

## Plug and Play Firmware and Hardware

### Features and Benefits

#### Burst fire

- Increase heater life/better temperature controllability

#### One input, one auxiliary input, four outputs

- Powerful flexibility at a competitive price

#### No dipswitches

- Easily configurable from the front panel

#### Multiple set points

- Flexible automatic control

#### Pluggable output modules

- Field expandable

#### Fast 10Hz sampling

- Improved control responsiveness

#### Programmable menus (Patent pending)

- Can be self-tailored for exact user needs

#### Open loop break protection

- Indication of thermal loop problem

#### NEMA 4X (IP65)

- Water and corrosion resistant front panel can be washed down

#### 16 programmable ramp and soak steps

- Profiles of dynamic production processes can be programmed into the controller

#### Automatic tuning

- Easy one step tuning of PID control parameters

Your Authorized Watlow Distributor Is:



Watlow's SERIES 96 is a powerful 1/6 DIN dual display controller that offers many advanced functions. This new controller can be tailored to perform hardware and software needs with hardware modules that are pluggable and exchangeable and software menus that may be user programmed to fit exact application requirements.

With one universal input, a second auxiliary input and four outputs the SERIES 96 can be programmed to perform: temperature measurement, input event switching, remote set point input, heating, boost heating, cooling, alarms, digital communications, ramp and soak and retransmit. These features make this controller ideally suited for applications in markets such as plastics packaging, semiconductor, food processing and lab equipment.

Set point ramping operations include two files with eight steps in each. The files can be linked to create a 16-step profile.

With fast 10Hz sampling, variable time base burst firing outputs, NEMA 4X front panel and 0.1 percent calibration accuracy this control can easily handle some of the toughest application needs.

The SERIES 96 is manufactured by ISO 9001 registered Watlow Controls and reliably backed by a three-year warranty.



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WIN-96-0406



# Specifications—1841

## Controller

- Microprocessor-based, user selectable control modes
- Heat and cool auto-tune for control outputs
- Universal input 1, auxiliary input 2, 4 outputs
- Control outputs user selectable as on-off, P, PI, PID
- Input sample period; Single input 10Hz (100 ms), dual input 5Hz (200 ms) adjustable digital filter
- Display update; 2Hz (500 ms), adjustable digital filter
- Output update; burst, 0.1 to 999.9 seconds
- Input/Output/Communication isolation
- Displayed in °C, °F, or process units

## Operator Interface

- Dual 4-digit LED displays: upper 10.2 mm (0.4 in.), lower 6.2 mm (0.244 in.)
- Advance, Up Arrow, Down Arrow, Infinity tactile keys

## Standard Conditions For Specifications

- Ambient temperature 25°C/77°F ±3°C, rated line voltage, 50 to 60Hz, 0 to 90 percent RH non-condensing, 15 minute warm-up

## Universal Input 1

### Thermocouple

- Type J, K, T, N, C (W5), E, Pt 2, D (W3), B, R, S thermocouple types
- >20MΩ input impedance
- Maximum 20Ω source resistance
- 30μA open detection bias

### RTD

- 2- or 3-wire platinum, 100Ω
- JIS and DIN curves
- Whole or tenth degree indication
- 150μA nominal RTD excitation current

### Process

- Range selectable: 0-10V<sub>rms</sub>(dc), 0-5V<sub>rms</sub>(dc), 1-5V<sub>rms</sub>(dc), 0-20mA, 4-20mA,
- Voltage input impedance 20kΩ
- Current input impedance 100Ω
- Minimum current source resistance 1MΩ
- Input resolution 50,000 bits (approx.) at full scale
- mV input impedance 20MΩ

## Input 2

### Event Input

- Contact or voltage
- 20KΩ input impedance
- Voltage input: event high state 3 to 36V<sub>rms</sub>(dc), event low state 0 to 2V<sub>rms</sub>(dc)
- Resistance/contact input: event high state > 23kΩ, event low state 0 to 2kΩ

### Remote Set Point Input: mA or VDC Range Selectable

- Voltage input impedance 20kΩ
- Current input impedance 100Ω

## Output Types

### Open Collector/Switched DC

- Open collector configuration:
  - Maximum voltage 42V<sub>rms</sub>(dc)
  - Maximum current 200mA
  - Maximum "on" resistance 1.1Ω
  - Maximum offstate leakage current 100μA
- Switched dc configuration:
  - Switched dc supply voltage 22 to 28V<sub>rms</sub>(dc)
  - dc supply current limited to 30mA

### Solid State Relay

- Optically isolated
- Zero cross switched
- Without contact suppression
- Minimum load current 0.5mA rms
- Maximum current 0.5A rms at 20 to 280V<sub>rms</sub>(ac)
- Maximum offstate leakage current 10μA rms
- For resistive loads only, must use RC suppression for inductive loads

### Electromechanical Relay

- Form C contact configuration
- Minimum load current 10mA @ 5V<sub>rms</sub>(dc)
- Rated resistive and inductive loads: 2A @ 250V<sub>rms</sub>(ac) or 30V<sub>rms</sub>(dc) maximum
- Electrical life 100,000 cycles at rated current
- For resistive loads only, must use RC suppression for inductive loads

### Process

- Range selectable: 0-20mA, 4-20mA, 0-5V<sub>rms</sub>(dc), 1-5V<sub>rms</sub>(dc), 0-10V<sub>rms</sub>(dc)
- Reverse or direct acting
- 0 to 10V<sub>rms</sub>(dc) voltage output into 1000Ω minimum load resistance
- 0 to 20mA current output into 800Ω maximum load resistance
- Resolution:
  - dc ranges = 2.5mV nominal
  - mA ranges = 5μA nominal
- Calibration accuracy:
  - dc ranges = ±15mV
  - mA ranges = ±30μA
- Temperature stability 100ppm/°C

### Retransmit

- Range selectable: 0-20mA, 4-20mA, 0-5V<sub>rms</sub>(dc), 1-5V<sub>rms</sub>(dc), 0-10V<sub>rms</sub>(dc)
- 0 to 10V<sub>rms</sub>(dc) voltage output into a 1,000Ω minimum load resistance
- 0 to 20mA current output into an 800Ω maximum load resistance
- Resolution:
  - dc ranges = 2.5mV nominal
  - mA ranges = 5μA nominal
- Calibration accuracy:
  - dc ranges = ±15mV
  - mA ranges = ±30μA
- Temperature stability 100ppm/°C

**Communications**

- EIA/TIA-485 or EIA/TIA-232
- Opto-isolated
- Modbus™ RTU protocol
- 1200, 2400, 4800, 9600, 19200 baud rates
- 32 maximum units can be connected (With additional 485 repeater hardware, up to 247 units may be connected)

**Accuracy**

- 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 900°C or -328 to 1470°F
  - Type C(W5): 0 to 2315°C or 32 to 4200°F
  - Type D(W3): 0 to 2315°C or 32 to 4200°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
  - DIN: -200 to 800°C or -328 to 1472°F
  - JIS: -200 to 630°C or -328 to 1166°F
  - Process: -1999 to 9999 units

**Thermocouple Inputs**

- Calibration accuracy ±0.1 percent of span ±1°C at standard conditions
  - 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
    - Types B; 0.24 percent of span for 870°C to 1700°C
- Accuracy span: 540°C/1000°F minimum
- Temperature stability: ±0.1 degree per degree change in ambient

**RTD Inputs**

- Calibration accuracy ±0.1 percent of span ±1°C at standard conditions
- Accuracy span: 540°C/1000°F minimum
- Temperature stability: ±0.05 degree per degree change in ambient

**Process Inputs**

- Voltage input ranges
  - Accuracy ±10mV ±1 LSD at standard conditions
  - Temperature stability ±100ppm/°C maximum
- Milliamp input ranges
  - Accuracy ±20µA ±1 LSD at standard conditions
  - Temperature stability ±100ppm/°C maximum

**Agency Approvals**

- UL®916 file number E185611, C-UL®, CE, NEMA 4X

**Terminals**

- Touch safe
- 22 to 12 AWG

**Power**

- 100-240V≈(ac/dc) +10 percent, -15 percent; 50/60Hz, ±5 percent
- 24-28V≈(ac/dc) +10 percent, -15 percent; 50/60Hz, ±5 percent
- 7.0VA maximum power consumption
- Data retention upon power failure via nonvolatile memory

**Operating Environment**

- 0 to 65°C, 32 to 149°F
- 0 to 90% RH, non-condensing
- Storage temperature: -40 to 85°C, -40 to 185°F

**Dimensions**

- Width 52 mm (2.05 in.)
- Height 52 mm (2.05 in.)
- Length 107 mm (4.2 in.)
- Depth behind panel surface 98.4 mm (3.875 in.)
- Approximate controller weight 0.2 kg (0.4 lbs)

**Allowable Operating Ranges**

Type J:	1.0	0 to 815°C	or	32 to 1500°F
	0.1	0.0 to 815.0°C	or	32.0 to 999.9°F
Type K:	1.0	-270 to 1370°C	or	-454 to 2500°F
	0.1	-199.9 to 999.9°C	or	-199.9 to 999.9°F
Type T:	1.0	-270 to 400°C	or	-454 to 750°F
	0.1	-199.9 to 400.0°C	or	-199.9 to 750.0°F
Type N:	1.0	0 to 1300°C	or	32 to 2372°F
	0.1	0.0 to 999.9°C	or	32.0 to 999.9°F
Type E:	1.0	-270 to 800°C	or	-454 to 1470°F
	0.1	-199.9 to 800.0°C	or	-199.9 to 999.9°F
Type C:	1.0	0 to 2315°C	or	32 to 4200°F
	0.1	0.0 to 999.9°C	or	32.0 to 999.9°F
Type D:	1.0	0 to 2315°C	or	32 to 4200°F
	0.1	0.0 to 999.9°C	or	32.0 to 999.9°F
Type Pt 2:	1.0	0 to 1395°C	or	32 to 2543°F
	0.1	0.0 to 999.9°C	or	32.0 to 999.9°F
Type R:	1.0	0 to 1760°C	or	32 to 3200°F
Type S:	1.0	0 to 1760°C	or	32 to 3200°F
Type B:	1.0	0 to 1816°C	or	32 to 3300°F
DIN	1.0	-200 to 800°C	or	-328 to 1472°F
	0.1	-199.9 to 800.0°C	or	-199.9 to 999.9°F
JIS	1.0	-200 to 630°C	or	-328 to 1166°F
	0.1	-199.9 to 630.0°C	or	-199.9 to 999.9°F
Process		-1999 to 9999 units		

**Functionality Matrix**

	Universal Input	Event & Remote Set Point	Control	Alarm	Retransmit	232/485 Comm
Input 1						
Input 2						
Output 1						
Output 2						
Output 3						
Output 4						

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

## Ordering Information—1842

### SERIES 96

Microprocessor-based  
 $\frac{1}{16}$  DIN with universal input 1.  
 Options include: software, power supply, input 2, four outputs and display color

#### Power Supply

- A = 100-240V $\approx$ (ac/dc)
- B = 24-28V $\approx$ (ac/dc)

#### Input 2

- 0 = None
- 1 = Event input & 0-5V $\approx$ (dc)/ 4-20mA (Remote set point input)

#### Output 1

- C = Switched dc/open collector
- D = Electromechanical relay, Form C, 2A, without RC suppression
- F = Universal Process, range selectable: 0-20mA, 4-20mA, 0-5V $\approx$ (dc), 1-5V $\approx$ (dc), 0-10V $\approx$ (dc)
- K = 0.5A solid state relay without RC suppression

#### Output 2

- A = None
- C = Switched dc output/open collector
- D = Electromechanical relay, Form C, 2A, without RC suppression
- F = Universal Process, range selectable: 0-20mA, 4-20mA, 0-5V $\approx$ (dc), 1-5V $\approx$ (dc), 0-10V $\approx$ (dc)
- K = 0.5A solid state relay without RC suppression

#### Output 3

- A = None
- D = Electromechanical relay, Form C, 2A, without RC suppression

#### Output 4

- A = None
- D = Electromechanical relay, Form C, 2A, without RC suppression
- M = Universal Retransmit, range selectable: 0-20mA, 4-20mA, 0-5V $\approx$ (dc), 1-5V $\approx$ (dc), 0-10V $\approx$ (dc)
- R = EIA/TIA 232 Communications
- U = EIA/TIA 485 Communications

#### Software/Preset Parameters

- 00 = Standard software (order with Standard Display/Overlay)
- AA = Ramping software (order with Ramping Display/Overlay)
- XX = Custom software
- XX = Preset parameters

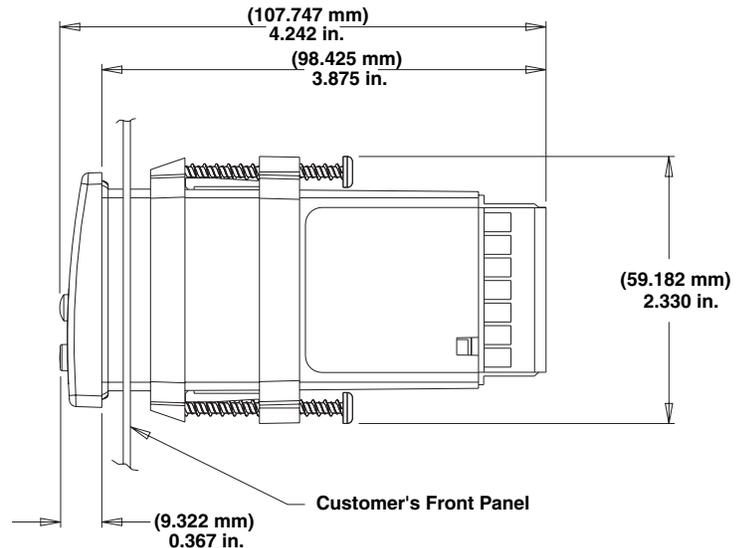
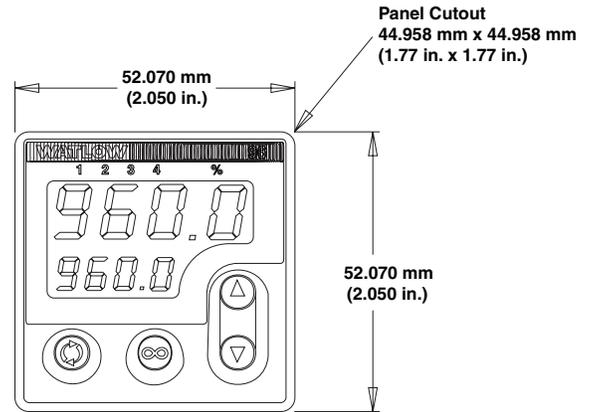
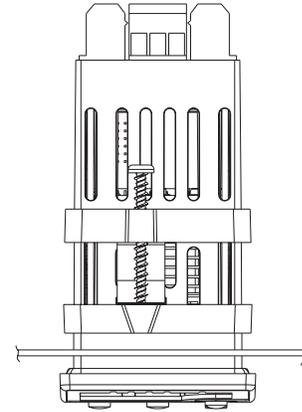
#### Standard Display/Overlay

- Upper/Lower
- RR = Red/Red display
- RG = Red/Green display
- GR = Green/Red display
- GG = Green/Green display

#### Ramping Display/Overlay

- Upper/Lower
- BA = Red/Red display
- BB = Red/Green display
- BC = Green/Red display
- BD = Green/Green display

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