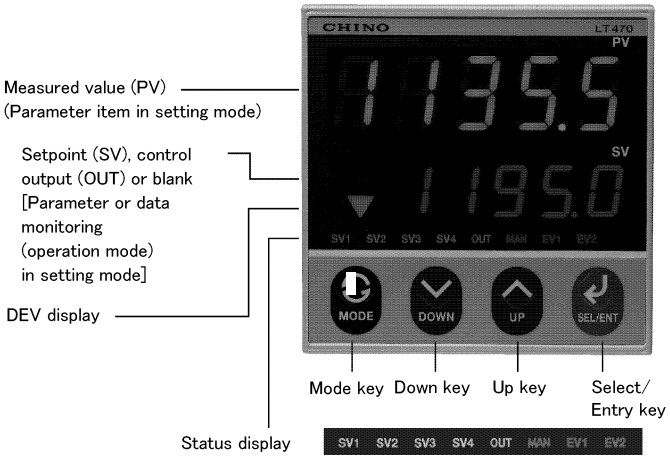
DIGITAL INDICATING CONTROLLER
LT470 SERIES

PERFORMANCE SPECIFICATION
CHINO

LT470 series, 1/4 DIN size, new digital indicating controllers feature all functions including 5-digit display, newly developed PID algorithms and the new learning type overshoot suppression function **JyroNavi** which are convenient in various control applications.



■ MODEL (The figure of 1 in □ shows a standard specification.)

LT47□ □ □ □ □ □ - □ □ □

Input signal
- 0: Universal input

Control output 1 (Heating)
- 1: On-off pulse type
- 2: On-off servo type
- 3: Current output type
- 5: SSR drive pulse type
- 6: Voltage output type
- U: Multiple control output type (On-off pulse type/current output type/SSR drive pulse type)

Control output 2 (Cooling) (option)
(This option cannot be applied to the Control output 1 of on-off servo type or multiple output type.)
- 0: Not provided
- 1: On-off pulse type
- 3: Current output type
- 5: SSR drive pulse type
- 6: Voltage output type

Remote contacts input (standard)/ Communications interface (option)
- 1: Remote contacts input 4 points (std)
- R: RS-232C (option)
- A: RS-422A (option)
- S: RS-485 (option)
- 0: Not provided (option)

(The remote contacts input is equipped as standard when you select a communications interface.)

Retransmission signal output
- 1: 4 to 20mA (standard)
- 2: 0 to 1V (option)
- 3: 0 to 10V (option)
- 0: Not provided (option)

Remote signal input (option)
(This option is combined with the option of 2-point additional event. When you select the remote signal input, please specify the code of additional event as 1 or 3.)
- 0: Not provided
- 5: 4 to 20mA
- 6: 0 to 1V
- 7: 0 to 10V

Additional event (option)/CT (option) *
- 0: Not provided
- 1: Event 2 points
- 2: Heater disconnection (CT)
- 3: Event 2-point + heater disconnection (CT)

Water-proof
- 0: Not provided
- 1: NEMA250 4X (IEC529 IP66)

Power voltage
- A: 100 to 240VAC (universal)

* The heater disconnection (CT) is only applied to the Control output 1 of on-off pulse type or SSR drive pulse type.

■ FEATURES

- High accurate setting by 5-digit display
- Universal input
- New PID algorithms built-in
- New learning type overshoot suppression function **JyroNavi** built-in
- MODBUS protocol communications for easy system configuration
- Remote contacts input and retransmission output are built-in as standard.
- 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-proof conforming to NEMA250 4X (equivalent to IEC529 IP66) (option)

■ MEASURING RANGES

Input type		Input range		
T/C	B	0.0 to 1820.0ºC	32 to 3300 ºF	
	R	0.0 to 1760.0ºC	32 to 3200 ºF	
	S	0.0 to 1760.0ºC	32 to 3200 ºF	
	N	0.0 to 1300.0ºC	32 to 2350 ºF	
	K	-200.0 to 1370.0ºC	-300 to 2450 ºF	
	E	-200.0 to 700.0ºC	-300.0 to 1250.0ºF	
	J	-200.0 to 900.0ºC	-300.0 to 1650.0ºF	
	T	-200.0 to 400.0ºC	-300.0 to 700.0ºF	
	U	-200.0 to 400.0ºC	-300.0 to 700.0ºF	
	L	-200.0 to 900.0ºC	-300.0 to 1650.0ºF	
	WRe5-WRe26	0 to 2310 ºC	32 to 4190 ºF	
	W-WRe26	0 to 2310 ºC	32 to 4190 ºF	
	PtRh40-PtRh20	0.0 to 1880.0ºC	32 to 3400 ºF	
	Platinel II	0.0 to 1390.0ºC	32 to 2500 ºF	
RTD	Pt100	-200.0 to 850.0ºC	-300.0 to 1500.0ºF	
	JPt100	-200.0 to 649.0ºC	-300.0 to 1200.0ºF	
DC voltage	20mV	0 to 20mV (0.00 to 20.00)	Scaling setting range: -19999 to 20000 Decimal place can be adjusted.	
	5V	0 to 5V (0.000 to 5.000)		
	10V	0 to 10V (0.000 to 10.000)		
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.

■ SPECIFICATIONS

INPUT SPECIFICATIONS

Input signal:
Thermocouple … B, R, S, N, K, E, J, T, U, L, WRe5-WRe26, W-WRe26, PtRh40-PtRh20, Platinel II
Resistance thermometer … Pt100, JPt100
DC voltage … 0 to 20mV, 0 to 5V, 0 to 10V
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.
Total of 20 kinds consisted of 14 kinds of thermocouple, 2 kinds of resistance thermometer, 3 kinds of dc voltage, and 1 kind of dc current

Accuracy ratings:
±0.1% of measuring range ± 1 digit (at reference operation conditions), exception PtRh40-PtRh20: ±0.3% ± 1 digit
Refer to the details of accuracy ratings.

Reference junction compensation accuracy:
±1.0ºC (23ºC ± 10ºC), ±2.0ºC (-10 to 50ºC)

Temperature unit: ºC or ºF

Sampling period: Approx. 0.2 second

Burnout: Up scale/down scale (selectable)

Allowable signal source resistance:
Thermocouple/mV input … 250Ω or less
V 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 … 1mA ± 20%

Measuring input shift (sensor correction):
Can be set with the resolution of 0.1 times the setting resolution of SV (-19999 to 20000)

Digital filter: 0.0 to 99.9 seconds

Scaling: Range/scale of DC voltage/current input (-19999 to 20000), optional setting

Scale decimal point: 0 to 4

Maximum allowable input range: DC voltage …±10VDC
RTD …±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. 0.2 second

Control system:
On-off pulse type PID system
Current output type PID system
SSR drive pulse type PID system
On-off servo type PID system
Voltage output type PID system
Multiple control type (on-off pulse type/current output type/SSR drive pulse type) PID system
* 2-position control is selectable.

Control setpoint: 4 sets switching, 5-digit setting

Setpoint limiter: Within measuring range

Setpoint ramp function:
Setpoint ramp unit … ºC/second, ºC/minute, ºC/hour (common to rising/falling)
Setpoint rising ramp: 0 to 20000 (0 = no operation)
Setpoint falling ramp: 0 to 20000 (0 = no operation)
PV start function … At SV change, power-on, MAN to AUTO, etc.

Control setpoint accuracy ratings:
Relative error to displayed value … ± 1 digit

Auto-tuning: Standard (Manual setting of PID constants enabled)

PID constants:
4 sets switching (interlocking to SV)
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% (4 sets switching, interlocking to SV)

Anti-reset windup:
High limit … 0.0 to 100.0%, Low limit … -100.0 to 0.0%

Overshoot suppression function:
On/off selectable (4 sets independent switching, interlocking to SV, independent keeping of learned results)

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 5A, 240VAC 5A, 30VDC 5A
  Inductive load 100VAC 2.5A, 240VAC 2.5A, 30VDC 2.5A
  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
- On-off servo type
  Output signal … On-off conductive signal
  Feedback resistance… 100Ω to 2.5kΩ
  Contact ratings …
  Resistive load 100VAC 5A, 240VAC 5A, 30VDC 5A
  Inductive load 100VAC 2.5A, 240VAC 2.5A, 30VDC 2.5A
  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.]
  Combination adjustment … Manual or auto-tuning
- Voltage output type
  Output signal … 0 to 10VDC
  Output resistance … Approx. 10Ω
  Load resistance … 50kΩ or more

Output limiter: 4 sets switching (interlocking to SV)
High limit … 0.0 to 105.0%, Low limit … -5.0 to 100.0%

Output variation limiter: 4 sets switching (interlocking to SV)
Rising … 0.1 to 100.0%, Falling … -100.0 to -0.1%

Output preset: -100.0 to 100.0%

PV error output: -5.0 to 105.0%

Run/Ready: Run/ready (control stop, output: preset output value) selectable

Preset output: -5.0 to 105.0%

Control at power recovery: Continuous/ready selectable

Auto-output/man-output (AUTO/MANUAL): Balanceless bumpless switching

EVENT SPECIFICATIONS

Event point: 2 points (Additional 2 points can be added. – option)

Event type:
Setting to each of Event 1/2
Absolute value alarm … High/low, standby enabled/disabled
Deviation alarm … High/low, standby enabled/disabled
Absolute value deviation alarm … High/low, standby enabled/disabled
Setpoint alarm … High/low, standby enabled/disabled
Output value alarm … High/low, standby enabled/disabled
Abnormal control loop, fail, heater disconnection alarm, timer function

Event setpoint: Event 1/2, 4 sets individual setting

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

Event delay: 0 to 9999 seconds

Event output phase: Normal/reverse selectable

Event output at Ready: Off/computation selectable

Event output:
Output signal … Form A relay output
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.]

RETRANSMISSION OUTPUT SPECIFICATIONS

Output signal being proportioned to the setpoint, the measured value, control output value, etc.

Output signal:
1 kind to be specified from 4 to 20mADC (load resistance … 400Ω or less), 0 to 1VDC, or 0 to 10VDC (output resistance … approx. 10Ω, load resistance … 50kΩ or more)

Output accuracy: ±0.2% of retransmission scale range

Output resolution: Approx. 1/30000

Retransmission scale: -19999 to 20000, optional setting

REMOTE CONTACTS INPUT SPECIFICATIONS

Following functions enabled by the remote contacts input

Input point: 4 points (No-voltage contacts or transistor open collector)
(Remote contacts rating …5VDC or more, 2mA or more)

Function:

The following functions are allocated by parameter settings.
(1) Setpoint external switching, (2) Auto/man external switching
(3) Run/ready switching, (4) Timer start-up, (5) Holding of the setpoint ramp operation, (6) Resetting of the setpoint ramp operation,
(7) Remote/local switching

DISPLAY/SETTING SPECIFICATIONS

Display type: 5-digit seven-segment LED display, two lines
Status display … 8 independent LEDs
Deviation display … 2-segment

Display content:

First LED (green) display …
At operation mode: Measured value (PV)
Decimal place of PV is optionally set in 0 to 4.
At setting mode: Parameter item
Second LED (red) display …
At operation mode: Setpoint (SV) or control output value (OUT)
At setting mode: Parameter or data monitoring (operation mode)
Status (red/green) …
EV1 (red): Lights when EV1 is activated.
EV2 (red): Lights when EV2 is activated.
MAN (red): Lights when the control output value is set manually.
SV1/2/3/4 (green): The number selected is lit.
OUT (green):Lights when the control output value is displayed in the second display.
Deviation display (green) … △ or ▽ lights in accordance with deviation (settable).

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

Eng. port: Communications enabled by connecting the exclusive cable (Model: RZ-EC1) to the Eng. port at the upper side of the case.
Parameter programming software package available (release shortly)

GENERAL SPECIFICATIONS

Rated power voltage: 100 to 240VAC 50/60Hz (universal)
Allowable power voltage: 90 to 264VAC
Power consumption: Approx. 16VA (max.)
Operation conditions:

Operation	Reference condition	Normal condition
Ambient temperature	23ºC ± 2ºC	-10 to 50ºC (Max. 40ºC for closed-installation)
Ambient humidity	55% ± 5%RH	20 to 90%RH
Power supply	100VAC ± 1%	90V to 264VAC
Power frequency	50Hz/60Hz ± 1%	50Hz/60Hz ± 2%
Mounting angle	Forward/backward ±3 degrees or less	Forward/backward ±10 degrees or less
Vibration/impact	$0m/s^2$ / $0m/s^2$	$2m/s^2$ / $0m/s^2$

Ambient temperature change ratio: 10ºC/H or less
Warm-up time: 30 minutes or more
Power interruption: Parameters are memorized by EEPROM (Writing: Approx. 100,000 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 power supply, control output event relay output
*2 = Terminals except above
Front and case: Front … Non-flammable ABS
Case … Non-flammable polycarbonate resin
Color: Gray
Installation: Flush panel installation
Weight: Approx. 350 to 500g (max.)
Transportation/storage condition (with packing at shipment):
Ambient temperature … -20 to 60ºC
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)
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.

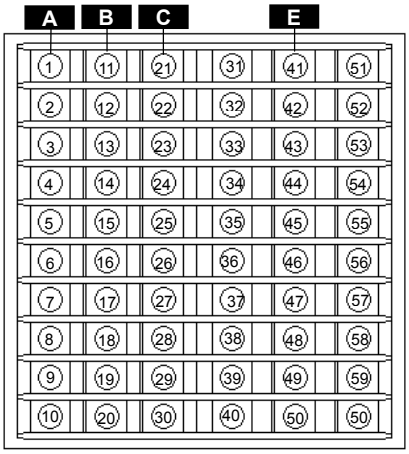
■ ACCURACY RATINGS

Input		Accuracy ratings	Details
T/C	B	±0.1% ± 1 digit exception: ±0.2% ± 1 digit for -200ºC to 0ºC	Not specified for less than 400ºC 400ºC to 800ºC: ±0.2% ± 1 digit
	R		0ºC to 400ºC: ±0.2% ± 1 digit
	S		0ºC to 400ºC: ±0.2% ± 1 digit
	N, K, E, J, T, U, L		
	WRe5-WRe26		
	W-WRe26		0ºC to 400ºC: ±0.4% ± 1 digit
	Platinel II		
	PtRh40-PtRh20	±0.3% ± 1 digit	0ºC to 400ºC: ±2% ± 1 digit 400ºC to 800ºC: ±1% ± 1 digit
RTD	Pt100	±0.1% ± 1 digit	
	JPt100		
DC voltage	mV, V	±0.1% ± 1 digit	
DC current	mA	±0.1% ± 1 digit	By using the shunt resistor specified for current input

■ OPTIONS

Option	Contents
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)
Communications interface (RS-232C, RS-422A or 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 setpoint/data transmission, digital transmission, or digital remote
Remote signal input	Remote input function By the remote contacts, Remote or Local can be selected, and the setpoint can be set in Remote. This function can be used in a secondary controller for cascade control. Input signal: 1 kind to be specified from 4 to 20mADC (input resistance approx. 50Ω), 0 to 1VDC (input resistance approx. 500kΩ or more), or 0 to 10VDC (input resistance approx. 100kΩ or more) Input accuracy: ±0.3% of input range ± 1 digit Input resolution: Approx. 1/40000 Remote scale: Optional setting from –19999 to 20000 Remote shift: Can be set by the resolution being 0.1 times the setting resolution of SV (-19999 to 20000) Cascade primary controller function Cascade calculation: SV2 = (a + d x SV1/100) x MV1 + b + c x SV1 SV2 … SV (%) of secondary controller SV1 … SV (%) of primary controller MV1 … PID constants (%) of primary controller Cascade parameters: a = primary ratio fixed parameter … 0.01 to 1.00 b = primary bias fixed parameter … -100.0 to 100.0% c = Primary bias variable parameter … 0.00 to 1.00 d = Primary ratio variable parameter… 0.00 to 1.00
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. 1/400 Recommended CT: Model CTL-6-S-H
Water-proof	For water-proofing of the front panel, a rubber packing is inserted between a controller and a panel board. NEMA250 4X (equivalent to IEC529, IP66) This option cannot be applied for closed-installation.

■ 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 Measuring input/control output 1/power supply

	No.	Voltage (current *)	T/C	RTD
Measuring input	1	+		
	2		+	A
	3	−	−	B
	4			B

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

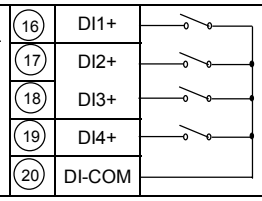
	No.	On-off pulse type multiple output 1 (On-off pulse output)	SSR drive pulse type Current output type Voltage output type	On-off servo type
Control output 1 (heating)	6	H (NC)	+	See **Line C**
	7	C (COM)	−	
	8	L (NO)		

Power	9	L (live)
	10	N (Neutral)

Line B Communications/remote contacts input

	No.	RS-232C	RS-422A	RS-485
Communications interface	11	SD	SDA	SA
	12		SDB	SB
	13	RD	RDA	
	14		RDB	
	15	SG	SG	SG

Remote contacts input	16	DI1+
	17	DI2+
	18	DI3+
	19	DI4+
	20	DI-COM



Line C Retransmission output/control output 2/CT/event output … differs on output type of heating control.

No.	Standard		No.	On-off servo type		No.	Multiple type	
21	+	Retransmission output	21			21	+	Retransmission output
22	−		22	R1 (open)	100 to 2kΩ	22	−	
23	H (NC) +	Control output 2 (cooling)	23	RC (common)		23		
24	C (COM) −		24	R2 (close)		24	+	Multiple output 2 (SSR drive pulse)
25	L (NO)		25	M3 (close)	M	25	−	
26	CT	CT input	26	M2 (open)		26	+	Multiple output 3 (Current output)
27	CT		27	M1 (common)	Power	27	−	
28	EV1	Buffer relay	28	EV1	Buffer relay	28	EV1	Buffer relay
29	EV2	Buffer relay	29	EV2	Buffer relay	29	EV2	Buffer relay
30	COM12	Power	30	COM12	Power	30	COM12	Power

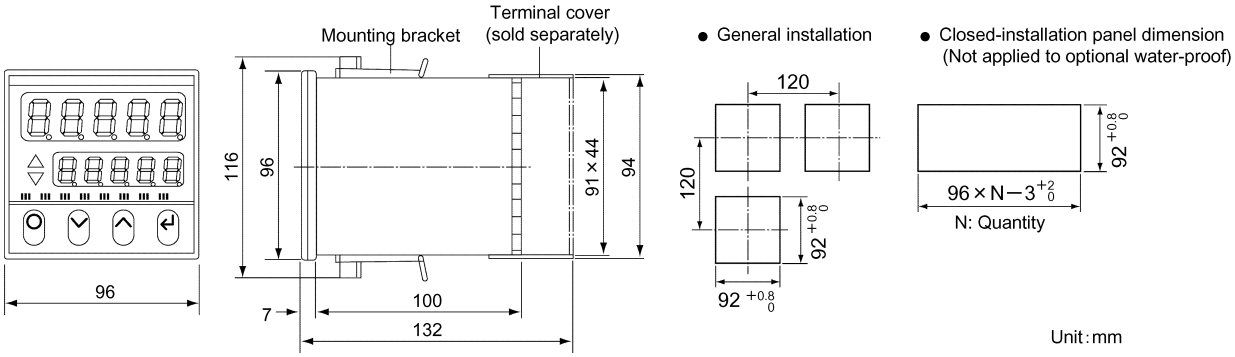
Note) The retransmission output is in **Line E** for on-off servo type and in **Line C** for other types.

Line E Remote contacts input, etc.

No.		
21	+	Retransmission output (On-off servo type only)
22	−	
23	+	Remote input
24	−	
25		
26	R/L+	Remote/Local *
27	R/L-COM	
28	EV3	Buffer relay
29	EV4	Buffer relay
30	COM34	Power

* R/L: Analog remote/local switching
(ON: Remote, OFF: Local)

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



■ ACCESSORIES (Separate purchase is required.)

Accessory	Remarks
CT (current transformer)	Recommendation: Model CTL-6-S-H
Terminal cover	The depth is extended to 132mm by the terminal cover.
Shunt resistor for current input (250Ω)	For measurement by DC current of 4 to 20mA

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