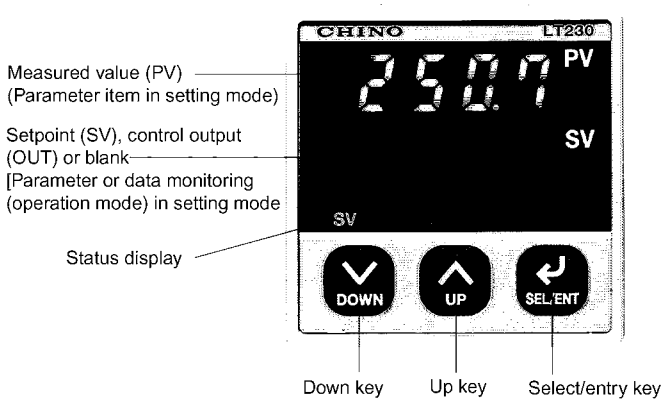
DIGITAL INDICATING CONTROLLER
LT230 Series

PERFORMANCE SPECIFICATION CHINO

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

LT23□□□□00–□□□

- Size
  - 3: 48mm x 48mm
- Input signal
  - 0: Standard universal input
  - 3: High temperature universal input
- Control output 1 (Heating)
  - 1: On-off pulse type
  - 3: Current output type
  - 5: SSR drive pulse type
  - 6: Voltage output type
- Control output 2 (Cooling) (option)
  (As this option is combined with the option of the event output, please specify the code of the event as 1 or 3.)
  - 0: Not provided
  - 1: On-off pulse type
- Communications interface (option)/ remote contacts input (option)
  - 0: Not provided
  - S: RS-485 + 2-point remote contacts input
  - 1: 2-point remote contacts input
  - 2: RS-485

  (For the combination with the option of the heater disconnection, please select the code of 2: RS-485 shown above.)
- Event output (option)/CT (option) *
  - 0: Not provided
  - 1: Event output (EV) 2 points
  - 3: Event 2-point + heater disconnection (CT)
- Water-protection
  - 0: Not provided
  - 1: IP65
- Power voltage
  - A: 100 to 240VAC (universal)
  - D: 24VDC (option)

* 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 IP65 (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/s^2 (10 to 60Hz)
Impact … 400m/s^2 or less

INTERNATIONAL STANDARDS

CE:
EN61326+A1 *, EN61010+A2

UL:
UL3121-1 (approval pending)

CSA (C-UL):
C22.2, No. 1010 (approval pending)

IP:
IEC529, IP65 (front panel: option)
Note) This option cannot be applied to 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

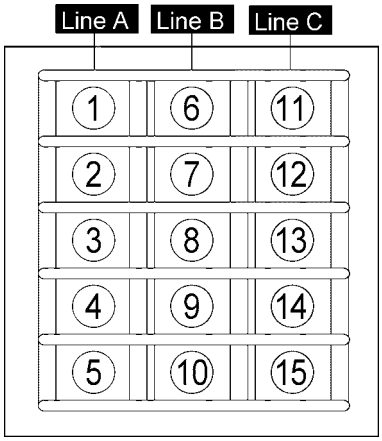
■ OPTIONS

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. IEC529, IP65 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.

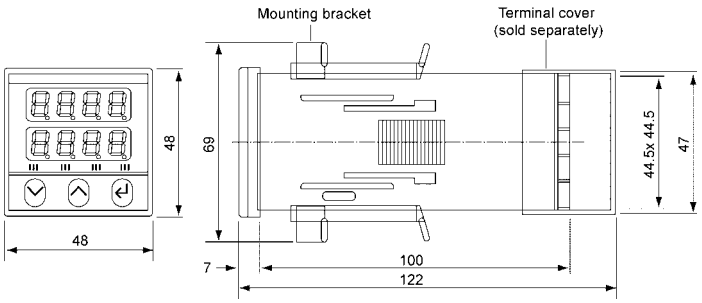
Line B **Communications/remote contacts input/CT input**

No.	RS-485	Remote contacts input	CT input
⑥	SA		
⑦	SB		
⑧	SG	DI-COM	
⑨		DI1+	CT
⑩		DI2+	CT

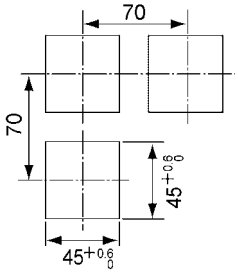
Line C **Event output/control output 2/power supply**

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)	−

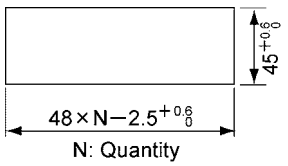
■ DIMENSIONS AND PANEL CUTOUT (Steel plate with thickness of 1 to 10mm is recommended for installation.)



• General installation



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



Unit: mm

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