

Digital Temperature Controller

EN Instruction Manual

Thank you for purchasing the OMRON E5GN Digital Temperature Controller. This manual describes the functions, performance, and application methods needed for optimum use of the product. Please observe the following items when using the product.

- This product is designed for use by qualified personnel with a knowledge of electrical systems.
- Before using the product, thoroughly read and understand this manual to ensure correct use.
- Keep this manual in a safe location so that it is available for reference whenever required.

OMRON CORPORATION
©All Rights Reserved

For detailed operating instructions, please refer to the E5CN/E5AN/E5EN/E5GN Digital Temperature Controllers User's Manual Basic Type (Cat. No. H156).

Suitability for Use

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product. Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product. NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM. See also Product catalog for Warranty and Limitation of Liability.

2109299-6A

Safety Precautions

Key to Warning Symbols

CAUTION Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or property damage. Read this manual carefully before using the product.

Warning Symbols

- Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock.
- Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.
- Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.
- Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.

CAUTION - Risk of Fire and Electric Shock

- This product is UL listed as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
- More than one disconnect switch may be required to de-energize the equipment before servicing.
- Signal inputs are SELV, limited energy.
- Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits.

If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.

Tighten the terminal screws to between 0.43 and 0.58 N·m. Loose screws may occasionally result in fire. Tighten the terminal screws for the auxiliary output 2 to between 0.5 and 0.6 N·m.

Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents.

A malfunction in the Temperature Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Temperature Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.

Precautions for Safe Use

- Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse effects on the performance and functions of the product. Not doing so may occasionally result in unexpected events. Use the product within specifications.
- The product is designed for indoor use only. Do not use the product outdoors. Do not use or store the product in any of the following locations.
 - Places directly subject to heat radiated from heating equipment.
 - Places subject to splashing liquid or oil atmosphere.
 - Places subject to direct sunlight.
 - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
 - Places subject to intense temperature change.
 - Places subject to icing and condensation.
 - Places subject to vibration and large shocks.
 - Use/store within the rated temperature and humidity ranges.
 - Provide forced-cooling if required.
 - To allow heat to escape, do not block the area around the product.
 - Do not block the ventilation holes on the product.
 - Be sure to wire properly with correct polarity of terminals.
 - Use the specified size (M3.0, with 5.8 mm or less) of crimped terminals for wiring. For open-wired connections, use stranded or solid copper wires with rated temperature of over 70°C and a gauge of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.8231 mm²). The stripping length for screw terminal blocks is 6 to 8 mm. The stripping length for screwless clamp terminal blocks is 10 mm. The stripping length for auxiliary output 2 is 9 mm. Up to two wires of some size and type, or two crimped terminals can be connected to a single terminal. Ferrules for screwless clamp terminals blocks must be 0.8 to 1.4 mm in diameter. The length of exposed conductor must be 8 to 12 mm. Ferrules for auxiliary output 2 must be 0.8 to 1.5 mm in diameter. The length of exposed conductor must be 6 mm. Do not wire the terminals which are not used.
 - Allow as much space as possible between the Temperature controller and devices that generate a powerful high-frequency or surge. Separate the high-voltage or large-current power lines from other lines, and avoid parallel or common wiring with the power lines when you are wiring to the terminals.
 - Use this product within the rated load and power supply.
 - Make sure that the rated voltage is attained within two seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.
 - Make sure that the Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
 - When executing self-tuning, turn the load and the unit ON simultaneously, or turn the load ON before you turn the controller ON.
 - A switch or circuit breaker should be provided close to this unit. The switch or circuit breaker should be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
 - Always turn OFF the power supply before removing the terminal block, and never touch nor apply shock to the terminals or electronic components.
 - Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
 - Design system (control panel, etc.) considering the 2 second of delay that the controller's output is set after power ON.
 - The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
 - The number of EEPROM write operations is limited. Therefore, use RAM write mode when frequently overwriting data during communications or other operations.
 - Do not use the Temperature Controller if the front sheet is peeling or torn.
 - When you remove the terminal block, check for corrosion.
 - When disassembling the Temperature Controller for disposal, use suitable tools.

Specifications

Power supply voltage	100 to 240 VAC, 50/60 Hz or 24 VAC, 50/60 Hz or 24 VDC
Operating voltage range	85 to 110% of the rated voltage
Power consumption	Approx. 5.5 VA (100 to 240 VAC) Approx. 3 VA (24 VAC) Approx. 2 W (24 VDC)
Indication accuracy (Ambient temperature: 23°C)	(±0.3 % of indication value or ±1°C, whichever is greater) ±1 digit max. Platinum resistance thermometer: (±0.2 % of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: 0.2 % FS ±1 digit max. Output current: approx. 7 mA per contact. ON: 1 kΩ max., OFF: 100 kΩ min.
Event input	ON: residual voltage 1.5 V max. OFF: leakage current 0.1 mA max. Relay outputs: 250 VAC, 2 A (resistive load) Electrical life of relay: 100,000 operations Voltage output (for driving SSR): 12 VDC, 21 mA Current output: 4 to 20 mA DC, 0 to 20 mA DC Load: 500 Ω max.
Control output 1	ON/OFF or 2-PID control Relay outputs: 250 VAC, 2 A (resistive load), electrical life: 100,000 operations
Control method	Relay outputs: 250 VAC, 2 A (resistive load), electrical life: 100,000 operations
Auxiliary outputs	Relay outputs: 250 VAC, 2 A (resistive load), electrical life: 100,000 operations
Ambient temperature	-10 to 55°C (with no icing or condensation)
Ambient humidity	25 to 85%
Storage temperature	-25 to 65°C (with no icing or condensation)
Altitude	Max. 2,000 m
Recommended fuse	T2A, 250 VAC, time-lag, low-breaking capacity
Weight	Approx. 90 g (main unit only)
Degree of protection	Front panel: IP66 Rear case: IP20 Terminal seal: IP00
Installation environment	Installation category: I, pollution degree 2 (as per IEC61010-1) EEPROM (non-volatile memory) (Number of write operations: 1,000,000)
Memory protection	

Wiring

Dimensions

Dimensions (mm)

Models with Screw Terminal Blocks

Models with Screwless Clamp Terminal Blocks

Installation

Individual mounting (mm)

Side-by-side mounting (waterproof not possible) (mm)

When waterproofing is required, be sure to mount the controller separately. Attach the waterproof packing from the terminal side and then insert the controller to the panel. Recommended panel thickness is 1 to 5 mm.

• Insert the controller through the hole in the panel. Push the adapter on from the rear and fasten temporarily, removing any gap between the controller, panel and adapter. Finally, secure two fixing screws alternately keeping the torque to between 0.29 to 0.39 N·m.

• Make sure that the surrounding temperature does not exceed the allowable operating temperature given in the specifications especially when two or more controllers are mounted.

Connections (The applicability of the electric terminals varies with the type of machine.)

Control output 1: Relay output 250 VAC, 2 A (resistive load). Voltage output (for driving SSR) 12 VDC, 21 mA. Current output 0 to 20 mA DC, 4 to 20 mA DC Load: 500 Ω max.

Auxiliary outputs 1 and 2: Relay output 250 VAC, 2 A (resistive load). • 100 to 240 VAC • 24 VAC/DC (no polarity)

Input power supply: 100 to 240 VAC, 24 VAC/DC (no polarity)

Control output 1: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Auxiliary output 1: 13, 14

Auxiliary output 2: 13, 14

RS-485 communications: B(+), A(-), SD, RD, SG

RS-232C communications: CT input, EV1, EV2

Event input: EV1, EV2

Analog input: DO NOT USE, DO NOT USE

Universal TC/PT input: A, B

• A heater burnout alarm, HS alarm, heater overcurrent alarm, or input alarm is output to the output to which the alarm 1 function is assigned.

• Since the voltage output (control output) is not electrically insulated from the internal power source of the controller, output terminals must be left unheated when using an earthed thermocouple thermometer. (Connection makes measurements unreliable due to sneak currents.)

• To comply with EMC standards, the length of the cable connecting the analog input or universal TC/PT input sensor must be 30 m or less. If the cable is longer than 30 m, the EMC standards will not be satisfied.

Names of parts on front panel

• No.1 display: Process value or set data symbol

• Level key: Use this key to change levels.

• Press the **OK** key and the **SET** key together for at least 3 seconds to switch to protect level.

• Mode key: Press this key to change the contents of the display. Press this key for 1 s or longer for reverse scroll.

• No.2 display: Set point, set data read-out value or changed input value

• Up and Down keys: Use the keys to change the values displayed on the No.2 display. Each press of **UP** key increments or advances the values displayed on the No.2 display. Each press of **DN** key decrements or returns the values displayed on the No.2 display.

Operation menu

Input Type

Input type	Input	Setting	Setting range
Platinum resistance thermometer	Pt100	0	-200 to 850 (°C) / -300 to 1500 (°F)
		1	-199.9 to 500.0 (°C) / -199.9 to 900.0 (°F)
		2	0.0 to 100.0 (°C) / 0.0 to 210.0 (°F)
Thermocouple	JPt100	3	-199.9 to 500.0 (°C) / -199.9 to 900.0 (°F)
	K	4	0.0 to 100.0 (°C) / 0.0 to 210.0 (°F)
		5	-200 to 1300 (°C) / -300 to 2300 (°F)
	J	6	-20.0 to 500.0 (°C) / 0.0 to 900.0 (°F)
		7	-100 to 850 (°C) / -100 to 1500 (°F)
	T	8	-20.0 to 400.0 (°C) / 0.0 to 750.0 (°F)
		9	-200 to 400 (°C) / -300 to 700 (°F)
	E	10	-199.9 to 400.0 (°C) / -199.9 to 700.0 (°F)
	L	11	-200 to 600 (°C) / -300 to 1100 (°F)
	U	12	-100 to 850 (°C) / -100 to 1500 (°F)
Infrared		13	-200 to 400 (°C) / -300 to 700 (°F)
		14	-199.9 to 400.0 (°C) / -199.9 to 700.0 (°F)
		15	-200 to 1300 (°C) / -300 to 2300 (°F)
		16	0 to 1700 (°C) / 0 to 3000 (°F)
		17	0 to 1700 (°C) / 0 to 3000 (°F)
		18	100 to 1800 (°C) / 300 to 3200 (°F)
		19	0 to 90 (°C) / 0 to 190 (°F)
		20	0 to 120 (°C) / 0 to 240 (°F)
		21	0 to 165 (°C) / 0 to 320 (°F)
		22	0 to 260 (°C) / 0 to 500 (°F)
Thermosensor ES1B		23	Use the following ranges for scaling: -199.9 to 999.9, -199.9 to 999.9. Vary Depending on "L", "H" value
		24	0 to 2300 (°C) / 0 to 3200 (°F)
Analog input		25	0 to 1300 (°C) / 0 to 2300 (°F)
		25	0 to 2300 (°C) / 0 to 3200 (°F)
Thermocouple	PL11	25	0 to 1300 (°C) / 0 to 2300 (°F)

*The default is "5".

*5.ERR will be displayed when a platinum resistance thermometer is mistakenly connected while input type is not set for it. To clear the 5.ERR display, correct the wiring and cycle the power supply.

Analog input type

Input type	Input	Setting	Setting range
Current input	4 to 20mA	0	Use the following ranges for scaling: 0 to 20mA
		1	-199.9 to 999.9, -199.9 to 999.9, -19.99 to 1.999
Voltage input	0 to 5V	2	Use the following ranges for scaling: 0 to 5V
		3	99.99, -1.999 to 9.999
	0 to 10V	4	

*The default is "0".

Alarms

Setting	Alarm type	Alarm output function
0	No alarm function	Positive alarm value (X) / Negative alarm value (X)
1	Deviation upper/lower limit	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
		SP: Vary with "L", "H" values
2	Deviation upper limit	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
3	Deviation lower limit	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
4	Deviation upper/lower range	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
5	Deviation upper/lower limit standby sequence ON	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
6	Deviation upper limit standby sequence ON	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
7	Deviation lower limit standby sequence ON	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
8	Absolute value upper limit	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
9	Absolute value lower limit	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
10	Absolute value upper limit standby sequence ON	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
11	Absolute value lower limit standby sequence ON	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
12	LBA (only for alarm 1)	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values
13	PV Change Rate Alarm	ON: Vary with "L", "H" values
		OFF: Vary with "L", "H" values

*1: Upper and lower limits can be set for parameters 1, 4 and 5 to provide for different types of alarm. These are indicated by the letter "L" and "H".

*The default is "2".

Error display (troubleshooting)

When an error has occurred, the No.1 display shows the error code. Take necessary measure according to the error code, referring the table below.

No.1 display	Meaning	Action	Status at error
5.ERR (S.Err)	Input error *2	Check the setting of the Input Type parameter, check the input wiring, and check for broken or shorts in the temperature sensor.	Control output: OFF Alarm: Operates as above the upper limit.
E333 (E333)	A/D converter error *2	After the correction of A/D converter error, turn the power OFF then back ON again. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	Control output: OFF Alarm: OFF
E111 (E111)	Memory error	Turn the power OFF then back ON again. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	Control output: OFF Alarm: OFF

If the input value exceeds the display limit (-199.9 to 999.9), though it is within the control range (EERR) will be displayed under -199.9 and (E333) above 999.9. Under these conditions, control output and alarm output will operate normally.

Refer to E5CN/AN/EN/NGN User's Manual Basic Type (Cat. No. H156) for details of control range.

*2: Error shown only for "Process value / Set point". Not shown for other status.

Other functions

For details about advanced function setting level or manual control level, refer to E5CN/E5AN/E5EN/NGN Digital Temperature Controllers User's Manual Basic Type (Cat. No. H156).

For communications details, refer to E5CN/AN/EN/NGN Digital Temperature Controllers Communications Manual Basic Type (Cat. No. H158).

Initial Setting Level (Control/alarm are both stopped.)

Operation Level

Adjustment Level

Only the value set to the **L25**: Temperature Input Shift parameter is applied to the entire temperature input range. When the process value is 200°C, the process value is treated as 201.2°C after input shift if the input shift value is set to 1.2°C. The process value is treated as 198.8°C after input shift if the input shift value is set to -1.2°C.

*6: The grayed-out setting items may not be displayed according to the models and setting.

Protection function

Protection function, to prevent unwanted settings, restricts the setting items to be used or designates if operation of the key is valid or invalid.

Operation / Adjustment protection

The following table shows the relationship between settings and protect limits related to Operation level and Adjustment level.

Level	Set value			
	0	1	2	3
Operation level	Process value	○	○	○
	PV/SP	○	○	○
	Others	○	○	○
Adjustment level		○	○	○
		○	○	○

○: Can be displayed and changed
○: Can be displayed
x: Display or shifting to another level is not possible.

Default setting : 0

Initial setting/Communications protection

This protect level restricts movement to the initial setting level, communications setting level and advanced function setting level.

Set value	Initial setting level	Communications setting level	Advanced function setting level
0	○	○	○
1	○	○	x
2	x	x	x

○: Change to other levels possible
x: Change to other levels not possible

Default setting : 1

Setting change protection

Setting changes by key operation are restricted.

OFF OFF: Setting can be changed by key operation

ON ON: Setting cannot be changed by key operation (OT will light.)

(Protect level settings can all be changed.)

AT (auto-tuning)

• AT in Adjustment level

Designate "Rt -2": 100% AT execute" or "Rt -1: 40% AT execute" to execute AT and "OFF": AT cancel" to cancel AT. 100%AT Execute "Rt-2" flashes

Also when AT execution ends, the display automatically returns to "OFF".

AT (auto-tuning)

OMRON EUROPE B.V.
Wegalaan 67-69, NL-2132 JD Hoofddorp The Netherlands
Phone 31-2356-81-300
FAX 31-2356-81-388
OMRON ELECTRONICS LLC
One Commerce Drive Schaumburg, IL 60173-5302 U.S.A
Phone 1-847-843-7900
FAX 1-847-843-7787
OMRON ASIA PACIFIC PTE. LTD.
No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark, Singapore 119967
Phone 65-6835-3011
FAX 65-6835-2711

OMRON Corporation
Shiojiko Horikawa, Shimogyo-ku, Kyoto, 600-8530 Japan

