

# SERIES F4 1/4 DIN Ramping Controllers



The SERIES F4 1/4 DIN industrial ramping controller meets the requirements of the most demanding ramp and soak processing applications. Easy to setup and operate, its programming features and proven performance capabilities are ideally suited for environmental chamber or furnace and oven applications. Single and dual channel versions are available.

Competitively-priced, the SERIES F4 ramping controller features a four line, high-definition LCD interface display for quick and easy profile programming and controller configuration. Its 16-bit microprocessor ensures accuracy and delivers performance advantages you can count on from a Watlow® controller.

Up to 256 steps can be programmed into as many as 40 nameable profiles that can be programmed to wait for events or for up to three different process variables. A guaranteed soak feature allows a setting for how closely to control a process.

Program the four digital event inputs to remotely start, pause or terminate any preprogrammed process recipes. Eight event outputs are segment programmable and three outputs can be assigned to a programmable compressor and boost heat/boost cool control. A real-time clock can start a profile at any time.

Serial communication and dual alarm relays are included in the base unit. The SERIES F4 ramping controller is packaged with a NEMA 4X front face to withstand harsh environments and a 4 in. (102 mm) deep case with removable connectors for wiring convenience. It is manufactured by Watlow, ISO 9001 registered and wprotected by a three-year warranty.

## Ramping Control Programming Made Easy Through Advanced Technology

### Features and Benefits

#### Guided 256 step, 40 profile ramp and soak programmable memory

- Supports a wide range of processing applications

#### High definition four-line LCD controller interface display

- Simplifies setup and operation

#### Menu customization

- Offers enhanced process monitoring

#### High performance 16-bit microprocessor

- Provides precise process control

#### Universal inputs

- Provides application versatility

#### Expandable modular construction

- Field upgradable

#### Enhanced environmental chamber control

- Supports humidity, compressor, boost heat/boost cool control

#### Cascade control

- Provides precise two variable control

#### Real-time clock with battery backup

- Offers operational flexibility

## Set Point Ramp and Soak Programming

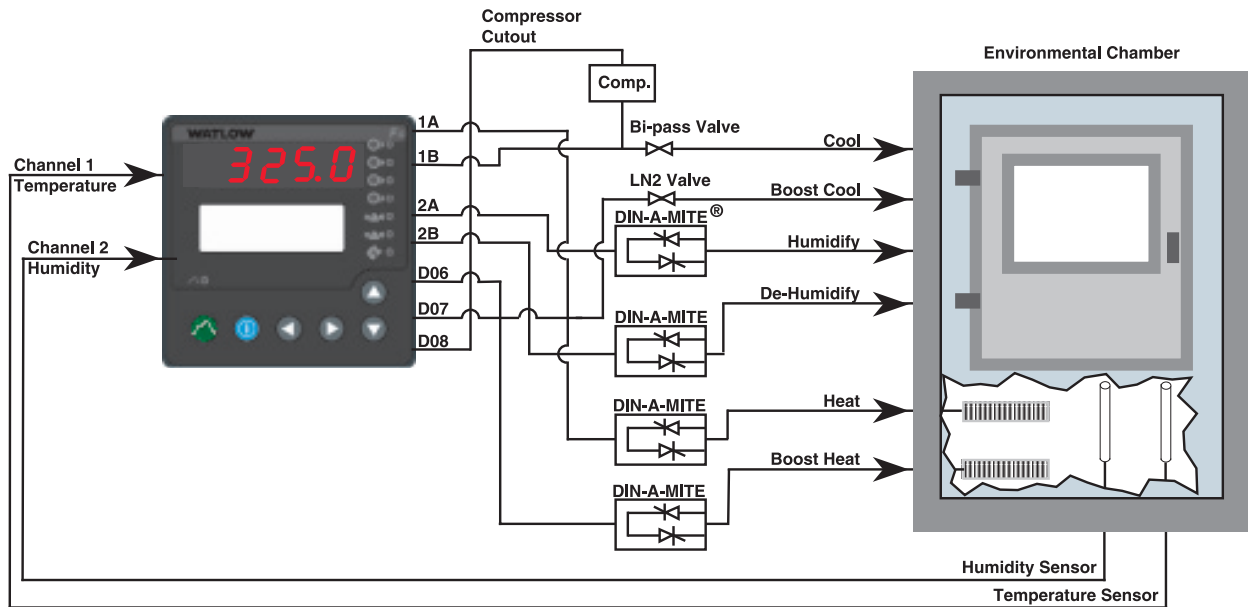
In response to customer needs, the Watlow SERIES F4 ramping controller has been enhanced with programming features that offer more capabilities with less programming complexity.

A programming guide provides step-by-step instructions for building profiles, offering choices for step configuration. For better operator recognition, profiles and digital I/O used for events can be named using up to 10 characters.

Five step types including ramp, soak, jump, auto start and end, offer complete programming flexibility.

Ramp steps can be based on time or rate. Ramp and soak steps can be programmed to wait for up to four event inputs and three process variables. As many as eight event outputs are step selectable. To accommodate changes to thermal systems characteristics over the operating range, up to 10 sets of PID heat/cool parameters are step selectable. The auto start step can start a profile based on a chosen set date, day of the week or daily. A jump step enables movement within a profile or to another profile. The end step terminates a program with the control outputs programmed to specific process needs.

## Temperature and Humidity Chamber Application



## Serial Communication

EIA-232 and EIA-485 serial communication interfaces are included in the base unit of both the SERIES F4S (single channel) and the SERIES F4D (dual channel) controllers. The baud rate is selectable as either 9600 or 19200 Kbaud. The protocol is Modbus® RTU.

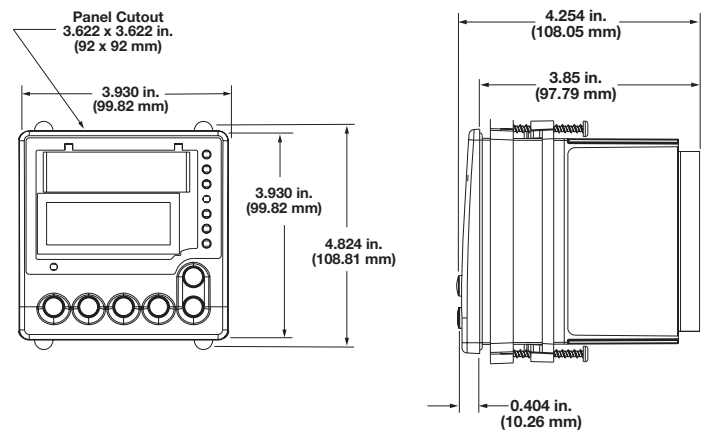
## Alarms

Two Form “C” electromechanical alarm relays are included in the base units. These alarms can be programmed as either process or deviation alarms. The alarms can be tied to up to three process variables.

## Optional Retransmit

Optional retransmit capability is available to retransmit one or two variables. These variables include up to three process variables, control set points or percent load power.

## Dimensional Drawings



### Dimension Specifications

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

## Specifications

### Universal Analog Inputs 1 (2 and 3 Optional)

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

### Thermocouple

- Type J, K, T, N, E, C (W5), D (W3), PTII, R, S, B
- Input impedance 20M $\Omega$

### RTD

- 2- or 3-wire platinum, 100, 500 or 1000 $\Omega$
- 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 $\Omega$
- Current input impedance 100 $\Omega$

### Digital Inputs (4)

- Update rate = 10Hz
- Contact or dc voltage (36VDC max.)
- 10K $\Omega$  input impedance

### Control Outputs (1A, 1B, 2A, 2B)

- 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 @ 24VAC min., 253VAC max.

### Process Outputs (Optional Retransmit)

- Update rate = 1Hz
- User selectable 0-10VDC, 0-5VDC, 1-5VDC @ 1K $\Omega$  min., 0-20mA, 4-20mA @ 800 $\Omega$  max.
- Resolution:  
dc ranges = 2.5mV nominal  
mA ranges = 5 $\mu$ A nominal
- Calibration accuracy:  
dc ranges =  $\pm$ 15mV  
mA ranges =  $\pm$ 30 $\mu$ A
- Temperature stability 100ppm/ $^{\circ}$ C

### Alarm Outputs

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

### Digital Outputs (8)

- Update rate = 10Hz
- Open collector output
- Off = 42VDC max. @ 10 $\mu$ A
- On = 0.2VDC max. @ 50mA sink
- Internal supply: 5VDC, @ 80mA

### Communications

EIA-232 and EIA-485 serial communications with Modbus<sup>®</sup> RTU protocol

### Safety and Agency Approvals

- UL<sup>®</sup>/C-UL<sup>®</sup> 916 listed, File #E185611

### Process Control Equipment

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

### 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 (7 years for battery backed RAM)
- Sensor input isolation from input to input to output to communication circuitry is 500VAC

### Operating Environment

- 32 to 130 $^{\circ}$ F (0 to 55 $^{\circ}$ 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 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 $^{\circ}$ F	or	-200 to 1370 $^{\circ}$ C
Type T:	-328 to 750 $^{\circ}$ F	or	-200 to 400 $^{\circ}$ C
Type N:	32 to 2372 $^{\circ}$ F	or	0 to 1300 $^{\circ}$ C
Type E:	-328 to 1470 $^{\circ}$ F	or	-200 to 800 $^{\circ}$ C
Type C (W5):	32 to 4200 $^{\circ}$ F	or	0 to 2315 $^{\circ}$ C
Type D (W3):	32 to 4352 $^{\circ}$ F	or	0 to 2400 $^{\circ}$ C
Type Pt 2:	32 to 2543 $^{\circ}$ F	or	0 to 1395 $^{\circ}$ C
Type R:	32 to 3200 $^{\circ}$ F	or	0 to 1760 $^{\circ}$ C
Type S:	32 to 3200 $^{\circ}$ F	or	0 to 1760 $^{\circ}$ C
Type B:	32 to 3300 $^{\circ}$ F	or	0 to 1816 $^{\circ}$ C
RTD (DIN):	-328 to 1472 $^{\circ}$ F	or	-200 to 800 $^{\circ}$ C
RTD (JIS):	-328 to 1166 $^{\circ}$ F	or	-200 to 800 $^{\circ}$ C
Process:	-19,999 to 30,000 units		

### Sensor Accuracy Ranges

#### Input ranges

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

**Note:** Specifications subject to change without notice.

## Ordering Information – 1/4 DIN Single Channel Ramping Controller

### Part Number

① ②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪ ⑫
F4	Single Channel Ramping S	Power Supply H	Output 1A	Output 1B	A	Auxiliary Input Module	Auxiliary Retransmit Module	Language and RTD Options	Display and Custom Options

③ Single Channel Ramping Controller	
S =	1 universal analog input, 4-digital inputs, 8-digital outputs, 2 alarms, EIA-232/485 comms

④ Power Supply	
H =	100-240VAC/VDC

⑤ Output 1A	
C =	Open collector/switched dc
F =	Process, 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
K =	Solid state Form A 0.5A relay

⑥ Output 1B	
A =	None
C =	Open collector/switched dc
F =	Process, 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
K =	Solid state Form A 0.5A relay

⑧ Auxiliary Input Module	
0 =	None
6 =	Dual universal inputs

⑨ Auxiliary Retransmit Module	
0 =	None
1 =	Single retransmit output 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
2 =	Dual retransmit outputs 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA

⑩ Language and RTD Option	
1 =	English with 100Ω RTD
2 =	German with 100Ω RTD
3 =	French with 100Ω RTD
4 =	Spanish with 100Ω RTD
5 =	English with 500 and 1KΩ RTD
6 =	German with 500 and 1KΩ RTD
7 =	French with 500 and 1KΩ RTD
8 =	Spanish with 500 and 1KΩ RTD

⑪ ⑫ Display and Custom Options	
RG =	Standard display (Red/Green display only)
XX =	Custom options: software, setting parameters, overlay

## Ordering Information – 1/4 DIN Dual Channel Ramping Controller

### Part Number

① ②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪ ⑫
F4	Dual Channel Ramping D	Power Supply H	Output 1A	Output 1B	Output 2A	Output 2B	Auxiliary Retransmit Module	Language and RTD Options	Display and Custom Options

③ Dual Channel Ramping Controller	
D =	3 universal analog inputs, 4-digital inputs, 8-digital outputs, 2 alarms, EIA-232/485 comms

④ Power Supply	
H =	100-240VAC/VDC

⑤ Output 1A	
C =	Open collector/switched dc
F =	Process, 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
K =	Solid state Form A 0.5A relay

⑥ Output 1B	
A =	None
C =	Open collector/switched dc
F =	Process, 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
K =	Solid state Form A 0.5A relay

⑦ Output 2A	
C =	Open collector/switched dc
F =	Process, 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
K =	Solid state Form A 0.5A relay

⑧ Output 2B	
A =	None
C =	Open collector/switched dc
F =	Process, 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
K =	Solid state Form A 0.5A relay

⑨ Auxiliary Retransmit Module	
0 =	None
1 =	Single retransmit output 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA
2 =	Dual retransmit outputs 0-5, 1-5, 0-10VDC, 0-20mA, 4-20mA

⑩ Language and RTD Option	
1 =	English with 100Ω RTD
2 =	German with 100Ω RTD
3 =	French with 100Ω RTD
4 =	Spanish with 100Ω RTD
5 =	English with 500 and 1KΩ RTD
6 =	German with 500 and 1KΩ RTD
7 =	French with 500 and 1KΩ RTD
8 =	Spanish with 500 and 1KΩ RTD

⑪ ⑫ Display and Custom Options	
RG =	Standard display (Red/Green display only)
XX =	Custom options: software, setting parameters, overlay

## Compatible Accessories

### Operator Interface Terminals (OIT)



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.

### SpecView



SpecView from Watlow is designed for industrial users and includes features such as data logging, trending and support for bar code readers and touch screens. Errors are reduced for any process by creating application-specific screens. The software provides a historical replay option, easy-to-use recipe features and remote access options, including LAN, internet and modem.

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