impedance

Control Outputs (1A, 1B)

- Update rate = 20Hz

Open Collector/Switched dc

- Internal load switching (nominal):
Switched dc, 22 to 28VDC, limited @ 30mA
- External load switching max.:
Open collector 42VDC @ 0.5A

Solid-state Relay

- Zero switched, optically coupled, 0.5A @ 24VACmin., 253VAC max.

Electromechanical Relay

- Form C, 2A @ 250VAC or 30VDC max.
- Resistive or inductive load
- Without contact suppression

Process Outputs (Optional Retransmit)

- Update rate = 1Hz
- User-selectable 0-10VDC, 0-5VDC, 1-5VDC @ 1K Ω min., 0-20mA, 4-20mA @ 800 Ω max.
- Resolution:

dc ranges = 2.5mV nominal

mA ranges = 5 μ A nominal

- Calibration accuracy:

dc ranges = \pm 15mV

mA ranges = \pm 30 μ A

- Temperature stability 100ppm/ $^{\circ}$ C

Alarm Outputs

- Output update rate 1Hz
- Electromechanical relay, Form C, 2A @ 30VDC or 240VAC max.

Communications

- EIA-232 and EIA-485 serial communications with Modbus[®] RTU protocol

Safety and Agency Approvals

- UL[®]/C-UL[®] 916 listed, File # E185611

Process Control Equipment

- NEMA 4X and IP65
- CE to EN 61010-1 and 61326

Terminals

- Touch-safe, removable terminal blocks, accepts 12 to 22-gauge wire

Power

- 100-240VAC, -15%, +10%; 50/60Hz, \pm 5%
- 24-28VAC/VDC, -15%, +10% (order option)
- 39VA max. power consumption
- Data retention upon power failure via nonvolatile memory. Sensor input isolation from input to input to output to communication circuitry is 500VAC

Operating Environment

- 32 to 149 $^{\circ}$ F (0 to 65 $^{\circ}$ C)
- 0 to 90% RH, non-condensing
- Storage temperature: -40 to 158 $^{\circ}$ F (-40 to 70 $^{\circ}$ C)

Accuracy

- Calibration accuracy and sensor conformity: \pm 0.1% of span \pm 1 $^{\circ}$ C @ 77 $^{\circ}$ F \pm 5 $^{\circ}$ F (25 $^{\circ}$ C \pm 3 $^{\circ}$ C) ambient, and rated line voltage \pm 10% with the following exceptions:
Type T: 0.12% of span for -328 to -58 $^{\circ}$ F (-200 to -50 $^{\circ}$ C)
Types R and S: 0.15% of span for 32 to 212 $^{\circ}$ F (0 to 100 $^{\circ}$ C)
Type B: 0.24% of span for 1598 to 3092 $^{\circ}$ F (870 $^{\circ}$ C to 1700 $^{\circ}$ C)
• Accuracy span: less than or equal to operating ranges, 1000 $^{\circ}$ F (540 $^{\circ}$ C) min.
• Temperature stability: \pm 0.1 $^{\circ}$ F/ $^{\circ}$ F (\pm 0.1 $^{\circ}$ C/ $^{\circ}$ C) rise in ambient for thermocouples
• \pm 0.05 $^{\circ}$ F/ $^{\circ}$ F (\pm 0.05 $^{\circ}$ C/ $^{\circ}$ C) rise in ambient for RTD sensors

Displays

- Process: 5 digit, 7 segment LED, red
- Control interface display: 4-row, 20-character high definition LCD green

Sensor Operating Ranges

Type J: 32 to 1500 $^{\circ}$ F or 0 to 815 $^{\circ}$ C

Type K: -328 to 2500°F or -200 to 1370°C
Type T: -328 to 750°F or -200 to 400°C
Type N: 32 to 2372°F or 0 to 1300°C
Type E: -328 to 1470°F or -200 to 800°C
Type C: 32 to 4200°F or 0 to 2315°C
Type D: 32 to 4352°F or 0 to 2400°C
Type Pt 2: 32 to 2543°F or 0 to 1395°C
Type R: 32 to 3200°F or 0 to 1760°C
Type S: 32 to 3200°F or 0 to 1760°C
Type B: 32 to 3300°F or 0 to 1816°C
RTD (DIN): -328 to 1472°F or -200 to 800°C
RTD (JIS): -328 to 1166°F or -200 to 800°C
Process: -19,999 to 30,000 units

Sensor Accuracy Ranges

Input ranges

Type J: 32 to 1382°F or 0 to 750°C
Type K: -328 to 2282°F or -200 to 1250°C
Type T: -328 to 662°F or -200 to 350°C
Type N: 32 to 2282°F or 0 to 1250°C
Type E: -328 to 1470°F or -200 to 800°C
Type C(W5): 32 to 4200°F or 0 to 2315°C
Type D(W3): 32 to 4352°F or 0 to 2400°C
Type Pt 2: 32 to 2540°F or 0 to 1393°C
Type R: 32 to 2642°F or 0 to 1450°C
Type S: 32 to 2642°F or 0 to 1450°C
Type B: 1598 to 3092°F or 870 to 1700°C
RTD (DIN): -328 to 1472°F or -200 to 800°C
RTD (JIS): -328 to 1166°F or -200 to 630°C
Process: -19,999 to 30,000 units

Silver SERIES touchscreen operator interface terminals provide a customizable user interface and log and graph data for Watlow controllers and other devices. A Silver SERIES operator interface terminal paired with Watlow controllers, is the perfect solution for industrial processes or machine control applications.
