

## Ramping Control Programming Made Easy Through Advanced Technology

The SERIES F4 ¼ DIN industrial ramping controllers offer an easy to set up and operate solution for the most demanding ramp and soak processing applications. The features and performance of these units make them ideally suited for environmental chamber or furnace and oven applications. Single and dual channel versions are available.

These competitively-priced controllers feature a four line, high-definition LCD interface display that makes profile programming and controller configuration significantly faster and easier. A 16 bit microprocessor supports all the accuracy and performance advantages you have come to expect from a Watlow controller.

Up to 256 steps can be programmed into as many as 40 nameable profiles. Profiles can be programmed to wait for events or for up to three different process variables. A guaranteed soak feature allows you to set how closely your process needs to be controlled.

The four digital event inputs can be programmed to remotely start, pause or terminate any of your preprogrammed process recipes. The eight event outputs are segment programmable, or three of them can be assigned to programmable compressor and boost heat/boost cool control. A real-time clock can be used to start a profile at any time.

Serial communication and dual alarm relays are included in the base unit. The SERIES F4 ramping controllers are packaged with a NEMA 4X front face to withstand harsh environments and a 101.6 mm (4.0 in.) deep case with removable connectors for wiring convenience.

The SERIES F4 controllers are manufactured by Watlow, ISO 9001 registered and backed by a three-year warranty.



### 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

- 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



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WIN-F4R-0407

**ISO 9001**



Registered Company  
Winona, Minnesota USA



## Set Point Ramp and Soak Programming

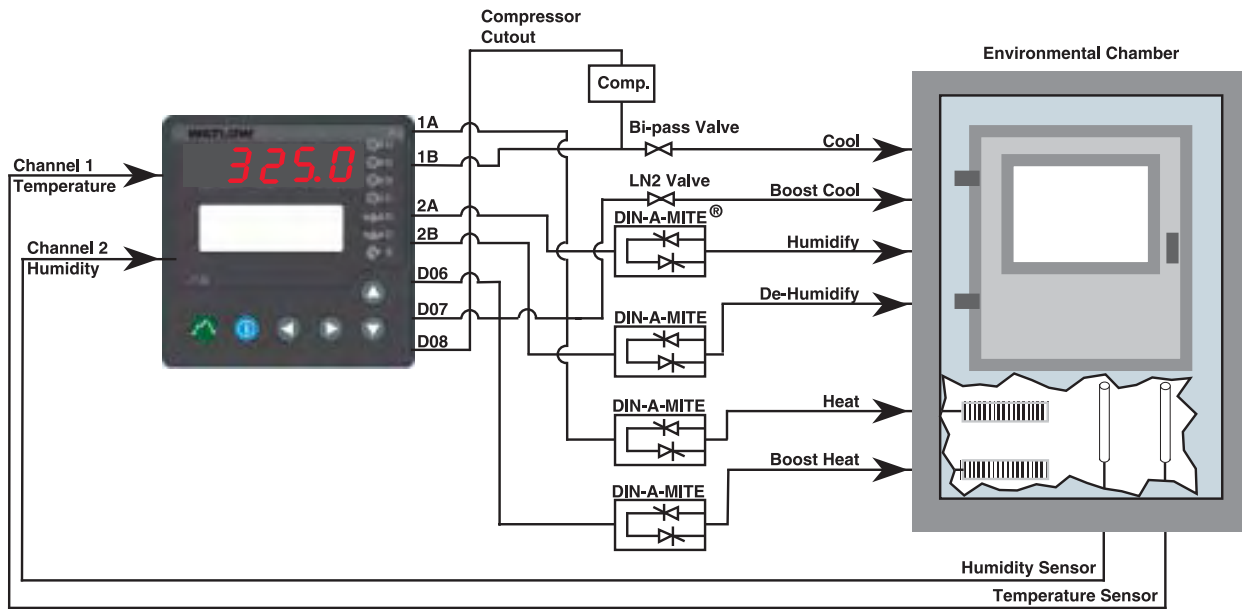
The enhanced programming features found in the SERIES F4 ramping controllers are the result of listening to our customers' demand for greater capabilities with reduced programming complexity.

A profile guide leads the programmer through the programming process by offering choices for step configuration. For better operator recognition, profiles and digital I/O used for events can be given names of up to 10 characters in length.

Five step types including ramp, soak, jump, auto start and end offer the programmer complete 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. Up to eight event outputs are step selectable. Since your thermal systems characteristics may change 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 set date, a day of the week or daily, the choice is yours. The jump step can be used to jump within a profile or to another profile. The end step terminates a program with the control outputs programmed to your process needs.

## Temperature and Humidity Chamber Application



## Serial Communication

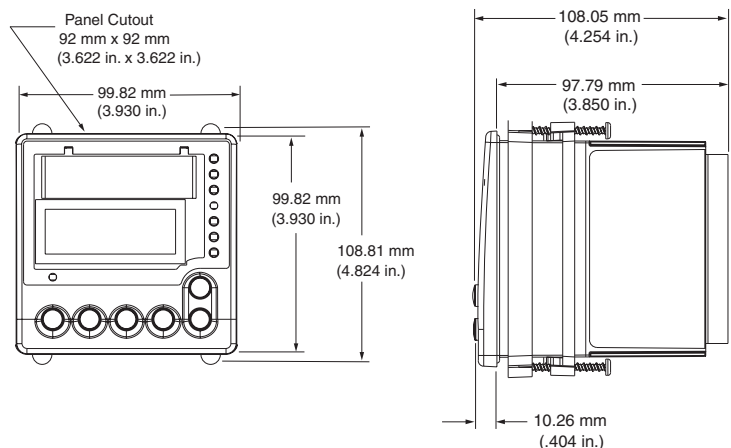
EIA-232 and EIA-485 serial communication interfaces are included in the base unit of both the SERIES F4S (single channel) and the SERIES F4D (dual channel) controllers. The baud rate is selectable as either 9600 or 19200 Kbaud. The protocol is Modbus®.

## 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.



## 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.)

## 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: 0-10V $\rightleftharpoons$ (dc), 0-5V $\rightleftharpoons$ (dc), 1-5V $\rightleftharpoons$ (dc), 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 (36V $\rightleftharpoons$ (dc) maximum)
- 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 28V $\rightleftharpoons$ (dc), limited @ 30mA
- External load switching (maximum):  
Open collector 42V $\rightleftharpoons$ (dc) @ 0.5A

### Solid State Relay

- Zero switched, optically coupled, 0.5A @ 24V $\sim$ (ac) minimum, 253V $\sim$ (ac) maximum

### Process Outputs (Optional Retransmit)

- Update rate = 1Hz
- User selectable 0-10V $\rightleftharpoons$ (dc), 0-5V $\rightleftharpoons$ (dc), 1-5V $\rightleftharpoons$ (dc) @ 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 @ 30V $\rightleftharpoons$ (dc) or 240V $\sim$ (ac) maximum

### Digital Outputs (8)

- Update rate = 10Hz
- Open collector output
- Off = 42V $\rightleftharpoons$ (dc) max @ 10 $\mu$ A
- On = 0.2V $\rightleftharpoons$ (dc) max @ 50mA sink
- Internal supply: 5V $\rightleftharpoons$ (dc), @ 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

- 100-240V $\sim$ (ac), -15 percent, +10 percent; 50/60Hz,  $\pm$ 5 percent
- 24-28V $\rightleftharpoons$ (ac/dc), -15 percent, +10 percent (order option)
- 39VA maximum 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 500V $\sim$ (ac)

### Operating Environment

- 0 to 55 $^{\circ}$ C (32 to 130 $^{\circ}$ F)
- 0 to 90 percent RH, non-condensing
- Storage temperature: -40 to 70 (-40 to 158 $^{\circ}$ F)

### Accuracy

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

### Displays

- Process: 5, 7 segment LED red
- Control interface display: high definition LCD green

### Sensor Operating Ranges:

Type J:	0	to	815 $^{\circ}$ C	or	32	to	1500 $^{\circ}$ F
Type K:	-200	to	1370 $^{\circ}$ C	or	-328	to	2500 $^{\circ}$ F
Type T:	-200	to	400 $^{\circ}$ C	or	-328	to	750 $^{\circ}$ F
Type N:	0	to	1300 $^{\circ}$ C	or	32	to	2372 $^{\circ}$ F
Type E:	-200	to	800 $^{\circ}$ C	or	-32	to	1470 $^{\circ}$ F
Type C: (W5)	0	to	2315 $^{\circ}$ C	or	32	to	4200 $^{\circ}$ F
Type D: (W3)	0	to	2400 $^{\circ}$ C	or	32	to	4352 $^{\circ}$ F
Type PTII:	0	to	1395 $^{\circ}$ C	or	32	to	2543 $^{\circ}$ F
Type R:	0	to	1760 $^{\circ}$ C	or	32	to	3200 $^{\circ}$ F
Type S:	0	to	1760 $^{\circ}$ C	or	32	to	3200 $^{\circ}$ F
Type B:	0	to	1816 $^{\circ}$ C	or	32	to	3300 $^{\circ}$ F
RTD (DIN):	-200	to	800 $^{\circ}$ C	or	-328	to	1472 $^{\circ}$ F
RTD (JIS):	-200	to	800 $^{\circ}$ C	or	-328	to	1166 $^{\circ}$ F
Process:	-19,999	to	30,000	units			

### Sensor Accuracy Ranges:

#### Input ranges

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

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

## Ordering Information

### ¼ DIN Single Channel Ramping Controller

#### SERIES F4

¼ DIN, Single Channel  
Ramping Controller

F4 S - A -

#### Single Channel Ramping Controller

1 universal analog input, 4-digital  
inputs, 8-digital outputs, 2 alarms,  
EIA-232/485 comms

#### Power Supply

H = 100-240V $\approx$ (ac/dc)

L = 24-28V $\approx$ (ac/dc)

#### Output 1A

C = Open collector/switched dc

F = Process, 0-5, 1-5, 0-10V $\approx$ (dc),  
0-20mA, 4-20mA

K = Solid state Form A 0.5 amp relay

#### Output 1B

A = None

C = Open collector/switched dc

F = Process, 0-5, 1-5, 0-10V $\approx$ (dc),  
0-20mA, 4-20mA

K = Solid state Form A 0.5 amp relay

#### Auxiliary Input Module

0 = None

6 = Dual universal inputs

#### Auxiliary Retransmit Module

0 = None

1 = Single retransmit output

0-5, 1-5, 0-10V $\approx$ (dc), 0-20mA, 4-20mA

2 = Dual retransmit outputs

0-5, 1-5, 0-10V $\approx$ (dc), 0-20mA, 4-20mA

#### Language and RTD Option

1 = English with 100 $\Omega$  RTD

2 = German with 100 $\Omega$  RTD

3 = French with 100 $\Omega$  RTD

4 = Spanish with 100 $\Omega$  RTD

5 = English with 500 and 1K $\Omega$  RTD

6 = German with 500 and 1K $\Omega$  RTD

7 = French with 500 and 1K $\Omega$  RTD

8 = Spanish with 500 and 1K $\Omega$  RTD

#### Display and Custom Options

RG = Standard display (Red/Green display only)

XX = Custom options: software, setting parameters,  
overlay

## Ordering Information

### ¼ DIN Dual Channel Ramping Controller

#### SERIES F4

¼ DIN, Dual Channel  
Ramping Controller

F4 D - -

#### Dual Channel Ramping Controller

3 universal analog inputs, 4-digital  
inputs, 8-digital outputs, 2 alarms,  
EIA-232/485 comms

#### Power Supply

H = 100-240V $\approx$ (ac/dc)

L = 24-28V $\approx$ (ac/dc)

#### Output 1A

C = Open collector/switched dc

F = Process, 0-5, 1-5, 0-10V $\approx$ (dc),  
0-20mA, 4-20mA

K = Solid state Form A 0.5 amp relay

#### Output 1B

A = None

C = Open collector/switched dc

F = Process, 0-5, 1-5, 0-10V $\approx$ (dc),  
0-20mA, 4-20mA

K = Solid state Form A 0.5 amp relay

#### Output 2 A

C = Open collector/switched dc

F = Process, 0-5, 1-5, 0-10V $\approx$ (dc), 0-20mA,  
4-20mA

K = Solid state Form A 0.5 amp relay

#### Output 2 B

A = None

C = Open collector/switched dc

F = Process, 0-5, 1-5, 0-10V $\approx$ (dc), 0-20mA, 4-20mA

K = Solid state Form A 0.5 amp relay

#### Auxiliary Retransmit Module

0 = None

1 = Single retransmit output 0-5, 1-5, 0-10V $\approx$ (dc),  
0-20mA, 4-20mA

2 = Dual retransmit outputs 0-5, 1-5, 0-10V $\approx$ (dc),  
0-20mA, 4-20mA

#### Language and RTD Option

1 = English with 100 $\Omega$  RTD

2 = German with 100 $\Omega$  RTD

3 = French with 100 $\Omega$  RTD

4 = Spanish with 100 $\Omega$  RTD

5 = English with 500 and 1K $\Omega$  RTD

6 = German with 500 and 1K $\Omega$  RTD

7 = French with 500 and 1K $\Omega$  RTD

8 = Spanish with 500 and 1K $\Omega$  RTD

#### Display and Custom Options

RG = Standard display (Red/Green display only)

XX = Custom options: software, setting parameters, overlay

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