



# CN710/CN730/CN740 Temperature Controller

## Instruction Sheet

Thank you very much for purchasing Omega Engineering CN700 Series Temperature Controller. Please read this instruction sheet before using your controller to ensure proper operation and please keep this instruction sheet handy for quick reference.

### 1 Precaution

#### ⚠ DANGER! Caution! Electric Shock!

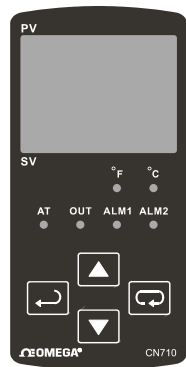
- DO NOT touch the AC terminals while the power is supplied to the controller to prevent an electric shock.
- Make sure power is disconnected while checking the unit inside.
- The symbol indicates this Controller is protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (equivalent to Class II of IEC 536).

#### ⚠ WARNING!

Mount the controller in a location that will not be subject to excessive temperature, shock, or vibration. All models are designed for mounting in an enclosed panel.

- Always use recommended solder-less terminals: Fork terminal with isolation (M3 screw, width is 7.0mm, hole diameter 3.2mm). Screw size: M3 x 6.5 (With 6.8 x 6.8 square washer). Recommended tightening torque: 0.4 N.m (4kgf.cm). Applicable wire: Solid/twisted wire of 2 mm<sup>2</sup>, 12AWG to 24AWG. Please be sure to tighten them properly.
- DO NOT allow dust or foreign objects to fall inside the controller to prevent it from malfunctioning.
- Never modify or disassemble the controller.
- DO NOT connect anything to the "Not used" terminals.
- Make sure all wires are connected to the correct polarity of terminals.
- DO NOT install and/or use the controller in places subject to: Dust or corrosive gases and liquid, high humidity and high radiation, vibration and shock, high voltage and high frequency
- Power must be off when wiring and changing a temperature sensor.
- Be sure to use compensating wires that match the thermocouple types when extending or connecting the thermocouple wires.
- Please use wires with resistance when extending or connecting a platinum resistance sensor (RTD).
- Please keep the wire as short as possible when wiring a platinum resistance sensor (RTD) to the controller and please route power wires as far as possible from load wires to prevent interference and induced noise.
- This controller is an open-type unit and must be placed in an enclosure away from high temperature, humidity, dripping water, corrosive materials, airborne dust and electric shock or vibration.
- Please make sure power cables and signals from instruments are all installed properly before energizing the controller, otherwise serious damage may occur.
- Please do not touch the terminals in the controller or try to repair the controller when power is applied to prevent an electric shock.
- Wait at least one minute after power is disconnected to allow capacitors to discharge, and please do not touch any internal circuit within this period.
- DO NOT use acid or alkaline liquids for cleaning. Please use a soft, dry cloth to clean the controller.
- This instrument is not furnished with a power switch or fuse. Therefore, if a fuse or power switch is required, install the protection close to the instrument. Recommended fuse rating: Rated voltage 250 V, Rated current 1 A. Fuse type: Time-lag fuse
- Note: This controller does not provide overcurrent protection. Use of this product requires that suitable overcurrent protection device(s) must be added to ensure compliance with all relevant electrical standards and codes. (Rated 250 V, 15 Amps max). A suitable disconnecting device should be provided near the controller in the end-use installation.

### 2 Display, LED, & Pushbuttons



PV displays process value  
SV displays setpoint value.

INDEX: advances the display to the next menu item.

UP ARROW: Increments a value or changes a menu item.

DOWN ARROW: Increments a value or changes a menu item.

ENTER: stores the value or item change.

### 3 Model Number Identification

CN73-□

OUTPUT 1  
2=Voltage Pulse  
3=Relay  
5=Current

CN71-□

OUTPUT 1  
2=Voltage Pulse  
3=Relay  
5=Current

CN74-□

OUTPUT 1  
2=Voltage Pulse  
3=Relay  
5=Current

### 4 Temperature Sensor Type & Temperature Range

Input Temperature Sensor Type	Register Value	LED Display	Temperature Range
Platinum resistance (Pt100) type3	15	Pt3	0.0 ~ 100.0°C

Input Temperature Sensor Type	Register Value	LED Display	Temperature Range
Platinum resistance (Pt100) type2	14	Pt2	-20.0 ~ 500.0°C
Platinum resistance (Pt100) type1	13	Pt1	-200 ~ 600°C
Platinum resistance (JPt100) type2	12	JPt2	0.0 ~ 100.0°C
Platinum resistance (JPt100) type1	11	JPt1	-20.0 ~ 400.0°C
Thermocouple (TC) B type	10	b	100 ~ 1,800°C
Thermocouple (TC) S type	9	s	0 ~ 1,700 °C
Thermocouple (TC) R type	8	r	0 ~ 1,700 °C
Thermocouple (TC) N type	7	n	-200 ~ 1,300 °C
Thermocouple (TC) E type	6	e	0 ~ 600 °C
Thermocouple (TC) T type2	5	t2	-20.0 ~ 400.0°C
Thermocouple (TC) T type1	4	t1	-200 ~ 400°C
Thermocouple (TC) J type2	3	J2	-20.0 ~ 400.0°C
Thermocouple (TC) J type1	2	J1	-100 ~ 850°C
Thermocouple (TC) K type2	1	K2	-20.0 ~ 500.0°C
Thermocouple (TC) K type1	0	K1	-200 ~ 1,300°C
Thermocouple (TC) L type	16	L	-200 ~ 850°C
Thermocouple (TC) U type	17	U	-200 to 500°C
Thermocouple (TC) Txx type	18	Txx	-200 to 800°C

### 5 Operation

There are three modes of operation: operation, regulation and initial setting. When power is applied, the controller will default to the operation mode. Press to switch to regulation mode. If is pressed for more than 3 seconds, the controller will switch to the initial setting mode. Pressing while in the regulation mode or initial setting mode, forces the controller to return to the operation mode. PV/SV: Sets the temperature set point and displays the temperature process value. Use to set the temperature set point.

Setting method: While in any function mode, press to select the desired function and use to change settings. Press to save the changes. Menu items are listed below.

Regulation Mode	Operation Mode	Initial Setting Mode
Auto-tuning (Set in PID control & RUN mode) Press	Use  to set temperature set point Press	Set input type Press
Set proportional band (Kp) (in PID control) Press	Control setting RUN or STOP Press	Set temperature unit (Not displayed when in analog input) Press
Set integral time (Ki) (in PID control) Press	Upper-limit alarm 1 (This parameter is available only when ALA1 function is enabled.) Press	Set upper-limit of temperature range Press
Set derivative time (Kt) (in PID control) Press	Lower-limit alarm 1 (This parameter is available only when ALA1 function is enabled.) Press	Set lower-limit of temperature range Press
P/PD control offset (when PID control is ON and Ki=0 set the value of PdoF. If Ki≠0, AT (Auto-tuning will automatically set the value of ioF. Press	Upper-limit alarm 2 (This parameter is available only when ALA2 function is enabled.) Press	Set Control method: ON/OFF, PID, or manual. Press
Heating/cooling hysteresis (in ON/OFF control) Press	Lower-limit alarm 2 (This parameter is available only when ALA2 function is enabled.) Press	Select heating or cooling control. Press
Heating/cooling control cycle setting (Set in PID control mode) Press	Set lock mode Press	Alarm 1 mode setting Press
Regulate temperature deviation value Press	Display and adjust output value. Press	Alarm 2 mode setting Press
Regulate upper-limit of analog output value (The setting is displayed when in analog output) Press		Communication write function enabled/disabled Press

Regulate lower-limit of analog output value (The setting is displayed when in analog output) Press  to return to "auto-tuning"		Communication address setting Press
		Communication baud rate setting Press
		Data length setting Press
		Parity bit setting Press
		Stop bit setting Press  to return to "set input type"

### Parameters List

1. Operation Mode: The default mode after start-up

LED Display	Explanation	Default
	RUN/STOP: Control setting. Run (rUn) or Stop (StoP) mode on the SV display.	RUN
	ALARM 1 HIGH: Upper limit for alarm 1. (Only available when alarm is set in the initial setting mode).	4.0°C
	ALARM 1 LOW: Lower limit for alarm 1. (Only available when alarm is set in the initial setting mode).	4.0°C
	ALARM 2 HIGH: Upper limit for alarm 2. (Only available when alarm is set in the initial setting mode).	4.0°C
	ALARM 2 LOW: Lower limit for alarm 2. (Only available when alarm is set in the initial setting mode).	4.0°C
	Lock Function Setting: LoC1, LoC2, or OFF. LoC1 mode will lock all settings, LoC2 locks everything except the set point value, and OFF will not lock any settings. Press  and  keys simultaneously, to release the lock status.	OFF
	OUT: The Output value adjustment and display in manual tuning control. (Not available in ON/OFF or Auto-tuning control).	0

2. Regulation Mode: Control parameters Settings

LED Display	Explanation	Default
	AT (Auto-Tuning): ON or OFF, when set ON, the execution of the auto-tuning function in PID control mode is automatically started. (Only available when PID control is selected in initial settings)	OFF
	P (Proportional Band in PID control): Sets P value.	47.6
	I (Integral Time in PID control): Sets I value.	260
	D (Derivative Time in PID control): Sets D value.	41
	PdoF: Offset output when P or PD control function is on. PID in initial settings is selected and the value of Ki (Integral Time in regulation mode) is equal to zero.	0
	ioF: Default value of integral volume when PID control is ON and the Ki (Integral Time in regulation mode) is not equal to zero. AT function can automatically set this parameter when PID control is active and Ki≠0.	0
	HIS (Heating Hysteresis): Available only in ON/OFF control. Sets the value the heating hysteresis.	0
	CIS (Cooling Hysteresis): Available only in ON/OFF control. Sets the value the cooling hysteresis.	0
	HtPd: PID heating control cycle setting. Only available when a PID control is selected in the initial settings.	Output Selection:
	CtPd: PID cooling control cycle setting. Only available when a PID control is selected in the initial settings.	Voltage: 4 sec. Relay : 20 sec.
	TPoF: Regulates the temperature deviation value.	0
	CrHi: Regulates the 20mA output deviation value.	0
	CrLo: Regulates the 4mA output deviation value.	0
	HIS (Heating Hysteresis): Available only in ON/OFF control. Sets the value the heating hysteresis.	0

3. Initial Setting Mode: Initial settings of the controller and communication parameters

LED Display	Explanation	Default
	INPUT: Select input temperature sensor type (Please refer to the contents of the "Temperature Sensor Type and Temperature Range" for detail)	PT2
	Engineering Unit(°F or °C): Select engineering unit F or C.	°C
	T-High: Upper limit for temperature range.	500.0
	T-Low: Lower limit for temperature range.	-20.0
	CONTROL METHOD (ON/OFF, PID, or manual tuning [rAnU]): Sets the control method for the set point value.	PID
	Control Action (Direct or Reverse Acting): Cooling [Cool] or heating [HEAT].	HEAT

LED Display	Explanation	Default
ALR1	ALARM 1: Alarm 1 setting. (See Alarm Output Section for set values and descriptions).	0
ALR2	ALARM 2: Alarm 2 setting. (See Alarm Output Section for set values and descriptions).	0
CoSH	C WE: Write-in function disabled/enabled. Can be set only when unit is equipped with serial communication.	OFF
C-no	C NO: Address setting. Can be set only when unit is equipped with serial communication.	1
bPS	BPS: Baud rate setting. Can be set only when unit is equipped with serial communication.	9,600
LEn	Length: Data length setting. Can be set only when unit is equipped with serial communication.	7
Prty	Parity: Parity bit setting. Can be set only when unit is equipped with serial communication.	E
StoP	Stop Bit: Stop bit setting. Can be set only when unit is equipped with serial communication.	1

Execution:

The programming execution is initiated through **r-5** in the operation mode.

When **r-5** is set to **rUn**, the program will start to execute in order from the step 0 of the start pattern.

When **r-5** is set to **StoP**, the program will stop and the control output is disabled

## 6 Heating & Cooling

Temperature control can be achieved either by heating or cooling. Please refer to the following for the operation:

Settings for heat or cool operation are found in the initial settings mode under **S-HC**.

Select **HEAT**, for heating (reverse) control on Output 1.

Select **COOL**, for cooling (forward) control on Output 1

### Input Error Indication

Setting value	Temperature sensor is not connected	Measured temperature value exceeds the temperature range	Unknown input
PV	no	over	Err
SV	Cont		Cont

## 7 Alarm Outputs

Depending on the controller model, there can be up to two alarm outputs. Each alarm output can be configured for an alarm type listed below. Alarm types are set in the initial setting mode. The alarm output is activated whenever the process temperature value (PV) is getting higher or lower than the set point of alarm limit.

Set Value	Alarm Type	Alarm Output Operation
0	Alarm function disabled	Output OFF
1	Deviation upper- and lower-limit: This alarm output operates when PV value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	ON: SV-(AL-L) SV SV+(AL-H) OFF: SV-(AL-L) SV SV+(AL-H)
2	Deviation upper-limit: This alarm output operates when PV value is higher than the setting value SV+(AL-H).	ON: SV SV+(AL-H) OFF: SV SV+(AL-H)
3	Deviation lower-limit: This alarm output operates when PV value is lower than the setting value SV-(AL-L).	ON: SV-(AL-L) SV OFF: SV-(AL-L) SV
4	Reverse deviation upper- and lower-limit: This alarm output operates when PV value is in the range of the setting value SV+(AL-H) and SV-(AL-L).	ON: SV-(AL-L) SV SV+(AL-H) OFF: SV-(AL-L) SV SV+(AL-H)
5	Absolute value upper- and lower-limit: This alarm output operates when PV value is higher than the setting value AL-H or lower than setting value AL-L.	ON: AL-L AL-H OFF: AL-L AL-H
6	Absolute value upper-limit: This alarm output operates when PV value is higher than the setting value AL-H.	ON: AL-H OFF: AL-H
7	Absolute value lower-limit: This alarm output operates when PV value is lower than the setting value AL-L.	ON: AL-L OFF: AL-L
8	Deviation upper- and lower-limit with standby sequence: This alarm output operates when PV value reaches set point (SV value) and the value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	ON: SV-(AL-L) SV SV+(AL-H) OFF: SV-(AL-L) SV SV+(AL-H)
9	Deviation upper-limit with standby sequence: This alarm output operates when PV value reaches set point (SV value) and the reached value is higher than the setting value SV+(AL-H).	ON: SV SV+(AL-H) OFF: SV SV+(AL-H)
10	Deviation lower-limit with standby sequence: This alarm output operates when PV value reaches the set point (SV value) and the reached value is lower than the setting value SV-(AL-L).	ON: SV-(AL-L) SV OFF: SV-(AL-L) SV
11	Hysteresis alarm output: Heating control: This alarm output operates if PV value is higher than the setting value SV+ (AL-H). This alarm output is OFF when PV value is lower than the setting value SV+ (AL-L).	ON: SV AL-L AL-H OFF: SV AL-L AL-H

Set Value	Alarm Type	Alarm Output Operation
12	Hysteresis alarm output: Cooling control: This alarm output operates if PV value is lower than the setting value SV-(AL-H). This alarm output is OFF when PV value is higher than the setting value SV-(AL-L).	ON: AL-H AL-L SV OFF: AL-H AL-L SV

(Note: AL-H and AL-L include AL1H, AL2H and AL1L, AL2L)

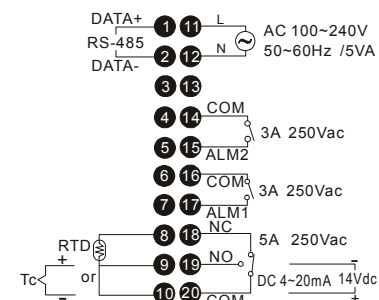
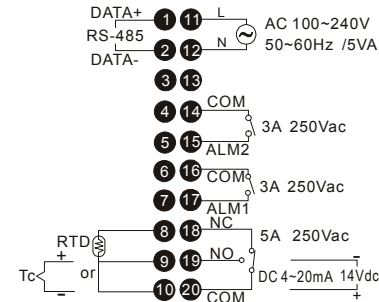
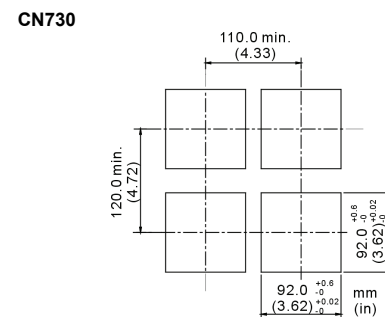
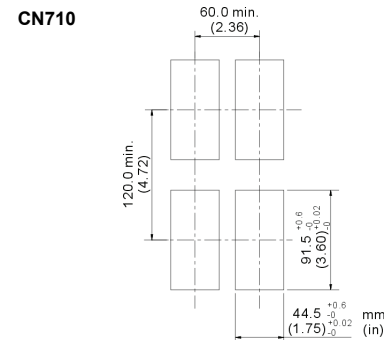
With the standby sequence, the alarm output will be temporarily disabled until the PV value reaches the set value. Then, the alarm output will operate. Once the alarming output operation is activated, there is a 1.5 sec. delay time to avoid any malfunction.

## 8 Specification

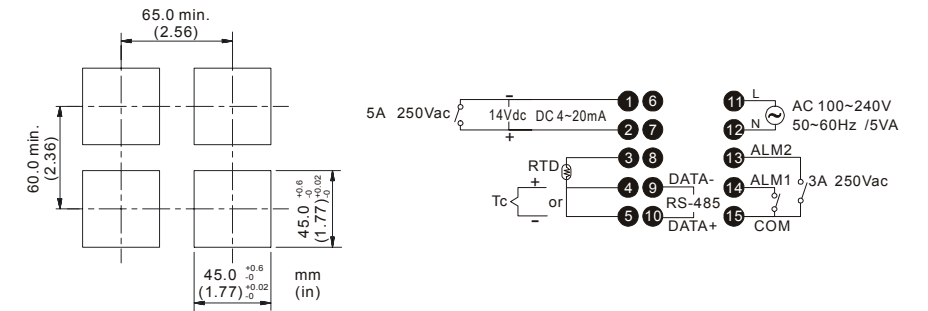
Input voltage	100 to 240VAC 50/60Hz
Operation voltage range	85% to 110% of rated voltage
Power consumption	5VA max.
Memory protection	EEPROM 4K bit (non-volatile memory (number of writes: 100,000))
Display method	2 line x 4 character 7-segment LED display Process value (PV): Red color, Set point (SV): Green color
Sensor type	Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK 3-wire Platinum RTD: Pt100, JPt100
Control mode	PID, ON/OFF, manual or auto-tuning.
Control output	Relay output: SPDT (SPST on the 1/16 DIN size series16C), Max. load 250VAC, 5A resistive load Voltage pulse output: DC 14V, Max. output current 40mA Current output: DC 4 ~ 20mA output (Load resistance: Max. 600Ω)
Display accuracy	0.1% of measuring range.
Sampling rate	0.5 sec.
RS-485 communication	MODBUS ASCII communication protocol (only on models designated with serial communication).
Vibration resistance	10 to 55Hz, 10m/s <sup>2</sup> for 10min, each in X, Y and Z directions
Shock resistance	Max. 300m/s <sup>2</sup> , 3 times in each 3 axes, 6 directions
Ambient temperature	32°F to 122°F (0°C ~ +50°C)
Storage temperature	-4°F ~ 150°F (-20°C ~ +65°C)
Altitude	2,000m or less
Relative humidity	0% ~ 80% (non-condensing)

## 9 Plan Cutout & External Dimensions

### Panel Cutout [dimensions are in mm (in.)] ■ Terminals Identification

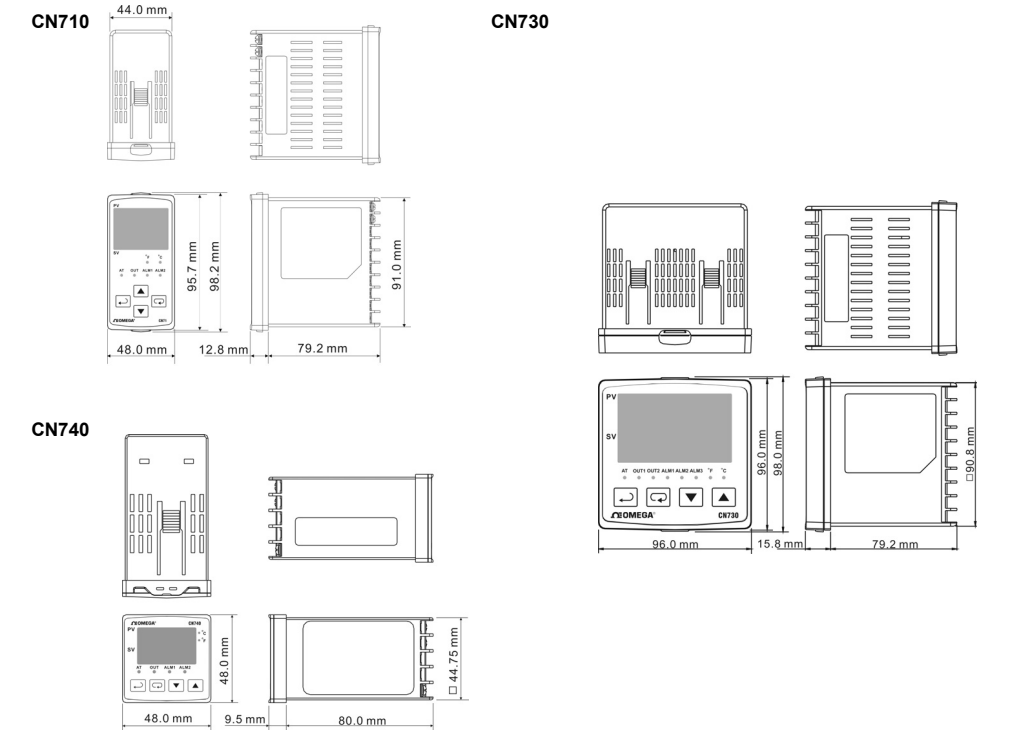


## CN740



## 10 External Dimensions

Dimensions are in millimeter (inch)



## 11 Mounting

### Mounting Method

- Step 1: Insert the controller through the panel cutout.
- Step 2: Insert the mounting bracket into the mounting groove at the top and bottom of the controller
- Step 3: Push the mounting bracket forward until the bracket stops at panel wall.
- Step 4: Insert and tighten screws on bracket to secure the controller in place. (The screw torque should be 0.8kgf-cm to 1.5kgf-cm)

### Mounting Bracket Installation

