

1/4 DIN Popularity...Watlow Reliability



Features and Benefits

Microprocessor-based

- Accurate and versatile

Dual digital LED display

- View set point and process simultaneously

Auto-tuning

- Quick and easy tuning

Auto/Manual operation

- Provides for open or closed loop control

Three levels of user lockout

- Provides process security

Set point range limiting

- Protects process and equipment

Dual alarm outputs

- Control auxiliary processes or annunciators

± 0.1% calibration accuracy

- Produce consistent product

Remote set point input

- Allows operation from a remote device

Automatic data logging

- Provides printed record of process

Optional retransmit of set point or process variable

- Can be used as a master programmer or connected to a chart recorder

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Watlow's Series 945 control comes in a popular ¼ DIN size that fits most applications. The control is designed with a variety of special features, including a unique data output that sends information directly to a serial printer for permanent records. Data can be printed in a table, chart or SPC format.

The Series 945 is a microprocessor-based, single input control featuring dual control output and dual alarm output. Optional retransmit output allows retransmit of set point or process variable. The 945 features a wide range of inputs and outputs, closed loop and open loop control with bumpless transfer, auto-tuning and serial communications interface. Range limiting of the set point variable matches the control to the application. Multiple levels of operator access guard against unwanted adjustments of the operating parameters.

The Series 945 is designed to operate in the most demanding industrial environments. Watlow's three-year warranty is an additional guarantee of Control Confidence®.



WATLOW

Watlow Controls

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ISO 9001



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Specifications

Control Mode

- Single or dual set point, non-ramping
- Single input, dual outputs, dual alarms
- Optional retransmit of set point or process variable
- Remote set point input, 0-5V \approx (dc) or 4-20mA, available with input Types 2 or 3
- Control outputs selectable as:
 - Heat, Heat/Heat, Heat/Cool, Cool, Cool/Cool, Cool/Heat
 - Outputs independent, related via dead band for Heat/Cool
 - On-off: Determined by HYS parameter for Outputs 1 and 2
 - PID Parameters:
 - Proportional band: 0 to 999°F/0 to 555°C/0 to 999 units or 0 to 999.9% of span
 - Reset: 0.00 to 9.99 repeats/minute
 - Integral: 0 and 00.1 to 99.9 minutes per repeat
 - Rate/Derivative: 0.00 to 9.99 minutes
 - Cycle time: 1 to 60 seconds
 - Dead band: $\pm 99^\circ\text{F}/\pm 55^\circ\text{C}$ or ± 99 units ($\pm 9.9^\circ\text{F}$, $\pm 5.5^\circ\text{C}$, ± 9.9 units for RTD 0.1° and process units)

Operator Interface

- Local/remote set point capability
- Membrane front panel
- Dual, four digit 0.56 in (14 mm) LED displays
- Mode, Auto/Man, Up and Down keys

Input

- Thermocouple, grounded or ungrounded sensors
- RTD 2 or 3 wire, platinum, 100 Ω @ 0°C software selectable: JIS curve (0.003916 $\Omega/\Omega/^\circ\text{C}$) or DIN curve (0.003850 $\Omega/\Omega/^\circ\text{C}$)
- Process, 0-5V \approx (dc) input impedance 100k Ω . 4-20mA input impedance 249 Ω
- Sensor break protection de-energizes control output to protect system or selectable bumpless transfer to manual operation
- °F or °C display or process units are user selectable
- Operating ranges

J T/C:	32	to	1382°F	or	0	to	750°C
K T/C:	-328	to	2282°F	or	-200	to	1250°C
T T/C:	-328	to	662°F	or	-200	to	350°C
N T/C:	32	to	2282°F	or	0	to	1250°C
C T/C:	797	to	4200°F	or	425	to	2315°C
Pt 2:	32	to	2543°F	or	0	to	1395°C
R T/C:	32	to	2642°F	or	0	to	1450°C
S T/C:	32	to	2642°F	or	0	to	1450°C
B T/C:	1598	to	3092°F	or	870	to	1700°C
1° RTD:	-328	to	1112°F	or	-200	to	600°C
0.1° RTD:	-99.9	to	392.0°F	or	-99.9	to	200.0°C
Process:	4mA	to	20mA	or	-500	to	3500 units
Process:	0V \approx (dc)	to	5V \approx (dc)	or	-500	to	3500 units

Primary Control Output (Heating or Cooling)

- Solid state relay, Form A, 0.5A @ 24V \sim min., 264V \sim max., opto-isolated, zero cross switching. Off state impedance is 20k Ω min. with contact suppression. 31M Ω without contact suppression.
- Electromechanical relay, Form C, 6A @ 120/240V \sim , 6A @ 28V \approx (dc), ½ hp @ 120V \sim , 125VA @ 120V \sim . Off state impedance, 20k Ω minimum. UL® recognized @ 100,000 cycles.
- Open collector, switched dc signal provides a minimum turn on voltage of 3V \approx (dc) into a minimum 500 Ω load; maximum on voltage not greater than 32V \approx (dc) into an infinite load.
- Process, 0-20mA or 4-20mA reverse or direct acting into a 600 Ω maximum load impedance, non-isolated.
- Process, 0-5V \approx (dc) or 0-10V \approx (dc) reverse or direct acting into a 1k Ω minimum load impedance, non-isolated.

Secondary Control Output (Heat, Cool, or Alarm)

- Solid state relay, Form A, 0.5A @ 24V \sim , min., 264V \sim max., opto-isolated, zero cross switching. Off state impedance is 20k Ω min. with contact suppression. 31M Ω without contact suppression.
- Electromechanical relay, Form A, 6A @ 120/240V \sim , 6A @ 28V \approx (dc), ½ hp @ 120V \sim , 125VA @ 120V \sim . Off state impedance is 20k Ω minimum. UL® recognized at 100,000 cycles.
- Open collector, switched dc signal provides a minimum turn on voltage of 3V \approx (dc) into a minimum 500 Ω load; maximum on voltage not greater than 32V \approx (dc) into an infinite load.

Alarm Outputs

- Electromechanical relay, jumper selectable as Form A (N.O.) or B (N.C.), 6A @ 120/240V \sim , 6A @ 28V \approx (dc), ½ hp @ 120V \sim , 125VA @ 120V \sim . Off state impedance is 20k Ω minimum. UL recognized at 100,000 cycles.

- Latching or non-latching
- Process or deviation
- Separate high and low values
- Alarm silencing (inhibit) on power up for deviation alarm 1
- Adjustable switching hysteresis, 1-99°F/1-55°C/1-99 units (9.9°F/5.5°C/9.9 units for 0.1° RTD).

Retransmit Output

- Retransmit of process or set point. User selectable range.
- 4-20mA into a 600 Ω maximum load, non-isolated.
- 0-5V \approx (dc) into a 1k Ω minimum load, non-isolated.

Accuracy

- Calibration accuracy: ± 0.1 percent of span, ± 1 LSD, 77°F $\pm 5^\circ\text{F}$ (25°C $\pm 3^\circ\text{C}$) ambient & rated line voltage ± 10 percent.
- Accuracy span: 1000°F/540°C minimum
- Temperature stability: $\pm 0.1^\circ\text{F}/^\circ\text{F}$ (0.1°C/°C) change in ambient.
- Voltage stability: ± 0.01 percent of span per percent of rated line voltage.

Communications

- Serial data communications, isolated
- RS-422A or RS-423A (RS-232C compatible), user selectable, or EIA-485
- ANSI X3.28 or Xon-Xoff protocol
- Data logging directly drives a serial printer, table, chart or SPC format

Agency Approvals

- UL File # E43684, UL 873
- CSA certified, File LR30586, C22.2

Terminals

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

Power

- 120/240V \sim +10 percent, -15 percent, 50/60Hz, ± 5 percent
- 16VA maximum
- Data retention upon power failure via nonvolatile memory

Operating Environment

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

Dimensions

- Height: 3.81 in² (97 mm), Overall depth: 7.0 in (175 mm)
Behind panel depth: 6.0 in (152 mm), Weight: 2.5 lb (0.4 kg)

Ordering Information

9 4 5 A - - 0 0 0

Input Type

- 1 = Type J, K, T, N, C, Pt 2 thermocouple
- 2 = Type J, K, T, N, C, Pt 2 thermocouple, RTD 1°, 4-20mA, 0-5V \approx (dc)
- 3 = Type J, K, T, N, C, Pt 2 thermocouple, RTD 0.1°, 4-20mA, 0-5V \approx (dc)
- 4 = Type R, S, B thermocouple

#1 Output

- B = Solid state relay with suppression, Form A, 0.5A
- C = Switched dc, open collector, non-isolated
- D = *Electromechanical relay, Form C, 6A
- E = Process, 0-10V \approx (dc), non-isolated
- F = Process, 4-20mA, non-isolated
- G = Process, 0-20mA, non-isolated
- H = Process 0-5V \approx (dc), non-isolated
- K = Solid state relay without contact suppression, Form A, 0.5A

#2 Output

- A = None
- B = Solid state relay with suppression, Form A, 0.5A
- C = Switched dc, open collector, non-isolated
- D = *Electromechanical relay, Form A, 6A
- K = Solid state relay without contact suppression, Form A, 0.5A

Alarms

- 0 = None
- 1 = *Single, electromechanical relay, 6A, Form A or B
- 2 = *Dual, electromechanical relay, 6A, Form A or B
- 3 = *Single, electromechanical relay, 6A/0-5V \approx (dc) retransmit
- 4 = *Single, electromechanical relay, 6A/4-20mA retransmit
- 5 = No alarm output/0-5V \approx (dc) retransmit
- 6 = No alarm output/4-20mA dc retransmit

Communications

- A = None
- B = Isolated RS-422/RS-423
- D = Isolated EIA-485

*Electromechanical relays are not recommended for PID control. They are warranted only for 100,000 contact closures.