

# 1/4 DIN Ramp/Soak Advanced Temperature/Process Controller with Graphics and USB Interface



## CN2300 Series



- ✓ Graphical LCD Text Display (Red/Green)
- ✓ Front Mounted USB Interface Port
- ✓ 64 Independent Programs
- ✓ 255 Segments per Program
- ✓ Universal Inputs
- ✓ Autotune
- ✓ Modular Isolated Control Outputs
- ✓ Data Logging Models (Data, Alarms and Events)
- ✓ RS485 Communications (Optional)
- ✓ Software with Configuration Cable (Optional)
- ✓ Alarm Functions
- ✓ 5 Language Options (English, French, German, Italian, Spanish)

**TRODEKS®**

Dual color, graphical LCD text display changes color from green to red.

The CN2300 Series 1/4 DIN profile controller with graphic/text LCD display and USB interface is an affordable temperature and process controller with advanced functionality including datalogging options. Designed to improve user efficiency many features are integrated to reduce commissioning time, simplify operation and minimize maintenance downtime. Features include graphic easy to read backlit LCD display, dual color screen (green/red), multi-language option, custom splash-screen on startup (bitmap file), alarm status view, on screen trend view, LEDs to indicate heat, cool, autotuning and alarm.



CN2301-R1-R2-R3 shown smaller than actual size.

Easy setup wizard via front keys for quick configuration of inputs, alarms, outputs, communications and real-time clock. Universal input for thermocouple, RTD's and linear DC process signals (mA, mV or V). Flexible modular output options include mechanical relay, dc Pulse, AC SSR triac and linear outputs. Select to precisely match the process, digital input (2 max) for setpoint selection, profile control, datalogging start/stop, control output enable/disable or auto/manual control. The CN2300 series features configurable menus (using optional software with cable for configuring units via RJ11 configuration socket), USB port for local upload/download of configuration files and download logged data to or from a USB memory stick. This allows easy configuration of multiple instruments by copying from one unit to another.

Profile feature includes 255 segments to allocate freely in up to 64 programs. Programs include ramp, soak, hold, loop or jump to other profile. User defined text profile name, delayed or real-time day/time profile start, and up to 5 event outputs.

The CN2300 data logging models include historic process data for analysis or reporting, and export data files via front USB or optional communications, and will log process values, setpoints or alarms (including minimum, maximum and average), with logging intervals from 1s to 30m. Many options include analog remote setpoint, built in 24 Vdc transmitter power supply, and graphical software.



## SPECIFICATIONS

### Process Input

**Sampling Rate:** 10 per second

**Resolution:** 16 bits, always four times better than display resolution

**Impedance:** >10M  $\Omega$  resistive, except DC mA (5  $\Omega$ ) and V (47k  $\Omega$ )

**Temperature Stability:** Error <0.01% of span per  $^{\circ}\text{C}$  change in ambient temperature

**Supply Variation:** Supply voltage influence negligible within supply limits

**Humidity Influence:** Negligible if non-condensing

**Process Display:** Displays up to 5% over and 5% under span limits

**Process Variable Input Offset:** Reading adjustable  $\pm$  Controller Span. +ve values added to Process Variable, -ve values subtracted from Process Variable

### Sensor Break Detection:

**Thermocouple and RTD:** Control goes to pre-set power value

**High and Sensor Break:** Alarms activate

**Linear (4 to 20 mA, 2 to 10V and 1 to 5V only):**

Control goes to pre-set power value

**Low and Sensor Break:** Alarms activate

**Isolation:** Isolated from all outputs (except SSR driver) at 240 Vac

Thermocouple Input	
T/C Type	Range
J	-200 to 1200 $^{\circ}\text{C}$ (-328 to 2192 $^{\circ}\text{F}^*$ )
K	-240 to 1373 $^{\circ}\text{C}$ (-400 to 2503 $^{\circ}\text{F}^*$ )
T	-240 to 400 $^{\circ}\text{C}$ (-400 to 752 $^{\circ}\text{F}^*$ )
E	-240 to 1000 $^{\circ}\text{C}$ (-400 to 1832 $^{\circ}\text{F}$ )
N	0 to 1399 $^{\circ}\text{C}$ (32 to 2551 $^{\circ}\text{F}^*$ )
L	0 to 762 $^{\circ}\text{C}$ (32 to 1402 $^{\circ}\text{F}^*$ )
R	0 to 1759 $^{\circ}\text{C}$ (32 to 3198 $^{\circ}\text{F}$ )
S	0 to 1762 $^{\circ}\text{C}$ (32 to 3204 $^{\circ}\text{F}$ )
B	100 to 1824 $^{\circ}\text{C}$ (211 to 3315 $^{\circ}\text{F}$ )
C	0 to 2320 $^{\circ}\text{C}$ (32 to 4208 $^{\circ}\text{F}$ )
D	0 to 2315 $^{\circ}\text{C}$ (0 to 4199 $^{\circ}\text{F}$ )
PtRh 20%:40%	0 to 1850 $^{\circ}\text{C}$ (32 to 3362 $^{\circ}\text{F}$ )

$\pm 0.1\%$  of full range,  $\pm 1\text{LSD}$  ( $\pm 1^{\circ}\text{C}$  for internal CJC if enabled).

\*Linearization better than  $\pm 0.2^{\circ}\text{C}$  ( $\pm 0.05$  typical).

Linearization for other ranges is better than better than 0.5  $^{\circ}\text{C}$ .

Optional decimal place can be displayed up to 999.9 $^{\circ}\text{C}/^{\circ}\text{F}$

**Supported RTD Types and Ranges:** 3-wire,

PT100: -199 to 800 $^{\circ}\text{C}$  (-328 to 1472 $^{\circ}\text{F}$ )

NI120: -80 to 240 $^{\circ}\text{C}$  (-112 to 464 $^{\circ}\text{F}$ )

Optional decimal place can be displayed up to 999.9 $^{\circ}\text{C}/^{\circ}\text{F}$

**RTD Excitation:** Sensor current 150 $\mu\text{A}$   $\pm 10\%$

**Lead Resistance:** <0.5% of span error for max 50  $\Omega$  per lead, balanced

Linear Types and Ranges		
Type	Range	Offset Range
mA DC	0 to 20 mA DC	4 to 20 mA DC
mV DC	0 to 50 mV DC	10 to 50 mV DC
Vdc	0 to 5 Vdc	1 to 5 Vdc
Vdc	0 to 10 Vdc	2 to 10 Vdc

Scalable from -9999 to 10000. Decimal point selectable from 0 to 3 places, but limited to 5 display digits (e.g 9999.9).



CN2301-R1-R2-R3

shown smaller than actual size.

**DC Calibration:**  $\pm 0.1\%$  of full range,  $\pm 1\text{LSD}$

**DC Input Multi-Point Linearization:** Up to 15 scaling values can be defined anywhere between 0.1 and 100% of input

Auxiliary Inputs		
Supported Input Types and Ranges		
Type	Slot A Ranges	Slot B Ranges
mA DC	0 to 20, 4 to 20	0 to 20, 4 to 20
mV DC		0 to 50, 10 to 50, 0 to 100
Vdc	0 to 5, 1 to 5, 0 to 10, 2 to 10	0 to 5, 1 to 5, 0 to 10, 2 to 10
Potentiometer		>2000W

**Accuracy:**  $\pm 0.25\%$  of input range 1 LSD

**Sampling Rate:** 4 per second

**Resolution:** 16 bits

**Impedance:** >10M resistive, except DC mA (10  $\Omega$ ) and V (47k  $\Omega$ )

**Sensor Break Detection:** 4 to 20mA, 2 to 10V and 1 to 5V ranges only. Control goes to pre-set power value if Aux input is the active setpoint source

**Isolation:** Reinforced safety isolation from outputs and inputs (except to digital Input B)

**Auxiliary Input Scaling:** Scalable as remote setpoint (RSP) input between -9999 and 9999, constrained within setpoint limits

### Digital Inputs

**Volt-Free Contacts (or TTL):** Open contacts (>5000 or 2 to 24 Vdc signal = Logic High Closed contacts) (<50 or -0.6 to +0.8 Vdc signal = Logic Low)

**Isolation:** Reinforced safety isolation from inputs and other outputs

**Digital Input Sensitivity:** Edge sensitive; requires high-low or low-high transition to change function; response within <0.25 second

Selectable Digital Input Functions		
Function	Logic High	Logic Low
Internal Setpoint Select	Local SP1	Alternate SP
Auto/Manual Control Select	Automatic	Manual Mode
Control Outputs	Enabled	Disabled



## Outputs

**Isolation:** Reinforced safety isolation from inputs and other outputs (common specification for all output types)

### Single Relay:

**Type and Rating:** Single pole single throw (SPST), 2A resistive at 120/240 Vac

**Lifetime:** >500,000 operations at rated voltage/current

### Dual Relay:

**Type and Rating:** Single pole single throw (SPST), 2A resistive at 120/240 Vac (dual relay modules have shared common)

**Lifetime:** >200,000 operations at rated voltage/current

### Quad Relay:

**Type and Rating:** Single pole single throw (SPST), 2A resistive at 120/240 Vac (dual relay modules have shared common)

**Lifetime:** >500,000 operations at rated voltage/current

### DC Pulse:

**Drive Capability:** SSR driver voltage >10V into 500  $\Omega$  minimum

### Triac:

**Operating Voltage:** 20 to 280Vrms (47 to 63Hz)

**Current Rating:** 0.01 to 1A (full cycle rms on-state @ 25°C); de-rates linearly above 40°C to 0.5A @ 80°C

### Linear DC:

**Ranges:** 0 to 5V, 0 to 10V, 1 to 5V, 2 to 10V and 0 to 20 mA, 4 to 20 mA (selectable) with 2% over/under-drive when used for control outputs

**Resolution:** 8 bits in 250 mS (10 bits in 1s typical, >10 bits in >1s typical)

**Accuracy:**  $\pm 0.25\%$  of range, (mA @ 250, V @ 2k)  
Degrades linearly to  $\pm 0.5\%$  for increasing burden (to specification limits)

## Transmitter PSU

**Power Rating:** 24 V nominal (19 to 28 Vdc) into 910  $\Omega$  minimum resistance (option to use DC Linear output as 0 to 10V stabilised PSU)

**Isolation:** Reinforced safety isolation from inputs and other outputs

## Communications

### PC Configuration

**Connection:** RS232 via PC configurator cable to RJ11 socket under case

**Isolation:** Not isolated from input or SSR driver outputs; for bench configuration only

### RS485

**Connection:** Locates in option slot A; connection via rear terminals

**Protocol:** MODBUS RTU

**Slave/Master Mode:** Slave address range 1 to 255 or setpoint master mode

**Supported Speeds:** 4800, 9600, 19200, 38400, 57600 or 115200 bps

**Data Type:** 8 data bits and 1 stop bit; odd, even or no parity

**Isolation:** 240V reinforced safety isolation from all inputs and outputs

### Ethernet

**Connection:** Locates in option slot A, connection via RJ45 connector on top of case

**Protocol:** MODBUS TCP (slave only)

**Supported Speed:** 10BaseT or 100BaseT

**Isolation:** 240V reinforced safety isolation from the supply, inputs and outputs (except SSR drivers)

## Loop Control

**Tuning Types:** Pre-tune, auto pre-tune, self-tune or manual tuning

**Proportional Bands:** Primary and secondary (e.g. heat and cool) 0.5% to 999.9% of input span in 0.1% increments, or on/off control

**Automatic Reset:** Integral time constant, 1 second to 99 minutes 59 seconds and off

**Rate:** Derivative time constant, 1 second to 99 minutes 59 seconds and off

**Manual Reset:** Bias 0 to 100% (-100% to +100% primary and secondary)

**Deadband/ Overlap:** -20% to +20% of primary + secondary proportional band

**ON/OFF Differential:** 0.1% to 10.0% of input span

**Auto/Manual Control:** Selectable with "bumpless" transfer when switching between automatic and manual control

**Cycle Times:** Selectable from 0.5s to 512s

**Setpoint Ramp:** Ramp rate selectable 1 to 9999 LSDs per hour and infinite



Easy programming via graphical menu display.

## Alarms

**Alarm Types:** Up to 5 alarms selectable as process high, process low, band, deviation, rate of signal change (per minute), sensor/input break, loop alarm; band and deviation (high or low) alarm values are relative to the current setpoint value

**Alarm Hysteresis:** A deadband from 1 LSD to full span (in display units) for process, band or deviation alarms; rate of change alarm hysteresis is the shortest time (1 to 9999 seconds) the rate of change must be above the threshold for the alarm activate, or fall below the threshold to deactivate

**Note:** If the duration is less than this time, the alarm will not activate no matter how fast the rate of rise.

### Combination Alarm

**Outputs:** Logical OR of alarms 1 and 2, 1 to 3, 1 to 4 or 1 to 5. Logical AND of alarms 1 to 5 with Profiler Events 1 to 5

### Operating Conditions (for Indoor Use)

#### Temperature:

**Operating:** 0 to 55°C (0 to 131°F)

**Storage:** -20 to 80°C (-4 to 176°F)

**Relative Humidity:** 20 to 95% non-condensing





Easy ramp and soak programming via graphical menu.

#### Supply Voltage and Power:

**Mains Versions:** 100 to 240 Vac  $\pm 10\%$ , 50/60 Hz, 20VA

**Low Voltage Versions:** 20 to 48Vdc 50/60 Hz 15VA or 22 to 65 Vdc 12 W

#### Environmental

**Front Panel Sealing:** To IP66 (IP65 front USB connector) IP20 behind the panel

#### Display

**Display Type:** 160 x 80 pixel, monochrome graphic LCD with a dual colour (red/green) backlight

**Display Area:** 66.54 W x 37.42 mm H (2.62 x 1.65")

**Display Characters:** 0 to 9, a to z, A to Z, plus ( ) - and \_

**Trend View:** 120 of 240 data points shown in a scrollable window; data is not retained when power turned off or if time base is changed

**Trend Data:** Any active alarm plus PV (solid) and SP (dotted) at sample time or maximum/minimum PV between samples (candle-stick graph)

**Trend Sample Rate:** 1; 2; 5; 10; 15; 30 seconds or 1; 2; 5; 10; 15; 30 minutes

#### Additional Communications Options–USB\*

**Connection:** Locates in option slot C; connection via front mounted connector

**Protocol:** USB 1.1 or 2.0 compatible; mass storage class

**Supply Current:** Up to 250 mA

**Targeted Peripheral:** USB memory stick

**Isolation:** Reinforced safety isolation from all inputs and outputs

*\*Not used for PC configuration.*

#### Data Recorder

**Recording Memory:** 1Mb non-volatile flash memory; data retained when power is turned off

**Recording Interval:** 1; 2; 5; 10; 15; 30 seconds or 1; 2; 5; 10; 15; 30 minutes

**Recording Capacity:** Dependant on sample rate and number of values recorded; two values can be recorded for up to 7 days at 10s intervals; more values or faster sample rates reduce the maximum duration

**RTC Battery Type:** CR 1616 3V lithium; clock runs for >1 year without power

**RTC Accuracy:** Real time clock error <1second per day

#### Profiler

##### Profile Limits:

**Number of profiles:** 64 maximum

**Total Number of Segments (All Programs):** 255 maximum

**Loop Back:** 1 to 9999 loops back to specified segment

**Profile Cycling:** 1 to 9999 or Infinite repeats per profile

**Sequence Repeats:** 1 to 9999 or Infinite repeats of joined profile sequences

**Segment Types:** Ramp up/down over time, ramp rate up/down, step, dwell, hold, join a profile, end or repeat sequence then end

**Timebase:** hh:mm:ss (hours, minutes and seconds)

**Segment Time:** Maximum segment time 99:59:59 hh:mm:ss; Use loop-back for longer segments (e.g. 24:00:00 x 100 loops = 100 days)

**Ramp Rate:** 0.001 to 9999.9 display units per hour

**Hold Segment Release:** Release with key press, at time of day or digital input

**Start From:** First segment starts from current setpoint or current input value

**Delayed Start:** After 0 to 99:59 (hh:mm) delay, or at specified day(s) and time

**Abort Action:** Keep last profile setpoint, use controller setpoint or control outputs off

**Power/Signal Loss Recovery:** Continue profile, restart profile, keep last profile setpoint, use controller setpoint or control outputs off

**Auto-Hold:** Hold if input >band above and/or below SP for each segment

**Profile Control:** Run, manual hold/release, abort or jump to next segment

**Segment Events:** Events turn on for the duration of the segment; for end segments, the event state persists until another profile starts, the user exits from profiler mode, or the unit is powered down

#### Dimensions

**Front Bezel Size:** ¼ DIN; 96 x 96 mm (3.78 x 3.78")

**Mounting:** Plug-in with panel mounting fixing strap

**Panel Cut-Out Size:** 92 x 92 mm (3.62 x 3.62") (maximum panel thickness 6.0 mm [0.236"])

**Depth Behind Panel:** 117 mm (4.61")

**Ventilation:** 20 mm (0.787") gap required above, below and behind

**Weight:** 0.65 kg (1.43 lb) maximum

**Terminals:** Screw type (combination head)



## To Order

Model No.	Description
<b>Profile Controller with Front USB Interface</b>	
CN2301-R1-R2-R3	Profile controller with 3 relay outputs
CN2301-DC1-DC2-DC3	Profile controller with 3 DC pulse outputs
CN2301-F1-R2-R3	Profile controller with 1 analog and 2 relay outputs
CN2301-T1-T2-T3	Profile controller with 3 AC SSR (triac) outputs
<b>Profile Controller with Front USB Interface and Recorder</b>	
CN2302-R1-R2-R3	Profile/recorder controller with 3 relay outputs
CN2302-DC1-DC2-DC3	Profile/recorder controller with 3 DC pulse outputs
CN2302-F1-R2-R3	Profile/recorder controller with 1 analog and 2 relay outputs
CN2302-T1-T2-T3	Profile/recorder controller with 3 AC SSR (triac) outputs
<b>Profile Controller with Front USB Interface, Low Voltage</b>	
CN2301-R1-R2-R3-LV	Profile controller with 3 relay outputs, low voltage
CN2301-DC1-DC2-DC3-LV	Profile controller with 3 DC pulse outputs, low voltage
CN2301-F1-R2-R3-LV	Profile controller with 1 analog and 2 relay outputs, low voltage
CN2301-T1-T2-T3-LV	Profile controller with 3 AC SSR (triac) outputs, low voltage
<b>Profile Controller with Front USB Interface and Recorder, Low Voltage</b>	
CN2302-R1-R2-R3-LV	Profile/recorder controller with 3 relay outputs, low voltage
CN2302-DC1-DC2-DC3-LV	Profile/recorder controller with 3 DC pulse outputs, low voltage
CN2302-F1-R2-R3-LV	Profile/recorder controller with 1 analog and 2 relay outputs, low voltage
CN2302-T1-T2-T3-LV	Profile/recorder controller with 3 AC SSR (triac) outputs, low voltage

## Output and Communications Options (Field Installable Modules)

Output 1 Slot	Description
2300X-R1	Relay module
2300X-DC1	DC pulse module
2300X-F1	Linear DC module
2300X-T1	Triac module
<b>Output 2 and 3 Slot</b>	
2300X-R2	Relay module
2300X-DC2	DC pulse module
2300X-F2	Linear DC module
2300X-T2	Triac module
2300X-R23	Dual relay module
2300X-DC23	Dual DC pulse module
2300X-TPS	Transmitter power supply
<b>Output 4 Slot</b>	
2300X-R4	Quad relay module
<b>Option A Slot</b>	
2300X-485	RS485 communications
2300X-DI	Digital input
2300X-RSP1	Basic remote setpoint
2300X-EI	Ethernet
<b>Option B Slot</b>	
2300X-RSPDI	Full remote setpoint with digital input

## Options (Language)

Model No. Suffix	Description
-FRENCH	French display language
-GERMAN	German display language
-ITALIAN	Italian display language
-SPANISH	Spanish display language

## Accessories

Model No.	Description
CN2300-SOFT	Configuration software and cable
CN2300-CABLE	Spare configuration cable
CNQUENCHARC	Noise suppression RC snubber (2 leads), 110 to 230 Vac

*Comes complete with mounting bracket and operator's manual.*