

# 1/4 DIN Ramp/Soak Temperature/Process Controller with Fuzzy Logic

CN3251



- ✓ Dual PID + Fuzzy Logic Control
- ✓ Up to 5 Outputs—Control, Alarm or Event
- ✓ Universal Sensor Input
- ✓ Switching Power Supply 100 to 240 Vac or Optional 12 to 24 Vac/Vdc
- ✓ 16-Segment Ramp/Soak Program
- ✓ Optional RS232, RS422, RS485 Digital Communications
- ✓ Programmable Remote Setpoint Input (Standard)



CN3251 1/4 DIN

Panel punches available, visit [omega.com/panelpunches](http://omega.com/panelpunches)

The CN3251 1/4 DIN temperature and process controller is a cost effective, high-performance, single loop controller that can be used for temperature, flow, pressure and level control applications. With universal sensor inputs and front panel operator setup, one CN3251 controller can be easily field configured for a wide variety of applications, and simply reconfigured as application needs change. This makes it an exceptional choice for applications requiring multiple control needs, manufacturing facilities, testing facilities and testing applications.

## Features

**5 Possible Outputs** for single output or heat/cool control, plus up to 3 alarms or event outputs

**Universal Sensor Input** accepts thermocouple, RTD or analog signals; 24 Vdc output for loop power

## Self-Tuning with Fuzzy Logic

optimizes PID control and minimizes overshoot

**Digital Input** for remote switching of 1 of the following:

- ✓ PID1/PID2
- ✓ Remote/local setpoint
- ✓ Main/auxiliary setpoint
- ✓ Ramp/soak operation
- ✓ Manual/auto control
- ✓ Alarm reset for latching alarms

## 16-Interval Ramp/Soak Program

with guaranteed soak, event outputs and looping

- ✓ Optional programmable analog
- ✓ Programmable remote setpoint input (standard on all products)

**AUX Pushbutton and LED** for front panel switching of:

- ✓ PID1/PID2
- ✓ Remote/local setpoint
- ✓ Main/auxiliary setpoint
- ✓ Ramp/soak operation
- ✓ Manual/suto control

**Security Code Protection** prevents unauthorized access

**Setpoint Ramp Rate** provides soft start at power-up, or on setpoint changes, to prevent uneven heating and overshoot

**Control Loop Protection** provides process protection from:

- ✓ Open sensor
- ✓ Shorted sensor
- ✓ Sensor reversed
- ✓ Control output open or shorted
- ✓ Power control device open or shorted
- ✓ Load power missing and self-diagnostics

**Operating Ambient** up to 65°C (150°F)



OMEGACARE<sup>SM</sup> extended warranty program is available for models shown on this page. Ask your sales representative for full details when placing an order. OMEGACARE<sup>SM</sup> covers parts, labor and equivalent loaners.

## Specifications

### Control Modes:

**Automatic:** On/off, proportional, PID, PI, PD, PID + fuzzy logic, heat/cool (dual PID)

### Control Adjustments:

**Control Setpoint:** Sensor range

**Setpoint Limits:** Sensor range

**Deadband:** 1 to 100°F

**Proportional Band:** Sensor range

**Manual Reset:** -99.9 to 99.9

**Automatic Reset:** 0.00 to 99.99 repeats per minute

**Rate:** 0 to 500 seconds

**Output Cycle Time:** 0.1 to 60.0 seconds

**Output Limit:** 0.0 to 100.0%

**Open Sensor/Out of Range Output Command:** 0.0 to 100.0%

**Display Offset:** -100 to 100°F

### Heat/Cool Adjustments:

**Output Offsets:** 0 to 100% of proportional band

**Cooling Medium:** Air, water or oil

### Alarm Adjustments:

**Setpoints:** High and low settings for each alarm output

### Alarm Types:

**Absolute:** High, low and high/low

**Tracking:** +deviation, -deviation, and  $\pm$ deviation

**Relay Action:** Latching or non-latching, energized or de-energized

**Alarm Deadband:** Adjustable, -18 to 38°C (0 to 100°F)

**Alarm Inhibit:** On power-up, enabled or disabled

**Control/Alarm Outputs:** Total of 5 control/alarm outputs possible

**Relay:** Form A contacts, 1.0 A at 120/230 Vac (resistive load)

**Solid State Relay Drive:** 24 Vdc nominal at 40 mA

**Triac:** 1 A continuous, 10 A in-rush @ 120 or 230 Vac

**Current/Voltage:** 4 to 20 mA into 0 to 800  $\Omega$ , field-changeable to 1 to 5 Vdc

### Output #5 (Optional):

**Relay:** N.O. form "C" contact, 5 A @ 120 or 2.5 A 230 Vac

**Sensor Input:** Field-selectable thermocouple, RTD, current or voltage

**Input Update Rate:** 2 samples/s

### Ramp/Soak Programming:

**Intervals:** 16

**Loops:** 1 loop, 0 to 255 times or continuous

**Event Outputs:** Up to 3

**Guaranteed Soak Differential:** Off, 1°F to sensor span

**Time Units:** Seconds, minutes, hours (1 s to 99.99 hours/segment)

**Ramp to Setpoint:** 1 to 9999°/hour on power-up

### Open Sensor and Out-of-Range

**Condition:** Programmable control action with display indicating condition "OPEN SENS"

## Front Panel



### Remote Setpoint Input:

**Input Signal:** 4 to 20 mA, 250  $\Omega$  input impedance, 1 to 5 Vdc, 110 K $\Omega$  input impedance, voltage or current field-selectable via switch

**Range:** Programmable over-selected sensor span

**Accuracy:**  $\pm 0.3\%$  of sensor span (initial accuracy) at 24°C (75°F) ambient temperature and rated line voltage, field calibrate to  $\pm 0.2\%$  of sensor span

**Digital Input:** Accepts dry-contact closure

### Analog Output Option:

**Assignable Functions:** Process variable, output #1 command, active setpoint, output #2 command

**Output Signal:** 4 to 20 mA into 0 to 800  $\Omega$  load, 1 to 5 Vdc into 100 K $\Omega$  or greater load selectable via DIP switch

**Range:** Programmable over selected sensor span for retransmission of process variable and active setpoint, fixed to 0 to 100% for transmission of output commands

**Accuracy:**  $\pm 0.2\%$  of programmed span,  $\pm 1$  LSD

### Digital Communications (Optional):

**RS232:** Single-drop, isolated

**RS422/485:** Multi-drop, isolated, field selectable by switch

**Baud Rates:** 1200, 2400, 4800, 9600, 19.2 K

**Protocols:** ASCII line, computer interface

**Instrument Power:** 100 to 240 Vac, 10%, -15%; 12 to 24 Vac/Vdc,  $\pm 10\%$ ; 50 to 60 Hz

**Operating Environment:** 0 to 65°C (32 to 150°F) ambient temperature, relative humidity <95%, non-condensing

### Dimensions:

**Overall:** 97 H x 97 W x 97 mm D (3.8 x 3.8 x 3.8")

**Depth Behind Panel:** 97 mm (3.8")

**Front Panel Projection:** 20 mm (0.8")

**Panel Cutout:** 91 x 91 mm (3.6 x 3.6")

**Weight:** 454 g (1 lb)

**Case Material:** High-impact, black ABS plastic

**Influence of Line Voltage Variation:**  $\pm 0.1\%$  of sensor span/10% change in nominal line voltage

### Noise Rejection:

**Common Mode Noise:** 140 dB at 60 Hz

**Series Mode Noise:**  $\pm 0.1\%$  of sensor span with 300 mV peak-to-peak, 50 or 60 Hz series mode noise

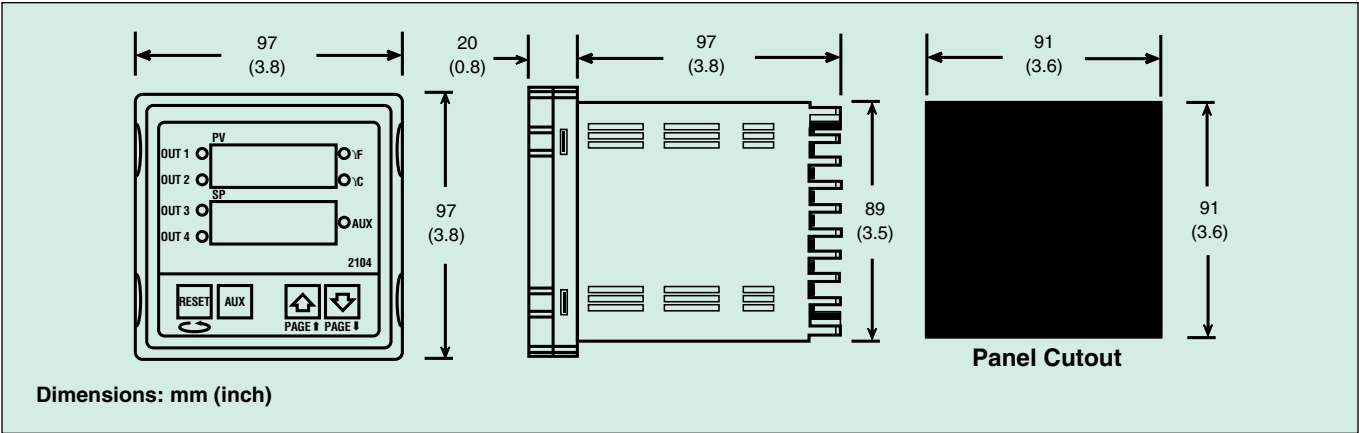
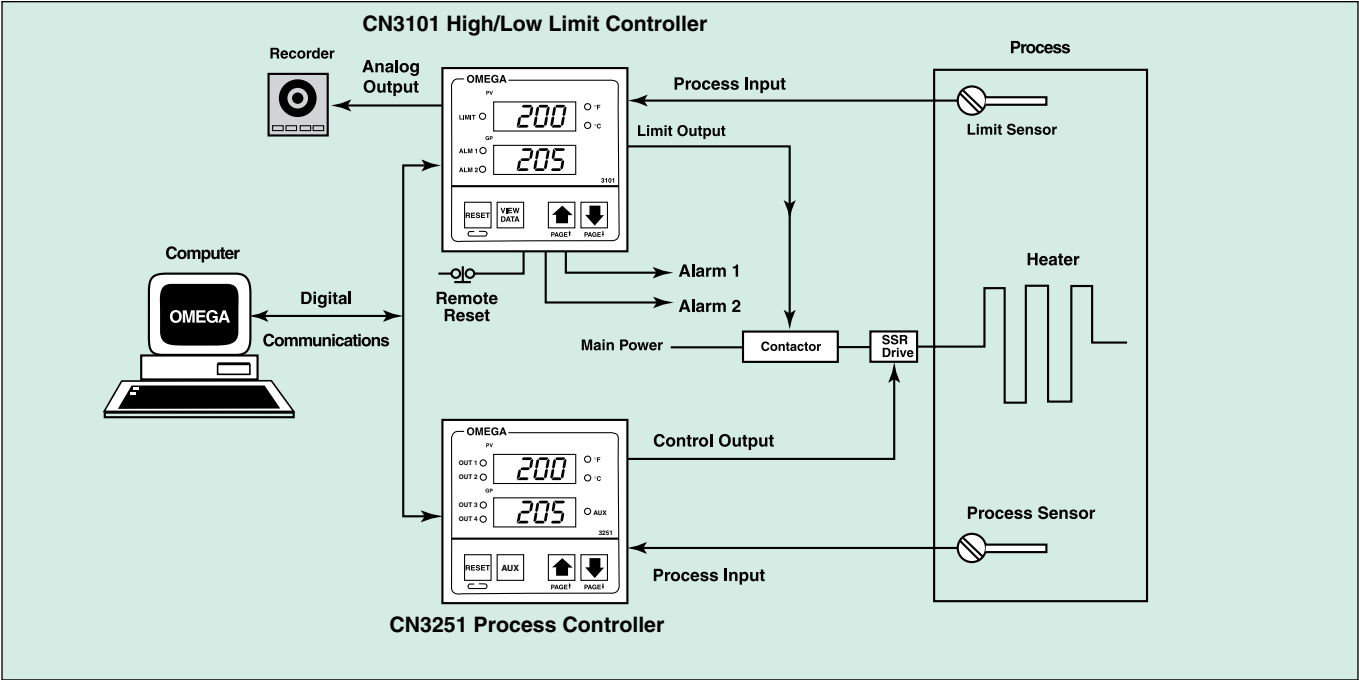
**RFI:** Typically less than 0.5% of sensor span at a distance of 1 m (3.1') from transmitter (4 W, 464 MHz)

Input Types and Ranges

Input Type	Range	Accuracy @ 25°C (77°F) Ambient (All ±% of Sensor Span)
J Iron Constantan	-73 to 760°C -100 to 1400°F	0.2%
K CHROMEGLA® ALOMEGA®	-184 to 1316°C -300 to 2400°F	0.2%
T Copper Constantan	-212 to 399°C -350 to 750°F	0.4% for PV <-80°C 0.2% for PV >-80°C
E CHROMEGLA® Constantan	-73 to 593°C -100 to 1100°F	0.2%
R Pt-13%Rh/Pt	-18 to 1760°C 0 to 3200°F	0.4%
S Pt-10%Rh/Pt	-18 to 1760°C 0 to 3200°F	0.4%
B Pt-30%Rh/ Pt-6%Rh	10 to 1816°C 50 to 3300°F	0.4% for PV >538°C
RTD Pt, 385 100 Ω	-128 to 538°C -200 to 1000°F -73.3 to 482.2°C -99.9 to 899.9°F	0.2%
4 to 20 mA	Scalable (-500 to 5000)	0.2%
0 to 5 Vdc	Scalable (-500 to 5000)	0.2%
1 to 5 Vdc	Scalable (-500 to 5000)	0.2%



CN3101 Series companion limit controller—accepts thermocouple, RTD and process signals.



**To Order Visit [omega.com/cn3251](http://omega.com/cn3251) for Pricing and Details**

Model Number	Description
<b>CN3251(*)</b>	Ramp/soak controller with fuzzy logic

Comes complete with operator's manual.

\* Specify output code from Single or Dual Output option tables below.

**Ordering Examples:** **CN3251-R**, ramp and soak controller with a relay/DC pulse heat output.

**OCW-2**, OMEGACARE<sup>SM</sup> extends standard 3-year warranty to a total of 5 years.

**CN3251-FR**, ramp and soak controller with a 4 to 20 mA heat output, relay cool output.

**OCW-2**, OMEGACARE<sup>SM</sup> extends standard 3-year warranty to a total of 5 years.

### Single Output Options (No Additional Charge)

Output Suffix	Output #1 Type
<b>-R</b>	Relay/DC pulse**
<b>-T</b>	AC SSR
<b>-F</b>	4 to 20 mA***

\*\*Field selectable.

\*\*\*Field selectable for 1 to 5 Vdc.

### Dual Output Options (Field Installable)

Order Suffix	Description Output #1	Output #2
<b>-RR</b>	Relay	Relay
<b>-TT</b>	AC SSR	AC SSR
<b>-FF</b>	4 to 20 mA***	4 to 20 mA***
<b>-DD</b>	DC pulse	DC pulse
<b>-FR</b>	4 to 20 mA***	Relay
<b>-DR</b>	DC pulse	Relay

\*\*\*Field selectable for 1 to 5 Vdc.

### Accessories

Model No.	Description
<b>3250X-R</b>	Relay/DC pulse output module
<b>3250X-T</b>	AC SSR output module
<b>3250X-FF***</b>	4 to 20 mA/4 to 20 mA output module
<b>3250X-RR</b>	Relay/relay output module
<b>3250X-TT</b>	AC SSR/AC SSR output module
<b>3250X-DD</b>	DC pulse/DC pulse output module
<b>3250X-FR***</b>	4 to 20 mA/relay output module
<b>3250X-DR</b>	DC pulse/relay output module
<b>3250X-S2</b>	RS232 digital communications board
<b>3250X-S4</b>	RS485/422 digital communications board
<b>3250X-CASE-COMM†</b>	Housing for CN3251s with digital communications
<b>3250X-CASE</b>	Housing for CN3251s without digital communications
<b>3250X-SBKT</b>	Side mounting bracket
<b>CN3200-SOFT-WIN2</b>	Software for communications option, Windows version
<b>CNQUENCHARC</b>	Noise suppression RC snubber (2 leads), 110 to 230 Vac

\*\*\*Field selectable for 1 to 5 Vdc. †Special controller case required when adding -S2 or -S4 to controllers.

### Options

Ordering Code	Description
<b>-TPS</b>	24 Vdc transmitter isolated output 65 mA <sup>3</sup>
<b>-LV1</b>	2 to 24 Vdc/Vac power
<b>-A1</b>	Dual alarm/event relays (shared common terminal)
<b>-S2<sup>2</sup></b>	RS232 digital communications, with one alarm/event relay
<b>-S4<sup>2</sup></b>	RS422/485 digital communications, with one alarm/event relay
<b>-PV2</b>	Recorder output, 4 to 20 mA/1 to 5 Vdc
<b>-S2-PV2</b>	RS232 digital communications, one alarm/event relay and recorder output
<b>-S4-PV2</b>	RS422/485 digital communications, one alarm/event relay and recorder output

<sup>1</sup> These options can be ordered with any model number.

<sup>2</sup> Only 1 of these options can be ordered at a time.

<sup>3</sup> Cannot be ordered with option "A".

CN3251-R shown smaller than actual size.





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