

## Temperature Controller Offers Flexibility and Expanded Communications Options

Watlow's new SERIES N7 temperature controllers provide ample flexibility for use in a broad range of applications. The controllers feature expanded communication options as well as modular architecture that provides customers with design options based on their unique specifications. The SERIES N7 offers customizable firmware and overlays including up to 32 LEDs and 32 switches.

The SERIES N7's enhanced technology includes a powerful processor with additional memory for sophisticated control algorithms as well as the ability to monitor and count various events. The SERIES N7 delivers up to four zones of control that can be sensed with thermocouples or 2-wire or 3-wire RTDs. Input offerings are process inputs available as either voltage or current. The SERIES N7 also offers a wide variety of outputs.

The base model is equipped with six open collector outputs, each with a nominal output voltage of 5V and a maximum current of 30mA. Two additional open collector outputs can be added for a total of eight possible outputs. The optional high voltage board offers up to six high voltage outputs which can be used in place of the open collector outputs. The SERIES N7 features two Solid State Relays (SSRs) with the option of six in total. Each SSR has a maximum operating current of 0.4 amps.

Watlow's SERIES N7 offers an optional NAFEM Ethernet communications interface to meet industry needs. The controller is UL® and C-UL® recognized, carries the EU LV and EMC directives for emissions and immunity, the NSF option and the CSA standard C22.2-24.

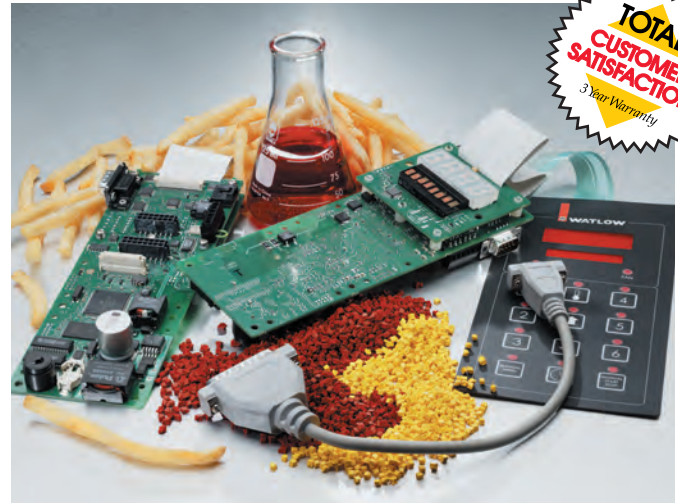
### Applications

- Foodservice applications including convection ovens, deep fat fryers, griddles and rotisserie ovens
- Medical
- Plastics processing
- Semiconductor

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### Features and Benefits

#### Modular Design

- Dual displays can be tailored to offer flexibility and design options
- High voltage output module provides for up to six high voltage relays
- Custom firmware allows multiple applications in one controller
- Overlay can be easily modified, allowing users to create a unique look with membrane switches and LEDs

#### Enhanced communications

- Ethernet communications module enables NAFEM protocol option
- Communications capable of flash downloading software, Modbus™ and PC communications

#### Customizable inputs and outputs

- Up to four sensor inputs can be customized to include thermocouples, RTDs or process inputs
- Up to ten outputs provide ranges including open collectors, SSRs, electromechanical relays, no-arc relays, current and voltage
- Up to eight event inputs allow for door switch use

#### Low voltage controller

- Vertical and horizontal orientations offer mounting options
- Mechanically fits within 69.85 mm x 196.85 mm (2.75 x 7.75 in.) outline
- Auto-tuning simplifies tuning of PID parameters
- Ambient temperature rating of 80°C (176°F) allows controller to withstand hot environments
- On board variable audible alarm alerts operator of control conditions



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WIN-N7-0303

ISO 9001



## Specifications

### Control Mode

- Up to four zones of control, PID or on-off control
- Microprocessor based, programmable, direct-acting control outputs, flash download
- One step auto-tuning, WATCURVE temperature compensation
- Displayed in °C, °F or process variable units
- Battery backed, real-time clock
- One non-isolated passive serial communications channel
- One non-isolated master serial communications channel
- Optional ethernet communications module
- Optional high-voltage output module

### Agency Approvals

- UL® 60730, C-UL®
- EU LV Directive 72/23/EEC
- EU EMC Directive 89/336/EEC
  - Emissions
  - Immunity
- NSF option
- NAFEM NDP communications
- CSA standard E60730-209

### Operator Interface

- Embedded membrane switch (LEDs and key switches embedded in overlay)
- Up to 32 embedded LEDs and 32 embedded switches
- Contamination and water resistant (Supplied by Watlow or customer)
- Displays: Four character 14.22 mm (0.56 in.) high, seven segment LED display and an eight character 5.08 mm (0.2 in.) dot matrix display
- Displays times, temperatures, user prompts and diagnostic codes
- User selectable time and temperature display formats. Time formats will include HH:MM, MM:SS, MMM:SS. Temperature formats will be °C or °F
- Menu driven operation and manual modes available
- Real time clock option displays time of day

### Accuracy

- Calibration accuracy and sensor conformity:  $\pm 1^\circ\text{F}$  for Type J thermocouple and RTD
- Voltage  $\pm 25\text{mV}$
- Current  $\pm 40\mu\text{A}$
- Accuracy span: Normally  $540^\circ\text{C}$  ( $1000^\circ\text{F}$ ) minimum span
- Temperature stability

### Configured Sensor Inputs

- Update rate: 5Hz

### Thermocouple

- Requires ungrounded thermocouples
- Accuracy:  $\pm 1.1^\circ\text{C}$  ( $2^\circ\text{F}$ )
- Drift:  $\pm 0.10^\circ\text{C}/^\circ\text{C}$  ( $\pm 0.10^\circ\text{F}/^\circ\text{F}$ )
- Input ranges:
  - Type J:  $-46^\circ\text{C}$  to  $316^\circ\text{C}$  ( $-50^\circ\text{F}$  to  $600^\circ\text{F}$ )
  - Type K:  $-46^\circ\text{C}$  to  $316^\circ\text{C}$  ( $-50^\circ\text{F}$  to  $600^\circ\text{F}$ )

### RTD

- 2- or 3-wire platinum
- DIN curve (0.00385 curve)
- Accuracy:  $\pm 1.1^\circ\text{C}$  ( $2^\circ\text{F}$ )
- Drift:  $\pm 0.10^\circ\text{C}/^\circ\text{C}$  ( $\pm 0.10^\circ\text{F}/^\circ\text{F}$ )
- Range:  $-46^\circ\text{C}$  to  $316^\circ\text{C}$  ( $-50^\circ\text{F}$  to  $600^\circ\text{F}$ )

### Voltage

- Input impedance: 60kW
- Input range: 0 to 12V
- Accuracy:  $\pm 25\text{mV}$
- Drift:  $\pm 5\text{mV}/\text{F}$

### Current

- Input impedance: 100 W
- Input range: 0 to 22mA
- Accuracy:  $\pm 40\text{mA}$
- Drift:  $\pm 5\text{mA}/\text{F}$

### Output Options

#### Switched DC Outputs

- 5V at 30mA maximum

#### Voltage Outputs

- Range: 0 to 12V at 50mA maximum
- Minimum: load impedance 500 W
- Accuracy:  $\pm 100\text{mV}$
- Drift:  $\pm 2.1\text{mV}/\text{F}$

#### Current Output

- Range: 0 to 22mA at 20V maximum
- Maximum load impedance: 1000 W
- Accuracy:  $\pm 100\text{mA}$
- Drift:  $\pm 4.3\text{mA}/\text{F}$

#### DC Input

- Input high: 3 to 30V or  $>10\text{kW}$
- Input low: -0.5 to 0.5V or  $<250\text{W}$

#### Optional High Voltage Board

- Optional high voltage board has six high-voltage outputs including two standard SSR outputs. The remaining four outputs can be SSRs, electromechanical or no arc relays.
- Relay specification:
  - Operating temperature:  $0^\circ$  to  $80^\circ\text{C}$  ( $0^\circ$  to  $176^\circ\text{F}$ )
  - Contact type: normally open
  - Maximum operating current: 8 Amps
  - Maximum operating voltage: 250V~(ac)
    - 120/240V~(ac)
    - 250VA pilot duty
- SSR specification
  - Operating temperature:  $0^\circ$  to  $80^\circ\text{C}$  ( $0^\circ$  to  $176^\circ\text{F}$ )
  - Contact type: normally open
  - Maximum operating current: 0.4 Amps
  - Maximum operating voltage: 250V~(ac)
    - 120/240V~(ac)
    - 0.4A pilot duty
- No arc specification
  - Operating temperature:  $0^\circ$  to  $80^\circ\text{C}$  ( $0^\circ$  to  $176^\circ\text{F}$ )
  - Contact type: normally open
  - Maximum operating current: 8 amps
  - Maximum operating voltage: 250V~(ac)

#### Power/Line Voltage

- 24V~(ac) power input (20.4 to 26.4V~(ac))
- Class 2 power source required
- 47 to 63Hz
- 15VA maximum
- Program retention upon power failure via non-volatile memory
- Battery/real time clock option: 6 year lithium battery, provides power upon backup power failure, operation resumption after power recovery, ability to display time of day

## Specifications (continued)

### Audible Alarm

- Internal audible alarm, 85dB @ 10cm @ 2KHz. Output frequencies supported: 250, 500, 1000, 2000, 4000Hz

### Operating Environment

- 0°C to 80°C (32°F to 176°F), 0 to 90 percent relative humidity, non-condensing

### Storage Temperature

- -40°C to 80°C (-40°F to 176°F)

### Dimensions

- Vertical – 196.85 mm x 76.2 mm x 50.8 mm (7.75 in. x 3 in. x 2 in.)
- Horizontal – 76.2mm x 196.85 mm x 50.8 mm (3 in. x 7.75 in. x 2 in.)

### Communications

- Communications parallel connector:
  - Supports addition of ethernet communications board
  - Support development of additional memory
- DB 9 communications connector:
  - EIA-232 and EIA-485 connections for:
    - Flash download
    - PC communications
    - Modbus™ communications
- Expansion bus connector  
For connection to expansion devices such as:
  - Motor speed control
  - Encoder
  - Multiple or custom displays
  - Other custom remote I/O

### Connectors

Connectors are customer supplied - Molex

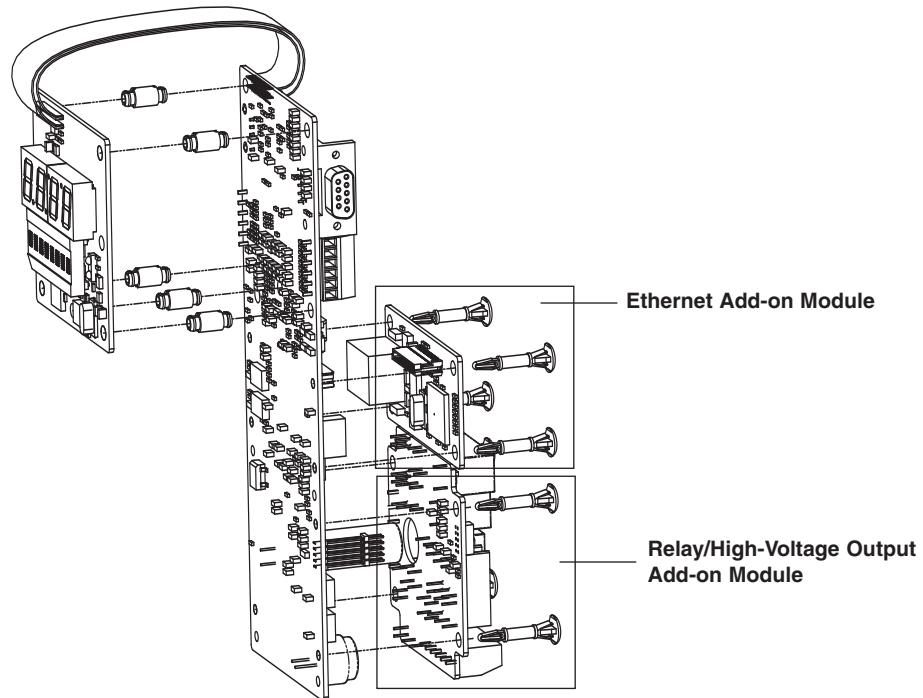
- Standard I/O 16 pin connector housing – 43025-1600
- Optional I/O 14 pin connector housing – 43025-1400
- Pins – 43030-0007

### High Voltage Module Adder Board Ordering Information

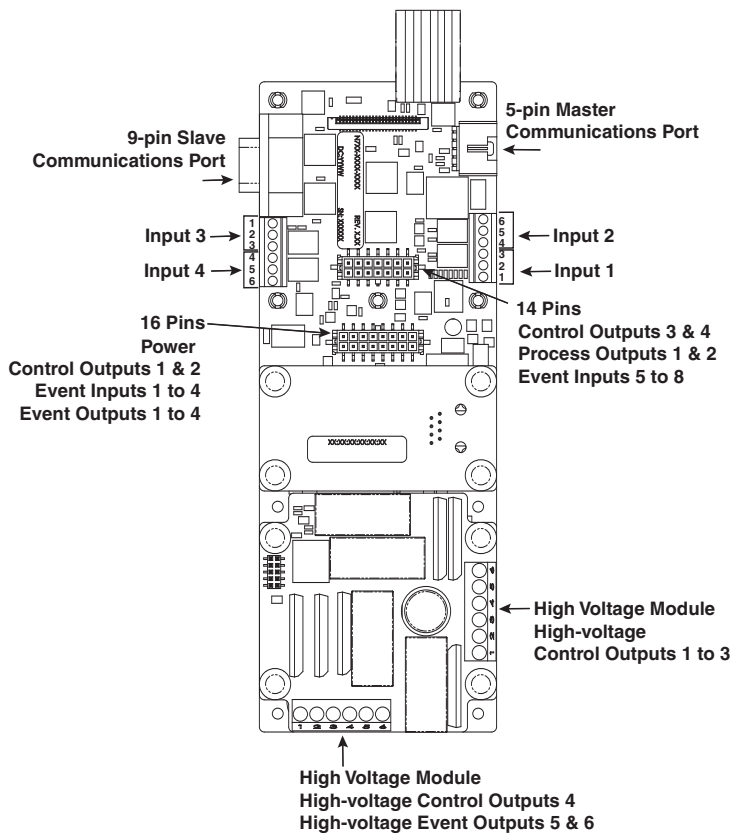
- A007-2660-0000 – Two SSRs
- A007-2660-0001 – Two SSRs and four mechanical relays
- A007-2660-0002 – Six SSRs
- A007-2660-0003 – Four SSRs and 2 mechanical relays
- A007-2660-0004 – Two SSRs and four no-arc relays

## Dimensions

Vertical View with  
Add-on Modules  
(exploded view)



## Location of Pins and Ports for Inputs and Outputs



### Notes:

- If customer wants to use inputs 3 or 4 as thermocouple, input 1 must also be thermocouple. Requires at least one ungrounded thermocouple.
- There is no option for suppression on any of the high voltage outputs.

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## Ordering Information

### SERIES N7

Up to four channels of microprocessor-based time and temperature control: 24V~(ac) power input

### Abbreviation for customer name

#### Input 1 and Input 2

- 1 = Dual thermocouple
- 2 = Input 1 thermocouple / input 2 process input
- 3 = Input 1 thermocouple / input 2 RTD
- 4 = Dual process inputs
- 5 = Input 1 RTD / input 2 process input
- 6 = Dual RTD inputs

#### Input 3 and Input 4

- 0 = None
- 1 = Input 3 and 4 thermocouples
- 2 = Input 3 process / input 4 thermocouple input
- 3 = Input 3 RTD / input 4 thermocouple
- 4 = Input 3 process input / input 4 process input
- 5 = Input 3 RTD / input 4 process input
- 6 = Input 3 RTD / input 4 RTD

#### Process Outputs, Event Inputs and Control Outputs

- 0 = No events or process outputs
- 1 = 4 event inputs (rated @ 0 to 30V or contact closure) and 2 control outputs (rated for 5V @ 30mA)
- 2 = Current output 1 (0 to 20mA) with 4 event inputs and 2 control outputs
- 3 = Current outputs 1 and 2 (both are rated 0 to 20mA) with 4 event inputs and 2 control outputs
- 4 = Current output 1 and dc output 2 (rated 0 to 10V) with 4 event inputs and 2 control outputs
- 5 = DC output (rated 0 to 10V) with 4 event inputs and 2 control outputs
- 6 = DC outputs 1 and 2 with 4 event inputs and 2 control outputs
- 7 = DC output 1 and current output 2 with 4 event inputs and 2 control outputs

#### Add on Ethernet Module

- 0 = None
- 1 = Ethernet module board

#### Add on High Voltage Module

- 0 = None
- 1 = 2 SSRs (rated at 0.4A, normally open)
- 2 = 2 SSRs and 4 mechanical relays (rated at 8A, normally open)
- 3 = 6 SSRs
- 4 = 4 SSRs and 2 mechanical relays

#### Display Options (Horizontal or Vertical)

- 1 = Vertical
- 2 = Horizontal left
- 3 = Horizontal right

#### Custom Software and Options Designator

XX= Made to order control, code number assigned by factory