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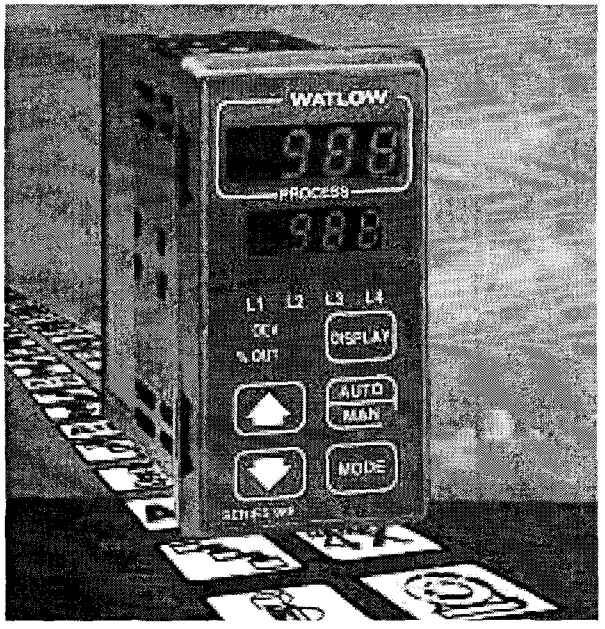
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SERIES 988/989



The Series 988/989 Offers More Features, Greater Versatility Than Any Other ⅛ DIN Control

Watlow's Series 988/989 is truly an innovation in the control field. The Series 988/989 is the first to combine so many key features into a single, ⅛ DIN size package. No other control offers the flexibility, compact size and durability of the Series 988/989.

This control meets a wide variety of needs in the process industries. Its broad range of I/O options allows control of virtually any process variable.

From the long list of product features, the Series 988/989's ability to provide single unit cascade control of a process is perhaps the most unique. The Series 988/989 is the only ⅛ DIN control with this feature. Other features include heater current monitoring, remote set point input, differential or ratio control. Valve control via slidewire feedback is another popular feature.

The Series 988/989 has all the standard characteristics you expect from a Watlow control and more. We expanded the auto-tuning capabilities and increased the alarm functionality. The Series 988/989 offers several unique control algorithms.

The Series 988/989 features a three-year warranty and four day shipment on all model numbers in limited quantities.

Features and Benefits

Two universal analog inputs and one event input
- Provides greater application versatility

Compact size 103 mm (4.06 in.) behind panel depth
- Fits easily in confined areas

10Hz sampling rate
- Improves control

Windows® configuration software and Modbus™ serial communications
- Offers remote operation

Slidewire feedback input
- Monitors valve position and offers precision control

Burst firing output
- Provides smooth process control

Signal conditioner power supply
- Eliminates the need for an external drive

NEMA 4X front panel
- Provides watertight and corrision resistance

Your Authorized Watlow Distributor is:

WATLOW

1241 Bundy Boulevard, P.O. Box 5580
Winona, Minnesota 55987-5580 USA
Phone: +1 (507) 454-5300
Fax: +1 (507) 452-4507
Internet: www.watlow.com
e-mail: info@watlow.com

WIN-988/989-0603

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Product Highlights

Easy to Operate

The Series 988/989's operator interface features the simplicity you expect from a Watlow control. The display key allows the operator to view information pertinent to the process, including deviation from set point, percent output and units of measurement.

The display key also returns the operator to the process and set point display from anywhere in the menu system. The setup menu is segmented into input, output, global and communication parameters, allowing movement forward or backward throughout the parameter sequence.

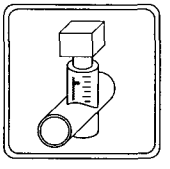
Use Up To Four Outputs

The control can have up to four outputs total, including the standard Watlow output options, along with retransmit and communications. Up to three outputs can be defined as a power supply output to power external signal conditioners, eliminating the need for an external power supply. The output types are recognized by the control to simplify control setup and operation, with no need for DIP switches.

Three Inputs Allow Greater Flexibility

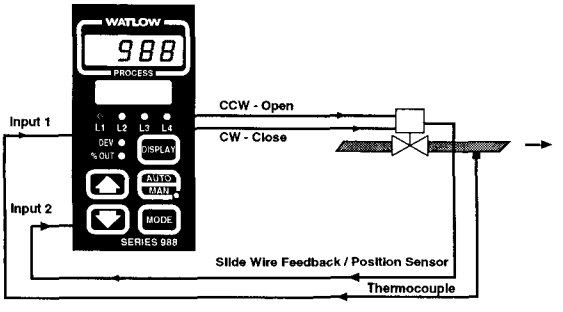
To accommodate unique system configurations, the Series 988/989 offers two universal analog inputs and one event (digital) input. The analog input applications are explained in detail below. The event input allows the operator to select a function at the close of a switch. This can lock out the front panel, switch PID values, go to a remote or second set point, etc. The inputs are optically isolated from all outputs, eliminating the need for external isolation circuitry.

Slidewire Feedback Valve Control

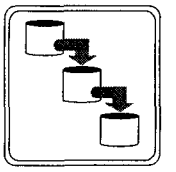


Valve positioning feedback (% open, % close) provides precise process control. The Series 988/989 is configurable for a wide variety of valves.

- Accepts virtually any valve input
- Front panel valve position display
- Increased valve life with anti-hunting parameter
- Greater process efficiency with precise control
- Easy set-up; increased operator productivity

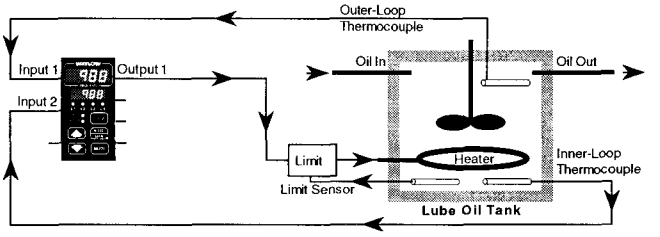


Cascade Control



Cascade control provides precise, two-variable process control. By measuring the secondary variable, the control can "feed forward," and automatically determine the primary variable set point.

- Precise control via cascade configuration
- Display of both process variables
- Low cost; one unit does the work of two
- Increased operator productivity with fast set-up

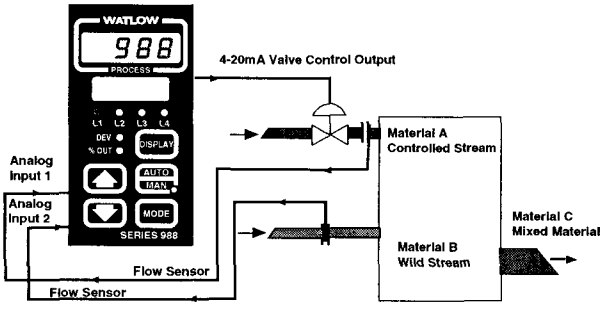


Ratio Control



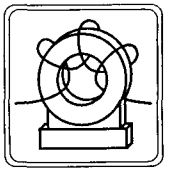
Whether mixing materials or controlling temperature indirectly, ratio control with the Series 988/989 provides automatic set point adjustments in response to system changes.

- Simplified process control; one control does the work of two
- Low cost solution; one control, display access - both process variables
- One control for many applications
- Easy set-up; increased operator productivity



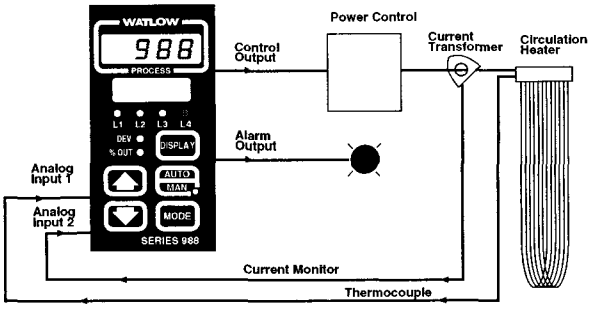
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Current Monitor



Current monitoring provides system performance and status information. The Series 988/989 accepts current transformer signal with no conditioning.

- Easily accessible heater status
- System performance data for troubleshooting or design enhancements
- System protection; fast shut down with overcurrent
- Easy setup; no external signal conditioner required



Specifications

Control Mode

- Dual input, quad output, optional retransmit of set point or process variable
- Programmable direct and reverse acting control outputs
- One step auto-tuning

Operator Interface

- Local/Remote set point capability
- Dual, four digit LED displays. Upper: 10 mm (0.4 in.), Lower: 8 mm (0.3 in.)
- MODE, AUTO/MAN, DISPLAY, UP and DOWN keys

Input

- Contact input for software function select.
- Type J, K, T, N, C, D, E, R, S, B, Pt 2 thermocouple, 1° or 0.1° RTD, or 0-50mV, 0-100mV, 0-20mA, 4-20mA, 0-5V⎓(dc), 1-5V⎓(dc), 0-10V⎓(dc), slidewire, digital event input or heater current options
- Sensor break protection de-energizes control 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

- Solid state relay, 0.5A @ 24V~(ac) min., 253V~(ac) max., opto-isolated, zero cross switching. With or without contact suppression
- Switched dc signal provides a minimum turn on voltage of 3V⎓(dc) into a minimum 500Ω load; maximum on voltage not greater than 32V⎓(dc) into an infinite load
- Electromechanical relay, Form C, 5A @ 120/240V~(ac), 6A @ 28V⎓(dc), ⅛ hp. @ 120V~(ac), 125VA @ 120V~(ac). With or without contact suppression
- Process, 0-20mA, 4-20mA, 0-5V⎓(dc), 1-5V⎓(dc), or 0-10V⎓(dc) reverse acting
- Electromechanical relay, Form A/B, 5A @ 120/240V~(ac), 6A @ 28V⎓(dc), ⅛ hp. @ 120V~(ac), 125VA @ 120V~(ac). Without contact suppression
- External transmitter power supply, 5V @ 30mA, 12V @ 30mA, or 20V @ 30mA
- EIA-232 communications or EIA-485/EIA-422 communications, opto-isolated

Output Selection Table	1	2	3	4
Solid State Relay 0.5A, with suppression	✓	✓	✓	✓
Switched dc, open collector	✓	✓	✓	✓
Electromechanical Relay, 5A Form C, with suppression	✓	✓		✓
Electromechanical Relay, 5A Form C, w/o suppression	✓	✓		✓
Universal Process 0-20mA, 4-20mA, 0-5V⎓(dc), 1-5V⎓(dc), 0-10V⎓(dc)	✓	✓		
Process Retransmit 0 -20mA, 4-20mA			✓	
Process Retransmit 0-5V⎓(dc), 1-5V⎓(dc), 0-10V⎓(dc)			✓	
Electromechanical Relay, 5A Form A/B, w/o suppression			✓	
External Transmitter Power Supply		✓	✓	✓
EIA-232 Communications EIA-485/EIA-422				✓ ✓

Accuracy

- Calibration accuracy & sensor conformity: ± 0.1 percent of span, ±1 LSD, 77°F ± 5°F (25°C ± 3°C) ambient & rated line voltage ±10 percent
- Accuracy span: 540°C/1000°F minimum
- Temperature stability: 0.1°C/°C (± 0.2°F/°F) change in ambient
- Voltage stability: ± 0.01 percent of span / percent of rated line voltage

Agency Approvals

- UL®, C-UL® File #43684
- CE approved
  89/336/EEC Electromagnetic Compatibility Directive
  EN 50081-2: 1994 Emissions
  EN 50082-2: 1995 Immunity
  73/23/EEC Low-Voltage Directive
  EN 61010-1: 1993 Safety
- NEMA 4X

Terminals

- #6 compression universal head screws, accepts 20-14 gauge wire

Power

- 100 - 240V~(ac) +10 percent/-15 percent, 50/60Hz, ± 5 percent.
- 16VA maximum ac 10VA maximum, low power
- Data retention upon power failure via non-volatile memory

Operating Environment

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

Mechanical

- ⅛ DIN panel mount, NEMA 4X (IP65 equivalent) front panel
- Overall width x height x depth
  Horizontal; 4.03 in. x 2.18 in. x 4.74 in.
  (102 mm x 55 mm x 120 mm)
  Vertical; 55 mm x 102 mm x 120 mm
  (2.18 in. x 4.03 in. x 4.74 in.)
- Depth behind panel; 103 mm (4.06 in.)
- Weight less than or equal to 0.40 kg (14.0 oz)

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Ordering Information

To order, complete the model number to the right with the information below:

9 8 - - -

Series 988/989 = Single channel, temperature/process controller, 2 inputs, 4 outputs, 2 digital inputs.

Power Supply & Mounting
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
A = Standard (Includes Modbus™)
B = Enhanced (Includes cascade, ratio, differential, duplex, dual PID set)

#1 Input
1 = Thermocouple only (Excluding Type B, R and S)
2 = Universal signal conditioner

#2 Input
0 = None
1 = Thermocouple only (Excluding Type B, R and S)
2 = Universal signal conditioner
3 = Slidewire feedback
4 = Current transformer[3]
5 = *Second digital contact event (One digital event is standard on all units)*

#1 Output
B = Solid state relay, Form A, 0.5A, with RC suppression
C = Switched dc or open collector, isolated
D = Electromechanical relay[1], Form C, 5A with RC suppression
E = Electromechanical relay[1], Form C, 5A without contact suppression
F = Universal process, 0-5V⎓(dc), 1-5V⎓(dc), 0-10V⎓(dc), 0-20mA (dc), 4-20mA⎓(dc), isolated
K = Solid state relay, Form A, 0.5A, without contact suppression

#2 Output
A = None
B = *Solid state relay, Form A, 0.5A, with RC suppression*
C = Switched dc or open collector, isolated
D = Electromechanical relay[1], Form C, 5A with RC suppression
E = Electromechanical relay[1], Form C, 5A without contact suppression
F = Universal process 0-5V⎓(dc), 1-5V⎓(dc), 0-10V⎓(dc)V⎓(dc), 0-20mA⎓(dc), 4-20mA⎓(dc), isolated
K = Solid state relay, Form A, 0.5A, without contact suppression
T = External signal conditioner power supply, 5, 12 or 20V⎓(dc) @ 30mA

#3 Output
A = None
B = Solid state relay, Form A, 0.5A, with RC suppression
C = *Switched dc or open collector, isolated*
J = Electromechanical relay[1], Form A or B, 5A without contact suppression
K = Solid state relay, Form A, 0.5A without contact suppression
M = Retransmit, 0-20mA⎓(dc), 4-20mA⎓(dc)
N = Retransmit, 0-5V⎓(dc), 1-5V⎓(dc), 0-10V⎓(dc)
T = External signal conditioner power supply, 5, 12 or 20V⎓(dc) @ 30mA

#4 Output
A = None
B = Solid state relay, Form A, 0.5A, with RC suppression
C = Switched dc or open collector, isolated
D = Electromechanical relay[1], Form C, 5A with RC suppression
E = *Electromechanical relay*[1], *Form C, 5A without contact suppression*
K = Solid state relay, Form A, 0.5A without contact suppression
R = EIA/TIA-232 communications, opto-isolated
S = EIA/TIA-485 and EIA/TIA-422 communications, opto-isolated
U = EIA/TIA-232 and EIA/TIA-485 communications, opto-isolated
T = External signal conditioner power supply, 5, 12 or 20V⎓(dc) @ 30mA

Display
GG = Green/Green displays
GR = Green/Red displays
RG = Red/Green displays
RR = Red/Red displays
XX = Custom overlays or default settings

Accuracy Range

Thermocouple			
Type B	870	to	1816°C
	(1598	to	3300°F)
Type C[2]	0	to	2316°C
	(32	to	4200°F)
Type D[2]	0	to	2316°C
	(32	to	4200°F)
Type E	-200	to	799°C
	(-328	to	1470°F)
Type J	0	to	816°C
	(32	to	1500°F)
Type K	-200	to	1371°C
	(-328	to	2500°F)
Type N	0	to	1300°C
	(32	to	2372°F)
Type R	0	to	1760°C
	(32	to	3200°F)
Type S	32	to	3200°F
	(0	to	1760°C)
Type T	-200	to	399°C
	(-328	to	750°F)
Pt 2[2]	0	to	1395°C
	(32	to	2543°F)
RTD Resolution (DIN or JIS)			
1° (DIN)	-200	to	800°C
	(-328	to	1472°F)
1° (JIS):	-200	to	630°C
	(-328	to	1166°F)
0.1°(DIN and JIS)			
	-73.3	to	537.7°C
	(-99.9	to	999.9°F)
Process			
0-5V⎓(dc)	-999	to	9999 units
1-5V⎓(dc)	-999	to	9999 units
0-10V⎓(dc)	-999	to	9999 units
0-20mA⎓(dc)	-999	to	9999 units
4-20mA⎓(dc)	-999	to	9999 units
0-50mV⎓(dc)	-999	to	9999 units
Slidewire	100	to	1200Ω
Current	0	to	50mA
Potentiometer	0	to	1200Ω

[1] Electromechanical relays warranted for 100,000 closures only. Solid state switching devices recommended for applications requiring fast cycle times or extended service life.
[2] Not an ANSI symbol.
[3] A current transformer input cannot be used in conjunction with a process output installed on output #1.

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