General Specifications

Model YTA110
Temperature Transmitter

YTA SERIES

GS 1C50B1-E

The YTA110 is the high performance temperature transmitter that accepts Thermocouple, RTD, ohms or DC milivolts inputs and converts it to a 4 to 20 mA DC signal for transmission. The YTA110 supports either BRAIN or HART® 275 communication protocol.

■ FEATURES

High performance, high reliability

Microprocesser-based sensing technology ensures long-term accuracy and high reliability.

Variety of sensor inputs

The type of sensor input is user-selectable from thermocouples (T/C), RTDs, ohms, or DC milivolts.

Digital communication

BRAIN or HART® communication protocol is available. The insturment configuration can be changed by the user with using the BT200 or HART®275 communicator.

Self-diagnostics function

Continuous self-diagnostics capability ensures long-term performance and lower cost of ownership.

LCD display with bargraph

The LCD display provides both a digital readout and percent bargraph simultaneously.

■ STANDARD SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

Accuracy
(A/D accuracy/span + D/A accuracy) or ± 0.1 % of calibrated span, whichever is greater.
See Table 1. on page 3.

Cold Junction Compensation Accuracy
(For T/C only)
± 0.5˚C (± 0.9 ˚F)

Ambient Temperature Effect
± 0.1 % of calibrated span per 10 ˚C change

RFI Effect
Tested per EN 50082-2, field intensity up to 10 V/m.

Power Supply Effect
±0.005 % of calibration span per volt

Vibration Effect
10 to 60 Hz 0.21 mm peak displacement
60 to 2000 Hz 3G

Position Effect
None

FUNCTIONAL SPECIFICATIONS

Input
Input type is selectable: Thermocouples, 2-, 3-, and 4-wire RTDs, ohms and DC milivolts. See Table 1. on page 3.

Span & Range Limits
See Table 1. on page 3.

Input signal source resistance (for T/C, mV)
1 kΩ or lower

Input lead wire resistance (for RTD, ohm)
10 Ω per wire or lower

Output
Two wire 4 to 20 mA DC. Signal range: 3.68 to 20.8 mA
BRAIN or HART ® protocol is superimposed on the 4 to 20 mA signal.
Any single value from the followings can be selected as the analog output singal.
Sensor 1, Terminal Temperature.
Also, up to three of the above values can be displayed on LCD display or read via communication.

Isolation
Input/Output/GND isolated to 500 V AC

Sensor Burnout
High (21.6 mA DC) or Low (3.6 mA DC), userselectable.

Output in Transmitter Failure
High (21.6 mA DC or more) or Low (3.2 mA DC or less).

Response Time
Approximately 0.5 seconds

Turn-on Time
Approximately 5 seconds

Damping Time Constant
Selectable from 0 to 99 seconds

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Ambient Temperature Limits
Option code may affect limits.
-40 to 85 ˚C (-40 to 185 ˚F)
-30 to 80 ˚C (-22 to 176 ˚F) with Integral Indicator

Ambient Humidity Limits
5 to 100 % RH at 40 ˚C (104 ˚F)

EMC Conformity CE , N200
For EMI (Emission): EN55011, AS/NZS 2064 1/2
For EMS (Immunity): EN50082-2

Self-calibration
The analog-to-digital measurement circuitry automatically self-calibrates for temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.

Self-diagnostics
Loss of input error, ambient temperature error, EEPROM error, and CPU error. Up to four error history can be stored in the memory.

Manual Output Function
The output value can be set manually.

Supply & Load Requirements

Supply Voltage
10.5 to 42 V DC for operation
16.4 to 42 V DC for digital communications, BRAIN and HART® protocols

Load
0 to 1335 Ω for operation
250 to 600 Ω for digital communication

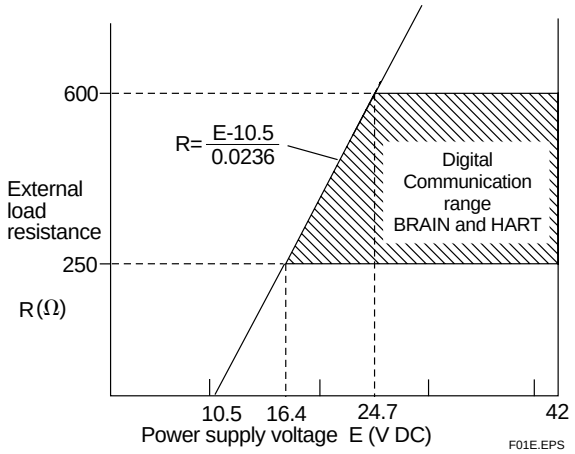

Figure 1. Relationship Between Power Supply Voltage and External Load Resistance.

Communication Requirements

BRAIN

Communication Distance
Up to 2 km (1.25 miles) when using CEV polyethylene-insulated PVC-sheathed cables. Communication distance varies depending on type of cable used.

Load Capacitance
0.22 μF or less

Load Inductance
3.3 mH or less

Input Impedance of communicating device
10 kΩ or more at 2.4 kHz.

HART®

Communication Distance
Up to 1.5 km (1 mile) when using multiple twisted pair cables. Communication distance varies depending on type of cable used.

Use the following formula to determine cable length for specific applications:

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10{,}000)}{C}$$

Where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
C_f = maximum shunt capacitance of receiving devices in pF

PHYSICAL SPECIFICATIONS

Enclosure

Material
Low copper cast-aluminum alloy
Coating
Polyurethan resin baked finish
Color: Deep-sea moss green (Munsell 0.6GY3.1/2.0)

Enclosure Classification
JIS C0920 immersion proof
(equivalent to NEMA 4X and IEC IP67)

Data and tag plat
SUS304 Stainless steel
Mounting
Optional mounting bracket can be used either for two-inch pipe or flat panel mounting.
Terminal Screws
M4 screws

Integral Indicator
Optional LCD digital indicator includes 5-digit numerical dispaly with ˚C, ˚F, K, ˚R, % and mV, 0 to 100 % bargraph and dot-matrix display.

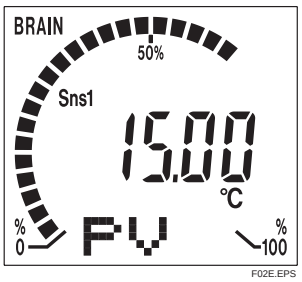

Figure 2. Integral Indicator Display Example.

Weight
1.2 kg(2.6lbs.) without Integral indicator and Mounting bracket. Integral indicator weights 0.2 kg(0.4 lbs.).

Electrical Connections
Refer to '**MODEL AND SUFFIX CODES'** on page 4**.**

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Table 1. Sensor type, measurement range, and accuracy.

Sensor Type		Reference Standard	Measurement Range °C	Measurement Range °F	Minimum Span (Recommended)	Accuracy: Input range °C	Accuracy: Input range °F	Accuracy: A/D Accuracy °C	Accuracy: A/D Accuracy °F	Accuracy: D/A Accuracy
T/C	B	IEC584	100 to 1820	212 to 3308	25 °C (45 °F)	100 to 300	212 to 572	± 3.0	± 5.4	± 0.02% of span
						300 to 400	572 to 752	± 1.0	± 1.8	
						400 to 1820	752 to 3308	± 0.75	± 1.35	
	E		-200 to 1000	-328 to 1832		-200 to -50	-328 to -58	± 0.35	± 0.63	
						-50 to 1000	-58 to 1832	± 0.16	± 0.29	
	J		-200 to 1200	-328 to 2192		-200 to -50	-328 to -58	± 0.40	± 0.72	
						-50 to 1200	-58 to 2192	± 0.20	± 0.36	
	K		-200 to 1372	-328 to 2502		-200 to -50	-328 to -58	± 0.50	± 0.90	
						-50 to 1372	-58 to 2502	± 0.25	± 0.45	
	N		-200 to 1300	-328 to 2372		-200 to -50	-328 to -58	± 0.80	± 1.44	
						-50 to 1300	-58 to 2372	± 0.35	± 0.63	
	R		-50 to 1768	-58 to 3214		-50 to 0	-58 to 32	± 1.0	± 1.8	
						0 to 100	32 to 212	± 0.80	± 1.44	
						100 to 600	212 to 1112	± 0.60	± 1.08	
						600 to 1768	1112 to 3214	± 0.40	± 0.72	
	S		-50 to 1768	-58 to 3214		-50 to 0	-58 to 32	± 1.0	± 1.8	
						0 to 100	32 to 212	± 0.80	± 1.44	
						100 to 600	212 to 1112	± 0.60	± 1.08	
						600 to 1768	1112 to 3214	± 0.40	± 0.72	
	T		-200 to 400	-328 to 752		-200 to -50	-328 to -58	± 0.25	± 0.45	
						-50 to 400	-58 to 752	± 0.14	± 0.25	
	W3	ASTM E988	0 to 2300	32 to 4172		0 to 400	32 to 752	± 0.80	± 1.44	
						400 to 1400	752 to 2552	± 0.50	± 0.90	
						1400 to 2000	2552 to 3632	± 0.60	± 1.08	
						2000 to 2300	3632 to 4172	± 0.90	± 1.62	
	W5		0 to 2300	32 to 4172		0 to 400	32 to 752	± 0.70	± 1.26	
						400 to 1400	752 to 2552	± 0.50	± 0.90	
						1400 to 2000	2552 to 3632	± 0.70	± 1.26	
						2000 to 2300	3632 to 4172	± 0.90	± 1.62	
	L	DIN43710	-200 to 900	-328 to 1652		-200 to -50	-328 to -58	± 0.30	± 0.54	
						-50 to 900	-58 to 1652	± 0.20	± 0.36	
	U		-200 to 600	-328 to 1112		-200 to -50	-328 to -58	± 0.50	± 0.90	
						-50 to 600	-58 to 1112	± 0.25	± 0.45	
RTD	Pt100	IEC751	-200 to 850	-328 to 1562	10 °C (18 °F)	-200 to 850	-328 to 1562	± 0.14	± 0.25	
	Pt200		-200 to 850	-328 to 1562		-200 to 850	-328 to 1562	± 0.30	± 0.54	
	Pt500		-200 to 850	-328 to 1562		-200 to 850	-328 to 1562	± 0.20	± 0.36	
	JPt100	JIS C1604	-200 to 500	-328 to 932		-200 to 500	-328 to 932	± 0.16	± 0.29	
	Cu	SAMA RC21-4	-70 to 150	-94 to 302		-70 to -40	-94 to -40	± 1.35	± 2.43	
						-40 to 150	-40 to 302	± 1.0	± 1.8	
	Ni120	—	-70 to 320	-94 to 608		-70 to 320	-94 to 608	± 0.11	± 0.19	
mV		—	-10 to 100 [mV]		3 [mV]	—		±12 [μV]		
ohm			0 to 2000 [Ω]		20 [Ω]			± 0.35 [Ω]		

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Total Accuracy = (A/D Accuracy / Span + D/A Accuracy) or (± 0.1% of calibrated span), whichever is greater.

For T/C input, add Cold Junction Compensation Accuracy (± 0.5 °C) to the total accuracy.

Example; when selecting Pt100 with measurement range of 0 to 200 °C.

$$\frac{0.14°C}{200°C} \times 100\% \text{ of span} + 0.02\% \text{ of span} = 0.09\% \text{ of span}$$

Since the value is smaller than ± 0.1% of span, the total accuracy is ± 0.1%.

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■ MODEL AND SUFFIX CODES

Model	Suffix Codes	Descriptions
YTA110	·····	Temperature Transmitter
Output Signal	**-D** ·····	4 to 20mA DC with digital commnuication (BRAIN protocol)
	-E ·····	4 to 20mA DC with digital communication (HART protocol, refer to GS 1C50T1-E)
—	**A** ·····	Always A
Electrical Connection	**0** ·····	G1/2 female
	2 ·····	1/2 NPT female
	3 ·····	Pg 13.5 female
	4 ·····	M20 female
Integral Indicator	**D** ·····	with digital indicator
	N ·····	None
Mounting Bracket	**B** ····	SUS304 Stainless steel 2-inch pipe mounting *1
	N ····	None
Optional Codes	/□	Optional Specifications

*1: For flat-panel mounting, please prepare bolts and nuts.

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■ OPTIONAL SPECIFICATIONS

Item		Descriptions		Code
Lightning protector		Power supply voltage: 10.5 to 32 V DC Allowable current: Max. 6000A(1×40μs), repeating 1000A(1×40μs) 100 times		**A**
Painting	Coating change	Epoxy resin coating		**X1**
	Color change	Amplifier cover only	Munsell renotation code: NI1.5 Black	**P1**
			Munsell renotation code: 7.5BG4/1.5, Jade green	**P2**
			Metallic silver	**P7**
Calibration Unit		Degree F/Degree R unit		**D2**
Output signal low-side in Transmitter failure		Output signal low-side: -5 %, 3.2 mA DC or less. Sensor burnout is also set to ' LOW ': -2.5 %, 3.6 mA DC		**C1**

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■ OPTIONAL SPECIFICATIONS (For Explosion Protected Types)

Item	Descriptions		Code
CENELEC (KEMA)	CENELEC (KEMA) Intrinsically safe, Type N and Flameproof approval combination [Intrinsically safe approval] EEx ia IIC, T4, T5 Ambient Temperature : -40 to 70°C for T4, -40 to 50°C for T5 Supply/Output circuit : Ui=30V, Ii=165mA, Pi=0.9W, Ci=20nF, Li=660μH Input circuit : Uo=8.6V, Io=30mA, Po=0.07W, Co=3μF, Lo=20mH Electrical Connection : 1/2 NPT female, Pg13.5 female and M20 female*1. [Type N approval (IEC)] Ex nC IIC, T4/T5 Ambient Temperature : -40 to 70°C for T4, -40 to 50°C for T5 Supply/output circuit : Ui=30V, Ii=150mA Input circuit : Uo=8.6V, Io=30mA, Po=70mW Electrical connection : 1/2 NPT female, Pg13.5 female and M20 female*1. [Flameproof approval] EEx d IIC T6, Ambient Temperature : -40 to 75°C Electrical Connection : 1/2 NPT female, Pg13.5 female and M20 female*1.		**KU1**
Canadian Standards Association (CSA)	CSA Intrinsically safe, non-incendive and Explosionproof approval combination [Intrinsically safe/non-incendive approval] Intrinsically safe for Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F and G; Class III, Division 1: Non-incendive for Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F and G; Class III, Division 1: Enclosure Type 4X Temperature Class : T4, Ambient Temperature : -40 to 60°C, Supply : Vmax=30V, Imax=165mA, Pmax=0.9W, Ci=18nF, Li=730μH Sensor input : Voc=9V, Isc=40mA, Po=0.09W, Ca=1μF, La=10mH Electrical Connection : 1/2 NPT female*2 [Explosionproof approval] Explosionproof Class I, Div.1, Groups B, C and D, Class II, Groups E, F and G, Class III. For Class I, Div.2 Locations “FACTORY SEALED, CONDUIT SEAL NOT REQUIRED” Enclosure Type 4X Temperature Class : T4 Ambient Temperature : -40 to 60°C Electrical Connection : 1/2 NPT female*2		**CU1**
Factory Mutual (FM)	FM Explosionproof approval Explosionproof Class I, Division 1, Groups A, B, C and D; Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G. “FACTORY SEALED, CONDUIT SEAL NOT REQUIRED.” Enclosure Rating: NEMA 4X Temperature Class : T6 Ambient Temperature : -40 to 60°C (-40 to 140°F) Electrical Connection : 1/2 NPT female*2		**FF1**
	FM Intrinsically safe, non-intrinsically and Explosionproof approval combination [Intrinsically safe/non-incendive approval] Intrinsically safe for Class I, II, III Division 1 Groups A, B, C, D, E, F and G. Non-incendive for Class I, II, Division 2 Groups A, B, C, D, E, F and G Class III, Division 1. Enclosure Type : 4X Temperature Class : T4 Ambient Temperature : -40 to 60°C (-40 to 140°F) Supply : Vmax=30V, Imax=165mA, Pmax=0.9W, Ci=18nF, Li=730μH Sensor : Voc=9V, Isc=40mA, Po=90Mw, Ca=1μF, La=10mH [Explosionproof approval] Class I, Division 1, Groups A, B, C and D.; Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G. "FACTORY SEALD, CONDUIT SEAL NOT REQUIRED." Enclosure Ratings : NEMA4X Temperature Class : T6 Ambient Temperature : -40 to 60°C (-40 to 140°F) Electrical Connection : 1/2NPT female*2		**FU1**
Japanese Industrial Standards (JIS)	JIS Flameproof approval Ex ds IIC T6 X Amb. Temp. : -20 to 60°C		**JF3**
Attached flameproof packing adapter*3	Electrical connection : G1/2 female Applicable cable : O.D. 8.5 to 11 mm	1 pc.	**G11**
		2 pc.	**G12**

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*1 : Applicable for Electrical Connection Code 2, 3 and 4.
*2 : Applicable for Electrical Connection Code 2.
*3 : If cable wiring is to be used to a JIS flameproof type transmitter, do not fail to add the YOKOGAWA-assured flameproof packing adapter.

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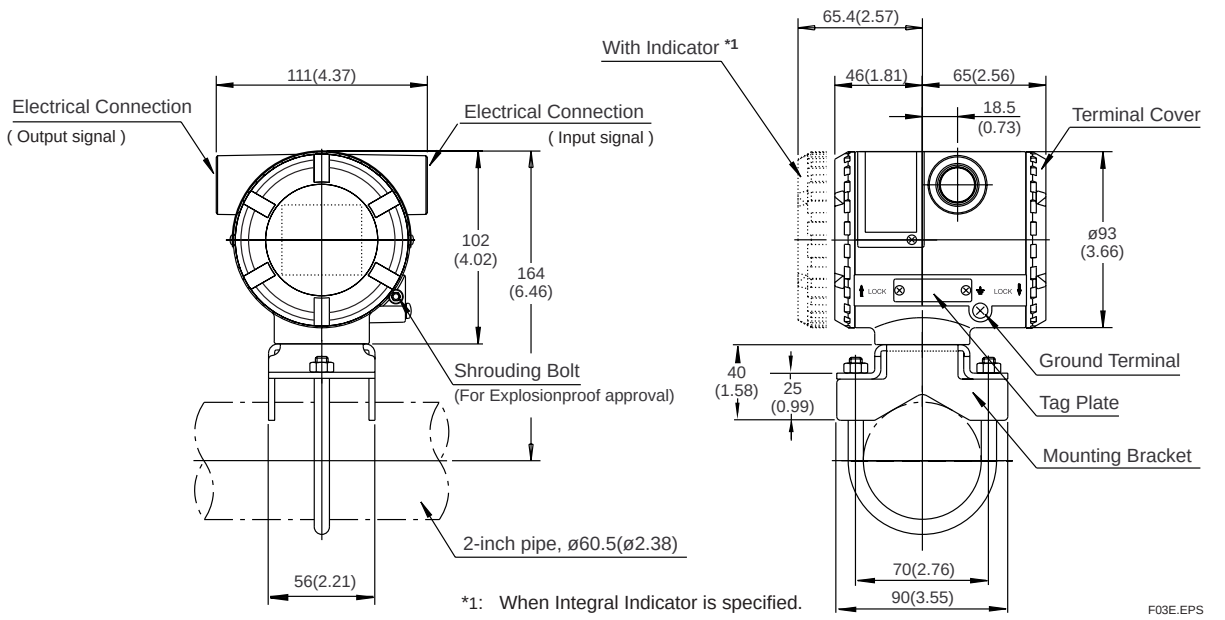
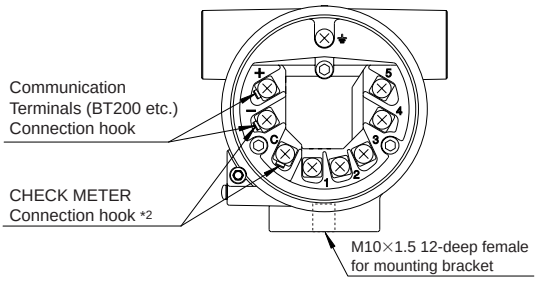
■ DIMENSIONS

Unit: mm (Approx. inch)



*1: When Integral Indicator is specified.

Terminals

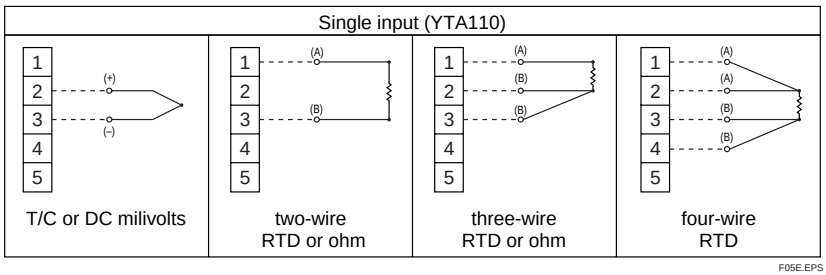


Terminal Configuration

+ −	Power Supply and output terminal
− C	External Indicator (ammeter) terminal *2
⏚	Ground terminal

*2: When using an external indicator or check meter, the internal resistance must be 10Ω or less.

Input Wiring



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< Ordering Information >

Specify the following when ordering

Model, suffix codes, and optional codes

The instrument is shipped with the settings shown in Table A. Specify the following when necessary.

1. Sensor type.
   For RTD and resistance input, specify the number of wire as well.
   (Example; Pt200 3-wire system)
2. Calibration range and unit
   1) Calibration range can be specified within the measurement range shown in Table 1. on page 3.
   2) Specify one range from °C, K, °F or °R for temperature input. °F and °R are available when Optional code D2 is specified. It is not necessary to specify the unit of mV and ohm inputs, for these units automatically will be mV or Ω.
3. Tag Number

Table A. Settings upon shipment.

Input sensor type	Pt100 three-wire system, or as specified
Calibration range lower limit	"0" or as specified
Calibration range upper limit	"100" or as specified
Calibration unit	"°C" or as specified
Damping time constant	2 seconds
Sensor burnout *1	High (110%, 21.6 mA DC)
Output in Transmitter failure *1	High (110%, 21.6 mA DC or more)
Integral Indicator *2	PV (°C)
Output type	Sensor 1
Tag number	As specified in order

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*1: Except when Optional code C1 is specified.
*2: When Integral indicator is specified.

< Related Instruments >

Power Distributor: Refer to GS 1B4T1-E, 1B4T2-E.
BRAIN TERMINAL: Refer to GS 1C0A11-E

< Reference >

HART; Trademark of The HART Communiation Foundation. (USA)

Material Cross Reference Table

SUS304	AISI 304

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