SERIES F4 ¼ DIN TEMPERATURE PROCESS CONTROLLERS

High Performance Controller Offers Application Versatility and Ease of Use

The SERIES F4 ¼ DIN temperature process controllers offer the performance and features to meet a wide range of industrial processing needs. F4 process controllers are ideally suited for semiconductor manufacturing equipment, plastic processing and packaging equipment and industrial process control applications.

This competitively priced controller features a four line, high definition LCD interface display along with an information key that makes set up and control operation significantly easier with less chance for error. A 16 bit microprocessor supports all the accuracy and performance advantages you have come to expect from a Watlow controller.

The enhanced software option enables the SERIES F4 to support complex control applications such as cascade, ratio and differential control.

The four digital inputs can be used to remotely modify the operation of the controller or enable the display of pre-defined operator messages. Advanced features include cascade, ratio, differential, slidewire 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 deep case with removable connectors for wiring convenience.

The SERIES F4 controller is manufactured by ISO 9001 registered Watlow Controls and is backed with a three-year warranty.

Two day availability on all standard models in quantities of 20 or less.

Features and Benefits

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

WATLOW

WIN-F4P-0403

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ISO 9001
Registered Company
Winona, Minnesota USA

General Purpose Control Operation

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

Full non-abbreviated parameter choices are displayed using a four line liquid crystal display. The display is back lit for wide angle viewing.The 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 their attention.

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

Control Inputs

Up to three universal analog inputs are supported. These 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.

Digital Inputs

These four inputs are programmable and can be used to remotely modify the operation of the controller as well as displaying pre-programmed messages on the operations display.

Control Outputs

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.
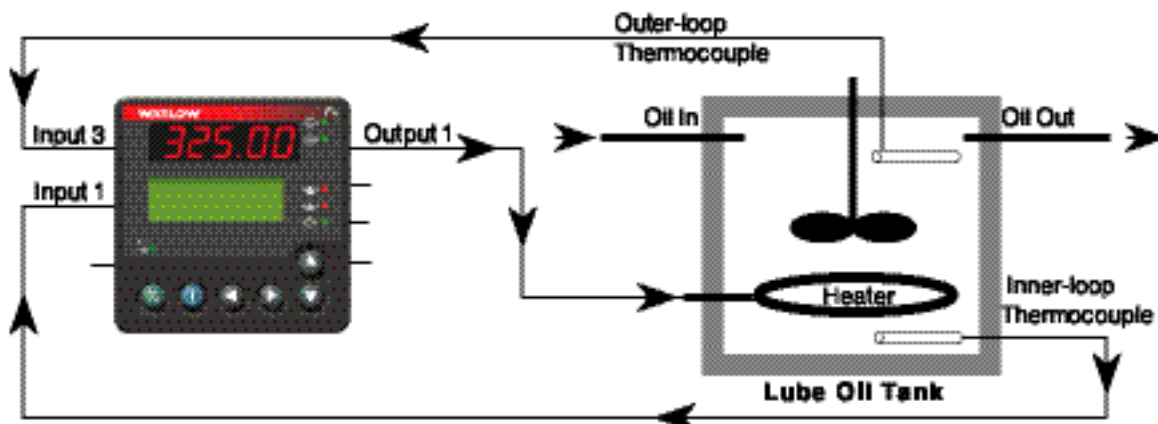
Alarms

Two alarms are included in the base unit.These alarms are programmable as process, deviation or rate.

Serial Communications

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

Retransmit

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.

Enhanced Control Operation

When the enhanced operation option is ordered, the SERIES F4 process controller is supplied with two additional universal analog inputs (inputs 2 and 3) and enhanced firmware to support numerous features that utilize the two additional inputs. The enhanced control option can be configured to support cascade control, (see the application diagram below), differential control, ratio control and slidewire 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 utilizes 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 the performance of thermal systems 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 and internal set point used to control the heater.

Modbus™ is a trademark of AEG Schneider Automation.

Specifications

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 1KW
- JIS or DIN curves, 1.0 or 0.1 indication

Process
- Input resolution [a] 50,000 bits at full scale
- Range selectable: 0-10V═(dc), 0-5V═(dc), 1-5V═(dc), 0-50mV, 0-20mA, 4-20mA
- Voltage input impedance 20KW
- Current input impedance 100W

Digital Inputs (4)
- Update rate = 10Hz
- Contact or dc voltage; 36V═(dc) max
- 10KW input impedance

Control Outputs (1A, 1B)
- Update rate = 20Hz

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

Solid-state Relay
- Zero switched, optically coupled, 0.5A @ 24V∼(ac) minimum, 253V∼(ac) max.

Electromechanical Relay
- Form C, 2A @ 250V∼(ac) or 30V═(dc) max.
- Resistive or inductive load
- Without contact suppression

Process Outputs (Optional Retransmit)
- Update rate = 1Hz
- User-selectable 0-10V═(dc), 0-5V═(dc), 1-5V═(dc) @1KW min., 0-20mA, 4-20mA @ 800W max.
- Resolution:
  dc ranges = 2.5mV nominal
  mA ranges = 5µA nominal
- Calibration accuracy:
  dc ranges = ±15mV
  mA ranges = ±30µA
- Temperature stability 100ppm/°C

Alarm Outputs
- Output update rate 1Hz
- Electromechanical relay, Form C, 2A @ 30V═(dc) or 240V∼(ac) 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

Note: Specifications subject to change without notice.

Power
- 100-240V∼(ac), -15 percent, +10 percent; 50/60Hz, ±5 percent
- 24-28V≈(ac/dc), -15 percent, +10 percent (order option)
- 39VA maximum power consumption
- Data retention upon power failure via nonvolatile memory. Sensor input isolation from input to input to output to communication circuitry is 500V∼(ac)

Operating Environment
- 0 to 65°C (32 to 149°F)
- 0 to 90 percent RH, non-condensing
- Storage temperature: -40 to 70°C (-40 to 158°F)

Accuracy
- Calibration accuracy and sensor conformity: ±0.1 percent of span ±1°C @ 25°C ±3°C (77°F ±5°F) ambient, and rated line voltage ±10 percent with the following exceptions:
  Type T: 0.12 percent of span for -200°C to -50°C
  Types R and S: 0.15 percent of span for 0°C to 100°C
  Type B: 0.24 percent of span for 870°C to 1700°C
- Accuracy span: Less than or equal to operating ranges, 540°C (1000°F) minimum
- Temperature stability: ±0.1°C/°C (±0.1°F/°F) rise in ambient for thermocouples
- ±0.05°C/°C (±0.05°F/°F) rise in ambient for RTD sensors

Displays
- Process: 5, seven-segment LED red
- Control interface display: high-definition LCD green

Sensor Operating Ranges

Type J:	0	to	815°C	or	32	to	1500°F
Type K:	-200	to	1370°C	or	-328	to	2500°F
Type T:	-200	to	400°C	or	-328	to	750°F
Type N:	0	to	1300°C	or	32	to	2372°F
Type E:	-200	to	800°C	or	-328	to	1470°F
Type C:	0	to	2315°C	or	32	to	4200°F
Type D:	0	to	2400°C	or	32	to	4352°F
Type Pt 2:	0	to	1395°C	or	32	to	2543°F
Type R:	0	to	1760°C	or	32	to	3200°F
Type S:	0	to	1760°C	or	32	to	3200°F
Type B:	0	to	1816°C	or	32	to	3300°F
RTD (DIN):	-200	to	800°C	or	-328	to	1472°F
RTD (JIS):	-200	to	800°C	or	-328	to	1166°F
Process:	-19,999 to 30,000 units						

Sensor Accuracy Ranges

Input ranges

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

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Ordering Information

SERIES F4 ¼ DIN Temperature Process Controller

SERIES F4 ──────────────────────── F4 P - A - ▯▯▯▯

Temperature/Process Controller
Single channel temperature/
process controller, two alarms,
EIA 232/485 comms, four
event inputs

Power Supply
H = 100-240V≈(ac/dc)
L = 24-28V≈(ac/dc)

Output 1A
C = Open collector/switched dc
E = Electromechanical relay, Form C
    2 amp without contact suppression
K = Solid state Form A 0.5 amp relay
    without contact suppression
F = Process, 0-5, 1-5, 0-10V⎓(dc),
    0-20mA, 4-20mA

Output 1B
A = None
E = Electromechanical relay, Form C
    2A without contact suppression
C = Open collector/switched dc
K = Solid state Form A 0.5 amp relay
    without contact suppression
F = Process, 0-5, 1-5, 0-10V⎓(dc),
    0-20mA, 4-20mA

Enhanced Control Operation
A = Standard control operation
B = Enhanced control operation, **dual universal
    inputs,** cascade, ratio, duplex, differential,
    slidewire

Auxiliary Retransmit Module
0 = None
1 = Single retransmit output 0-5, 1-5, 0-10V⎓(dc),
    0-20mA, 4-20mA
2 = Dual retransmit outputs 0-5, 1-5, 0-10V⎓(dc),
    0-20mA, 4-20mA

Language and RTD Options
1 = English with 100ΩRTD   5 = English with 500 & 1KΩRTD
2 = German with 100ΩRTD   6 = German with 500 & 1KΩ RTD
3 = French with 100ΩRTD   7 = French with 500 & 1KΩRTD
4 = Spanish with 100ΩRTD   8 = Spanish with 500 & 1KΩ RTD

Display and Custom Options
RG = Red/Green display
XX = Custom options, software, setting parameters,
     overlays

Panel Cutout
92 mm x 92 mm
(3.622 in. x 3.622 in.)

99.82 mm (3.930 in.)
99.82 mm (3.930 in.)
108.81 mm (4.824 in.)

108.05 mm (4.254 in.)
97.79 mm (3.850 in.)
10.26 mm (.404 in.)
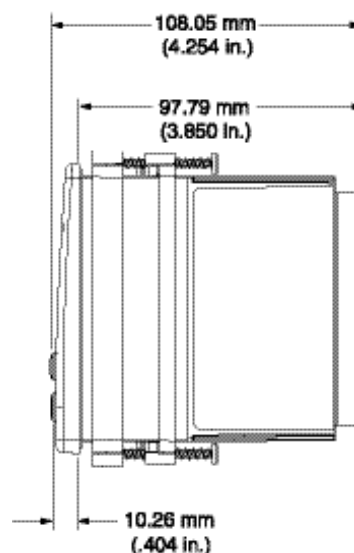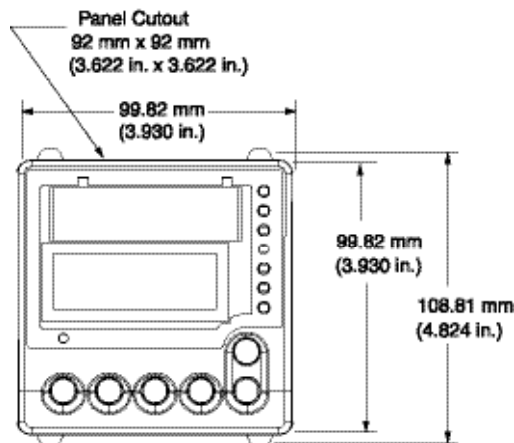
Specifications
Dimensions
• Width x height x depth
  99 mm x 99 mm x 97 mm panel mount
  (3.93 in. x 3.93 in. x 3.85 in.)