A Ramping Controller With Guided Programming

The Series F4 industrial ramping controllers provide powerful, precise control of the most demanding ramp and soak processing applications. They are also easy to set up and operate. Their features and performance 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 display that makes profile programming and controller configuration fast and easy. A 16-bit microprocessor supports the accuracy and performance you expect from a Watlow controller.

As many as 256 steps can be programmed into as many as 40 namable profiles. Profiles can be programmed to wait for events or for three different process variables. A guaranteed soak feature insures that the process follows the profile within a specified band.

The four digital event inputs can be programmed to remotely start, pause or terminate any of your preprogrammed profiles. The eight event outputs are step programmable; three of them can be assigned to programmable compressor and boost heat/boost cool control. The real-time clock permits you to start or repeat 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 an IP65 (NEMA 4X) front face to withstand harsh environments, and an 108 mm-deep case with removable connectors for wiring convenience.

The Series F4 controllers are manufactured by Watlow Controls, an ISO 9001-registered company, and backed by a three-year warranty.

Features and Benefits

Memory stores 40 profiles, in as many as 256 steps
- Supports a wide range of processing applications

Guided profile programming and "information" key
- Simplifies setup

High definition four-line LCD interface display
- Simplifies setup and operation

Menu customization
- Enhances process monitoring

High performance 16-bit microprocessor
- Precise process control

Universal inputs
- Application versatility

Expandable modular construction
- Field upgradable

Enhanced environmental chamber control
- Supports humidity, compressor, boost heat/boost cool control

Cascade control
- Precise two variable control

Real-time clock with battery backup
- Operational flexibility

WATLOW

ENG-F4-99 (1759)

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C E

ISO 9001
Registered Company
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## 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 by offering choices for step configuration. (For better operator recognition, profiles and digital inputs and ouputs used for events can be given names of up to 10 characters in length.)

Five step types, including ramp, soak, jump, autostart 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 as many as four event inputs and three process variables. The eight event outputs are step selectable. Since your thermal system's characteristics may change over its operating range, 10 sets of PID heat/cool parameters are step selectable. The autostart step can start a profile based on a set date, a day of the week, or daily. The jump step can 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
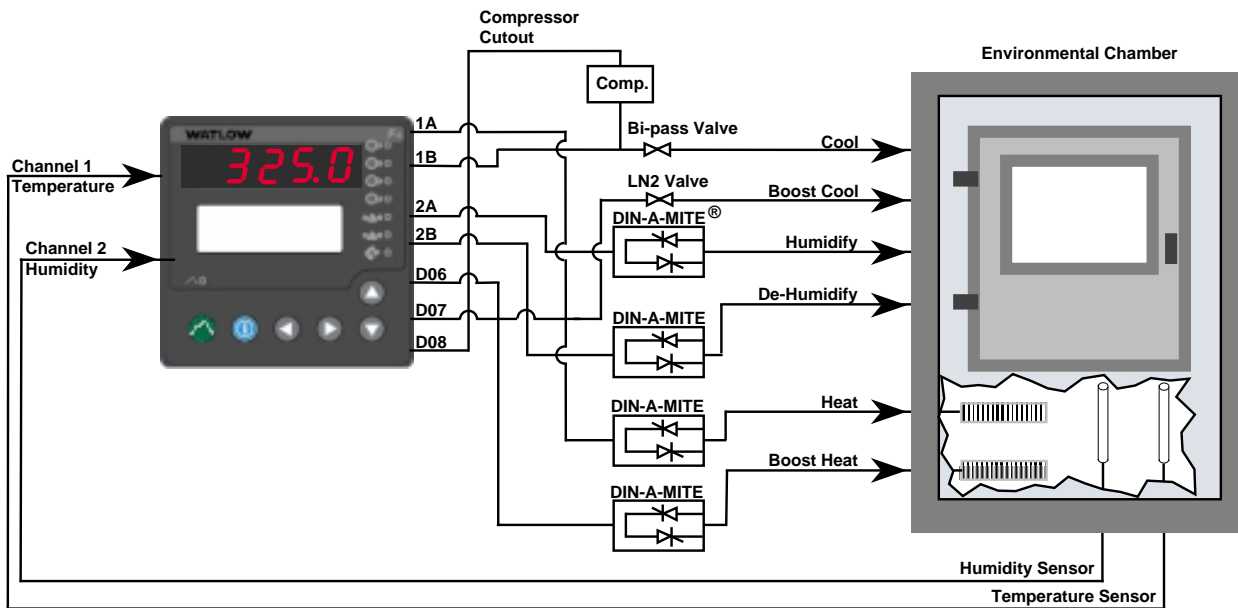
Serial Communication

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.

Modbus™ is a trademark of AEG Schneider Automation.
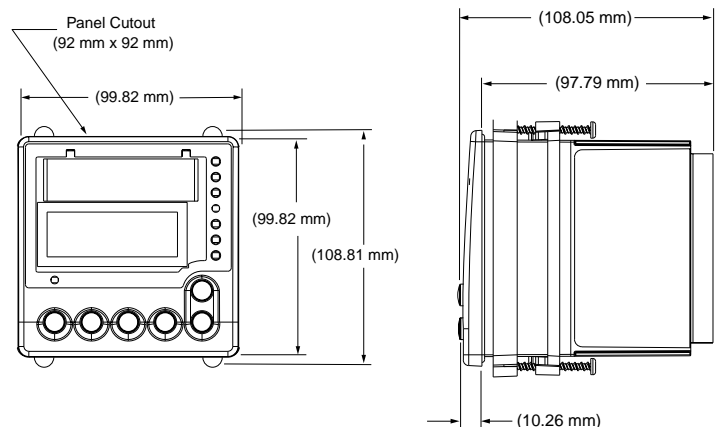
Specifications

Dimensions

- Width x height x depth
  panel cutout: 92 mm x 92 mm x 108 mm
  front face: 99.8 mm x 99.8 mm x 97.8 mm

Specifications (1760)

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, PTII, D (W3), B, R, S

RTD
- 2- or 3-wire platinum, 100Ω
- JIS or DIN curves, 1.0 or 0.1 indication

Process
- Input resolution ≈ 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 20KΩ
- Current input impedance 100Ω

Digital Inputs (4)
- Update rate = 10Hz
- Contact or dc voltage
- 10KΩ input impedance

Control Outputs (1A, 1B, 2A, 2B)
- Update rate = 20Hz

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

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

Process Outputs (Optional Retransmit)
- Update rate = 1Hz
- User-selectable 0-10V⎓ (dc), 0-5V⎓ (dc), 1-5V⎓ (dc) @1KΩ min., 0-20mA, 4-20mA @ 800Ω 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 rate1Hz
- Electromechanical relay, Form C, 2A @ 30V⎓ (dc) or 240V∼ (ac) maximum

Digital Outputs (8)
- Update rate = 10Hz
- Open collector output
- Off: 42V⎓ (dc) max @ 10μA
- On: 0.2V⎓ (dc) max @ 50mA sink
- Internal supply: 5V⎓ (dc), @ 80mA

Communications
EIA-232 and EIA-485 serial communications with Modbus™ RTU protocol

Safety and Agency Approvals
- CE EMC to EN50082-2
- CE EMC to EN55011
- CE to EN 61010
- UL®/C-UL 916-listed, File # E185611
- IP65 (NEMA 4X)

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

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

Operating Environment
- 0 to 55°C
- 0 to 90% RH, non-condensing
- Storage temperature: -40 to 70°C

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

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

Sensor Operating Ranges:

Type	Ind.		°F		°C		
Type J:	1.0	32	to 1500°F	or	0	to	815°C
Type K:	1.0	-328	to 2500°F	or	-200	to	1370°C
Type T:	1.0	-328	to 750°F	or	-200	to	400°C
Type N:	1.0	32	to 2372°F	or	0	to	1300°C
Type E:	1.0	-328	to 1470°F	or	-200	to	800°C
Type C:	1.0	32	to 4200°F	or	0	to	2315°C
Type D:	1.0	32	to 4200°F	or	0	to	2315°C
Type PTII:	1.0	32	to 2543°F	or	0	to	1395°C
Type R:	1.0	32	to 3200°F	or	0	to	1760°C
Type S:	1.0	32	to 3200°F	or	0	to	1760°C
Type B:	1.0	32	to 3300°F	or	0	to	1816°C
RTD (DIN):	1.0	-328	to 1472°F	or	-200	to	800°C
RTD (JIS):	1.0	-328	to 1166°F	or	-200	to	800°C
Process:		-1999	to9999 units				

Sensor Accuracy Ranges:

Input ranges

Type	°F		°C	
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 4200°F	or	0 to 2315°C	
Type PTII:	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:	-1999 to 9999 units			

Note: These specifications are subject to change without prior notice.

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Ordering Information (1761)

¼ DIN Single-Channel Ramping Controller

Series F4   **F4 S** _ - _ _ **A** _ -
¼ DIN, Single-Channel
Ramping Controller

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≈ (ac/dc)
L = 24-28V≈ (ac/dc)

Output 1A
C = Open collector/switched dc
F = Process, 0-5, 1-5, 0-10V⎓ (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⎓ (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⎓ (dc),
 0-20mA, 4-20mA
2 = Dual retransmit outputs 0-5, 1-5, 0-10V⎓ (dc),
 0-20mA, 4-20mA

Language Option
(Consult factory for availability)
1 = English (default is U.S. PID units, Fahrenheit)
2 = German (preset to S.I. PID units, Celsius)
3 = French (preset to S.I. PID units, Celsius)
4 = Spanish (preset to S.I. PID units, Celsius)
5 = English (preset to S.I. PID units, Celsius)

Custom Options
R = Red display
G = Green display
XX= Custom options: software, setting parameters, overlay

Consult your sales representative or distributor
regarding model number information for controller
defaults to SI units.

Ordering Information (1833)

¼ DIN Dual Channel Ramping Controller

Series F4   **F4 D** _ _ - _ _ _ _ -
¼ DIN, Dual Channel
Ramping Controller

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≈ (ac/dc)
L = 24-28V≈ (ac/dc)

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

Output 2A
C = Open collector/switched dc
F = Process, 0-5, 1-5, 0-10V⎓ (dc),
 0-20mA, 4-20mA
K = Solid-state Form A 0.5-amp relay

Output 2B
A = None
C = Open collector/switched dc
F = Process, 0-5, 1-5, 0-10V⎓ (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⎓ (dc), 0-20mA, 4-20mA
2 = Dual retransmit outputs 0-5, 1-5, 0-10V⎓ (dc),
 0-20mA, 4-20mA

Language Option
(Consult factory for availability)
1 = English (default is U.S. PID units, Fahrenheit)
2 = German (preset to S.I. PID units, Celsius)
3 = French (preset to S.I. PID units, Celsius)
4 = Spanish (preset to S.I. PID units, Celsius)
5 = English (preset to S.I. PID units, Celsius)

Custom Options
R = Red display
G = Green display
XX= Custom options: software, setting parameters, overlay

Consult your sales representative or distributor
regarding model number information for controller
defaults to SI units.