



## Get Two Controllers in one Compact 1/8 DIN Package

The Watlow Series 998 vertical 1/8 DIN two channel process controller and the horizontal 1/8 DIN Series 999 offer two channels of PID control in a single package. With up to six outputs, the controller is designed to handle most applications where multiple processes need to be controlled.

The two analog inputs accept 11 different thermocouple types, RTD and scaleable process inputs. A single event input allows the operator to reset an alarm remotely, turn controller outputs off, or lock out the front panel.

Six output options provide a wide range of flexibility:

- Two heat/cool (reverse/direct) outputs per channel
- Two alarm outputs
- Scaleable retransmit output of set point or process
- Digital communications

The Series 998/999 is packaged with a NEMA 4X front panel to withstand harsh environments, a four-inch case depth and touch-safe wiring terminal.

The Series 998/999 features a three-year warranty and four day shipment on all model numbers.

### Features

- Two analog inputs, six control/alarm outputs
- Auto-tuning
- Optional dual alarm
- Optional digital communications
- Hardware and software lockout options
- NEMA 4X front panel (IP65 equivalent)
- 5Hz sampling rate per channel and burst-fire control option

### Benefits

- Two complete controls in a single package
- One step tuning of system parameters for each channel
- User-selectable output alarms to monitor either channel
- Remote operation using serial communications
- Provides several parameter levels of operator security
- Provides watertight corrosion resistant front
- Smooth, accurate control of the process



# WATLOW

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ISO 9001



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# S E R I E S 9 9 8 / 9 9 9

## Specifications

### Control Mode

- Two input, six output, optional retransmit, alarms or digital communication outputs
- Programmable direct and reverse acting controller outputs
- One step auto-tuning

### Operator Interface

- Dual, four digit LED displays: upper: 0.4" (10 mm), lower: 0.3" (8 mm)
- MODE, AUTO/MANUAL, DISPLAY, UP and DOWN keys

### Input

- Contact input for software function select
- Type J, K, T, N, C, R, S, B, Pt 2, W3, W5 thermocouple, 1° or 0.1° RTD, or 0 to 100mV, 0 to 20mA, 4 to 20mA, 0 to 5V=(dc), 1 to 5V=(dc), or 0 to 10V=(dc) options
- Sensor break protection de-energizes controller output to protect system or selectable bumpless transfer to manual operation; latching or non-latching
- °F or °C display or process units, user selectable

### Output Options

- Dual solid state relay, 0.5A @ 24V~(ac) minimum, 253V~(ac) maximum, opto-isolated, zero cross switching; with or without contact suppression
- Dual switched dc signal provides a source voltage of 23.5 to 30.2 V=(dc), with a source resistance of 1500Ω
- Dual electromechanical relay, Form A, 2A @ 120/240V~(ac), 2A @ 28V=(dc); without contact suppression
- Single process, 0 to 20mA, 4 to 20mA, 0 to 5V=(dc), 1 to 5V=(dc) or 0 to 10V=(dc) reverse acting
- Electromechanical relay, Form A/B, 5A @ 120/240V~(ac), 6A @ 28V=(dc), ½ hp @ 120V~(ac), 125VA @ 120V~(ac); without contact suppression
- External transmitter power supply
- EIA-232 or EIA-485/EIA-422 communications, opto-isolated

### Accuracy

- Calibration accuracy and sensor conformity: ± 0.1% of span, ±1 LSD, 77°F ± 5°F (25°C ± 3°C) ambient & rated line voltage ±10%
- Accuracy span: 1000°F (540°C) minimum
- Temperature stability: ± 0.2°F/F (0.1°C/C) change in ambient

### Agency Approvals

- UL®, CSA, NEMA 4X, and CE

### Terminals

- #6 compression universal head screws, accepts 28 to 14 gauge wire

### Power

- 100 to 240V~(ac) +10%/-15%, 50/60Hz, ± 5%
- 24 to 28V=(ac/dc) +10%/-15%, 50/60Hz, ± 5%
- 16VA maximum

### Operating Environment

- 32 to 149°F (0 to 65°C), 0 to 90% RH, non-condensing

### Mechanical

- ½ DIN panel mount, NEMA 4X (IP65 equivalent) front panel
- Overall width x height x depth  
Horizontal; 4.03" x 2.18" x 4.74", (102 mm x 55 mm x 120 mm)  
Vertical; 2.18" x 4.03" x 4.74", (55 mm x 102 mm x 120 mm)
- Depth behind panel; 4.06" (103 mm)
- Weight less than or equal to 14.0 oz (0.40 kg)

## Allowable Operating Range

Available with basic or universal signal conditioner:

J T/C:	32	to	1500°F	or	0	to	816°C
K T/C:	-328	to	2500°F	or	-200	to	1371°C
T T/C:	-328	to	750°F	or	-200	to	399°C
N T/C:	32	to	2372°F	or	0	to	1300°C
E T/C:	-328	to	1470°F	or	-200	to	799°C
C T/C:	32	to	4200°F	or	0	to	2316°C
D T/C:	32	to	4200°F	or	0	to	2316°C
Pt 2:	32	to	2543°F	or	0	to	1395°C

Available with universal signal conditioner:

R T/C:	32	to	3200°F	or	0	to	1760°C
S T/C:	32	to	3200°F	or	0	to	1760°C
B T/C:	32	to	3300°F	or	0	to	1816°C
1°RTD (JIS):	-328	to	1166°F	or	-200	to	630°C
1°RTD (DIN):	-328	to	1472°F	or	-200	to	800°C
0.1°RTD (JIS and DIN):	-99.9	to	999.9°F	or	-73.3	to	537.7°C
0-5V=(dc), 1-5V=(dc), 0-10V=(dc), 0-20mA, 4-20mA, 0-100mV=(dc):	-999	to	9999				

## Ordering Information

### Series 998/999

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Dual channel microprocessor based, dual input, six output temperature control, ½ DIN vertical or horizontal

### Hardware

- 6 = 24 to 28V=(ac/dc) nominal, vertical mounting
- 7 = 24 to 28V=(ac/dc) nominal, horizontal mounting
- 8 = 100 to 240V=(ac/dc) nominal, vertical mounting
- 9 = 100 to 240V=(ac/dc) nominal, horizontal mounting

### Software

- D = Dual channel software (includes Modbus™)
- S = Special customer features

### Channel A Input

- 1 = Basic thermocouple signal conditioner (excluding Type R, S and B thermocouple)
- 2 = Universal signal conditioner (see Range Information)

### Channel B Input

- 1 = Basic thermocouple signal conditioner (excluding Type R, S and B thermocouple)
- 2 = Universal signal conditioner (see Range Information)

### Channel A Outputs

- C = Dual switched dc, isolated
- E = \*Dual mechanical relay, Form A, 2A, without suppression
- F = Single universal process, 0 to 5V=(dc), 1 to 5V=(dc), 0 to 10V=(dc), 0 to 20mA, 4 to 20mA, isolated
- K = Dual solid state relay, Form A, 0.5A, without suppression

### Channel B Outputs

- C = Dual switched dc, isolated
- E = \*Dual mechanical relay, Form A, 2A, without suppression
- F = Single universal process, 0 to 5V=(dc), 1 to 5V=(dc), 0 to 10 V=(dc), 0 to 20mA, isolated
- K = Dual solid state relay, Form A, 0.5A, without suppression

### Output 3

- A = None
- B = Solid state relay, Form A, 0.5A, with suppression
- C = Switched dc, open collector, isolated
- J = \*Mechanical relay, Form A/B, 5A, without suppression
- K = Solid state relay, Form A, 0.5A, without suppression
- M = Retransmit, 0 to 20mA, 4 to 20mA
- N = Retransmit, 0 to 5V=(dc), 1 to 5V=(dc), 0 to 10 V=(dc) @30mA
- T = External signal conditioner power supply, 5, 12 or 20 V=(dc) @30mA

### Output 4

- A = None
- B = Solid state relay, Form A, 0.5A, with suppression
- C = Switched dc, open collector, isolated
- D = \*Mechanical relay, Form C, 5A, with suppression
- E = \*Mechanical relay, Form C, 5A, without suppression
- K = Solid state relay, Form A, 0.5A, without suppression
- R = Isolated EIA-232 communications
- S = Isolated EIA-485/EIA-422 communications
- U = Isolated EIA/TIA 232 and EIA/TIA 485 communications
- T = External signal conditioner power supply, 5, 12 or 20 V=(dc) @30mA

### Display/Overlay

- GR = Green/Red displays
- RR = Red/Red displays
- GG = Green/Green displays
- RG = Red/Green displays
- XX = Custom overlays, parameters or software

\* Electromechanical relays are not recommended for PID control.

They are warranted only for 100,000 contact closures.

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