

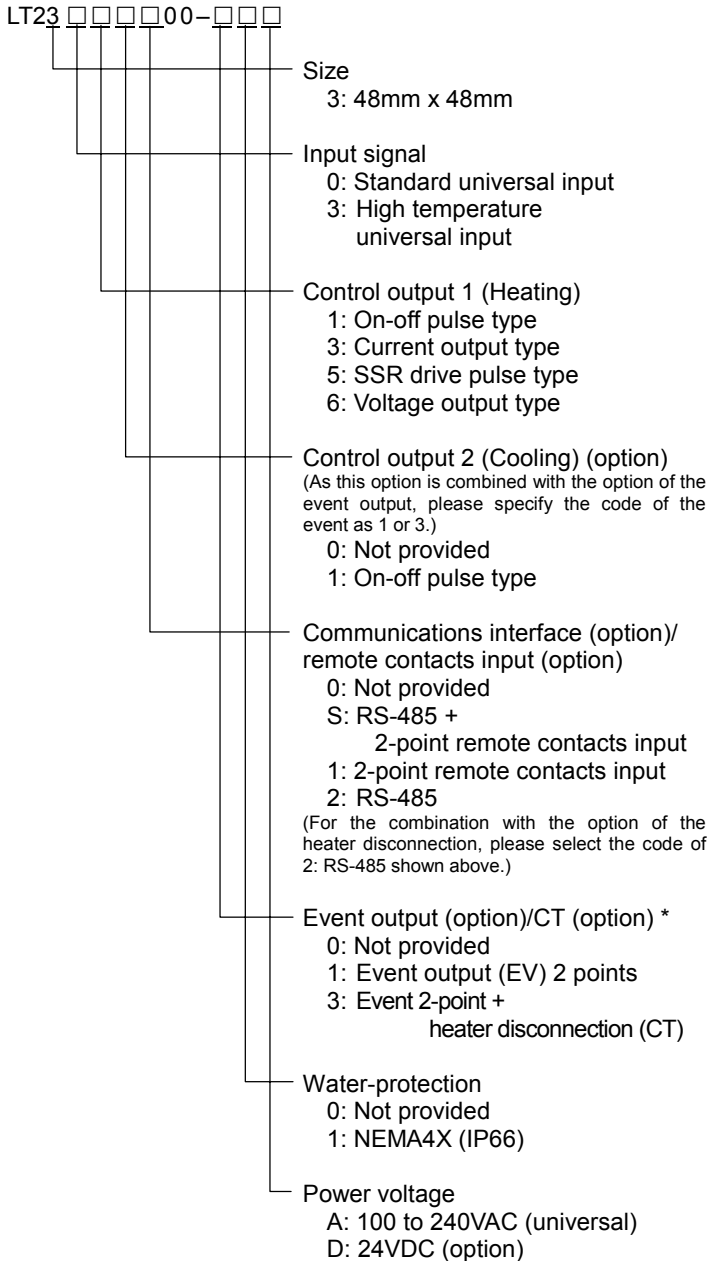
DIGITAL INDICATING CONTROLLER

LT230 Series

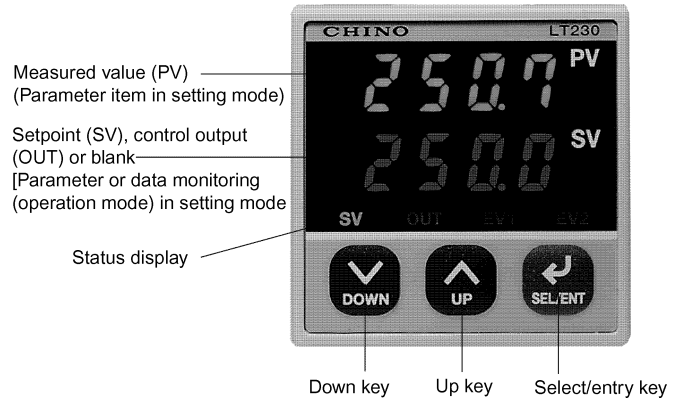


LT230 series, 1/16 DIN size, new digital indicating controllers feature all functions including newly developed PID algorithms and overshoot suppression function which are convenient in various control applications.

MODEL



- * 1. For the combination with the control output 2, the event output point becomes 1.
- 2. The heater disconnection (CT) is only applied to the control output 1 of on-off pulse type or SSR drive pulse type.
- 3. The heater disconnection (CT) cannot be combined with the remote contacts input.



FEATURES

- Two kinds of universal input (Standard and for high temperature)
- New PID algorithms built-in
- New overshoot suppression function built-in
- MODBUS protocol communications for easy system configuration
- Various functions are built in for easy control.
- Only 7mm thickness of the front panel
- Conformance to CE, UL and CSA (UL, CSA: Approval pending)
- Water-protection conforming to NEMA250 4X (IEC529 IP66) (option)

MEASURING RANGES

Input type	Input range		STD	HIGH
T/C	B	0.0 to 1820°C	32 to 3300°F	○ ○
	R	0.0 to 1760°C	32 to 3200°F	○ ○
	S	0.0 to 1760°C	32 to 3200°F	○ ○
	N	0.0 to 1300°C	32 to 2350°F	○ ○
	K	-200 to 1370°C	-300 to 2450°F	○ ○
	E	-199.9 to 700.0°C	-300 to 1250°F	○ —
	J	-199.9 to 900.0°C	-300 to 1650°F	○ —
	T	-199.9 to 400.0°C	-300 to 700°F	○ —
	U	-199.9 to 400.0°C	-300 to 700°F	○ —
	L	-199.9 to 900.0°C	-300 to 1650°F	○ —
	WRe5-WRe26	0 to 2310°C	32 to 4190°F	— ○
	W-WRe26	0 to 2310°C	32 to 4190°F	— ○
	PtRh40-PtRh40	0 to 1880°C	32 to 3400°F	— ○
Platinel II	0 to 1390°C	32 to 2500°F	— ○	
RTD	Pt100	-199.9 to 850.0°C	-300 to 1500°F	○ ○
	JPt100	-199.9 to 649.0°C	-300 to 1200°F	○ ○
DC voltage	5V	0 to 5V (0.000 to 5.000)	Scaling setting range: -19999 to 20000 Decimal place can be adjusted.	○ ○
DC current	20mA *	4 to 20mA (1.000 to 5.000 - Converted into voltage value)		○ ○

Note: For the current input, a 250Ω shunt resistor (sold separately) is required.
The ranges marked with ○ are built in.

■ SPECIFICATIONS

INPUT SPECIFICATIONS

Input signal:

- Thermocouple ...
 - Standard universal input:
 - B, R, S, N, K, E, J, T, U, L
 - High temperature universal input:
 - B, R, S, N, K, WRe5-WRe26, W-WRe26, PtRh40-PtRh20, Platinel II
- Resistance thermometer ... Pt100, JPt100
- DC voltage ... 0 to 5V
- DC current ... 4 to 20mA [By using a 250Ω shunt resistor (sold separately) and 5V range (1 to 5V)]

Measuring range:

Refer to the list of measuring ranges.

Accuracy ratings:

±0.25% of measuring range ± 1 digit (at reference operation conditions)
Refer to the details of accuracy ratings.

Reference junction compensation accuracy:

±1.0°C (23°C ± 10°C), ±2.0°C (-10 to 50°C)

Temperature unit:

°C or °F

Sampling period:

Approx. 0.5 second

Burnout:

Up scale (thermocouple input/resistance thermometer input)

Allowable signal source resistance:

Thermocouple ... 250Ω or less
Voltage input ... 1kΩ or less
Resistance thermometer input ... 10Ω or less (per wire)

Input resistance:

Thermocouple/DC voltage ... 1MΩ or more
DC current ... Approx. 250Ω

Measuring current:

Resistance thermometer ... Approx. 110μA

Measuring input shift (sensor correction):

Can be set by the resolution being 0.1 times the setting resolution of SV (-1999 to 9999)

Digital filter:

0.0 to 99.9 seconds

Scaling:

Range/scale of DC voltage/current input (-1999 to 9999), optional setting

Scale decimal point:

0 to 3

Maximum allowable input range:

DC voltage ... ±10VDC
Resistance thermometer ... ±5VDC

Maximum common mode voltage:

30VAC

Common mode rejection ratio:

130dB or more (50/60Hz) (signal source resistance 1Ω or less)

Series mode rejection ratio:

50dB or more (50/60Hz) (signal source resistance 1Ω or less)

CONTROL SPECIFICATIONS

Control cycle time:

Approx. 0.5 second

Control system:

On-off pulse type PID system
Current output type PID system
SSR drive pulse type PID system
Voltage output type PID system
* 2-position control can be selected.

Control setpoint:

2 sets switching, 4-digit setting

Setpoint limiter:

Within measuring range

Setpoint ramp function:

Setpoint ramp unit ... °C/minute (common to rising/falling)
Setpoint rising ramp ... 0 to 9999 (0 = no operation)
Setpoint falling ramp ... 0 to 9999 (0 = no operation)
PV start function ... At SV change, power-on, Run/Ready

Control setpoint accuracy ratings:

Relative error to displayed value ... ± 1 digit

Auto-tuning:

Standard (Manual setting of PID constants enabled)

PID constants:

P ... 0.1 (0.0) to 999.9% (0 = 2-position)
I ... 0 to 9999 seconds
D ... 0 to 9999 seconds

PID deadband (gap):

0.0 to 9.9%

Anti-reset windup:

High limit ... 0.0 to 100.0%
Low limit ... -100.0 to 0.0%

Overshoot suppression function:

ON/OFF selectable

Control operation:

With direct/reverse action switching

Output specifications:

- On-off pulse type
 - Output signal ... On-off pulse conductive signal
 - Contact ratings ...
 - Resistive load 100VAC 3A, 240VAC 3A, 30VDC 3A
 - Inductive load 100VAC 1.5A, 240VAC 1.5A, 30VDC 1.5A
 - Electrical relay life ... More than 100,000 times
 - Pulse cycle ... Approx. 1 second to 180 seconds adjustable
 - Contact protection element ... Not built-in [If required, add a contact protection element (sold separately) externally.]
- Current output type
 - Output signal ... 4 to 20mADC
 - Load resistance ... 600Ω or less
- SSR drive pulse type
 - Output signal ... On-off pulse voltage signal
 - At ON 12VDC ± 20% (load current ... 20mA or less)
 - At OFF 0.8VDC or less
 - Pulse cycle ... Approx. 1 second to 180 seconds adjustable
- Voltage output type
 - Output signal ... 0 to 10VDC
 - Output resistance ... Approx. 10Ω
 - Load resistance ... 50kΩ or more
- Output limiter:
 - 1 set
 - High limit ... 0.0 to 105.0%
 - Low limit ... -5.0 to 100.0%
- Output variation limiter:
 - 0.1 to 100.0%
- Output preset:
 - 100.0 to 100.0%
- Run/Ready:
 - Run/ready (control stop, output: preset output value) switching
- Preset output:
 - 5.0 to 105.0%
- Control at power recovery:
 - Continuous/ready switching

EVENT SPECIFICATIONS

Event calculation:

2 points

Event output point:

None (standard)
[2-point relay output (EV1/EV2) can be added as an option.]

Event type:

Setting to each of Event 1/2
Absolute value alarm ... High/low, standby enable/disable
Deviation alarm ... High/low, standby enable/disable
Absolute value deviation alarm ... High/low, standby enable/disable
Output value alarm ... High/low, standby enable/disable
FAIL, heater disconnection alarm, timer function (EV1/EV2 only)

Event setpoint:

Event 1/2 individual setting

Event deadband:

Can be set by the resolution being 0.1 times the setting resolution of SV,
Setting to each Event 1/2

Event output phase:

Normal/reverse switching

Event output at Ready:

Off/computation switching

DISPLAY SPECIFICATIONS

Display type:

4-digit seven-segment LED display, two lines
Status display ... 4 independent LEDs

Display content:

First LED (green) display ...

- At operation mode: Measured value (PV)
- At setting mode: Parameter item

Second LED (red) display ...

- At operation mode: Setpoint (SV) or control output value (OUT)
- At setting mode: Parameter

Status (red/green) ...

- EV1 (red): Lights when EV1 is activated.
- EV2 (red): Lights when EV2 is activated.
- SV (green): Lights when the SV is displayed in the second display.
- OUT (green): Lights when the control output value is displayed in the second display.

Operation mode display:

No display function of the operation mode screen, 5 levels

Automatic return:

Returns to operation mode if any key is not pressed for more than 1 minute in setting mode.

Password:

No display function of the setting mode screen by a password, 3 levels

Key lock:

Locking function of parameters, 5 levels

GENERAL SPECIFICATIONS

Rated power voltage:

- 100 to 240VAC 50/60Hz (universal)
- * 24VDC power voltage is available as an option.

Allowable power voltage:

90 to 264VAC

Power consumption:

Approx. 10VA

Operation conditions:

Operation	Reference condition	Normal condition
Ambient temperature	23°C ± 2°C	-10 to 50°C (Max. 40°C for closed-installation)
Ambient humidity	55% ± 5%RH (No dew condensation)	20 to 90%RH (No dew condensation)
Power supply	100VAC ± 1%, 24VDC	90V to 264VAC, 24VDC ± 10%
Power frequency	50Hz/60Hz ± 1%	50Hz/60Hz ± 2%
Mounting angle	Forward/backward ±3° or less	Forward/backward ±10° or less
Vibration/impact	0m/s ² / 0m/s ²	2m/s ² / 0m/s ²

Ambient temperature change ratio:

10°C/H or less

Warm-up time:

30 minutes or more

Power interruption:

Parameters are memorized by EEPROM (Writing: Approx. 1,000,000 times).

Insulation resistance:

Between primary side terminals (*1) and secondary side terminals (*2) 20MΩ or more at 500VDC

Dielectric strength:

Between primary side terminals (*1) and secondary side terminals (*2) 1 minute at 1500VAC

*1 = Terminals of AC (L, N) power supply, control output, event output

*2 = Terminals except above and DC power supply (+, -)

Front and case:

Front ... Non-flammable ABS

Case ... Non-flammable polycarbonate resin

Color:

Gray

Installation:

Flush panel installation

Weight:

Approx. 200g

Transportation/storage condition (with packing at shipment):

Ambient temperature ... -20 to 60°C

Ambient humidity ... 5 to 95%RH (no dew condensation)

Vibration ... 0 to 4.9m/s² (10 to 60Hz)

Impact ... 400m/s² or less

INTERNATIONAL STANDARDS

CE:

EN61326+A1 *, EN61010+A2

UL:

UL3121-1 (approval pending)

CSA (C-UL):

C22.2, No. 1010 (approval pending)

NEMA:

NEMA250 4X (front panel: option) (equivalent to IEC529 IP66)

Note: Not available in closed-installation

* The display of the measured value and output may vary up to ±10% or ±2mV under the EMC test ambient.

ACCURACY RATINGS

Input		Accuracy ratings	Details
T/C	B	±0.25% ± 1 digit exception: ±0.5% ± 1 digit for -200°C to 0°C	Not specified for less than 400°C 400°C to 800°C: ±0.5% ± 1 digit
	R		0°C to 400°C: ±0.5% ± 1 digit
	S		0°C to 400°C: ±0.5% ± 1 digit
	N		
	K		
	E		
	J		
	T		
	U		
	L		
	WRe-WRe26		
	W-WRe26		0°C to 400°C: ±0.5% ± 1 digit
	Platinel II		
	PtRh40-PtRh20	±0.5% ± 1 digit	Not specified for less than 400°C 400°C to 800°C: ±0.5% ± 1 digit
RTD	Pt100	±0.25% ± 1 digit	
	JPt100		
DC voltage	V	±0.25% ± 1 digit	
DC current	mA	±0.25% ± 1 digit	By using the shunt resistor specified for current input

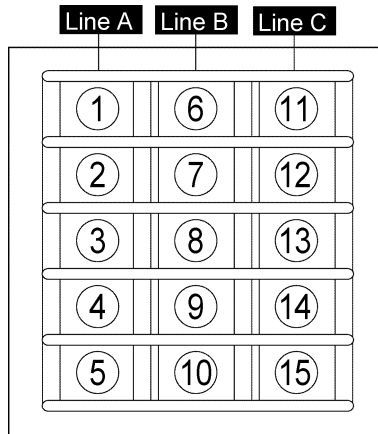
OPTIONS

Option	Contents
Communications interface (RS-485)	The setpoint and the measured value can be transmitted to a master CPU, and the parameters can be set by the master CPU. Protocol: MODBUS, RTU mode/Ascii mode switching, and private protocol Address: 01 to 99 Communications function: 1 kind to be specified from setting/data transmission, digital transmission, or digital remote * Parameters can be re-written approx. 1 million times.
Remote contacts input	The followings can be switched by the remote contacts input. Input point: 2 points (No-voltage contacts or transistor open collector) (Remote contacts rating ... 5VDC or more, 1mA or more) Function: The following functions are allocated by parameter settings. (1) Setpoint external switching (2) Run/ready switching, (3) Timer start-up (4) Remote/local switching
Control output 2 (Heating/cooling)	Control calculation: Matching computation/cooling proportion computation switching Matching computation parameters • Split direct ... 0.0 to 60.0% • Split reverse ... 40.0 to 100.0% Cooling proportion computation parameters • Cooling proportional band coefficient ... 0.00 to 10.00 • Deadband ... -50.0 to 50.0% Pulse cycle: 1 second to 180 seconds (cooling side)
Event output	Event output point: Relay output 2 points (EV1/EV2) Contact ratings: Resistive load 100VAC 3A, 240VAC 3A, 30VDC 3A Inductive load 100VAC 1.5A, 240VAC 1.5A, 30VDC 1.5A Minimum load 5VDC or more, 10mADC or more Electrical relay life ... More than 100,000 times Contact protection element ... Not built-in [If required, add a contact protection element (sold separately) externally.]
Heater disconnection detection	Function to detect the heater disconnection by CT input (CT: separate purchase required) Input signal: 5.0 to 50.0AAC (50/60Hz) Input accuracy: ±5% of full scale ± 1 digit Resolution: Approx. 1/100 CT: Model CTL-6-S-H is required.
Water-protection	For water-protection of the front panel, a rubber packing is inserted between a controller and a panel board. NEMA250 4X (equivalent to IEC529, IP66) Note) This option cannot be applied to closed-installation.
DC voltage power drive	Power voltage: 24VDC ± 10% [To be supplied from (class 2)] Power consumption: Maximum 6W

ACCESSORIES (Separate purchase is required.)

Accessory	Remarks
CT (current transformer)	Recommendation: Model CTL-6-S-H
Terminal cover	The depth is extended to 115mm by the terminal cover.
Shunt resistor for current input (250Ω)	For measurement by DC current of 4 to 20mA

■ TERMINAL BOARD



Note) 1. All terminal screws are M3.5.
2. For Y-tip or O-tip, use it with the outside dimension of 7mm or less.

Line A Control output 1

No.	On-off pulse type	SSR drive pulse type Current output type Voltage output type
①	COM	+
②	NO	-

Measuring input

No.	Voltage (Current)	Thermocouple	Resistance thermometer
③	/	/	A
④	+	+	B
⑤	-	-	B

* For current input
Connect a shunt resistor (250Ω, sold separately) to + and - terminals.

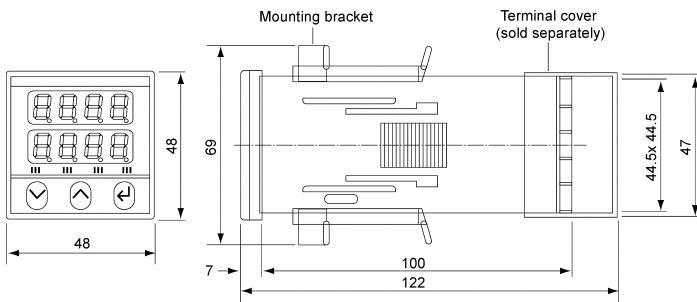
Line B Communications/remote contacts input/CT input

No.	RS-485	Remote contacts input	CT input
⑥	SA	/	/
⑦	SB	/	/
⑧	SG	DI-COM	/
⑨	/	D11+	CT
⑩	/	D12+	CT

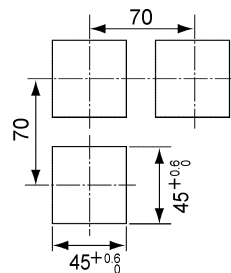
Line C Event output/control output 2/power supply

No.	Event output	Control output 2 + event output	AC power	DC power
⑪	EV1	EV1	/	/
⑫	EV2	NO	/	/
⑬	COM1/2	COM	/	/
⑭	/	/	L (live)	+
⑮	/	/	N (neutral)	-

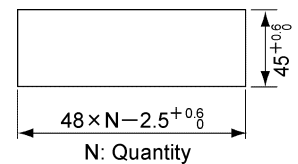
■ DIMENSIONS AND PANEL CUTOUT (Steel plate with thickness of 1 to 10mm is recommended for installation.)



• General installation



• Closed-installation panel dimension (Not applied to optional water-protection)



Unit: mm

Specifications subject to change without notice. Printed in Japan (I) 2002. 7

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