



Two-Degree-of-Freedom PID Temperature Controllers

TN Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death

- 01. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.**(e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, economic loss or fire.
- 02. Do not use or store the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- 03. Install on a device panel to use.**
Failure to follow this instruction may result in electric shock.
- 04. Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire or electric shock.
- 05. Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.
- 06. Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire or electric shock.

⚠ Caution Failure to follow instructions may result in injury or product damage

- 01. When connecting the power input and relay output, use AWG 20 (0.50 mm²) cable or over, and tighten the terminal screw with a tightening torque of 0.74 to 0.90 N m.**
When connecting the sensor input and communication cable without dedicated cable, use AWG 28 to 16 cable and tighten the terminal screw with a tightening torque of 0.74 to 0.90 N m.
Failure to follow this instruction may result in fire or malfunction due to contact failure.
- 02. Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage
- 03. Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire or electric shock.
- 04. Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
Failure to follow this instruction may result in fire or product damage.

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- Check the polarity of the terminals before wiring the temperature sensor. For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length. For thermocouple (TC) temperature sensor, use the designated compensation wire for extending wire.
- Keep away from high voltage lines or power lines to prevent inductive noise. In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line. Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Do not apply excessive power when connecting or disconnecting the connectors of the product.

- 1 character of ModBus RTU is fixed at 11 bit.

Input Type and Using Range

The setting range of some parameters is limited when using the decimal point display.

Input type		Decimal point	Display	Using range (°C)	Using range (°F)
Thermo-couple	K (CA)	1	K C R H	-200 to 1,350	-328 to 2,462
		0.1	K C R L	-199.9 to 999.9	-199.9 to 999.9
	J (IC)	1	J I C H	-200 to 800	-328 to 1,472
		0.1	J I C L	-199.9 to 800.0	-199.9 to 999.9
	E (CR)	1	E C R H	-200 to 800	-328 to 1,472
		0.1	E C R L	-199.9 to 800.0	-199.9 to 999.9
	T (CC)	1	E C C H	-200 to 400	-328 to 752
		0.1	E C C L	-199.9 to 400.0	-199.9 to 752.0
	B (PR)	1	b P R	0 to 1,800	32 to 3,272
	R (PR)	1	R P R	0 to 1,750	32 to 3,182
	S (PR)	1	S P R	0 to 1,750	32 to 3,182
	N (NN)	1	N N N	-200 to 1,300	-328 to 2,372
	C (TT) ⁰¹⁾	1	C E E	0 to 2,300	32 to 4,172
	G (TT) ⁰²⁾	1	G E E	0 to 2,300	32 to 4,172
	L (IC)	1	L I C H	-200 to 900	-328 to 1,652
		0.1	L I C L	-199.9 to 900.0	-199.9 to 999.9
	U (CC)	1	U C C H	-200 to 400	-328 to 752
		0.1	U C C L	-199.9 to 400.0	-199.9 to 752.0
	Platinel II	1	P L I I	0 to 1,390	32 to 2,534
	L (RUS)	1	L R H	-200 to 800	-328 to 1,472
		0.1	L R L	-199.9 to 800.0	-199.9 to 999.9
RTD	Cu50 Ω	0.1	C U S	-199.9 to 200.0	-199.9 to 392.0
	Cu100 Ω	0.1	C U I D	-199.9 to 200.0	-199.9 to 392.0
	JPt100 Ω	1	J P E H	-200 to 650	-328 to 1,202
		0.1	J P E L	-199.9 to 650.0	-199.9 to 999.9
	DPT50 Ω	0.1	d P E S	-199.9 to 600.0	-199.9 to 999.9
	DPT100 Ω	1	d P E H	-200 to 650	-328 to 1,202
		0.1	d P E L	-199.9 to 650.0	-199.9 to 999.9
Nickel120 Ω	1	N I I Z	-80 to 260	-112 to 500	
Analog	0 to 10 V	-	R V I	0 to 10 V	
	0 to 5 V	-	R V Z	0 to 5 V	
	1 to 5 V	-	R V Z	1 to 5 V	
	0 to 100 mV	-	R H V I	0 to 100 mV	
	0 to 20 mA	-	R H A I	0 to 20 mA	
	4 to 20 mA	-	R H A Z	4 to 20 mA	

• Permissible line resistance per line: ≤ 5 Ω

01) C (TT): Same as existing W5 (TT) type sensor

02) G (TT): Same as existing W (TT) type sensor

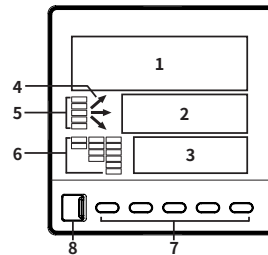
Display accuracy

Input type	Using temperature	Display accuracy
Thermo-couple RTD	At room temperature (23°C ±5°C)	(PV ±0.2% or ±1 °C higher one) ±1-digit • Thermocouple K, J, T, N, E below -100 °C and L, U, PLII, RTD Cu50 Ω, DPT50 Ω: (PV ±0.3% or ±2 °C higher one) ±1-digit • Thermocouple C, G and R, S below 200 °C: (PV ±0.3% or ±3 °C higher one) ±1-digit • Thermocouple B below 400 °C: There is no accuracy standards
	Out of room temperature range	(PV ±0.5% or ±2 °C higher one) ±1-digit • RTD Cu50 Ω, DPT50 Ω: (PV ±0.5% or ±3 °C higher one) ±1-digit • Thermocouple R, S, B, C, G: (PV ±0.5% or ±5 °C higher one) ±1-digit • Other sensors: ≤ ±5 °C (≤-100 °C)
Analog	At room temperature (23°C ±5°C)	±0.2% F.S. ±1-digit
	Out of room temperature range	±0.5% F.S. ±1-digit

Unit Descriptions

• Below is based on TNL Series.

• The shape and function of each part may be different depending on the series, and it is possible to check the additional information in the user manual.



1. PV display part (White)

• RUN mode: Displays PV (Present value) and unit.
• Setting mode: Displays parameter name

2. SV display part (Green)

• RUN mode: Displays SV (Setting value) and unit.
• Setting mode: Displays parameter setting value.

3. Operating value display part (Yellow)

• RUN mode: Displays selected value among MV (Manipulated output value), P/S, TM, CT with unit.

4. Temperature control indicator

• Fixed control: Relative PV value status display based on SV
PV > SV (↗), PV = SV (→), PV < SV (↘)
• Program control: Displays temperature control status of up (↗), hold (→), down (↘).

7. Input key

Display	Name	Description
LOCK	Lock	Turns ON during key lock status.
PROG	Program	Turns ON during program control.
WAIT	Wait	Turns ON during waiting status.
HBA1/2	Heater break alarm	Turns ON when the heater break alarm output is ON.

Display	Name
[U]	User key
[M]	Mode key
[◀], [▼], [▲]	Setting value control key

8. PC loader port

For connecting communication converter (SCM-USP).

6. Output status indicator

Display	Name	Description
OUT1/2	Control output	Turns ON when the control output is ON
AT	Auto tuning	Flashes during auto tuning every 1 sec
MAN	Manual control	Turns ON during manual control mode
STOP	Control output stop	Turns ON during control output stop mode
HOLD	Program control hold	Turns ON when program control is hold status
AL1 to 6	Alarm output	Turns ON when the alarm output is ON

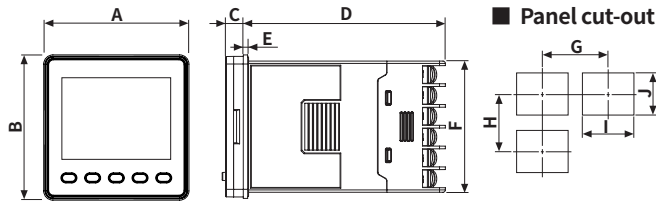
Errors

Display	Input	Description	Output	Troubleshooting
OPEN	Temperature sensor	Flashes at 0.5 sec interval when input sensor is disconnected or sensor is not connected.	'Sensor error, MV' parameter setting value	Check input sensor status.
	Analog	Flashes at 0.5 sec interval when input is over F.S. ±10%.	'Sensor error, MV' parameter setting value	Check analog input status.
HHHH	Temperature sensor	Flashes at 0.5 sec interval if the input value is above the input range. ⁰¹⁾	Heating: 0%, Cooling: 100%	When input is within the rated input range, this display disappears.
	Analog	Flashes at 0.5 sec interval if the input value is over 5 to 10% of high limit or low limit value.	Normal output	
LLLL	Temperature sensor	Flashes at 0.5 sec. interval if the input value is below the input range. ⁰¹⁾	Heating: 100%, Cooling: 0%	
	Analog	Flashes at 0.5 sec interval if the input value is over 5 to 10% of low limit or high limit value.	Normal output	
ERR	-	Flashes at 0.5 sec interval if there is error for setting and it returns to the error-before screen.	-	Check setting method.
EMRE	-	Flashes twice and stops operation at the start of operation if the timer operation related parameter setting is not completed.	'STOP, MV' parameter setting value	Set the timer operation related parameters.
PENE	-	Flashes twice and stops operation at the start of operation if the program operation related parameter setting is not completed.	'STOP, MV' parameter setting value	Set the program operation related parameters.
ER□□	-	Flashes twice the address of failed Slave when using Sync communication or PLC setting copy function.	-	Check the failed slave connection status and communication settings.

01) Be careful that when HHHH / LLLLL error occurs, the control output may occur by recognizing the maximum or minimum input depending on the control type.

Dimensions

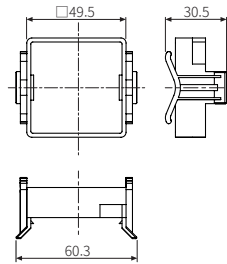
- Unit: mm, For the detailed drawings, follow the Autonics website.
- Below is based on TNS Series.



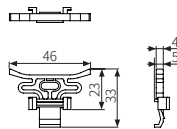
	Body						Panel cut-out			
	A	B	C	D	E	F	G	H	I	J
TNS	49	49	6	69	1.5	44.8	≥ 65	≥ 65	45 ^{+0.6} ₀	45 ^{+0.6} ₀
TNH	49	97	6	69	1.5	91.5	≥ 65	≥ 115	45 ^{+0.6} ₀	92 ^{+0.8} ₀
TNL	97	97	6	69	1.5	91.5	≥ 115	≥ 115	92 ^{+0.8} ₀	92 ^{+0.8} ₀

Bracket

TNS

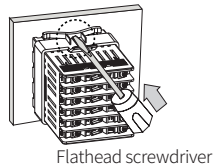


Other series



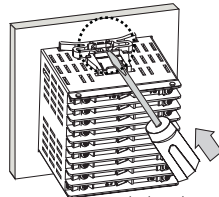
Installation Method

TNS



Flathead screwdriver

Other series



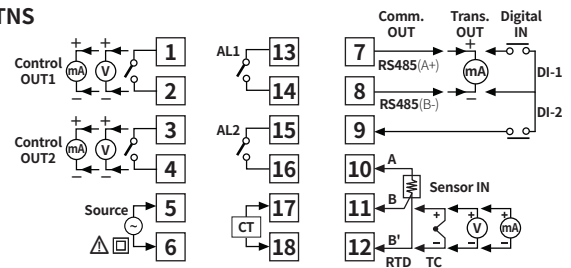
Flathead screwdriver

Insert the unit into a panel, fasten the bracket by pushing with tools with a flathead screwdriver.

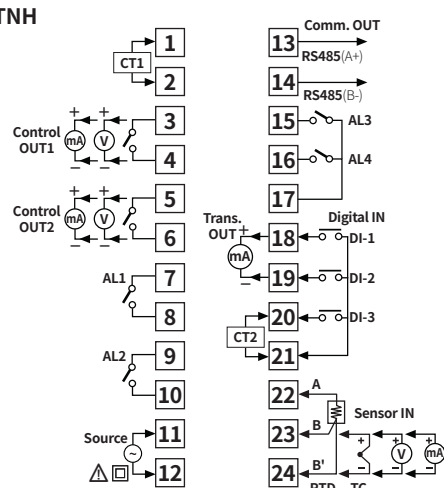
Connections

- Digital input is not electrically insulated from internal circuits, so it should be insulated when connecting other circuits.

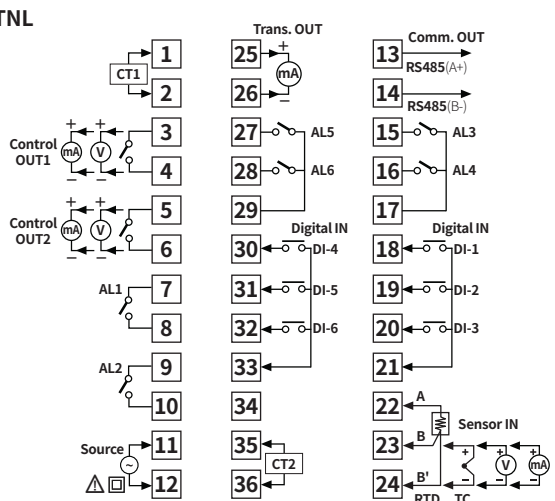
TNS



TNH

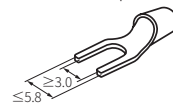


TNL

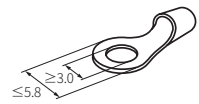


Crimp Terminal Specifications

- Unit: mm, Use the crimp terminal of follow shape.



Fork crimp terminal



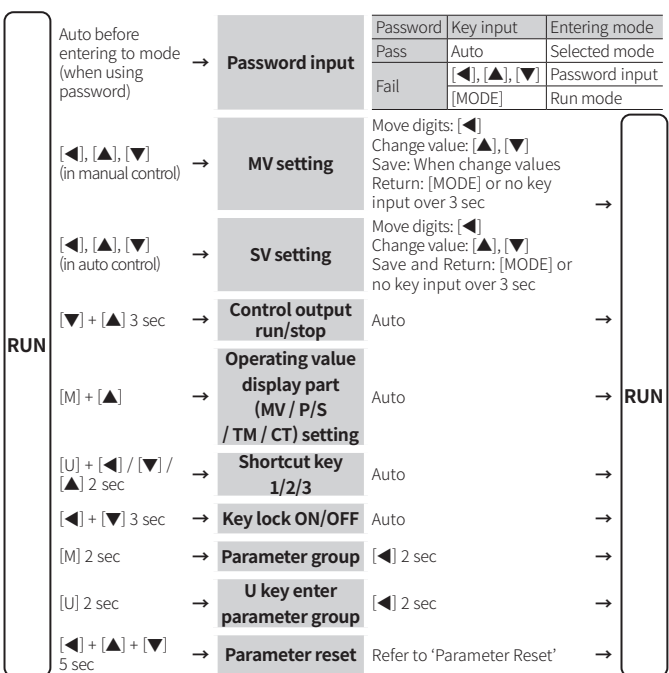
Round crimp terminal

Initial Display When Power is ON

When power is supplied, after all display will flash for 1 sec, model name is displayed sequentially. After input sensor type will flash twice, enter into RUN mode.

Display part	1. Model	2. Model	3. Input specification	4. RUN mode
PV	ENSP	RS	TYPE	OPEN
SV	42RR	006	KCRH	0

Mode Setting



• TNS series does not support 'MV setting', 'Operation value display part setting' mode. For the details, refer to the user manual.

Parameter Reset

01. Press the [◀] + [▲] + [▼] keys for over 5 sec. in run mode, INIT turns ON.
02. Change the setting value as YES by pressing the [▲], [▼] keys.
03. Press the [M] key to reset all parameter values as default and to return to run mode.

Function: Alarm

Alarm output sets alarm operation and alarm option.
Each alarm operates individually in two alarm output models.
When the current temperature is out of alarm range, alarm clears automatically.

- **H:** Alarm output hysteresis

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Mode	Name	Alarm operation	Description
OFF	-	-	No alarm output
dVCL	Deviation high limit		If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
JJdV	Deviation low limit		If deviation between PV and SV as low limit is higher than set value of deviation temperature, the alarm output will be ON.
JdVCL	Deviation high, low limit		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
CLdVJ	Deviation high, low limit reverse		If deviation between PV and SV is higher than the lower limit deviation set value and less than the upper limit deviation set value, the alarm output will be ON.
PvCL	Absolute value high limit		If PV is higher than the absolute value, the output will be ON.
JJPv	Absolute value low limit		If PV is lower than the absolute value, the output will be ON.

Mode	Name	Description
L b R	Loop break alarm	Loop break detection, alarm output turns ON.
S b R	Sensor break alarm	Sensor break detection, alarm output turns ON.
H b R 1	Heater break alarm	At CT1, heater break detection, alarm output turns ON.
H b R 2	Heater break alarm	At CT2, heater break detection, alarm output turns ON.
R U N	Control output ON	Control output ON, alarm output turns ON.
S t o P	Control output OFF	Control output OFF, alarm output turns ON.
P A U S E	Control output PAUSE	Control output PAUSE, alarm output turns ON.
P S E	Pattern control start	Pattern control start, alarm output turns ON. It is also output in case of repeat start.
P E N d	Pattern control end	Pattern control end, alarm output turns ON.
P o e	Pattern control delay point	If the total operation time of the pattern is exceeded, alarm output turns ON at the time of exceeding.
S S E	Step start notice	Step start, alarm output turns ON.
S E N d	Step end notice	Step end, alarm output turns ON.
S o e	Step delay point notice	If the step operation time is exceeded, the alarm output turns ON at the time of exceeding.

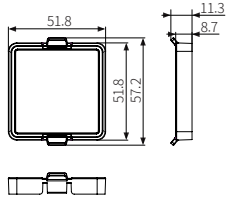
■ Option

Mode	Name	Description	Condition of reapply
$R_L - a$	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.	-
$R_L - b$	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status.	-
$R_L - C$	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.	Power ON
$R_L - d$	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.	
$R_L - E$	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.	Power ON, change SV, change alarm temperature / operation or change STOP to RUN mode
$R_L - F$	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence 1. It operates not only by power ON/OFF, but also alarm set value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.	

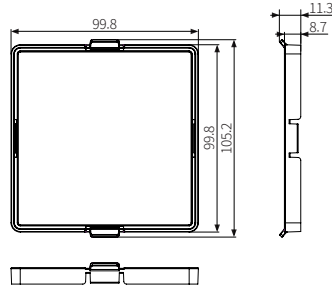
Sold Separately: Front Cover

• Unit: mm

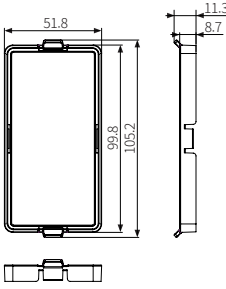
■ TNS: FSA-COVER



■ TNL: FLA-COVER



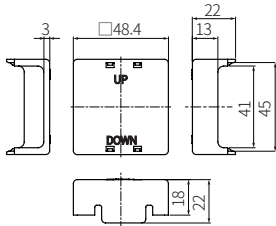
■ TNH: FHA-COVER



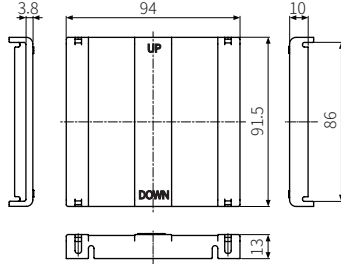
Sold Separately: Terminal Protection Cover

• Unit: mm

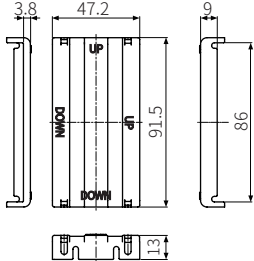
RSA-COVER: DIN W48 × H48



RLA-COVER: DIN W96 × H96



RHA-COVER: DIN W48 × H96

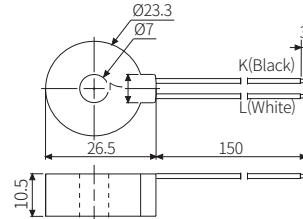


Sold Separately: Current Transformer (CT)

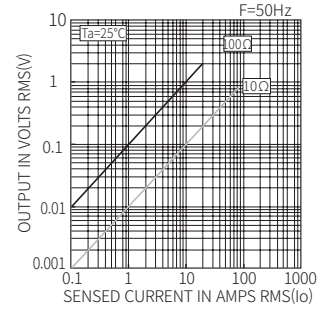
• Unit: mm

- The current for above CTs is 50A same but inner hole sizes are different. Please use this for your environment.
- Do not supply primary current in case that CT output is open. High voltage will be generated in CT output.

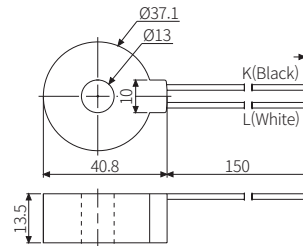
CSTC-E80LN



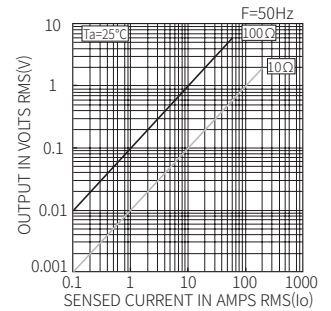
- Max. load current: 80A (50/60Hz)
- Current ratio: 1/1000
- Wire-wound resistance: $31\Omega \pm 10\%$



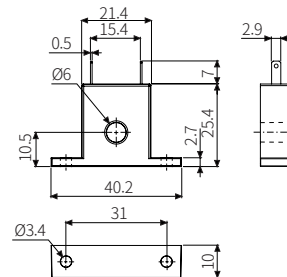
CSTC-E200LN



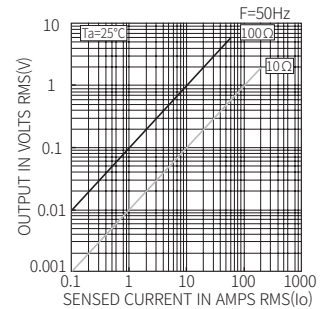
- Max. load current: 200A (50/60Hz)
- Current ratio: 1/1000
- Wire-wound resistance: $20\Omega \pm 10\%$



CSTS-E80PP



- Max. load current: 80A (50/60Hz)
- Current ratio: 1/1000
- Wire-wound resistance: $31\Omega \pm 10\%$



Segment Table

The segments displayed on the product indicate the following meanings. It may differ depending on the product.

7 Segment	11 Segment	12 Segment	16 Segment
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
A	A	A	A
b	b	b	b
c	c	c	c
d	d	d	d
E	E	E	E
F	F	F	F
G	G	G	G
H	H	H	H
I	I	I	I
J	J	J	J
K	K	K	K
L	L	L	L
M	M	M	M
N	N	N	N
O	O	O	O
P	P	P	P
Q	Q	Q	Q
R	R	R	R
S	S	S	S
T	T	T	T
U	U	U	U
V	V	V	V
W	W	W	W
X	X	X	X
Y	Y	Y	Y
Z	Z	Z	Z