Test&Measurement

YOKOGAWA

Process Test Tool Selection

Vol.12

Precision Making

Catalog YMI110-EN

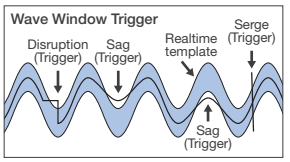
Complete measurements
Complete portability

DL350 ScopeCorder

- Combines features of an oscilloscope and a data acquisition recorder into a single chassis.
- A4-sized compact & light weight chassis, 8.4-inch touch screen and 3 hours battery operation.
- Choose from 18 types of input modules: Voltage, Temperature, Strain, Acceleration, Frequency etc.

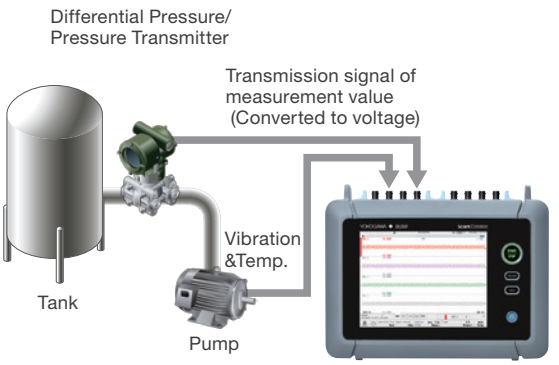
Oscilloscope + Data Recorder = SCOPECORDER

Monitor / Verify Power Line Quality



- Oscilloscope-like user interface (Scope Mode)
- Up to 1000 Vrms isolated voltage inputs
- Capture sags, surge and interruption waves precisely by Wave Window Trigger
- Harmonic, power and FFT analysis functions

Conservation and operation check of Plant Equipment



- Recorder-like user interface (Recorder Mode)
- Real-time recording with 200 Mpoints memory and 50 days continuous recording onto SD card
- Record voltage, temperature, vibration at the same time

Contents

Process Calibrators

Pressure Calibrator	CA700
External Pressure Sensor	PM100
Multi Function Calibrator	CA500/550
Multi Function Calibrator	CA71/CA51
Volt mA Calibrator	CA310
TC Calibrator	CA320
RTD Calibrator	CA330
Process Multi Meter	CA450
Hand Pump	910series

Selection Guide *1

Front view						
Product Type			Pressure Calibrator	Multi Function Calibrator		Multi Function Calibrator
Model			CA700	CA500	CA550	CA71/CA51
Source and measurement Form			Source and measurement Simultaneous (pressure and voltage/current)	Source and measurement Simultaneous		Source and measurement Simultaneous
Source Function	DC voltage (DCV)		5 V (0.015% of setting)	100 mV/1-5/5/30 V (0.015% of setting)	100 mV/1-5/5/30 V (0.015% of setting)	100 mV/1/10/30 V (0.02% of setting)
	DC current (DCmA)		20 mA (0.015% of setting)	20/4-20 mA (0.015% of setting)	20/4-20 mA (0.010% of setting)	20/4-20 mA (0.025% of setting)
	DC current (mA SIMULATE)		20 mA (0.015% of setting)	20 mA (0.015% of setting)	20 mA (0.010% of setting)	20 mA (0.05% of setting)
	Resistance (Ω)		—	400/4000 Ω (0.020% of setting)	400/4000 Ω (0.015% of setting)	400 Ω (0.025% of setting)
	Resistance temperature detector (RTD)		—	Pt100/JPt100/Pt200/Pt500/Pt1000/ Cu10/Ni120/Pt50/Pt50G/Pt100G/ Cu50M/Cu100M*3	Pt100/JPt100/Pt200/Pt500/Pt1000/ Cu10/Ni120/Pt50/Pt50G/Pt100G/ Cu50M/Cu100M*3	Pt100/JPt100 (0.025% of setting)
	Thermocouple (TC)		—	K/E/J/T/N/L/U/R/S/B/C/XK/A/D/G/ PLATINEL II/PR20-40*3	K/E/J/T/N/L/U/R/S/B/C/XK/A/D/G/ PLATINEL II/PR20-40*3	K/E/J/T/N/L/U/R/S/B (0.02% of setting)
	Frequency (Hz) Pulse (PULSE)	Output pulse setting	—	500/5000 Hz/50 kHz 1100.0/min*3	500/5000 Hz/50 kHz 1100.0/min*3	500/1000 Hz/10 kHz 99999 cycles*4
		Output voltage	—	+0.1 V to +15 V	+0.1 V to +15 V	+0.1 V to +15 V
		Dry contact	—	○	○	○
Measurement Function	AC voltage (ACV)		—	—	—	1/10/100/300 V (0.5% of reading)
	DC voltage (DCV)		5 V/50 V (0.015% of reading)	100 mV/5/50 V (0.015% of reading)	100 mV/5/50 V (0.015% of reading)	100 mV/1/10/100 V (0.025% of reading)
	DC current (DCmA)		20 mA/100 mA (0.015% of reading)	50 mA (0.015% of reading)	50 mA (0.010% of reading)	20/100 mA (0.025% of reading)*1
	Resistance (Ω)		—	400/4000 Ω (0.020% of reading)	400/4000 Ω (0.015% of reading)	400 Ω (0.05% of reading)
	Resistance temperature detector (RTD)		—	Pt100/JPt100/Pt200/Pt500/Pt1000/ Cu10/Ni120/Pt50/Pt50G/Pt100G/ Cu50M/Cu100M*3	Pt100/JPt100/Pt200/Pt500/Pt1000/ Cu10/Ni120/Pt50/Pt50G/Pt100G/ Cu50M/Cu100M*3	Pt100/JPt100 (0.05% of reading) (CA71 only)
	Thermocouple (TC)		—	K/E/J/T/N/L/U/R/S/B/C/XK/A/D/G/ PLATINEL II/PR20-40*3	K/E/J/T/N/L/U/R/S/B/C/XK/A/D/G/ PLATINEL II/PR20-40*3	K/E/J/T/N/L/U/R/S/B (0.05% of reading)(CA71 only)
	Frequency (Hz)		—	500/5000 Hz/50 kHz*3	500/5000 Hz/50 kHz*3	100/1000 Hz/10 kHz
	Pulse (PULSE)		—	0 to 99999*3 Maximum integration time: 60 min		0 to 99999 CPM 0 to 99999 CPH
	24 V loop power supply		○: 24 V ±1 V (communication resistance OFF)	○: 24 V±2 V (communication resistance ON/OFF)		○: (no regulations)*5
			○: 24 V ±6 V (communication resistance ON)			(No communication resistance mode)
	Pressure		200 kPa/1000 kPa/3500 kPa*2 (0.02% of reading)	—		—
General specifications/functions	Display		Dot matrix LCD	Dot Matrix LCD		segment LCD
	Source pattern	Step sweep	○: (15/30/45/60 seconds)	○: (5 to 600 seconds)		○: (2.5/5 seconds)
		Linear sweep	○: (15/30/45/60 seconds)	○: (5 to 600 seconds)		○: (16/32 seconds)
		Span check	○	○		—
		Program sweep	—	○: (5 to 600 seconds)		—
	Data memory		As Found/As Left/error rate pass or fail judgment (250 Data)	○: (100 data)	○: (250 files) CSV files	○: (50 data)
	Communication interface		USB	USB TYPE B		RS232C (CA71 only)
	Power supply		Six alkaline AA batteries	Four alkaline AA batteries		Four alkaline AA batteries AC adapter (Sold separately)
	Battery life (alkaline AA batteries)		35 hours (when 24 V loop power supply is OFF during current measurement) Approx. 10 hours (when 24 V loop power supply is ON)	Approx. 16 hours (Measurement ON, 5 V output/10 kΩ or more		Approx. 40 hours (measurement OFF, output DC 5 V/10 kΩ or more) Approx. 20 hours (source/measurement simultaneously, output DC 5 V/10 kΩ or more) Approx. 12 hours (source/measurement simultaneously, output 20 mA/5 V)
	Dimensions Approx		264 (W) × 188 (H) × 96 (D) mm	Approx. 130 (W) × 260 (H) × 53 (D) mm		190 (W) × 120 (H) × 55 (D) mm
	Weight		Approx. 2 kg	Approx. 900 g		Approx. 730 g

*1: Typical accuracy and ranges are shown. For details, please refer to each product page in this catalog. *2: Ranges of each gauge pressure
*3: For the frequency, pulse source and measurement accuracy of the CA500/550, please refer to page 15. *4: For the frequency, pulse source and measurement accuracy of the CA71, please refer to page 17.
*5: The loop power source function of the CA71 has different connection method from other models. *6: For the TC source and measurement accuracy of the CA320, please refer to page 20.
*7: For the RTD source and measurement accuracy of the CA330, please refer to page 22. *8: The accuracy of the DC voltage source of the CA450 is not specified. Please use 99031(1-5 V conversion set) for DC voltage source.

Selection Guide

Front view						
Product name			Volt mA Calibrator	TC Calibrator	RTD Calibrator	Process Multi Meter
Model			CA310	CA320	CA330	CA450
Source and measurement Form			Source or measurement Switching	Source or measurement Switching	Source or measurement Switching	Source or measurement Switching
Source Function	DC voltage (DCV)		500 mV/5/30 V (0.015% of setting)	90 mV (0.015% of setting)	—	*8
	DC current (DCmA)		20 mA (0.015% of setting)	—	—	25 mA (0.05% of setting)
	DC current (mA SIMULATE)		20 mA (0.015% of setting)	—	—	25 mA (0.05% of setting)
	Resistance (Ω)		—	—	500 Ω/3000 Ω (0.025% of setting)	—
	Resistance temperature detector (RTD)		—	—	Pt100/JPt100/Pt200/Pt500/Pt1000/ Cu10/Ni120/Pt50/Pt50G/Pt100G/ Cu50M/Cu100M*7	—
	Thermocouple (TC)		—	K/E/J/T/N/L/U/R/S/B C/XK/A/D/G/Platinel II*6	—	—
	Frequency (Hz) Pulse (PULSE)	Output pulse setting	—	—	—	—
		Output voltage	—	—	—	—
		Dry contact	—	—	—	—
Measurement Function	AC voltage (ACV)		—	—	—	600 mV/6/60/600/1000 V (0.09% of reading)
	DC voltage (DCV)		500 mV/5 V/30 V/50 V (0.015% of reading)	90 mV (0.015% of reading)	—	600 mV/6/60/600/1000 V (0.09% of reading)
	DC current (DCmA)		20 mA/50 mA (0.015% of reading)	—	—	30/100 mA (0.05% of reading)
	Resistance (Ω)		—	—	500/3000 Ω (0.025% of reading)	600 Ω/6/60/600 kΩ/6/60 MΩ (0.2% of reading)
	Resistance temperature detector (RTD)		—	—	Pt100/JPt100/Pt200/Pt500/Pt1000/ Cu10/Ni120/Pt50/Pt50G/Pt100G/ Cu50M/Cu100M*7	—
	Thermocouple (TC)		—	K/E/J/T/N/L/U/R/S/B C/XK/A/D/G/Platinel II*6	—	—
	Frequency (Hz)		—	—	—	200 Hz/2 kHz/20 kHz (0.005%reading)
	Pulse PULSE)		—	—	—	—
	24 V loop power supply		○: 24 V ±1 V (communication resistance OFF)	×	×	○: (no regulations)
			○: 24 V ±6 V (communication resistance ON)			
	Pressure		—	—	—	—
General specifications/functions	Display		segment LCD	segment LCD	segment LCD	segment LCD
	Source pattern	Step sweep	○: (15/30/45/60 seconds)	○: (15/30/45/60 seconds)	○: (15/30/45/60 seconds)	○: (15/30/45/60 seconds)
		Linear sweep	○: (15/30/45/60 seconds)	○: (15/30/45/60 seconds)	○: (15/30/45/60 seconds)	○: (15/40 seconds)
		Span check	○	○	○	○
		Program sweep	—	—	—	—
	Data memory		—	—	—	—
	Communication interface		—	—	—	IR-USB
	Power supply		four alkaline AA batteries AC adapter (Sold separately)	four alkaline AA batteries AC adapter (Sold separately)	four alkaline AA batteries AC adapter (Sold separately)	four alkaline AA batteries AC adapter (Sold separately)
	Battery life (alkaline AA batteries)		Approx. 50 hours (5 V source load 10 kΩ or more) Approx. 25 hours (20 mA source load 5 V or less)	Approx. 55 hours	Approx. 55 hours	During measurement: approx. 140 hours During generation: approx. 10 hours
	Dimensions Approx		90 (W) × 192 (H) × 42 (D) mm	90 (W) × 192 (H) × 42 (D) mm		90 (W) × 192 (H) × 49 (D) mm
	Weight		Approx. 440 g	Approx. 440 g	Approx. 440 g	Approx. 600 g

Process Calibrators

Pressure Calibrator CA700

■ Features

- Achieves the highest accuracy in the portable class
  - Basic accuracy: Pressure (measurement) / 0.01% rdg.
    Current/voltage (source/measurement) / 0.015% rdg.
- Achieves the highest resolution and widest range in the portable class
  - 0.001 kPa (200.000 kPa range)
- Strong support for field calibration and maintenance work
  - Calibration procedures of pressure transmitters and pressure switches are embedded.
  - "As Found", "As Left" data and error rate (%) can be recorded.
- IP54 dustproof and waterproof robust case enables use in harsh environments.
- Three high-performance hand pump models for different pressure ranges are available.
- Pressure calibration in the high pressure range is possible with external pressure sensor PM100 connection.

■ Basic Specifications (Measurement Unit) 23°C±3°C

● Pressure Measurement

Model	CA700-E-01	CA700–E–02	CA700–E–03
Pressure type	Gauge		
Measurement range	Positive pressure: 0 to 200 kPa Negative pressure: -80 to 0 kPa	Positive pressure: 0 to 1000 kPa Negative pressure: -80 to 0 kPa	Positive pressure: 0 to 3500 kPa Negative pressure: -80 to 0 kPa
Measurement display range	To 240.000 kPa	To 1200.00 kPa	To 4200.00 kPa
Resolution	0.001 kPa	0.01 kPa	0.01 kPa
Measurement accuracy (6 months after calibration) (Tested after zero calibration)	Positive pressure 20 to 200 kPa: ±(0.01% of reading + 0.003 kPa) 0 to 20 kPa: ±0.005 kPa	Positive pressure: ±(0.01% of reading + 0.04 kPa)	Positive pressure: ±(0.01% of reading + 0.15 kPa)
	Negative pressure: ±(0.2% of reading + 0.080 kPa)	Negative pressure: ±(0.2% of reading + 0.08 kPa)	Negative pressure: ±(0.2% of reading + 0.08 kPa)
Input port	Rc 1/4 or 1/4 NPT female thread (selectable)		
Measurement unit material	Diaphragm: Hastelloy C276 and input port: SUS316		

● DC Current Measurement

Range	Resolution	Measurement range	Measurement accuracy (1 year)	Remark
20 mA	1 μA	0 to ±20.000 mA	0.015% of reading + 3 μA	Input resistance: 10 Ω or less. The maximum display is 1.2-fold of range.
100 mA	10 μA	0 to ±100.00 mA	0.015% of reading + 30 μA	

● DC Voltage Measurement

Range	Resolution	Measurement range	Measurement accuracy (1 year)	Remark
5 V	0.1 mV	0 to ±5.0000 V	0.015% of reading + 0.5 mV	Input resistance: approx. 1 MΩ. The maximum display is 1.1-fold of range.
50 V	1 mV	0 to ±50.000V	0.015% of reading + 5 mV	

● 24 V Loop Power Supply

Supply voltage	Remark
24 V ±1 V	Load current 24 mA when communication resistance OFF
24 V ±6 V	Load current 20 mA when communication resistance ON

■ Basic Specifications (Generation Unit) 23°C±3°C

● DC Current Source

Range	Resolution	Source range	Accuracy (1 year)	Remark (when communication resistance OFF)
20 mA	1 μA	0 to 20.000 mA	0.015% of setting + 3 μA	Compliance voltage: 24 V. The maximum setting is 1.2-fold of range.
20 mA SIMULATE	1 μA	0 to 20.000 mA		External power supply: 5 to 28 V. The maximum setting is 1.2-fold of range.

● DC Voltage Source

Range	Resolution	Source range	Accuracy (1 year)	Remark
5 V	0.1 mV	0 to 5.0000 V	0.015% of setting + 0.5 mV	Load resistance: 5 kΩ or more. The maximum setting is 1.1-fold of range.

■ General Specifications

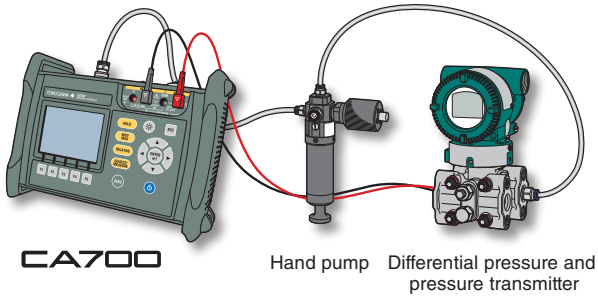
Display	Dot matrix LCD (320 × 240 dots)
Backlight	LED
Display refresh rate	Approx. 300 ms (3 times/sec)
Warm-up time	Approx. 5 minutes
Power supply	Six alkaline AA batteries
Battery life	Approx. 35 hours when measuring current with the 24 V loop power supply OFF and approx 10 hours with the 24 V loop power supply ON
Auto power-off	Approx. 60 minutes (the function can be disabled)
Insulation resistance	100 MΩ or more (500 VDC) between the input terminal and case and between the input port and case
Withstand voltage	500 VAC for 1 minute between the input terminal and case and between the input port and case
Protection grade	IP54 dustproof and waterproof structure
Dimensions	Approx. 264 (W) × 188 (H) × 96 (D) mm, excluding protrusions
Weight	Approx. 2 kg (including batteries)
Compliance standards	Safety: EN61010-1, EN61010-2-030, contamination class 2
	EMC: EN61326-1 Class A, EN55011 Class A Group 1
Operating temperature / humidity ranges	-10 to 50℃ and 20 to 80%RH (no condensation)
Storage temperature / humidity ranges	-20 to 60℃ and 20 to 80%RH (no condensation)
Interfaces	Select and switch between USB A mass-storage device, USB mini-B communication device class, and mass storage class
External sensor	A dedicated external sensor can be connected via a connector. (Planned to be released in the future)
Accessories*1	A set of 1.7 m long black and red lead wires with alligator clips for generation and measurement, six alkaline AA batteries, R1 1/4" – 1/8" NPT female thread × 1, ferrite core × 2, R 1/4" – 1/4" NPT female thread × 1, accessory case, instruction manual (CD), startup guide, shoulder strap

*1: The type of the included conversion connector varies depending on the suffix code (–P1 and –P2). For details, refer to "CA700 Accessories" on the page 8

Supports Various Applications

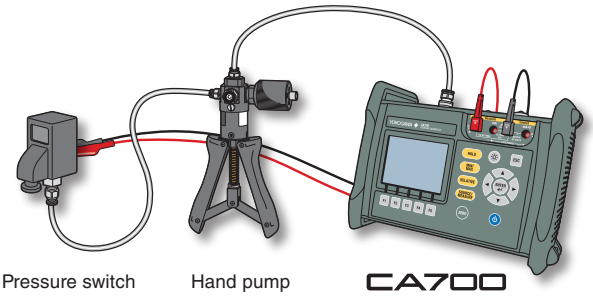
■ Field Calibration of Differential Pressure and Pressure Transmitters

Calibration of pressure transmitters is required to accurately measure the input and output values and to calculate the error rate.
The CA700 ensures reliable calibration with its function to accurately measure the input and output values of pressure and current.
Additionally its embedded calibration procedures enable users to perform certain calibration following the prescribed procedure.



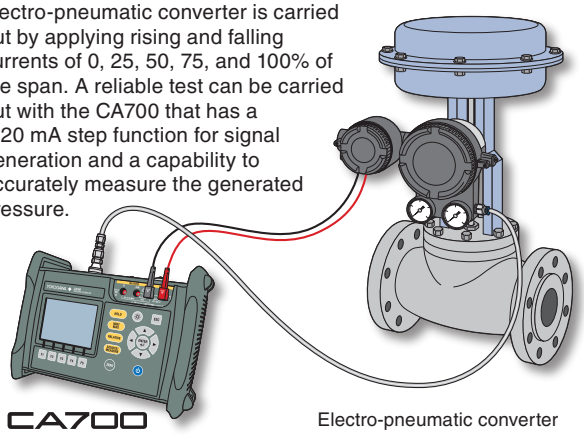
■ Pressure Switch Test

A pressure switch test measures the pressure at the time when the contact opens and closes and the resistance at the time when the dead band contact closes.
A test procedure is embedded to enable users to carry out a test following the prescribed procedure.



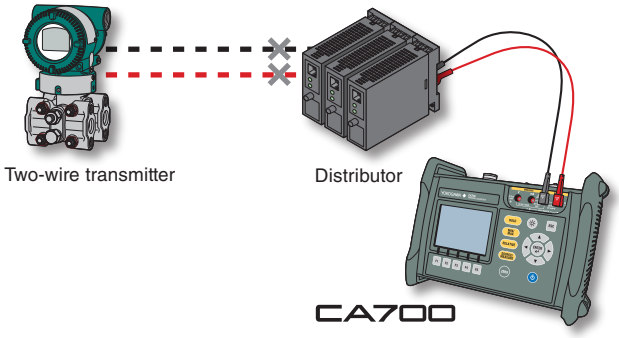
■ Check and I/O Adjustment of an Electro-pneumatic Converter

Input and output adjustment of an electro-pneumatic converter is carried out by applying rising and falling currents of 0, 25, 50, 75, and 100% of the span. A reliable test can be carried out with the CA700 that has a 4-20 mA step function for signal generation and a capability to accurately measure the generated pressure.



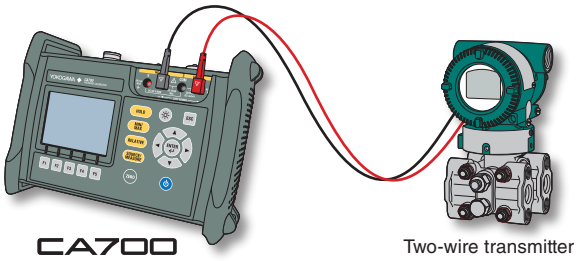
■ 20 mA SIMULATE (Two-wire Transmitter Simulator)

The CA700 can also be used as a transmitter simulator to carry out a loop test. It can absorb (SINK) the set current from an external voltage generating device (e.g., a distributor system or PLC) of instrumentation equipment. 4-20 mA current can be sourced with an accuracy of 0.015% of the reading.



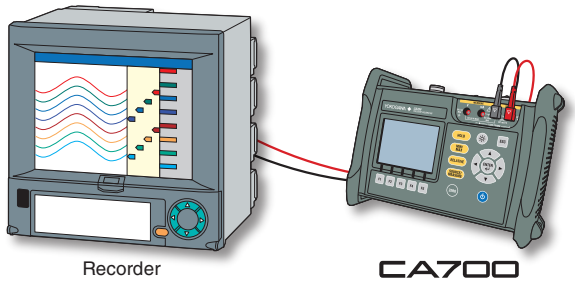
■ Two-wire Transmitter Loop Check

DC mA signals can be measured by supplying power to the transmitter from a 24 V DC power supply. DC mA signal measurement and zero-point check can be performed with an accuracy of 0.015% of the reading. A 250-ohm resistor for HART and BRAIN communication is included in this calibrator so there is no need to attach an external resistor when connecting to a handy terminal.



■ Input Command Check and Adjustment of Recorders and Controllers

Instrumentation loop test and operation/command check can be performed by sourcing DC 1-5 V / 4-20 mA instrumentation signals with an accuracy of 0.015% of the reading. Furthermore, two patterns of linear sweep and step sweep can be selected (the sweep time can be specified from 15, 30, 45, and 60 sec).



Process Calibrators

■ Model and Suffix Code

● CA700

Product name	Model	Suffix code					
Pressure Calibrator	CA700	General use type					
		–E	All countries except Japan				
				–01	Gauge pressure: 200 kPa		
				–02	Gauge pressure: 1000 kPa		
				–03	Gauge pressure: 3500 kPa		
					–U1	Metric units*1	
					–U2	Metric units and non-metric units	
						–P1	Rc 1/4” female thread
						–P2	1/4” NPT female thread

*1: Only kPa, Pa, hPa, MPa, mbar, bar, atm are available.

● Separately Sold Accessories *2

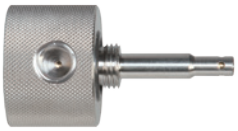
Product name	Model	Specification
Carrying Case	93050	Bag for the calibrator, accessories, and peripheral devices
Grabber Clip	98026	A set of separate red and black clips (for 2 m long wires)
Cleaning Unit *3	91040	Can connect to –P1 or –P2, input and output port are Rc1/8” female thread
Cleaning Unit *3	91041	Can connect to –P1 or –P2, input and output port are 1/8” NPT female thread

*2: These accessories are not included in the CA700 calibrator package.
*3: Available to clean the pressure sensor of main unit (CA700) after liquid pressure measurement.

Carrying Case
93050

Grabber Clip
98026

Cleaning Unit
91040/91041



● CA700 Accessories *4

Product name	Model	Specification
Connector *5	91080	R 1/4” male thread to 1/8” NPT female thread conversion connector (for -P1)
Connector *5	91081	R 1/4” male thread to 1/4” NPT female thread conversion connector (for -P1)
Connector *6	91082	1/4” NPT male thread to 1/8” NPT female thread conversion connector (for –P2)
Lead Wires for Source / Measurement	98064	Red and black alligator clip lead wires, 1.7 m long
Accessory Bag	B9108XA	For lead wires and connector

*4: Included in the CA700 calibrator package at the time of purchase.
*5: Included in the package when suffix code –P1 is selected.
*6: Included in the package when suffix code –P2 is selected.

Connector 91080
(R 1/4” male thread to 1/8” NPT female thread)

Connector 91081
(R 1/4” male thread to 1/4” NPT female thread)

Connector 91082
(R 1/4” NPT male thread to 1/8” NPT female thread)

Lead Wires for Source/Measurement
98064

Accessory Bag
B9108XA

■ Main Features

- Support Universal Communication Protocol & Other Vendors' Devices
  (BRAIN, FOUNDATION™ Fieldbus H1, HART®, ISA100.11a)
- Control the Pressure Calibrator CA700 remotely
- Include the calibration procedure of a pressure/Differential Pressure/Pressure Transmitter
- Provide automatic recording of calibration data, calculation of relative error and pass/fail determination
- Improve work efficiency by the automatic generation function of the test report
  (The report format can be selected from text, web browser or template.)

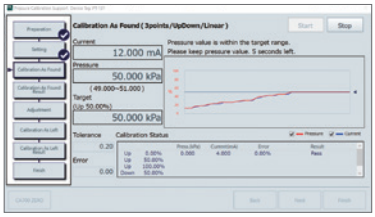
* FieldMate is provided by YOKOGAWA. Please refer to the URL below for further details.
http://www.yokogawa.com/fieldmate/

FieldMate

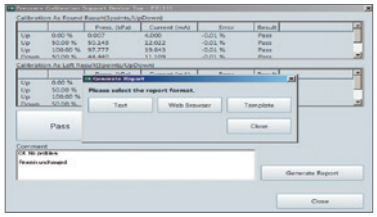
■ Smart Calibration of CA700 and FieldMate Differential Pressure / Pressure Transmitter

FieldMate is PC and tablet based software for adjusting, setting and managing devices.
It systematizes a series of work from field calibration of a pressure/differential pressure transmitter to report generation in combination with the Pressure Calibrator CA700. They achieve speedy, highly efficient field calibration by offering calculation of relative error, pass/fail determination and report generation as well as automatic recording of device information and calibration data.
Recorded calibration data can be registered in FieldMate' s database (device maintenance information) along with other maintenance information.
Analysis of accumulated device maintenance information and calibration data is useful for estimation/decision of deterioration diagnosis and device replacement of pressure/differential pressure transmitters.

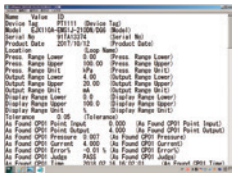
Preparation → **Setting** → **As found Cal.** → **Adjustment** → **As left Cal.** → **Report**



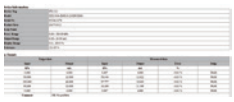
Calibration support screen



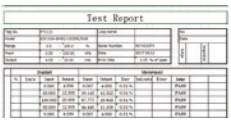
Report output screen



Text



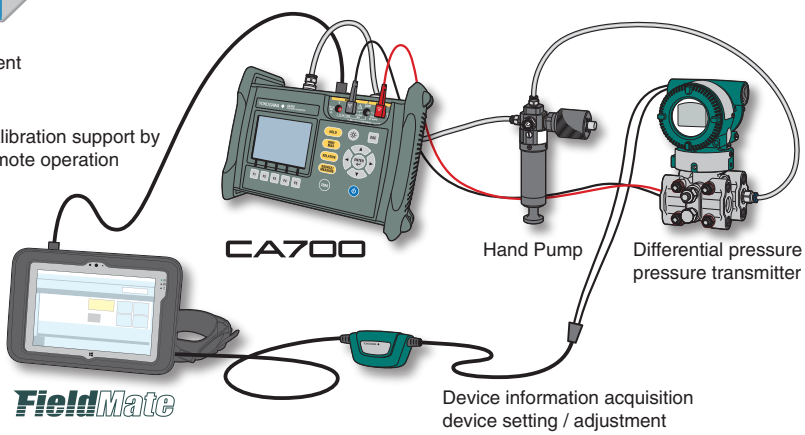
Web browser



Template

For maintenance information management
FieldMate

Calibration support by remote operation



Hand Pump

Differential pressure and pressure transmitter

Device information acquisition
device setting / adjustment

Process Calibrators

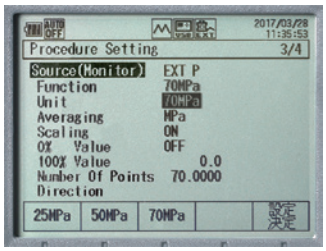
External Pressure Sensor PM100

● External Pressure Sensor PM100
Pressure measurement up to 70 MPa with the CA700!

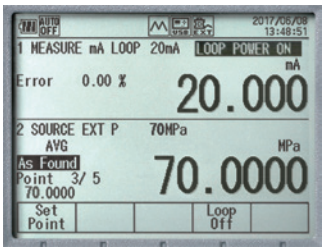
■ Features

- The highest measurement accuracy in field type
  Basic accuracy: 0.01% of reading
- The highest resolution in class
  0.0001 MPa is achieved in each range
- Multi range (Three pressure ranges in one unit)
  7 MPa/10 MPa/16 MPa (-05)
  25 MPa/50 MPa/70 MPa (-06)

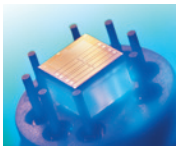
PM100 CA700



Setting screen



Measurement screen



Silicon Resonant Sensor

■ Basic Specifications

16 MPa Model (-05)

Items		Specifications		
Pressure type		Shield gauge		
Measurement Range		0 to 7 MPa sg	0 to 10 MPa sg	0 to 16 MPa sg
Measurement display range		to 8.4000 MPa	to 12.0000 MPa	to 19.2000 MPa
Measurement accuracy*1, *2	6*3 months after calibration (Test after zero calibration)*5	± (0.01% of reading + 2 kPa)	± (0.01% of reading + 3 kPa)	± (0.01% of reading + 5 kPa)
	1*4 year after calibration (Test after zero calibration)*5	± (0.01% of reading + 2.8 kPa)	± (0.01% of reading + 3.8 kPa)	± (0.01% of reading + 5.8 kPa)
Allowable input		2.7 kPa abs to 23 MPa sg		
Temperature coefficient		± (0.001% of reading + 0.16 kPa) / ˚C or less		

70 MPa Model (-06)

Items		Specifications		
Pressure type		Shield gauge		
Measurement Range		0 to 25 MPa sg	0 to 50 MPa sg	0 to 70 MPa sg
Measurement display range		to 30.0000 MPa	to 60.0000 MPa	to 77.0000 MPa
Measurement accuracy*1, *2	6*3 months after calibration (Test after zero calibration)*5	± (0.01% of reading + 6 kPa)	± (0.01% of reading + 10 kPa)	± (0.01% of reading + 16 kPa)
	1*4 year after calibration (Test after zero calibration)*5	± (0.01% of reading + 9.5 kPa)	± (0.01% of reading + 13.5 kPa)	± (0.01% of reading + 19.5 kPa)
Allowable input		2.7 kPa abs to 98 MPa sg		
Temperature coefficient		± (0.001% of reading + 0.7 kPa) / ˚C or less		

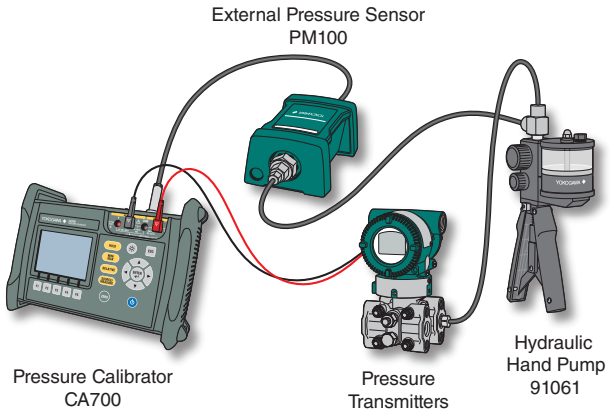
Common Specifications

Items	Specifications
Resolution	0.0001 MPa (0.1 kPa)
Response time*6	2.5 s or less
Internal volume	Approx. 6 cm^3
Influence of positional setup	Zero point drift ±1 kPa or less
Measurement fluid	Gas and liquid (non-corrosive, non-flammable, non-explosive, and non-toxic fluids)
Measurement fluid temperature	–10 to 50˚C (Liquid temperature 5 to 50˚C)
Pressure sensor	Silicon resonant sensor
Pressure sensor element	Diaphragm
Input port	1/2 NPT female thread
Measurement unit material	Diaphragm: Hastelloy C276 and input port: SUS316

*1: Yokogawa's pressure standard accuracy is excluded
*2: The value measured with the PM100 is in digital communication with the CA700, and there is no error between these instruments.
*3: 23˚C±3˚C, 6 months after calibration, Test after zero calibration
*4: 23˚C±3˚C, 1 year after calibration, Test after zero calibration
*5: Zero-point calibration condition: Under atmospheric pressure
*6: Time from 3.5 MPa to atmospheric release and from 0 MPa to ±3.5 kPa

Applications

■ Field calibration of pressure transmitter



■ Model and Suffix Code

Product name	Model	Suffix Code		
External Pressure sensor	PM100	General use type		
		–E	All countries except Japan	
			–05	Shield gauge Pressure (7 MPa/10 MPa/16 MPa Range switching)
			–06	Shield gauge Pressure (25 MPa/50 MPa/70 MPa Range switching)
			–P3	(1/2" NPT female thread)

■ PM100 Accessories

Product name	Model	Specification
Connection cable	95020	1 m
Connector	91083	1/2" NPT male thread to 1/8" NPT female thread conversion connector
Connector	91084	1/2" NPT male thread to 1/4" NPT female thread conversion connector (when -05 is selected)
Connector	91085	1/2" NPT male thread to Rc1/4" female thread conversion connector (when -05 is selected)
Connector	91086	1/2" NPT male thread to 1/4" NPT female thread conversion connector (when -06 is selected)
Connector	91087	1/2" NPT male thread to Rc1/4" female thread conversion connector (when -06 is selected)

Connection cable 95020

Connector 91083
(1/2" NPT male thread to 1/8" NPT female thread)

Connector 91084
(1/2" NPT male thread to 1/4" NPT female thread)

Connector 91085
(1/2" NPT male thread to Rc1/4" female thread)

Connector 91086
1/2" NPT male thread to 1/4" NPT female thread

Connector 91087
1/2" NPT male thread to Rc1/4" female thread

Process Calibrators

Low Pressure Hand Pump **91071**

- High performance hand pump capable of generating pressure in the low pressure range and fine adjustment (with scale)
- Pressure generation range: -83 to 700 kPa
- Ideal for pressure generation in the low pressure range
- Replacement valve set 91045 (Separately Sold Accessories) for easy maintenance
- Smooth pressurization with less internal leaking

Pneumatic Hand Pump **91075**

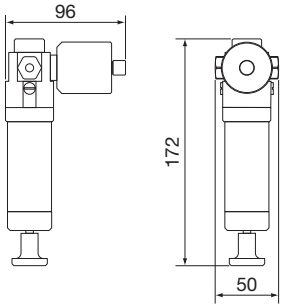
- High performance hand pump with wide range pressurization and fine adjustment (with scale)
- Pressure generation range: –83 to 4000 kPa
- Suitable for pressure generation from low pressure to medium pressure range
- Replacement valve set 91045 (Separately Sold Accessories) for easy maintenance
- Smooth pressurization with less internal leaking

■ Hand Pump Specifications

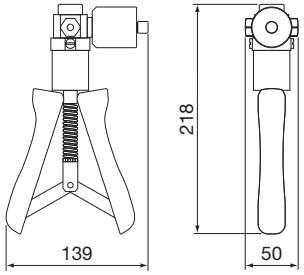
Product name	Model	Pressure generation range	MWP (maximum working pressure)	Connection port	Pressurized media
Low Pressure Hand Pump	91071	-83 to 700 kPa	1000 kPa	Rc1/8" female thread, Rc1/4" female thread	Air
Pneumatic Hand Pump	91075	-83 to 4000 kPa	5100 kPa	Rc1/8" female thread, Rc1/4" female thread	Air

■ Hand Pump External Dimensions

91071 Unit: mm



91075 Unit: mm



The external dimensions vary slightly depending on the stroke adjustment of the handle.

Process Calibrators

■ Model and Suffix Code

● Pressure Hand Pump Kits*1

Product name	Model	Specification
Low Pressure Hand Pump Kit	91070	Low Pressure Hand Pump (91071), Low pressure and pneumatic hand pump connectors (91053), Low pressure and pneumatic hand pump case (93054)
Pneumatic Hand Pump Kit	91074	Pneumatic Hand Pump (91075), Low pressure and pneumatic hand pump connectors (91053), Low pressure and pneumatic hand pump case (93054)

*1: These accessories are not included in the CA700 calibrator package at the time of purchase.

Low Pressure Hand Pump Kit
91070

Pneumatic Hand Pump Kit
91074

● Hand Pump Kit Accessories*2

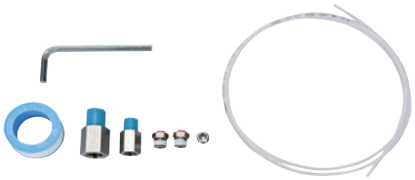
Product name	Model	Specification
Low Pressure Hand Pump	91071	Hand pump: -83 to 700 kPa (pressure generation range)
Pneumatic Hand Pump	91075	Hand pump: -83 to 4000 kPa (pressure generation range)
Low pressure and pneumatic hand pump connectors*3	91053	Connector set for the 91053 (quick adapter, sealing cap, flexible hose, sealing tape, and hex wrench)
Hand pump case	93054	Case for 91071, 91075, 91053 (91071, 91075, 91053, and instruction manual)
Replacement Valve Set*4	91045	Valve set for low pressure and pneumatic (Valve, O-ring, spring, cap each 2 pcs)

*2: These accessories are included in the hand pump kit (91070, 91074) at the time of purchase. They can also be purchased separately.
*3: Quick Adapter The maximum working pressure of the quick adapter is 1.0 MPa, and the maximum working pressure of the flexible hose is 2.0 MPa. If high airtightness and pressure resistance are required, use a connector with a ferrule or sleeve. Also, use a hose that is strong enough to withstand the pressure generated. Use hoses that are strong enough to withstand the pressure generated.
*4: Valves are already mounted on the low-pressure and pneumatic hand pump product body. 91045 is a replacement part.

Low Pressure Hand Pump
91071

Pneumatic Hand Pump
91075

Low pressure and pneumatic hand pump connectors
91053



Hand pump case
93054

Replacement Valve Set
91045

Process Calibrators

Multi Function Calibrator CA500/550

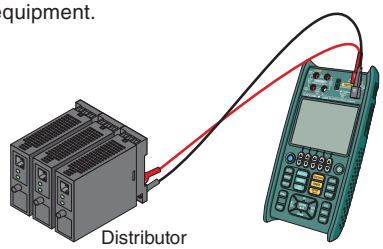
■ Features

- **High Accuracy**
  - CA550 0.010% (DCmA) /0.020% (Ω) /0.3˚C (RTD)
  - CA500 0.015% (DCmA) /0.015% (Ω) /0.1˚C (RTD)
- **Multi-function**
  - Sources and measures DC voltage, DC current, RTD, TC, resistance, frequency and pulse signals
  - Corresponds to 17 types of TC standard (JIS/IEC/DIN/ASTM/GOST R)
  - Corresponds to 14 types of RTD standard (JIS/IEC/GOST R)
- **Multiple source patterns**
  - Linear sweep function
  - Step sweep function
  - Program sweep function
- **Thin design × Robustness**
  - Thin body that is easy to hold withone hand, and improved robustness with protection

CA500/550 application examples

■ 20 mA SIMULATE

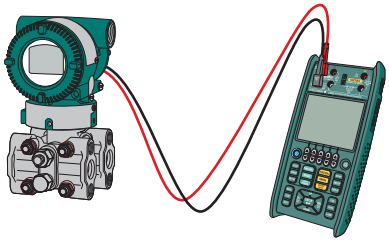
The CA500 series can be used as a transmitter simulator to perform a loop test. It sinks the set current from an external voltage source of instrumentation equipment.



Distributor

■ Zero point adjustment of HART transmitter

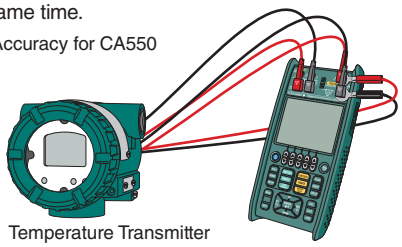
CA550 supports HART communication (Universal command/Common practice command).
Reading of HART device information, writing of LRV/URV, and trimming of analog output are possible.



■ RTD SIMULATE

CA500/CA550 corresponds to 14 types of RTD for sourcing.It achieves the high basic accuracy of 0.1°C* (typical of type Pt100), which enables it to operate a highly reliable test.
Additionally, input and output testing of temperature transmitters is possible at the same time.

*Accuracy for CA550



Temperature Transmitter

Easy-to-view Display

CA500 features a Reflective LCD, providing improved outdoor visibility. Main display (generated/measured values) and Sub display (%, mV, Ω, etc.) allow required information at a work site to be confirmed at a glance.

Wiring information display function

A wiring diagram is displayed according to the function selected.
This function allows a user to perform wiring while referring to a wiring diagram and prevents mis-wiring.

Thermocouple generation using TC Mini Plug

Using a TC Mini Plug together with a compensating lead wire enables generation of thermal electromotive force without an external RJ sensor.*

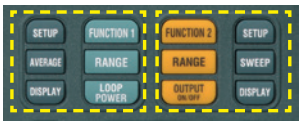
*A compensating lead wire needs to be prepared by customer.

Easy-to-use key operation

0%/100% keys
The source can be easily switched between 0% and 100% of range.
Users can also set a desired value.

UP/DOWN keys
The output is changed in preset steps by pressing UP or DOWN key.

Operation key layout
Keys related to generation and measurement are arranged collectively to allow easy and intuitive operation.



SQUARE ROOT output

For 4-20 mA, 1-5 V ranges, users can choose between LINEAR and SQUARE ROOT output.

	Current		Voltage	
	LINEAR	SQUARE ROOT	LINEAR	SQUARE ROOT
0%	4 mA	4 mA	1 V	1 V
25%	8 mA	5 mA	2 V	1.25 V
50%	12 mA	8 mA	3 V	2 V
75%	16 mA	13 mA	4 V	3.25 V
100%	20 mA	20 mA	5 V	5 V

Actual output values

CA550 Only — Automatic input/output testing (Program sweep)

Automatic input/output testing is possible by setting source values for each step for a calibration target. Calibration results such as generated value, measured value, error rate, date/time, and pass/fail are saved in CSV format in the CA550 main unit. By connecting the CA550 to a PC using a standard USB cable, the instrument can be recognized as a mass-storage device for data to be transferred to the PC.

CA550 Only — HART COMMUNICATION PROTOCOL

HART communication function*1 HART/BRAIN modem function*1
BRAIN TagNo acquisition function*2

*1 when CA550-F2 or -F3 is specified. *2 when CA550-F2 is specified.

The following items are supported by HART communication function:

• TagNo. • PV value (including reading of PV %value, AO value, SV value, TV value, QV value)	Read
• LRV (Lower limit of range) • Damping • URV (Upper limit of range)	Read and Write
• Trim D/A at 4 mA • Trim D/A at 20 mA • PV Zero	Write

Please note that not all commands are supported by HART communication. TagNo acquisition function is available in BRAIN communication. No other functions are available.

Process Calibrators

■ Specifications

● Voltage/Current/Resistance/Pulse Source Unit

Function	Range	Resolution	Source range	Accuracy (1 year) ±(% of Setting + offset)		Note
				CA500	CA550	
DC voltage	100 mV	1 µV	±110.000 mV	0.015% + 10 µV	0.015% + 5 µV	Maximum output current: 10 mA
	1–5 V	0.1 mV	0.0000 to 6.0000 V	0.015% + 0.5 mV		Maximum output current: 10 mA Value output function supporting square root computation is available
	5 V	0.1 mV	±6.0000 V	0.015% + 0.5 mV		Maximum output current: 10 mA
	30 V	1 mV	±33.000 V	0.015% + 5 mV		Maximum output current: 1 mA
DC current	20 mA	1 µA	±24.000 mA	0.015% + 3 µA	0.010% + 2 µA	Source voltage: 0 to +20 V
	4–20 mA	1 µA	0.000 to 24.000 mA	0.015% + 3 µA	0.010% + 2 µA	Source voltage: 0 to +20 V Value output function supporting square root computation is available
	20 mA SIMULATE	1 µA	0.000 to 24.000 mA	0.015% + 3 µA	0.010% + 2 µA	External power supply: +5 to +28 V
Resistance	400 Ω	10 mΩ	0.00 to 440.00 Ω	0.020% + 0.1 Ω*1	0.015% + 0.05 Ω*1	Allowable measurement current: 0.1 to 3 mA
	4000 Ω	100 mΩ	0.0 to 4400.0 Ω	0.020% + 0.5 Ω*1	0.015% + 0.2 Ω*1	Allowable measurement current: 0.05 to 0.6 mA
Frequency /pulse*4	500 Hz	0.01 Hz	1.00 to 550.00 Hz	0.005% + 0.01 Hz		Square wave, 50% Duty Cycle, +0.1 to +15 V Pulse number: Continuous 1 to 99999 cycles Maximum load current: 10 mA
	5000 Hz	0.1 Hz	1.0 to 5500.0 Hz	0.005% + 0.1 Hz		
	50 kHz	0.001 kHz	0.001 to 50.000 kHz	0.005% + 0.001 kHz		
	CPM	0.1/min	1.0 to 1100.0/min	0.5/min		

● 24 V Loop Power Supply

Supply voltage	Note
24 V±2 V	Communication resistance: OFF Maximum load current: 24 mA

● Voltage/Current/Resistance/Pulse Measurement Unit

Function	Range	Resolution	Measurement range	Accuracy (1 year) ±(% of reading + offset)		Note
				CA500	CA550	
DC voltage	100 mV	1 µV	±110.000 mV	0.015% + 10 µV	0.015% + 5 µV	Input resistance: 1 GΩ or more
	5 V	0.1 mV	±6.0000 V	0.015% + 0.5 mV		Input resistance: Approx. 1 MΩ
	50 V	1 mV	±55.000 V	0.015% + 5 mV		Input resistance: Approx. 1 MΩ
DC current	50 mA	1 µA	±60.000 mA	0.015% + 3 µA	0.010% + 2 µA	Input resistance: 10 Ω or less
Resistance	400 Ω	10 mΩ	0.00 to 440.00 Ω	0.020% + 0.1 Ω*2, *3	0.015% + 0.05 Ω*2, *3	Voltage applied current measurement method (typical 1 mA@0 Ω, 781 µA@400 Ω, 240 µA@4 kΩ)
	4000 Ω	100 mΩ	0.0 to 4400.0 Ω	0.020% + 0.5 Ω*2, *3	0.015% + 0.2 Ω*2, *3	
Pulse measurement*4	500 Hz	0.01 Hz	1.00 to 550.00 Hz	0.005% + 0.01 Hz		Measurement time: 1.0 s (Max. 10 s), 0.5 V to 30 Vpp
	5000 Hz	0.1 Hz	1.0 to 5500.0 Hz	0.005% + 0.1 Hz		
	50 kHz	0.001 kHz	0.001 to 50.000 kHz	0.005% + 0.001 kHz		
	PULSE COUNT	1	0 to 99999	2		Maximum integration time: 60 min, 0.5 V to 30 Vpp

Accuracy is guaranteed under the environmental conditions of +23˚C±5˚C, 20 to 80% RH. For use in the temperature range of –10 to +18˚C or +28 to +50˚C, add the temperature coefficient: 0.005% of Range/˚C.

*1 When using the included binding post (99045)
*2 Above accuracy is defined for 4 wire measuring.
*3 Accuracy for 3 wire measuring: 0.05Ω to 400 Ω range; 0.2 Ω to 4000 Ω range is added, on condition the resistance of all cables are the same.
Accuracy for 2 wire measuring: Same with 3 wire measuring on condition the resistance of cables are excluded.
*4 Dry contact compatible

● Thermocouple (TC) Source/Measure (Terminal TC-A: TC plug terminal)

Accuracy of Source/Meas (Common to CA500/CA550)

t: Temperature of Source/Meas.

TC	Source/Meas Temperature Range	Source Accuracy [°C] (1 year) (±˚C)	Meas. Accuracy [°C] (1 year) (±˚C)	Standard or Regulation
K	–200.0 ≤t< 0.0˚C	0.5 + |t| × 0.30%	0.5 + |t| × 0.30%	EC60584-1*1, *2
	0.0 ≤t< +500.0˚C	0.5	0.5	
	+500.0 ≤t≤ +1372.0˚C	0.5 + (t – 500.0) × 0.03%	0.5 + (t – 500.0) × 0.02%	
E	–250.0 ≤t< –200.0˚C	1.1 + (|t| – 200.0) × 2.00%	1.1 + (|t| – 200.0) × 2.00%	IEC60584-1*1, *2
	–200.0 ≤t< 0.0˚C	0.5 + |t| × 0.30%	0.5 + |t| × 0.30%	
	0.0 ≤t< +500.0˚C	0.5	0.5	
	+500.0 ≤t≤ +1000.0˚C	0.5 + (t – 500.0) × 0.02%	0.5 + (t – 500.0) × 0.02%	
J	–210.0 ≤t< 0.0˚C	0.5 + |t| × 0.30%	0.5 + |t| × 0.30%	IEC60584-1*1, *2
	0.0 ≤t≤ +1200.0˚C	0.5 + t × 0.02%	0.5 + t × 0.02%	
T	–250.0 ≤t< –200.0˚C	1.1 + (|t| – 200.0) × 2.50%	1.1 + (|t| – 200.0) × 2.50%	IEC60584-1*1
	–200.0 ≤t< 0.0˚C	0.5 + |t| × 0.30%	0.5 + |t| × 0.30%	
	0.0 ≤t≤ +400.0˚C	0.5	0.5	
N	–200.0 ≤t< 0.0˚C	0.6 + |t| × 0.40%	0.6 + |t| × 0.30%	IEC60584-1*1
	0.0 ≤t≤ +1300.0˚C	0.6	0.6	
L	–200.0 ≤t< 0.0˚C	0.5 + |t| × 0.15%	0.5 + |t| × 0.15%	DIN 43710 1985
	0.0 ≤t≤ +900.0˚C	0.5	0.5	
U	–200.0 ≤t< 0.0˚C	0.5 + |t| × 0.20%	0.5 + |t| × 0.20%	DIN 43710 1985
	0.0 ≤t≤ +600.0˚C	0.5	0.5	
R	–20.0 ≤t< 0.0˚C	2.0	2.0	IEC60584-1*1, *2
	0.0 ≤t< +100.0˚C	2.0	1.4	
	+100.0 ≤t≤ +1767.0˚C	1.4	1.4	
S	–20.0 ≤t< 0.0˚C	2.0	2.0	IEC60584-1*1, *2
	0.0 ≤t< +100.0˚C	2.0	1.4	
	+100.0 ≤t≤ +1768.0˚C	1.4	1.4	
B	+600.0 ≤t< +800.0˚C	1.2	1.5	IEC60584-1*1, *2
	+800.0 ≤t< +1000.0˚C	1.0	1.2	
	+1000.0 ≤t≤ +1820.0˚C	1.0	1.1	
C	0.0 ≤t< +1000.0˚C	0.8	0.8	IEC60584-1*1
	+1000.0 ≤t≤ +2315.0˚C	0.8 + (t – 1000.0) × 0.06%	0.8 + (t – 1000.0) × 0.06%	
XK	–200.0 ≤t< 0.0˚C	0.4 + |t| × 0.20%	0.4 + |t| × 0.20%	GOST R 8.585-2001
	0.0 ≤t< +300.0˚C	0.4	0.4	
	+300.0 ≤t≤ +800.0˚C	0.5	0.5	
A	0.0 ≤t< +1000.0˚C	1.0	1.0	IEC60584-1
	+1000.0 ≤t≤ +2500.0˚C	1.0 + (t – 1000.0) × 0.06%	1.0 + (t – 1000.0) × 0.06%	
D (W3Re/W25Re)	0.0 ≤t< +300.0˚C	1.4	1.8	ASTM E1751/E1751M
	+300.0 ≤t< +1500.0˚C	1.2	1.2	
	+1500.0 ≤t≤ +2315.0˚C	1.8	2.2	
G (W/W26Re)	+100.0 ≤t< +300.0˚C	1.4	1.8	ASTM E1751/E1751M
	+300.0 ≤t< +1500.0˚C	1.2	1.2	
	+1500.0 ≤t≤ +2315.0˚C	1.8	2.2	
PLATINELII	0.0 ≤t< +100.0˚C	0.6	1.8	ASTM E1751/E1751M
	+100.0 ≤t< +1000.0˚C	0.8	1.8	
	+1000.0 ≤t≤ +1395.0˚C	1.0	2.2	
PR20-40	0.0 ≤t< +500.0˚C	10.0	11.0	ASTM E1751
	+500.0 ≤t< +1000.0˚C	3.0	4.0	
	+1000.0 ≤t≤ +1888.0˚C	2.0	2.0	

Using internal reference junction compensation
Accuracy is guaranteed under the environmental conditions of 23˚C±5˚C, 20 to 80% RH. For use in the temperature range of –10 to +18˚C or 28 to 50˚C, add the temperature coefficient: 0.05˚C/˚C.
Errors of TC are not included.
The display resolution for source/measure is 0.1˚C
Terminal TC-B (reference junction compensation: off) Source/measurement accuracy 0.3˚C (typical)

*1 Also compliant with JIS C 1602
*2 IPTS-68 (JIS C 1602 1981) may be selected.

About formula of accuracy
The accuracy of source or measuring is defined by constant value or formula of linear expression.
Example) Accuracy of type K at measuring point of 1000.0°C is ±(0.5 + (1000.0 – 500) × 0.02%)°C = ±0.6°C

Process Calibrators

● RTD Source/Measure

t: Temperature of Source/Meas.

RTD	Coefficient	Temperature Range	Source/Meas. Accuracy (1 year) (±°C)		Allowable excitation current	Standard or Regulation
			CA500	CA550		
Pt100	3851	−200.0 ≤t< +100.0°C	0.3	0.1	0.1 to 3 mA	IEC60751*1
		+100.0 ≤t≤ +800.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
	3850	−200.0 ≤t< +100.0°C	0.3	0.1	0.1 to 3 mA	JIS C 1604 1989 (Pt100)
		+100.0 ≤t≤ +630.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
	3916	−200.0 ≤t< +100.0°C	0.3	0.1	0.1 to 3 mA	JIS C 1604 1989 (JPt100)
		+100.0 ≤t≤ +510.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
	3926	−200.0 ≤t< +100.0°C	0.3	0.1	0.1 to 3 mA	Minco Application Aid #18
		+100.0 ≤t≤ +630.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
Pt200	3851	−200.0 ≤t< +100.0°C	0.3	0.1	0.05 to 3 mA	IEC60751*1
		+100.0 ≤t≤ +630.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
Pt500	3851	−200.0 ≤t< +100.0°C	0.3	0.1	0.05 to 0.6 mA	IEC60751*1
		+100.0 ≤t≤ +630.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
Pt1000	3851	−200.0 ≤t< +100.0°C	0.2	0.1	0.05 to 0.6 mA	IEC60751*1
		+100.0 ≤t≤ +630.0°C	0.2 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
Cu10	427	−100.0 ≤t≤ +260.0°C	1.5	1.2	0.1 to 3 mA	Minco Application Aid #18
Ni120	627	−80.0 ≤t≤ +260.0°C	0.2	0.1	0.1 to 3 mA	Minco Application Aid #18
Pt50	3851	−200.0 ≤t< +100.0°C	0.4	0.2	0.1 to 3 mA	IEC60751*1
		+100.0 ≤t≤ +630.0°C	0.4 + (t−100) × 0.033%	0.2 + (t−100) × 0.033%		
Pt50G	—	−200.0 ≤t< +100.0°C	0.4	0.2	0.1 to 3 mA	GOST R 8.625-2006
		+100.0 ≤t≤ +800.0°C	0.4 + (t−100) × 0.033%	0.2 + (t−100) × 0.033%		
Pt100G	—	−200.0 ≤t< +100.0°C	0.3	0.1	0.1 to 3 mA	GOST R 8.625-2006
		+100.0 ≤t≤ +630.0°C	0.3 + (t−100) × 0.033%	0.1 + (t−100) × 0.033%		
Cu50M	—	−180.0 ≤t≤ +200.0°C	0.4	0.2	0.1 to 3 mA	GOST R 8.625-2006
Cu100M	—	−180.0 ≤t≤ +200.0°C	0.3	0.1	0.1 to 3 mA	GOST R 8.625-2006

Accuracy is guaranteed under the environmental conditions of +23°C±5°C, 20 to 80% RH. For use in the temperature range of −10 to +18°C or +28 to +50°C, add the temperature coefficient: 0.05°C/°C.
Above accuracy is defined for 4 wire measuring. Accuracy for 3 wire measuring: 1.0°C to Cu 10; 0.6°C to Pt50/Pt50G/Cu50M; 0.3°C to other RTD is each added, on condition the resistance of all cables are the same. Accuracy for 2 wire measuring: Same with 3 wire measuring on condition the resistance of cables are excluded. The accuracy of source is the one when using the included binding post (99045) *1 Also compliant with JIS C 1604.

■ Common Specifications

● Source

Generation unit voltage limiter	Approx. −5 V to +36 V
Generation unit current limiter	Approx. ±30 mA
Sweep function	Step/Linear/Program
Interval time	5 to 600 s
Generation load condition	C ≤10 µF, L ≤10 mH
Output resistance	20 mΩ or less
Output response time	DC Voltage/Current/TC: Approx. 250 ms RTD/Resistance: Approx. 1 ms

● Measurement

CMRR	120 dB (50/60 Hz)
NMRR	60 dB (50/60 Hz)
Rating between terminals	H/L terminals: 50 V LOOP/mA terminals: 30 V mA/L terminals: 50 mA
Current terminal protective input	PTC protection
Maximum voltage application between measurement terminals and earth	50 V peak

■ General Specifications

Function	CA500	CA550
Display	Monochrome Dot Matrix LCD	
Built-in light	Selection of "Constantly ON", "Constantly OFF" or "Auto off by approx. 10 min" OFF, level dimming function	
Display refresh rate	Approx. 1 s	
Warm-up time	Approx. 5 min	
Language	English (default setting), Japanese, Chinese, Korean, Russian	
Power supply	DC 5 V±10%, max. 500 mA, Four alkaline AA batteries, Battery life: Approx. 16 hours (Measurement ON, 5 V output/10 kΩ or more)	
Auto power-off	Approx. 30 minutes (disabled by default)	
Ground voltage	Measurement terminal: 50 V, Source terminal: 30 V	
Insulation resistance	Between FUNCTION1-2 terminals: DC 500 V 50 MΩ or more	
Withstand voltage	Between FUNCTION1-2 terminals: 500 V AC for 10 seconds	
Dimensions	Approx. 130 (W) × 260 (H) × 53 (D) mm	
Weight	Approx. 900 g (including batteries)	
Safety standard	EN61010-1, Overvoltage Category I, Pollution Degree 2 EN61010-2-030, Measurement category O (other)	
Operation environment	Temperature: −10 to +50°C, Humidity: 80%R.H. (40°C or less), 50%R.H. (40 to 50°C) *No condensation, Altitude: 2000 m or less	
Storage environment	Temperature: −20 to +60°C, Humidity: 90%R.H. (No condensation)	
Interface	USB B communication device class	USB B communication device class, USB B mass storage class
Application	—	HART communication mode
Number of Data Records	Up to 100 results	Up to 250 CSV files
Accessories	Source lead cables, Measurement lead cables, Binding post (2 sets), USB cable (2 m, USB Type A - USB Type B), Soft case (for accessories), four AA alkaline batteries, Instruction manual (CD), Startup guide, Shoulder strap	

■ Model and Suffix code

● Accessories*1

Name	Model	Description
Lead cable for source	98020	1 red, 2 black, 1.7 m 7 mm fork terminal to alligator clip
Source/measurement lead cable	98035	3 red, 1 black, 1.7 m L plug terminal to alligator clip
Binding Post (Red Black)	99045	1 short plate attached*2
Binding Post (Red Red)	99046	1 short plate attached*2
USB Cable	A1421WL	USB Type A to Type B, 2 m
Soft Case	B8080FQ	Soft case for accessories

*1 Included with the CA500/CA550 main unit.
*2 The short plate is not used on CA500/CA550 (common parts with the CA300 series).

● Accessories (sold separately)

Name	Model	Description
Lead cables	98064	1 red, 1 black, 1.7 m L plug terminal to alligator clip
RJ Sensor*3	90080	Pt100 JIS AA class or equivalent
Grabber Clip	98026	1 red-black pair, 2 m, separate type
Soft carrying case	SU2006A	For CA500/CA550 main unit
TC Mini Plug Set 2*4	90045	K (yellow)/ E (violet)/ J (black)/ T (blue)
TC Mini Plug Set 3*4	90046	K (yellow)/ E (violet)/ J (black)/ T (blue)/ R•S (green)/ B•U (white)/ G (red, green)/ N (orange)
Carrying Case	93026	Product body, lead cables for generation and measurement, and terminal adapter, AC adapter storage

*3: RJ sensor is dedicated to CA500/550/320, unable to be used with CA71 and CA150.
*4: Other types of mini plugs and a compensating lead wire need to be prepared by customer.


Lead cable for source
98020


Source/measurement lead cable
98035


Binding Post (Red Black)
99045


Binding Post (Red Red)
99046


USB Cable
A1421WL


Soft Case
B8080FQ


Lead cables
98064


RJ Sensor*3
90080


Grabber Clip
98026


Soft carrying case
SU2006A


TC Mini Plug Set 2*4
90045


TC Mini Plug Set 3*4
90046

Process Calibrators

■ Features

- Multiple source and measurement of voltage, current, resistance, thermocouple, resistance temperature detector, frequency and pulse. (temperature measurement: CA71 only)
- The rotary switch enables easy operation like a DMM.
- Source and measurement (count) of dry contact pulse is available.
- Various source patterns such as the functions of divided output, auto-step and sweep.
- Two-way power source of batteries and an AC adapter (sold separately)

■ Functions

- Divided output (n/m) function
- Auto-step function
- Sweep function
- Memory function (50 data)
- Equivalent output of TC and RTD
- Internal reference junction compensation sensor
- 20 mA SINK function
- Communication function (RS232) (CA71 only)
- Voltage pulse and contact pulse
- CPM (count/minute) and CPH (count/hour)

■ Specifications

● Source

unit Accuracy: ±(% of setting + μV, mV, mA, Ω or ℃)

	Range	accuracy (23±5℃/1 year)	Resolution
DC voltage	100 mV	±(0.02% + 15 μV)	10 μV
	1 V	±(0.02% + 0.1 mV)	0.1 mV
	10 V	±(0.02% + 1 mV)	1 mV
	30 V	±(0.02% + 10 mV)	10 mV
DC current	20 mA	±(0.025% + 3 μA)	1 μA
	4-20 mA		4 mA
mA SINK	20 mA	±(0.05% + 3 μA)	1 μA
Resistance	400 Ω	±(0.025% + 0.1 Ω)	0.01 Ω
RTD	Pt100	±(0.025% + 0.3℃)	0.1℃
	JPt100		
TC	K/E/J	±(0.02% + 0.5℃) (-100℃ or greater) ±(0.02% + 1℃) (-100℃ or less)	0.1℃
	T/N/L/U	±(0.02% + 0.5℃) (0℃ or greater) ±(0.02% + 1℃) (0℃ or less)	
	R/S	±(0.02% + 1.5℃) (100℃ or greater) ±(0.02% + 2.5℃) (100℃ or less)	1℃
	B	±(0.02% + 1.5℃) (1000℃ or greater) ±(0.02% + 2℃) (1000℃ or less)	
Frequency/pulse	500 Hz	±0.2 Hz	0.1 Hz
	1000 Hz	±1 Hz	1 Hz
	10 kHz	±0.1 kHz	0.1 kHz
	Pulse cycle	---	1 cycle

● Measurement

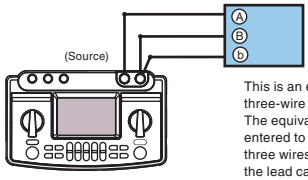
unit Accuracy: ±(% of reading + μV, mV, μA, ℃ or dgt ⇒ digit)

	Range	Accuracy (23±5℃/year)	Resolution
DC voltage	100 mV	±(0.025% + 20 μV)	10 μV
	1 V	±(0.025% + 0.2 mV)	0.1 mV
	10 V	±(0.025% + 2 mV)	1 mV
	100 V	±(0.05% + 20 mV)	0.01 V
DC current	20 mA	±(0.025% + 4 μA)	1 μA
	100 mA	±(0.04% + 30 μA)	10 μA
Resistance	400 Ω	±(0.05% + 0.1 Ω)	0.01 Ω
AC voltage	1 V	±(0.5% + 5 dgt)	1 mV
	10 V		0.01 V
	100 V		0.1 V
	300 V	±(0.5% + 2 dgt)	1 V
Frequency/pulse	100 Hz	±2 dgt	0.01 Hz
	1000 Hz		0.1 Hz
	10 kHz		0.001 kHz
	CPM	---	1 CPM
	CPH		1 CPH
TC (CA71 only)	K	±(0.05% + 1.5℃) (-100℃ or greater) ±(0.05% + 2℃) (-100℃ or less)	0.1℃
	E		
	J		
	T		
	N		
	L		
	U		
	R	±(0.05% + 2℃) (100℃ or greater) ±(0.05% + 3℃) (100℃ or less)	1℃
	S		
	B		
RTD (CA71 only)	Pt100	±(0.05% + 0.6℃)	0.1℃
	JPt100		

Multi Function Calibrator CA71/CA51

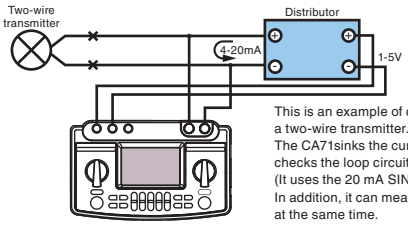
CA71 application examples

■ Connection with device supporting three-wire RTD thermometer



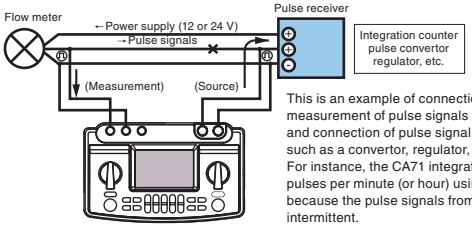
This is an example of connection with a device used as a three-wire RTD thermometer.
The equivalent output of the temperature set on the CA71 is entered to the device under calibration. At this point, wiring three wires is necessary to cancel the cable resistance of the lead cable connecting the CA71 and the target device.

■ Input and output test of distributor with 20 mA SINK



This is an example of connection with a distributor used as a two-wire transmitter.
The CA71sinks the current of supply voltage up to 28 V and checks the loop circuit.
(It uses the 20 mA SINK range.)
In addition, it can measure the output value of the distributor at the same time.

■ Test of flow meter and receiver



This is an example of connection of integrated value measurement of pulse signals from a flow meter and connection of pulse signal generation to a receiver such as a convertor, regulator, etc.
For instance, the CA71 integrates and counts the number of pulses per minute (or hour) using the CPM/CPH function because the pulse signals from the flow meter is intermittent.

■ General specifications

	Description
Source unit response time	Approx. 1 second (The amount of time from the output starts changing to enters within the accuracy)
Source unit voltage limiter	Approx. 32 V
Source unit current limiter	Approx. 25 mA
Measurement unit max. input	Voltage terminal: DC/AC 300 V Current terminal: 120 mA
Current terminal input protection	Fuse: 100 mA/400 V
Measurement unit voltage to ground	Max. 300 V
Measurement display update rate	Approx. 1 time/second
Serial interface (CA71 only)	Available with connecting a communication cable (RS232): Sold separately as an accessory
Power supply	Four alkaline AA batteries (LR6) or a dedicated AC adapter (8.5 V /150 mA: sold separately)
Conforming standards	Safety standards: EN61010-1, EN61010-2-030, EN61010-2-033 Measurement category III 300 V Lead cables for measurement (RD031): EN61010-031 Indoor use, Operating altitude 2000 m or less, Pollution degree 2 EMC standards: EN61326-1 Class A EMC Regulatory Arrangement in Australia and New Zealand EN 55011 ClassA Group1 Korea Electromagnetic Conformity Standard
Withstand voltage	Between input and output terminals 3.7 kVAC 1 minute
Operating temperature and humidity ranges	0-50℃ 20-80% RH (no condensation)
Weight	Approx. 730 g (including batteries)

Process Calibrators

Volt mA Calibrator CA310

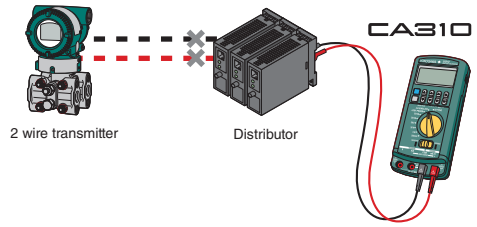
■ Features

- Basic accuracy: 0.015%
  (Source&Meas. accuracy of Voltage mA)
- 20 mA SIMULATE (SINK) function
- Simultaneously supplies 24 V loop power and measure output signal with high accuracy
- HART/BRAIN comm. resistance (250 Ω) embedded
- Sub display displays span% of the source value
- Corresponds to various types of source pattern
  (Step sweep/ Linear sweep/ Manual step/ Span check)

CA310 application examples

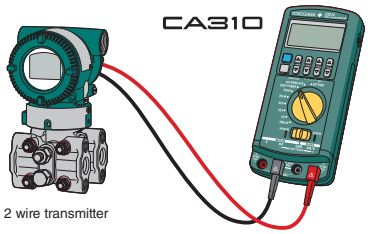
■ 20 mA SIMULATE (Two-wire Transmitter simulator)

CA310 is capable to execute a loop check by simulating a transmitter, sinking the current signal from the external source (distributor). It achieves the high accuracy 0.015% of setting to source 4-20 mA.



■ Two-wire Transmitter Loop Check

DC mA signals can be measured by supplying power to the transmitter from a 24 V DC power supply. DC mA measurement and zero-point check can be performed with an accuracy of 0.015% of reading. A 250-ohm resistor for HART and BRAIN communication is included in this calibrator so there is no need to attach an external resistor when connecting to a handy terminal.



■ Basic Specification (Source function) CA310

● DC Current source

Range	Resolution	Source range	Accuracy (1 year)	Note
20 mA	1 µA	0.000 to 24.000 mA	0.015% of setting + 3 µA	Compliance voltage: 24 V
20 mA SIMULATE	1 µA	0.000 to 24.000 mA	0.015% of setting + 3 µA	External power supply: 5 V to 28 V

● DC Voltage source

Range	Resolution	Source range	Accuracy (1 year)	Note
500 mV	10 µV	0.00 to 550.00 mV	0.015% of setting + 50 µV	Max. current: 10 mA
5 V	0.1 mV	0.0000 to 5.5000 V	0.015% of setting + 0.5 mV	Max. current: 10 mA
30 V	1 mV	0.000 to ±33.000 V	0.015% of setting + 5 mV	Max. current: 1 mA

Accuracy is specified at ambient temperature (Ta) of :23±5℃
Temperature effect: 0.005% or Range/℃ is added for other ambient temperature (Ta < 18℃, Ta > 28℃)

■ Basic Specification (Measurement function) CA310

● DC Current measurement

Range	Resolution	Measurement range	Accuracy (1 year)	Note
20 mA	1 µA	0 to ±24.000 mA	0.015% reading + 3 µA	Input resistance: less than 10 Ω
50 mA	1 µA	0 to ±60.000 mA	0.015% reading + 3 µA	

● DC Voltage measurement

Range	Resolution	Measurement range	Accuracy (1 year)	Note
500 mV	10 µV	0 to ±550.00 mV	0.015% of reading + 50 µV	Input resistance: approx. 1 MΩ
5 V	0.1 mV	0 to ±5.5000 V	0.015% of reading + 0.5 mV	Input resistance: approx. 1 MΩ
30 V	1 mV	0 to ±33.000 V	0.015% of reading + 5 mV	Input resistance: approx. 1 MΩ
50 V	1 mV	0 to ±55.000 V	0.015% of reading + 5 mV	Input resistance: approx. 1 MΩ

● 24 V Loop Power Supply

Range	Supply voltage	Note
Loop Power	24 V ±1 V	Communication resistance OFF: load current 24 mA
	24 V ±6 V	Communication resistance ON: load current 20 mA

Accuracy is specified at ambient temperature (Ta) of :23±5℃
Temperature effect: 0.005% or Range/℃ is added for other ambient temperature (Ta < 18℃, Ta > 28℃)

■ Measurement Unit Common Specifications

- CMRR approx. 120 dB (50/60 Hz)
- NMRR approx. 60 dB (50/60 Hz)
- Measurement terminal maximum input:
  Voltage terminal DC 50 V
  Current terminal DC 50 mA
- Current terminal protective input: PTC protection
- Maximum allowable applied voltage: Measure terminal to ground 50 V peak

■ Generation Unit Common Specifications

- Generation unit voltage limiter: Approx. 36 V
- Generation unit current limiter: Approx. 30 mA
- Sweep function Step (25%)/ Linear
- Step time 15 sec/30 sec/45 sec/60 sec
- Generation load condition: C ≤ 0.1 µF, L ≤ 10 mH
- Output resistance: under 10 mΩ
- Output response time: under 300 ms
- Maximum allowable applied voltage: Source terminal to ground 42 V peak

■ Features

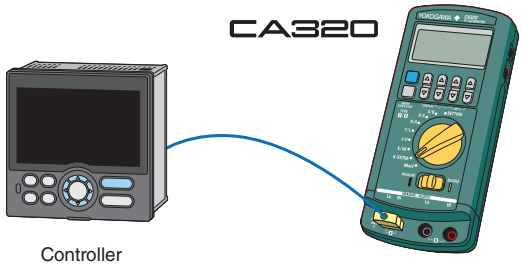
- Basic accuracy: 0.5℃ (Typical of TC type K)
  Including accuracy of internal RJC
- Corresponds to 16 types of TC standard
  (JIS/IEC/DIN/ASTM/GOST R)
- Sub display shows value of voltage source and span (%)
- Corresponds to various types of source pattern
  (Step sweep/ Linear sweep/ Manual step/ Span check)
- Corresponds to other TC types by mV source function
- Measures TC sensor output as a thermometer

TC Calibrator **CA320**

CA320 application examples

■ TC SIMULATE

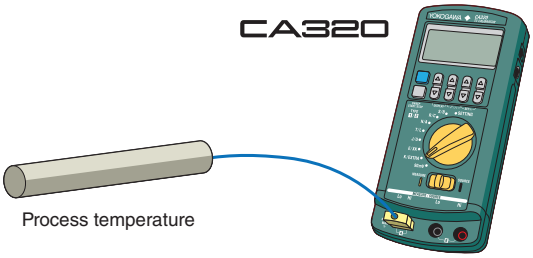
CA320 corresponds to 16 types of TC for sourcing. It achieves the high basic accuracy of 0.5°C (typical of type K), three times better than the previous model which enables it to operate a highly reliable test. Additionally, the difference of temperature between objects can be compensated, by using external RJ sensor or a compensating lead wire.



Controller

■ TC MEASURING

CA320 can measure the output of TC like a thermometer. It achieves the basic accuracy of 0.5°C (typical of type K), three times better than the previous model and is for multiple use for process temperature measuring by corresponding to 16 types of TC.



Process temperature

Useful function installed

■ Addition of sub display

The sub display additionally displays span (%), source value of voltage or resistance, while the main displays setting value.

■ Corresponds to 2 WAY Power supply

Power is supplied by 2 ways: AA Alkaline batteries or AC Adapter

AC Adapter is sold separately

Process Calibrators

■ Basic specification (Source/ Measure) CA320

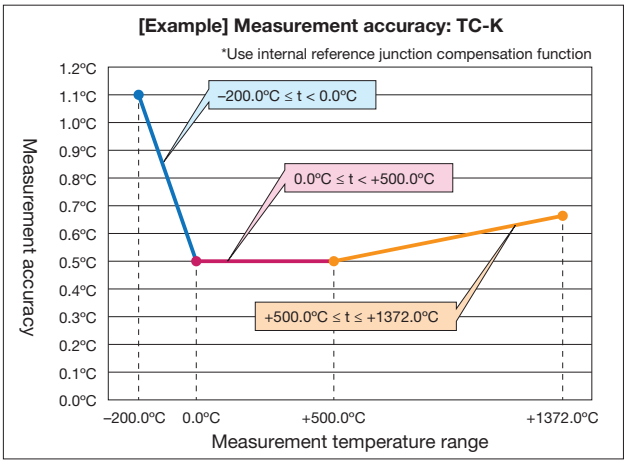
● Thermocouple (TC) Source/Measure (Terminal A: TC plug terminal)

t: Temperature of Source/Meas.

TC		Accuracy (1 year)			Standard or Regulation
		Source/Meas. Temperature	Source Accuracy [℃]	Meas. Accuracy [℃]	
K		-200.0℃ ≤ t < 0.0℃	0.5 + |t| × 0.3%	0.5 + |t| × 0.3%	IEC60584-1 JIS C1602
		0.0℃ ≤ t < +500.0℃	0.5	0.5	
		+500.0℃ ≤ t ≤ +1372.0℃	0.5 + (t-500) × 0.03%	0.5 + (t-500) × 0.02%	
E		-250.0℃ ≤ t < -200.0℃	1.1 + (|t|-200) × 2.0%	1.1 + (|t|-200) × 2.0%	IEC60584-1
		-200.0℃ ≤ t < 0.0℃	0.5 + |t| × 0.3%	0.5 + |t| × 0.3%	
		0.0℃ ≤ t < +500.0℃	0.5	0.5	
		+500.0℃ ≤ t ≤ +1000.0℃	0.5 + (t-500) × 0.02%	0.5 + (t-500) × 0.02%	
J		-210.0℃ ≤ t < 0.0℃	0.5 + |t| × 0.3%	0.5 + |t| × 0.3%	IEC60584-1
		0.0℃ ≤ t ≤ +1200.0℃	0.5+tx0.02%	0.5+tx0.02%	
T		-250.0℃ ≤ t < -200.0℃	1.1 + (|t|-200) × 2.5%	1.1 + (|t|-200) × 2.5%	IEC60584-1
		-200.0℃ ≤ t < 0.0℃	0.5 + |t| × 0.3%	0.5 + |t| × 0.3%	
		0.0℃ ≤ t ≤ +400.0℃	0.5	0.5	
N		-200.0℃ ≤ t < 0.0℃	0.6 + |t| × 0.4%	0.6 + |t| × 0.3%	IEC60584-1
		0.0℃ ≤ t ≤ +1300.0℃	0.6	0.6	
L		-200.0℃ ≤ t < 0.0℃	0.5 + |t| × 0.15%	0.5 + |t| × 0.15%	DIN 43710
		0.0℃ ≤ t ≤ +900.0℃	0.5	0.5	
U		-200.0℃ ≤ t < 0.0℃	0.5 + |t| × 0.2%	0.5 + |t| × 0.2%	DIN 43710
		0.0℃ ≤ t ≤ +600.0℃	0.5	0.5	
R		-20.0℃ ≤ t < 0.0℃	2.0	2.0	IEC60584-1
		0.0℃ ≤ t < +100.0℃	2.0	1.4	
		+100.0℃ ≤ t ≤ +1767.0℃	1.4	1.4	
S		-20.0℃ ≤ t < 0.0℃	2.0	2.0	IEC60584-1
		0.0℃ ≤ t < +100.0℃	2.0	1.4	
		+100.0℃ ≤ t ≤ +1768.0℃	1.4	1.4	
B		+600.0℃ ≤ t < +800.0℃	1.2	1.5	IEC60584-1
		+800.0℃ ≤ t < +1000.0℃	1.0	1.2	
		+1000.0℃ ≤ t ≤ +1820.0℃	1.0	1.1	
C		0.0℃ ≤ t < +1000.0℃	0.8	0.8	IEC60584-1
		+1000.0℃ ≤ t ≤ +2315.0℃	0.8 + (t-1000) × 0.06%	0.8 + (t-1000) × 0.06%	
XK		-200.0℃ ≤ t < 0.0℃	0.4 + |t| × 0.2%	0.4 + |t| × 0.2%	GOST R 8.585-2001
		0.0℃ ≤ t < +300.0℃	0.4	0.4	
		+300.0℃ ≤ t ≤ +800.0℃	0.5	0.5	
A		0.0℃ ≤ t < +1000.0℃	1.0	1.0	IEC60584-1
		+1000.0℃ ≤ t ≤ +2500.0℃	1.0 + (t-1000) × 0.06%	1.0 + (t-1000) × 0.06%	
Extra TC	D (W3Re/W25Re)	0.0℃ ≤ t < +300.0℃	1.4	1.8	ASTM E1751/E1751M
		+300.0℃ ≤ t < +1500.0℃	1.2	1.2	
		+1500.0℃ ≤ t ≤ +2315.0℃	1.8	2.2	
	G (W/W26Re)	+100.0℃ ≤ t < +300.0℃	1.4	1.8	ASTM E1751/E1751M
		+300.0℃ ≤ t < +1500.0℃	1.2	1.2	
		+1500.0℃ ≤ t ≤ +2315.0℃	1.8	2.2	
	PLATINEL II	0.0℃ ≤ t < +100.0℃	0.6	1.8	ASTM E1751/E1751M
		+100.0℃ ≤ t < +1000.0℃	0.8	1.8	
		+1000.0℃ ≤ t ≤ +1395.0℃	1.0	2.2	

Errors of TC are not included
Accuracy is specified at ambient temperature(Ta) of: 23±5℃ using internal junction compensation.
Temperature effect: 0.05%/℃ is added for other ambient temperature (Ta < 18℃, Ta > 28℃)
The display resolution for source / measure is 0.1℃

About formula of accuracy
The accuracy of source or measuring are defined by constant value or formula of linear expression.
Example Accuracy of type K at measuring point of 1000.0℃ is ±(0.5 + (1000.0-500) × 0.02%)℃= ±0.6℃



● DC Voltage Source and Measurement

Range	Resolution	Source Measure range	Accuracy (1 year)		Notes
			Source	Measure	
90 mV	1 μV	-11.000 to ±99.999 mV	0.015% of setting+10 μV	0.015% of reading+10 μV	Max. output current: 10 mA

Accuracy is specified at ambient temperature (Ta) of 23±5℃
Temperature effect: 0. 005% of Range/℃ is added for other ambient temperature (Ta < 18℃, Ta > 28℃)

■ Common source specification
- Output resistance: under 40 mΩ
- Output response: under 300 msec
- Max. load: C < 0.1 μF, L < 10 mH

■ Features

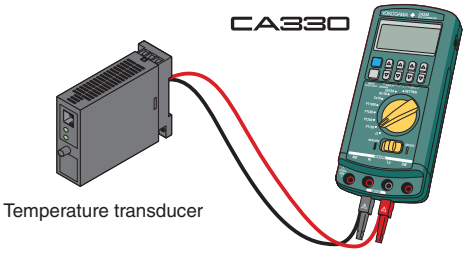
- Basic accuracy: 0.3℃ (Typical of Pt100)
- Corresponds to 14 types of RTD standard (JIS/IEC/GOST R)
- Sub display displays value of resistance source and span (%)
- Corresponds to various types of source pattern
  (Step sweep/ Linear sweep/ Manual step/ Span check)
- Corresponds to 2,3,4 wire. Realizes RTD simulation
- Measures output of RTD sensor as a thermometer

RTD Calibrator CA330

CA330 application examples

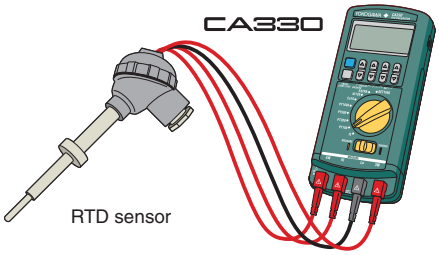
■ RTD SIMULATE

CA330 corresponds to 14 types of RTD for sourcing. It achieves the high basic accuracy of 0.3°C (typical of type Pt100), twice better than the previous model which enables it to operate a high reliable test.



■ RTD MEASURING

CA330 can measure the output of RTD like a thermometer. It achieves the basic accuracy of 0.3°C (typical of type Pt100), twice better than the previous model and is for multiple use of process temperature measuring by corresponding to 14 types of RTD.

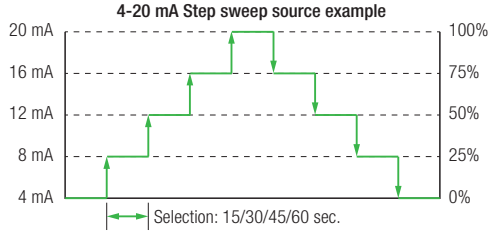


Supports efficient operation with various types of source pattern

■ Step sweep function

Sources by 25% step automatically from 0% to 100% of span which improves efficiency of operation. It can correspond to various response time of field devices. (15/30/45/60 seconds)

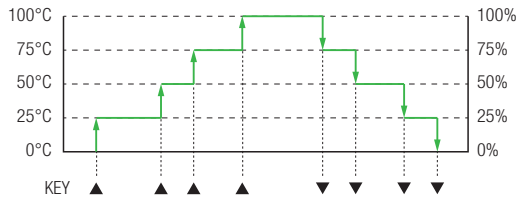
4-20 mA Step sweep source example



■ Manual step function

Sources by 25% step manually from 0% to 100% of span.
Users can do step sourcing at arbitrary timing corresponding to situations.

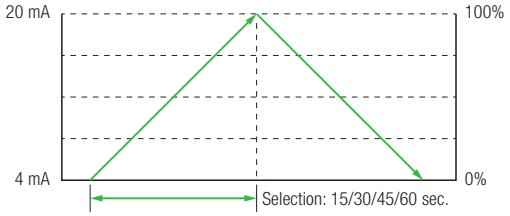
0°C - 100°C Manual step source example



■ Linear sweep function

Sources continuously from 0% to 100% and is capable to check meter and make linearity tests. Sweep time can be selected by 15/30/45/60 seconds.

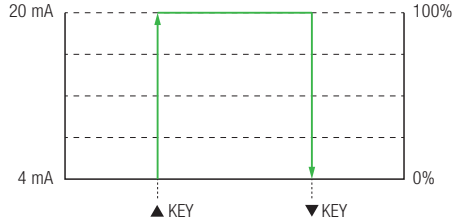
Linear sweep source example



■ Span check function

Switches sources 0%⇔100% by one touch. With this function, it makes it simple to make adjustment and to inspect the open and close operation of valves.

4-20 mA Span check example



Process Calibrators

■ Basic specification (Source/ Measure) CA330

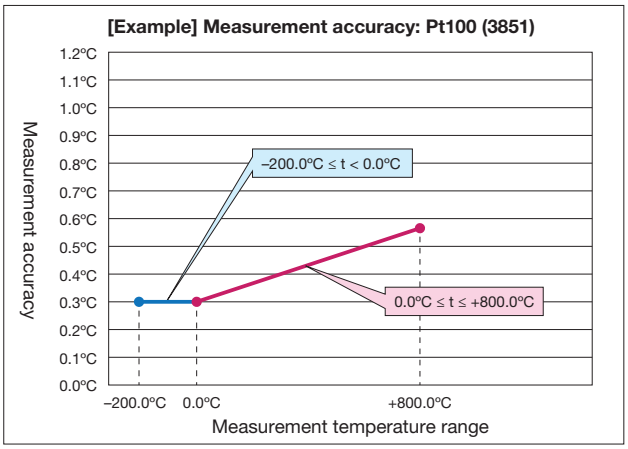
● RTD Source/Measure

t: Temperature of Source/Meas.

RTD		Coefficient	Accuracy (1 year)			Excitation current	Standard or Regulation
			Source/Meas. Temp.	Source Accuracy [℃]	Meas. Accuracy [℃]		
Pt100		3851	-200.0℃ ≤ t < 0.0℃	0.3	0.3	0.1-3 mA	IEC60751 JIS C 1604
			0.0℃ ≤ t ≤ + 800.0℃	0.3 + t × 0.033%	0.3 + t × 0.033%		
		3850	-200.0℃ ≤ t < 0.0℃	0.3	0.3	0.1-3 mA	JIS C 1604 1989 (Pt100)
			0.0℃ ≤ t ≤ + 630.0℃	0.3 + t × 0.033%	0.3 + t × 0.033%		
		3916	-200.0℃ ≤ t < 0.0℃	0.3	0.3	0.1-3 mA	JIS C 1604 1989 (JPt100)
			0.0℃ ≤ t ≤ + 510.0℃	0.3 + t × 0.033%	0.3 + t × 0.033%		
		3926	-200.0℃ ≤ t < 0.0℃	0.3	0.3	0.1-3 mA	Minco Application Aid #18
			0.0℃ ≤ t ≤ + 630.0℃	0.3 + t × 0.033%	0.3 + t × 0.033%		
Pt200		3851	-200.0℃ ≤ t < 0.0℃	0.3	0.3	0.05-0.8 mA	IEC60751
			0.0℃ ≤ t ≤ + 630.0℃	0.3 + t × 0.050%	0.3 + t × 0.050%		
Pt500		3851	-200.0℃ ≤ t < 0.0℃	0.4	0.4	0.05-0.6 mA	IEC60751
			0.0℃ ≤ t ≤ + 630.0℃	0.4 + t × 0.033%	0.4 + t × 0.033%		
Pt1000		3851	-200.0℃ ≤ t < 0.0℃	0.2	0.2	0.05-0.6 mA	IEC60751
			0.0℃ ≤ t ≤ + 630.0℃	0.2 + t × 0.033%	0.2 + t × 0.033%		
Cu10		427	-100.0℃ ≤ t ≤ + 260.0℃	1.5	1.5	0.1-3 mA	Minco Application Aid #18
Ni120		627	-80.0℃ ≤ t ≤ + 260.0℃	0.2	0.2	0.1-3 mA	Minco Application Aid #18
Extra RTD	Pt50	3851	-200.0℃ ≤ t < 0.0℃	0.4	0.4	0.1-3 mA	IEC60751
			0.0℃ ≤ t ≤ + 630.0℃	0.4 + t × 0.050%	0.4 + t × 0.050%		
	Pt50G	—	-200.0℃ ≤ t < 0.0℃	0.4	0.4	0.1-3 mA	GOST R 8.625-2006
			0.0℃ ≤ t ≤ + 800.0℃	0.4 + t × 0.050%	0.4 + t × 0.050%		
	Pt100G	—	-200.0℃ ≤ t < 0.0℃	0.3	0.3	0.1-3 mA	GOST R 8.625-2006
			0.0℃ ≤ t ≤ + 630.0℃	0.3 + t × 0.033%	0.3 + t × 0.033%		
	Cu50M	—	-180.0℃ ≤ t < 0.0℃	0.4	0.4	0.1-3 mA	GOST R 8.625-2006
			0.0℃ ≤ t ≤ + 200.0℃	0.4 + t × 0.050%	0.4 + t × 0.050%		
	Cu100M	—	-180.0℃ ≤ t < 0.0℃	0.3	0.3	0.1-3 mA	GOST R 8.625-2006
			0.0℃ ≤ t ≤ + 200.0℃	0.3 + t × 0.033%	0.3 + t × 0.033%		

Accuracy is specified at ambient temperature (Ta) of 23±5℃.
Temperature effect: 0.05℃/℃ is added for other ambient temperature (Ta < 18℃, Ta > 28℃)
The display resolution for source / measure is 0.1℃
Above accuracy is specified for 4 wire measuring.
Accuracy for 3 wire measuring: 1.0℃ to Cu10; 0.6℃ to Pt50, Pt50G and Cu50M; 0.3℃ to other RTD is each added, on condition the resistance of all cables are the same.
Accuracy for 2 wire measuring: Same with 3 wire measuring excluding resistance of cables.

About formula of accuracy
The accuracy of source or measuring are defined by constant value or formula of linear expression.
Example) Accuracy of Pt100 (3851) at measuring point of 100.0℃ is ±(0.3 + 100.0 × 0.033%)℃= ±0.333℃



● Resistance source and measure

Range	Resolution	Source and Meas. Range	Accuracy (1 year)		Note
			Source	Measurement	
500 Ω	10 mΩ	0.00 to 550.00 Ω	0.025% of setting + 0.1 Ω	0.025% of reading + 0.1 Ω	Excitation current 0.1 to 3 mA
3000 Ω	100 mΩ	0.0 to 3300.0 Ω	0.025% of setting + 0.5 Ω	0.025% of reading + 0.5 Ω	Excitation current 0.05 to 0.6 mA

Accuracy is specified at ambient temperature (Ta) of 23±5℃. Temperature effect: Add the accuracy of ±(0.005% of range) /℃ for other ambient temperature (Ta < 18℃, Ta > 28℃) ..
Above accuracy is defined for 4-wire measuring.
Accuracy for 3 wire measuring: 0.05 Ω to 500 Ω range; 0.2 Ω to 3000 Ω range is added, on condition the resistance of all cables are the same.
Accuracy for 2 wire measuring: Same with 3 wire measuring on condition the resistance of cables are excluded.

■ Common measurement specification
- Excitation current: Method of voltage surge current meausre (typical 0.78 mA at 0 Ω, 0.6 mA at 500 Ω, 0.27 mA at 3000 Ω
- Disconnection detection: Detects when Hi terminal is open.
- Allowable resistance for measuring cables: under 10 Ω

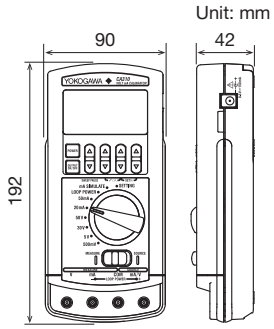
■ Common source specificaiton
- Response time: Under 5 msec (Excluding 3000 Ω range, Pt500 and Pt1000)
- Max. load: C < 10 μF, L < 10 mH
- Sweep: Step (25%) / linear
- Step time: 15 sec / 30 sec / 45 sec/ 60 sec

■ General Specification

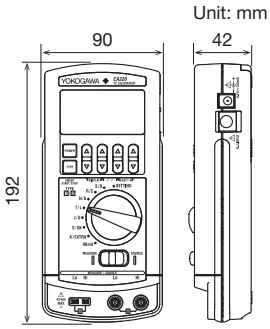
Display	Segment LCD
Backlight	LED (Selection of "Constantly ON", "Constantly OFF" or "Auto off by approx. 2 min")
Display refresh rate	Approx. 1 sec.
Warm-up time	Approx. 5 min.
Power supply	Four alkaline AA batteries, Dedicated AC Adapter (Sold separately)
Battery lilfe	CA310: 50 hours (5 V source, load over 10 kOhm), 25 hours (20 mA source, load under 5 V) / CA320: 55 hours / CA330: 55 hours
Auto Power Off	Approx. 20 min. (Disabled by setting)
Dimensions	Approx. 90 (W) × 192 (H) × 42 (D)
Weight	Approx. 440 g
Standard	Safety: EN61010-1 / EN61010-2-030
	EMC: EN61326-1 Class A Table 2. EN55011 Class A Group1
Operating temperature / humidity ranges	-10 to 55℃ 20 to 80%RH (without condensation)
Storage temperature / humidity ranges	-20 to 60℃ 90% RH or less (without condensation)
Accessories	CA310: Carrying case (B9108NK) / Lead cables (a set of black and red lead wires for generation and measurement / 98064) / four AA alkaline batteries / Instruction manual
	CA320: Carrying case (B9108NK) / Lead cables (a set of black and red lead wires for generation and measurement / 98040) / Binding post (Red Black 1 piece / 99045) / four AA alkaline batteries / Instruction manual
	CA330: Carrying case (B9108NK) / Lead cables (a set of 1 black and 3 red lead wires for generation and measurement / 98035) / Binding post (Red Red 1 piece / 99046) / Binding post (Red Red 1 piece / 99046) / four AA alkaline batteries / Instruction manual

■ External Dimensions (CA300 series)

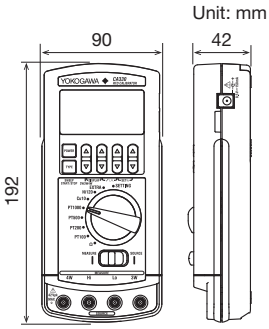
CA310



CA320

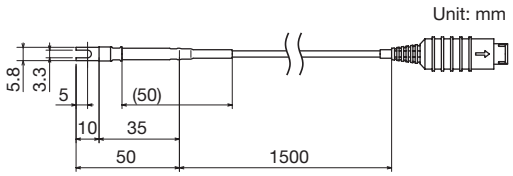


CA330

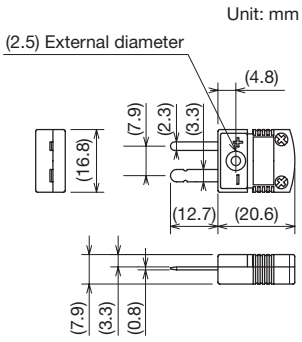


■ External Dimensions (Accessories)

RJ sensor
90080



TC connector



Process Calibrators

■ Model Name and Model Code

● Main units (CA300 series)

Name	Model	Suffix Code	Description
Volt mA Calibrator	CA310		Voltage and Current Simulate Model
TC Calibrator	CA320		Thermocouple Simulate Model
RTD Calibrator	CA330		RTD Simulate Model
		/TE	Add °F setting procedure (for CA320, CA330)

● Accessories Sold Separately *1

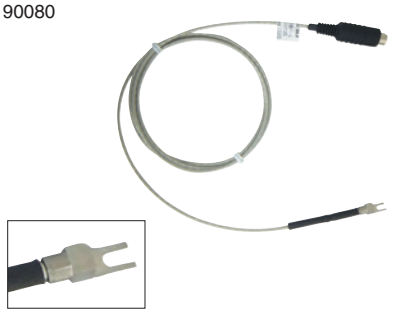
Name	Model	Description
AC Adapter	94013	Input: AC 120 V, 50/60 Hz
AC Adapter	94016	Input: AC 220 V to 240 V, 50/60 Hz
RJ Sensor *2	90080	for CA320: RJ (Reference Junction)
Grabber Clip *3	98026	for CA series: separate type (one set of Red and Black 2.0 m)
Rubber Boots *4	93060	for protection of main unit
Strap	97040	for hanging main unit on wall with rubber boot
Accessory Case	B9108XA	for accessories
TC Mini Plug Set 2 *5	90045	K (Yellow) /E (Violet) /J (Black) /T (Blue)
TC Mini Plug Set 3 *5	90046	K (yellow)/ E (violet)/ J (black)/ T (blue)/ R•S (green)/ B•U (white)/ G (red, green)/ N (orange)

*1: These accessories are not included with main unit when purchased
*2: RJ sensor is dedicated for CA320. It is unable to be used for CA71 and CA150
*3: It is impossible to be used with binding post (model no. 99045/99046)
*4: It is impossible to put in the carrying case with rubber boot (93060)
*5: TC mini plugs are dedicated for CA320. Other types of mini plugs are required to be prepared by customer.

AC Adapter
94013

AC Adapter
94016

RJ Sensor
90080



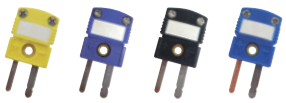
Grabber Clip
98026

Rubber Boots
93060

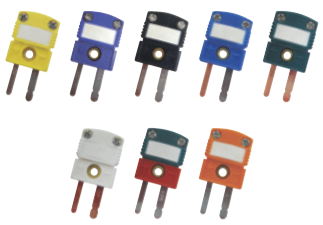
Strap
97040

Accessory Case
B9108XA

TC Mini Plug Set 2
90045



TC Mini Plug Set 3
90046



■ Model Name and Model Code

● Accessories (included with main unit)*1

Name	Model	Description
Lead Cables *2	98064	for CA310, Alligator Clip Cable (Red Black 1 set/ 1.7 m)
Lead Cables *3	98035	for CA330, Alligator Clip Cable (Red × 3 pcs, Black × 1 pce 1 set/ 1.7 m)
Lead Cables *4	98040	for CA320, Alligator Clip Cable (Red Black 1 set/ 1.7 m)
Binding Post (Red Black) *5	99045	1 short plate attached
Binding Post (Red Red) *6	99046	1 short plate attached
Carrying Case *7	B9108NK	for main unit and lead cables

*1: These accessories are included with main unit. Included types of accessories are different according to the type of main unit.
*2: Included with CA310 when purchased.
*3: Included with CA330 when purchased.
*4: Included with CA320 when purchased.
*5: Included with CA320/CA330 when purchased.
*6: Included with CA330 when purchased.
*7: It is impossible to put in main unit with rubber boots..

Lead Cables
98064

Lead Cables
98035

Lead Cables
98040

Binding Post
99045

Binding Post
99046

Carrying Case
B9108NK

Process Calibrators

Process Multi Meter CA450

■ Features

- Simultaneous 24 V loop power and mA measurement
- HART/BRAIN mode setting with loop power (Adds 250 ohm resistance internally)
- SIMULATE (SINK) function simulates transmitters
- 4-20 mA span/step/auto-step/sweep output
- High accuracy signal measurement: DC mA 0.05%/30.000 mA
- Handheld DMM function
- Dedicated sensor modes for direct reading of many sensor signal types
- Measurement categories 600 V CAT. IV, 1000 V CAT. III
- DMM Communication Package can be used to save and manage the measurement data.

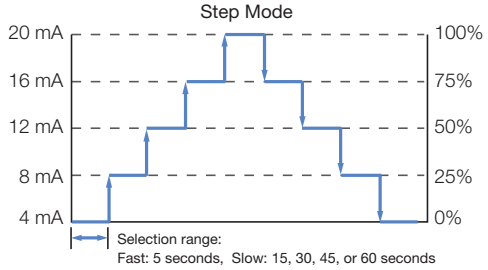
■ Specifications

	Specifications	Typical accuracy and range
Measurement unit	DC voltage	0.09% rdg + 1 dgt 600.0 mV to 1000 V
	AC voltage (Actual RMS value)	0.5% rdg + 5 dgt 600.0 mV to 1000 V (45-500 Hz)
	DC current (mA)	0.05% rdg + 2 dgt/30.000 mA
		0.05% rdg + 2 dgt/100.00 mA
	Resistance	0.2% rdg + 1 dgt 600.0 Ω to 60.00 MΩ
	Frequency	0.005% rdg + 1 dgt 199.99 Hz to 19.999 kHz
	Diode test	1% rdg + 2 dgt 2.000 V
	Continuity	Buzzer On when approx. 50±30 Ω or less
	Display update (times/second)	2.5 to 5
	Data hold	○
	Peak hold (DCV)	○
	Deviation	○
	Max./min.	○
Source unit	DC current (mA)	0.05% with respect to the range (20 mA) Range: 0-25 mA 15 V to 48 VDC
	Simulate (sink)	0.05% with respect to the range (20 mA) Range: 0-25 mA 28 Vmax
	Loop power source function	24 V (ON/OFF function for the resistance of 250 Ω)
	Auto step	○
	Auto sweep	○
	Step (manual)	○
General specs	Safety standard	EN61010/ 1000 V CAT. III, 600 V CAT. IV
	Communication (option)	IR-USB
	Back light	○
	Operating temperature	-20 to + 55℃
	Storage temperature	-40 to + 70℃
	Current terminal shutter fpr preventing incorrect connections	○

Conditions Surrounding temperature: 23℃± 5℃ Relative humidity:45 to 75% (no condensation)
Measurement accuracy: ±(% of reading + digits)

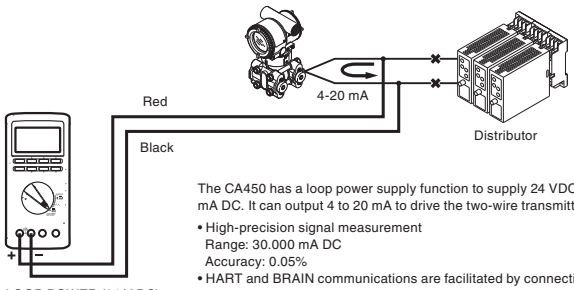
Step generation function

The step can be generated by increasing or decreasing the step between 0 and 20 mA or between 4 and 20 mA in increments of 25% up to 100% with one touch, or stepwise automatically (step width is selectable) to improve work efficiency. The Slow mode of Step Mode can also be used to change the step time in accordance with the performance of field devices.



CA450 application examples

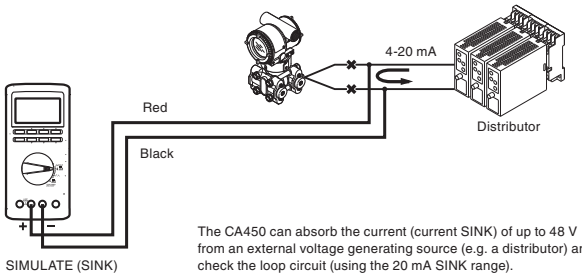
■ Loop check function



The CA450 has a loop power supply function to supply 24 VDC/20 mA DC. It can output 4 to 20 mA to drive the two-wire transmitter.

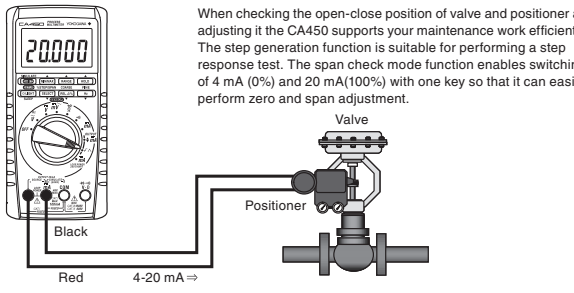
- High-precision signal measurement
  Range: 30.000 mA DC
  Accuracy: 0.05%
- HART and BRAIN communications are facilitated by connecting a communicator using the HART mode resistance (250 Ω).

■ Transmitter simulation function



The CA450 can absorb the current (current SINK) of up to 48 V from an external voltage generating source (e.g. a distributor) and check the loop circuit (using the 20 mA SINK range).

■ Valve/Positioner application



When checking the open-close position of valve and positioner and adjusting it the CA450 supports your maintenance work efficiently The step generation function is suitable for performing a step response test. The span check mode function enables switching of 4 mA (0%) and 20 mA(100%) with one key so that it can easily perform zero and span adjustment.

■ General specifications

External dimensions	Approx. 90 (W) × 192 (H) × 49 (D) mm
Weight	Approx. 600 g (including batteries)
Power supply	Four alkaline AA batteries (LR6)
Battery life	When alkaline AA batteries are used DC voltage measurement Approx. 140 hours DC current source (SIMULATE) Approx. 140 hours DC current source (SOURCE) 12 mA (load 500 Ω) Approx. 10 hours

Process Calibrators

■ CA series accessories (sold separately)

●: Optional accessory

Product name	Model	Description	Applicable models							
			CA700	CA500	CA550	CA71	CA310	CA320	CA330	CA450
AC adapter	94013	Input: AC 120 V, 50/60 Hz				●	●	●	●	
	94016	Input: AC 220 V to 240 V, 50/60 Hz				●	●	●	●	
Alligator test lead	99014	For CA450: 600 V CAT IV 1000V CAT III alligator (1 set each of red and black)								●
Lead cable	98064	For CA series: alligator lead cables (1 set each of red and black, 1.7 m)	*3	●	●	●	*3			*3
Grabber clip	98026	For CA series: separate type (1 set each of red and black, 2 m)	*3	●	●		●	●	●	●
Case	93029	For CA450: portable case								●
	93043-P1	For CA450: large-sized storage case with a main frame case								●
	B9108XA	For CA series: accessory storage case	*3			●	●	●	●	●
	93026	For CA500/CA550: portable case (can store main frame and accessories together)		●	●					
Carrying case	93050	For CA700: main frame/accessory/peripheral devices storage case	●							
Soft carrying case	SU2006A	For CA500/CA550 main unit		●	●					
Rubber boots*1	93060	For CA300 series: main frame protection (mint green-colored)					●	●	●	
Strap	97040	For CA300 series: rubber boots connection (for wall hanging)					●	●	●	
RJ sensor	B9108WA	For CA71: RJ (for reference junction compensation)				●				
	90080	For CA500/CA550/CA320: RJ (for reference junction compensation/Pt100 JIS AA class or equivalent)		●	●			●		
TC mini plug set 2*2	90045	K (yellow)/E (purple)/J (black)/T (blue)		●	●			●		
TC mini plug set 3*2	90046	K (yellow)/ E (violet)/ J (black)/ T (blue)/ R•S (green)/ B•U (white)/ G (red, green)/ N (orange)		●	●			●		
Connection cable	91017	For CA71: RS232C cable				●				
	92015	For CA450: DMM communication package								●
Magnet hook	99032	Magnet hook (maximum load: 1.5 kg)								●
AC/DC current probe	96095	AC 130 A/DC 180 A output AC/DC 10 mV/A								●
AC current probe	96001	AC 400 A output AC 10 mV/A								●
Cleaning unit	91040	CA700 cleaning unit: input port and output port Rc 1/8 female thread	●							
	91041	CA700 cleaning unit: input and output port 1/8 NPT female thread	●							
Low Pressure Hand Pump Kit	91070	Low Pressure Hand Pump (91071), Low pressure and pneumatic hand pump connectors (91053), Low pressure and pneumatic hand pump case (93054)	*4							
Pneumatic Hand Pump Kit	91074	Pneumatic Hand Pump (91075), Low pressure and pneumatic hand pump connectors (91053), Low pressure and pneumatic hand pump case (93054)	*4							
Low Pressure Hand Pump	91071	Hand pump: -83 to 700 kPa (pressure generation range)	*5							
Pneumatic Hand Pump	91075	Hand pump: -83 to 4000 kPa (pressure generation range)	*5							
External pressure sensor	PM100	Accuracy: 0.01% of reading, Pressure range: 16 MPa model (-05)/70 MPa model (-06)	●							
Binding Post (Red Black)	99045	1 short plate attached*6		●	●					
Binding Post (Red Red)	99046	1 short plate attached*6		●	●					

*1: It is impossible to put in the carrying case attached to the CA300 series (B9108KF) with rubber boots.
*2: TC mini plugs are for CA500series and CA320 only. Compensating conductors to connect TC mini plug and TC must be provided by the customer.
*3: Standard accessory
*4: These accessories are not included in the CA700 calibrator package at the time of purchase.
*5: These accessories are included in the hand pump kit (91070, 91074) at the time of purchase. They can also be purchased separately.
*6: The short plate is not used on CA500/CA550 (common parts with the CA300 series).

■ CA series standard accessories (supplied with main unit)

●: Standard accessory

Product name	Model	Description	Applicable models							
			CA700	CA500	CA550	CA71	CA310	CA320	CA330	CA450
Test lead	98020	For CA500/CA550/CA71		●	●	●				
	98064	For CA series: alligator lead cables (1 set each of red and black, 1.7 m)	●				●			●
	98035	For CA500/CA550/CA330		●	●				●	
	98040	For CA320: alligator lead cables (1 set each of red and black, 1.8 m)						●		
	98073	For CA450: 600 V CAT IV 1000 V CAT III (1 set each of red and black)								●
	RD031	Measurement test lead				●				
Case	B9108NK	For CA300: portable case					●	●	●	
	93016	For CA71: portable case (can store main frame and accessories together)				●				
	B9108XA	Accessory storage case	●							
Terminal adapter	99021	For CA71: for Y terminal cable connection				●				
Binding post	99045	For CA320 and CA330: for Y terminal cable connection (1 short plate attached)						●	●	
	99046	For CA330: for Y terminal cable connection (1 short plate attached)							●	
Fuse	A1635EF	For CA71: fuse 1 piece				●				
	99042	For CA450 440 mA/1000 V 10 kA fusing type 1 piece								●
Conversion connector	91080*7	For CA700: R 1/4 male thread to 1/8 NPT female thread conversion connector	●							
	91081*7	For CA700: R 1/4 male thread to 1/4 NPT female thread conversion connector	●							
	91082*8	For CA700: 1/4 NPT male thread to 1/8 NPT female thread conversion connector	●							
USB Cable	A1421WL	USB Type A to Type B, 2 m		●	●					
Soft Case	B8080FQ	Soft case for accessories		●	●					

*7: Included in the package when suffix code -P1 is selected.
*8: Included in the package when suffix code -P2 is selected.

Digital Multi Meters

Handheld 50000 count TY700 Series
Handheld 6000 count TY500 Series

Selection Guide

	Model	TY720	TY710	TY530	TY520
Basic functions	Detection method	RMS/MEAN (switching)	RMS	RMS/MEAN (switching)	RMS
	Basic accuracy (DCV)	0.02%		0.09%	
	Frequency bandwidth	100 kHz	20 kHz	1 kHz	
	Count	50000		6000	
	Bar graph display (units: segment)	51		31	
	Back light	White LED		LED	
Measurement	Voltage (AC/DC)	1000 V	1000 V	1000 V	1000 V
	Current (AC/DC)	10 A	10 A	10 A	10 A
	Resistance	50 MΩ	50 MΩ	60 MΩ	60 MΩ
	Frequency	99.99 kHz	99.99 kHz	99.99 kHz	99.99 kHz
	Capacitance	50 mF	50 mF	1000 µF	1000 µF
	Temperature	+1372℃*	+1372℃*	+600℃*	+600℃*
Other measurement	Duty cycle (%)	●	●	—	—
	Low power resistance	●	—	—	—
	AC + DC	●	●	—	—
	Max./min./avg. value	●	●	●	—
	Diode test	●	●	●	●
	Continuity check	●	●	●	●
	Deviation/percentage (%) calculation	●	●	●	●
	Decibel calculation	●	●	—	
Additional functions	Auto/manual range	●	●	●	●
	Peak hold	●	—	—	—
	PC connection*	●*	●*	●*	—
	Data logging	●*	●*	●*	—
	Measurement value storage	10000	1000	1600	—
	Operating temperature range	-20 to 55℃	-20 to 55℃	-10 to 55℃	-10 to 55℃
Safety standard	CAT IV	600 V	600 V	600 V	600 V
	CAT III	1000 V	1000 V	1000 V	1000 V
	CAT II	—	—	—	—

* The communication package (model: 92015) for DMM is necessary when connection it with PC.

■ Features

- 50000 counts
- Measures true RMS value
- High accuracy: 0.02% rdg (DCV range)
- DCV + ACV measurement
- Supports EN61010-1 1000V III and 600V CAT IV
- Operates in a wide range of temperatures from -20 to 55℃
- Provides strong support for data management:
  equipped data memory for logging
  connection with a PC via USB communication
  Data storage capacity: 1000 data (TY710), 10000 data (TY720)
- Current terminal shutter for preventing incorrect connections
- Various measurement functions
  - Peak hold function (TY720 DCV/DCA range)
  - Decibel calculation function
  - Maximum, minimum and average value display
  - Dual display

Handheld 50000 count **TY700 Series**


TY720


TY710

■ Specifications

*Accuracy: ±(% of reading + mininum number of digits)

Model		TY720			TY710		
Detection method		RMS/MEAN (switching)			RMS		
Item	Range	Accuracy					
DC voltage	50 mV	0.05 + 10					
	500 mV /2400 mV	0.02 + 2					
	5 V	0.025 + 5					
	50 V/500 V/1000 V	0.03 + 2					
AC voltage (RMS)	50 mV	10 to 20 Hz 20 Hz to 1 kHz	1 kHz to 10 kHz 10 kHz to 20 kHz	20 kHz to 50 kHz 50 kHz to 100 kHz	10 to 20 Hz 20 Hz to 1 kHz	1 kHz to 10 kHz 10 kHz to 20 kHz	20 kHz to 50 kHz 50 kHz to 100 kHz
		2 + 80 0.4 + 40	5 + 40 5.5 + 40	15 + 40 15 + 40	— —	— —	— —
	500 mV/5 V/ 50 V/500 V	1 + 30 0.4 + 30	0.4 + 30 1 + 40	2 + 70 5 + 200	1.5 + 30 0.7 + 30	0.7 + 30 2 + 50	— —
	1000 V		3 + 30 —	— —		3 + 30 —	— —
AC voltage (MEAN)		10 to 20 Hz	20 Hz to 500 Hz	500 Hz to 1 kHz			
	50 mV	4 + 80	1.5 + 30	5 + 30	—		
	500 mV/5 V/ 50 V/500 V/1000 V	2 + 30	1 + 30	3 + 30	—		
DCV + ACV	5 V/50 V/500 V	DC, 10 to 20 Hz 20 Hz to 1 kHz	DC, 1 kHz to 10 kHz 10 kHz to 20 kHz	DC, 20 kHz to 50 kHz 50 kHz to 100 kHz	DC, 10 to 20 Hz 20 Hz to 1 kHz	DC, 1 kHz to 10 kHz 10 kHz to 20 kHz	DC, 20 kHz to 50 kHz 50 kHz to 100 kHz
		1.5 + 10 0.5 + 10	0.5 + 10 1 + 10	2 + 10 5 + 20	1.5 + 10 1 + 10	1 + 10 2 + 10	— —
	1000 V	1.5 + 10 0.5 + 10	— —	— —	1.5 + 10 1 + 10	— —	— —
DC current	500 µA/5000 µA/ 50 mA/500 mA	0.2 + 5					
	5 A	0.6 + 10					
	10 A	0.6 + 5					
AC current (RMS)	500 µA/5000 µA/ 50 mA/500 mA	10 Hz to 20 Hz	20 Hz to 1 kHz	1 kHz to 5 kHz	10 Hz to 20 Hz	20 Hz to 1 kHz	1 kHz to 5 kHz
		1 + 20	0.75 + 20	1 + 30	1.5 + 20	1 + 20	—
	5 A/10 A	1.5 + 20	1 + 20	2 + 30			
AC current (MEAN)	500 µA/5000 µA/ 50 mA/500 mA	10 Hz to 20 Hz	20 Hz to 1 kHz	1 kHz to 5 kHz			
		2 + 20	1.5 + 20	2 + 30	—		
	5 A/10 A	3 + 20	2 + 20	4 + 30	—		
DCA + ACA	500 µA/5000 µA/ 50 mA/500 mA	DC, 10 to 20 Hz	DC, 20 Hz to 1 kHz	DC, 1 kHz to 5 kHz	DC, 10 to 20 Hz	DC, 20 Hz to 1 kHz	DC, 1 kHz to 5 kHz
		1.5 + 10	1 + 10	1.5 + 10	2 + 10	1.5 + 10	—
	5 A/10 A	2 + 10	1.5 + 10	3 + 10			
Resistance	500 Ω/5 kΩ/50 kΩ 500 kΩ	0.05 + 2			0.1 + 2		
	5 MΩ	0.5 + 2					
	50 MΩ	1 + 2					
Low power resistance	5 kΩ/50 kΩ/500 kΩ	0.2 + 3			—		
	5 MΩ	1 + 3			—		
Frequency	2.0 to 99.99 kHz	0.02 + 1					
Capacitance	5 nF/50 nF/500 nF 5 µF/50 µF	1 + 5					
	500 µF	2 + 5					
	5 mF/50 mF	3 + 5					
Continuity check	500 Ω	Buzzer is turned on when 100±50 Ω or less					
Diode test	2.4 V	1 + 2					
Temperature	-200 to 1372℃	1 + 1.5℃					
Other measurements		Duty cycle/decibel calculation/max. min. and avg. value calculation/deviation percentage (%) calculation					
Additional functions		Data hold/auto hold/peak hold (only TY720)/range hold/manual memory logging memory/auto power off/back light (white LED)					
Applicable standards		Safety standard: EN61010-1, EN61010-031 1000V CAT III, 600 V CAT IV pollution level 2 EMC standard: EN61326-1 ClassB EN55022 ClassB Group 1					
Display		LCD (digital display: 50,000 counts, dual/bar graph display: 51 segments)					
Measurement cycle		6 times/second (digital display), 15 times/second (bar graph display)					
Power source and battery life		4 alkaline AA batteries/approx. 120 hours (continuous use)					
External dimensions and weight		Approx. 90 (W) × 192 (H) × 49 (D) mm//approx. 560 g (including batteries)					
Standard Accessories		Instruction manual/4 alkaline AA batteries/a set of test lead/fuse (main frame storage) 440 mA/1000 V and 10 A/1000 V					
Optional Accessories (sold separately)		DMM communication package (92015) TC-K temperature probe (90050, 90051, 90055, 90056), Carrying case (93029)					

Digital Multi Meters

Handheld 6000 count TY500 Series


TY530


TY520

■ Features

- 6000 counts
- High accuracy: 0.09% rdg (DCV range)
- Supports EN61010-1 1000 V CAT III and 600 V CAT IV
- Can measure AC/DC current with the AC/DC clamp-on probe (sold separately) in the sensor mode
- Includes data memory for logging (up to 1600 data) (only TY530)
- Current terminal shutter for preventing incorrect connections
- Various measurement functions
  - Filter on/off function
  - Maximum, minimum and average value display (only TY530)

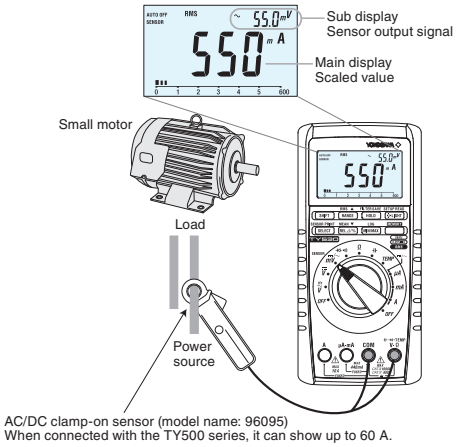
■ Specifications

*Accuracy: ±(% of reading + minimum number of digits)

Model		TY530	TY520
Detection method		RMS/MEAN (switching)	RMS
Item	Range	Accuracy	
DC voltage	600 mV/6 V/60 V/600 V	0.09 + 2	
	1000 V	0.15 + 2	
AC voltage	600 mV/6 V/60 V/600 V	500 to 1 kHz: 1.5 + 5; 40 to 500 Hz: 1 + 5; 50/60 Hz: 0.5 + 5	
	1000 V	—	
DC current	600 µA/6000 µA/60 mA	0.2 + 2	
	600 mA/6 A/10 A	0.5 + 5	
AC current	600 µA/6000 µA/60 mA/600 mA/6 A/10 A	40 to 1 kHz: 1.5 + 5	50/60 Hz: 0.75 + 5
Resistance	600 Ω/6 kΩ/60 kΩ/600 kΩ	0.4 + 1	
	6 MΩ	0.5 + 1	
	60 MΩ	Less than 0-40 MΩ	
Frequency	10 to 99.99 kHz	0.02 + 1	
Capacitance	1 nF	2 + 10	
	100 nF/1 µF/10 µF	2 + 5	
	100 µF/1000 µF	3 + 5	
Continuity check	600 Ω	Buzzer is turned on when 50±30 Ω or less	
Diode test	2 V	1 + 2	
Temperature	-50 to 600℃	2 + 2℃	
Other measurements		On/off switching of low path filter, RMS/MEAN value switching (only TY530)	
Additional functions		Data hold/auto hold/range hold/deviation percentage (%) calculation/auto power off/back light/sensor function (scaling function)	
		Functions included only in TY530: maximum, minimum and average value display, communication function, memory function, logging memory (up to 1600 data)	
Applicable standards		Safety standard: EN61010-1, EN61010-031, 1000 V CAT III, 600 V CAT IV pollution level 2	
		EMC standard: EN61326-1 ClassB, EN55022 ClassB Group 1	
Display		3.5-digit LCD (digital display: 6,000 counts, dual/bar graph display: 31 segments)	
Measurement cycle		5 times/second (digital display), 25 times/second (bar graph display)	
Power source and battery life		4 alkaline AA batteries/approx. 300 hours (when direct voltage is measured and alkaline AA batteries are used.)	
External dimensions and weight		Approx. 90 (W) × 192 (H) × 49 (D) mm/approx. 570 g (including batteries)	
Accessories		Instruction manual/4 alkaline AA batteries/a set of test lead	

Direct readout of sensor output signals

The TY500 series can scale sensor output signals (DC/AC mV) arbitrarily and change their units.
(The unit have 16 options.)
The dual display enables users to view the output signal and scaled value.



■ Introduction of our product which can output voltage

Clamp-on probe 960 series*1

AC/DC clamp-on probe
96095

Current clamp-on probe
96001

*1 In addition, the current clamp-on probe 9603X series for the CW series is available. Only the TY520 and TY530 have the scaling function.

● Data manamement by dedicated application software
Data saved in the DMM can be managed by the dedicated application software (Model 92015).

■ Features

- Saved data can be transmitted from the internal memory to a PC. Data collected in SAVE-memory mode or logging memory mode
- Measurements by the DMM can be monitored on a PC in real time.
- Large amounts of data that cannot be saved in the DMM internal memory can be transmitted to a PC in real time. Data can be written to an Excel* spreadsheet. Maximum number of real-time data transmission: 32767
- Measurement data ca be laid out in an Excel spreadsheet. Graphs can be automatically created on a spreadsheet.
- 92015 Communications Package specifications
  • Communication cable
  Communication cable: IR communication adapter, USB communication cable: 1
  Cable length: 2 m
  Interface: USB 1.1
  Supported models: TY710, TY720, TY530, CA450
- Application software
  • System requirements of PC
  Operating system: Windows 7, 8, 10*
  Contents: CD-ROM software: 1
  Communication cable (communication adapter included): 1
  User's manual

* Windows and Excel are registered trademarks of Microsoft Corporation in the United States.

■ Standard Accessories

Product name	Model	Description	Applicable models			
			TY720	TY710	TY530	TY520
Test leads	98073	1000 V CAT III 600 V CAT IV 1 set each of red and black	●	●	●	●
Fuse	99015	440 mA/1000 V (1 pc/1 set)	●	●	●	●
	99016	10 A/1000 V (1 pc/1 set)	●	●	●	●

■ Optional Accessories (Sold Seperately)

Product name	Model	Description	Applicable models			
			TY720	TY710	TY530	TY520
DMM communication package	92015	USB communication adapter + communication cable + application software	●	●	●	●
Test leads	99014	1000 V CAT III 600 V CAT IV with alligator clips, 1 set each of red and black	●	●	●	●
Alligator clips	B9646HF	Alligator clips, 1 set each of red and black	●	●	●	●
Carrying case	93029	Hard case (main unit + test leads + communication caple)	●	●	●	●
Temperature probe TC (Type-K)	90050B	Hydraulic: -50 to 600℃	●	●	●	●
	90051B	Hydraulic: -50 to 600℃	●	●	●	●
	90055B	Surface: -20 to 250℃	●	●	●	●
	90056B	Surface: -20 to 500℃	●	●	●	●
Current clamp-on probe	96010	AC 400 A: output AC 10 mV/A*1	●	●	●	●
	96030	AC 200 A: output AC 2.5 mV/A*1	●	●	●	●
	96031	AC 500 A: output AC 1.0 mV/A*1	●	●	●	●
	96033	AC 50 A: output AC 10 mV/A*1	●	●	●	●
	96036	AC 2 A: output AC 25 mV/A*1	●	●	●	●
	96095	AC130 A/DC180 A: output AC10 mV/A, DC10 mV/A*2	●	●	●	●

*1: Please use it with t.he ACV range. It is necessary to read the indicated value in a different way as TY720 and TY710. The example: In AC1V display = 100 A TY520 and TY530, it is possible to scale it. (Even 60 A or less display is possible in case of 96001.)
*2: Please use it with the ACV or DCV range. It is necessary to read the indicated value in a different way as TY720 and TY710. The example: In AC1V display = 100 A TY520 and TY530, it is possible to scale it. (Even 60 A or less display is possible in case of 96001.)

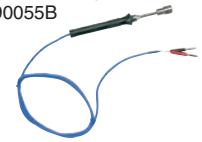
Measurement leads
98073

Fuse
99015

Fuse
99016

Carrying case
93029

TC-K probe
(banana plug output)
90055B



Model	96036	96033	96030	96031
Current clamp-on probe				
Diameter of measurable conductor	ϕ40 mm	ϕ18 mm	ϕ30 mm	ϕ30 mm
Measuring range	AC 2 A	AC 50 A	AC 200 A	AC 500 A
Output voltage	AC 50 mV	AC 500 mV	AC 500 mV	AC 500 mV
Accuracy	±0.5% of rdg	±0.5% of rdg	±0.5% of rdg	±0.5% of rdg
Amplitude	±0.01 mV	±0.1 mV	±0.1 mV	±0.1 mV
Phase	less than ±2°	less than ±1.0°	less than ±0.5°	less than ±1.0°
Frequency range	20 Hz to 5kHz	20 Hz to 20 kHz	20 Hz to 20 kHz	20 Hz to 5 kHz
Maximum circuit voltage	AC 50 V	AC 300 V	AC 600 V	AC 600 V
External dimensions	70 × 120 × 25 mm	52 × 106 × 25 mm	73 × 130 × 30 mm	73 × 130 × 30 mm
Weight	Approx. 300 g	Approx. 220 g	Approx. 300 g	Approx. 300 g

Clamp-on Testers

Clamp-on Process Meter	CL420
AC Clamp-on Tester	CL120, CL150, CL155
AC/DC Clamp-on Tester	CL220, CL250, CL255
Leakage and Load Clamp-on Tester	CL320, CL340, CL345
Accurate Leakage Clamp-on Tester	30031A, 30032A
Leakage Clamp-on Tester	CL360

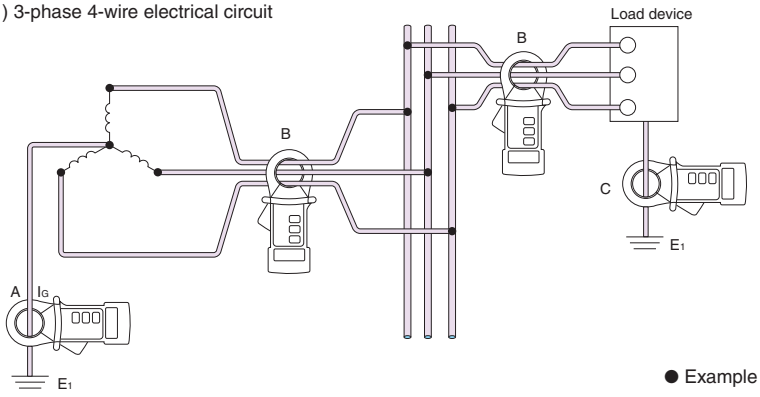
Selection Guide

Model	Diameter of measurable conductor [mm]	Range	Accuracy ±(rdg+dgt)	AC current	DC current	Leak current	DC voltage	AC voltage	Resistance	Continuity check	Frequency	True RMS	Output	Data hold	Peak hold	Filter
CL120	24 dia.	20 to 200 A	2.0 + 7	●										●		
CL150	54 dia.	400 to 2000 A	1.0 + 3	●			●	●	●	●			●	●	●	
CL155	54 dia.	400 to 2000 A	1.0 + 3	●			●	●	●	●		●	●	●	●	
CL220	24 dia.	400 to 300 A	1.0 + 4	●	●									●		
CL250	55 dia.	400 to 2000 A	1.5 + 2	●	●		●	●	●	●			●	●		
CL255	55 dia.	400 to 2000 A	1.5 + 2	●	●		●	●	●	●	●	●	●	●	●	
CL320	24 dia.	20 mA to 200 A	2.0 + 4	●		●								●		●
CL340	40 dia.	40 mA to 400 A	1.0 + 5	●		●								●	●	●
CL345	40 dia.	40 mA to 400 A	1.0 + 5	●		●						●		●	●	●
30031A	40 dia.	3 mA to 60 A	1.0 + 5	●		●								●		
30032A	40 dia.	3 mA to 60 A	1.0 + 5	●		●								●		●
CL360	68 dia.	200 mA to 1000 A	1.0 + 2	●		●							●	●	●	●
CL420	6 dia.	DC 20 to 100 mA	0.2 + 3		●								●	●		

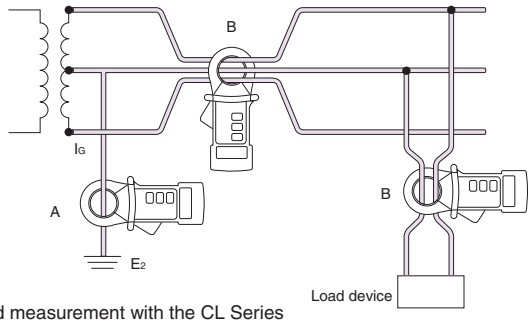
Measurement Example

●Measurement method of leakage current  : Measurement location of leakage current A: Measurement of the grounding wire for the transformer class B grounding work B: Measurement of the electrical circuit C: Measurement of the grounding wire of electrical equipment

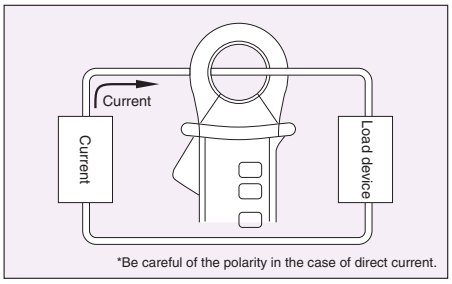
(1) 3-phase 4-wire electrical circuit



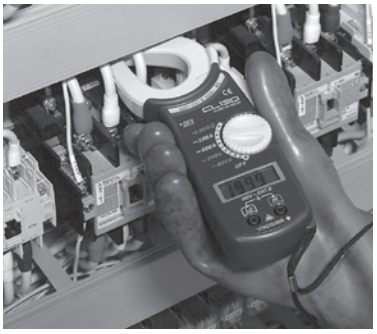
(2) Single-phase 3-wire electrical circuit



● In the case of load current



● Example of load measurement with the CL Series



Clamp-on Process Meter **CL420**

Measure 4 to 20 mA DC signals without breaking the loop!

■ Features

- 0.2% Accuracy, 0.01 mA Resolution
- Dual Display
- LED Torch Light, Backlight Display
- Analog Output Available

■ Specifications

Model	CL420	
Diameter of measurable conductor	6 mm diameter max.	
DC Current	Range and resolution [Range]	Accuracy*1
	20 mA: 0.00 to±21.49 mA 100 mA: ±21.0 to ±126.0 mA	±(0.2% rdg+5 dgt)*2 ±(1.0% rdg+5 dgt)
DC Voltage OUTPUT [10 mV/mA]	20 mA: 0.0 to±214.9 mV 100 mA: ±210 to±1260 mV	(DCA Accuracy)+(±0.5 mV) (DCA Accuracy)+(±3 mV)
Display	4-digit LCD Numeric display	
Response time	Approx. 1.5 seconds (2.5 seconds when across the range)	
Range switching	Auto range	
Operating temperature and humidity	-10˚C to +50˚C 80% RH or less (no condensation)	
Safety Standards	EN61010-1, EN61010-2-030, EN61010-2-032	
Withstanding voltage	2.21 kV AC for 5 seconds (between the core and the case)	
Power supply	Four AA-size alkaline batteries (1.5 V LR6)	
Battery life	Approx. 60 hrs (continuous) backlight off and LED light off	
Other functions	Data hold, Zero adjust function, Auto power off, LED Torch light, Back light display, Illuminant panel	
External dimensions and weight	61 (W) × 111 (H) × 40 (D) mm Approx. 290 g (including batteries)	
Standard accessories	User's Manual, Batteries, Soft case (93045)	

*1 At 23˚C ±5˚C, 45% to 75% RH
Measurement accuracy: ±(% of reading + digits)
Terms of accuracy: Open and close the clamp sensor after power on and perform zero adjustment.
*2 The 20 mA range accuracy assurance is the average of 5 times measuring.

● Product Model Code

Name	Model
Clamp-on Process Meter	CL420

● Standard Accessories (supplied)

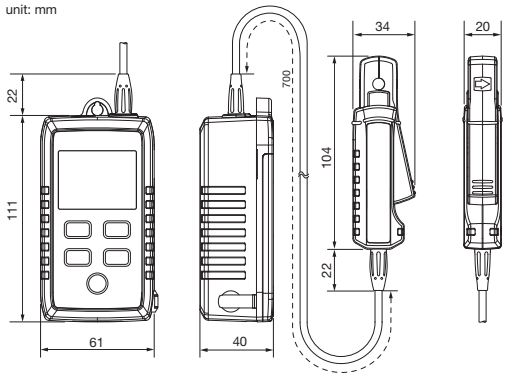
Name	Model
Soft case	93045

● Optional Accessories (sold separately)

Name	Model
Output cable (banana plug)	98076
Output cable (for screw terminal)	98077

External dimensions

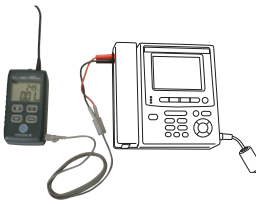
unit: mm



■ Examples of Analog Output Application

Example of 98076 output cable connecting to TY530

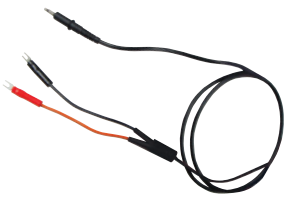
Example of 98077 output cable for screw terminal connecting to a data logger



■ Accessories (sold separately)

Output cable
Model: 98076

Output cable (for screw terminal)
Model: 98077



■ Accessories (supplied)

Soft case for CL420
Model: 93045

Clamp-on Testers

AC Clamp-on Tester CL120

Light Weight & Compact Design

- ACA
- 24 mm dia.
- AC/20 to 200 A

■ Specifications

Accuracy: (23℃ ±5℃, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	20 A	2.0 + 7 (50 to 1 kHz)
	200 A	2.0 + 5 (50/60 Hz)
		3.0 + 10 (40 to 1 kHz)

AC Clamp-on Testers CL150/CL155

Wide Range of Current Measurement

- ACA
- 54 mm dia.
- AC/400 to 2000 A
- AC V/DC V/Ω
- DC Output
- RMS for CL155

■ Specifications

Accuracy: (23℃ ±5℃, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	400 A	1.0 + 3 (50/60 Hz)
		2.0 + 3 (40 to 1 kHz)
	2000 A (0 to 1500 A)	1.0 + 3 (50/60 Hz)
		3.0 + 3 (40 to 1 kHz)
	2000 A (1500 to 2000 A)	3.0 (50/60 Hz)
ACV	40/400/750 V	1.0 + 2 (50/60 Hz)
		1.5 + 3 (40 to 1 kHz)
DCV	40/400/1000 V	1.0 + 2
Resistance	400/4 k/40 k/400 kΩ	1.5 + 2, Beep sound at less than 50±35 Ω

AC/DC Clamp-on Tester CL220

AC/DC Current Measurement

- ACA/DCA
- 24 mm dia.
- AC/40 to 300 A
- DC/40 to 300 A

■ Specifications

Accuracy: (23℃ ±5℃, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy
ACA	40 A	1.0 + 4
	300 A (20 to 200 A)	1.5 + 4
	300 A (200 to 300 A)	3.0
DCA	40 A	1.0 + 4 (50/60 Hz)
		2.5 + 4 (20 to 1 kHz)
	300 A (20 to 200 A)	1.5 + 4 (50/60 Hz)
		2.5 + 4 (20 to 1 kHz)
	300 A (200 to 300 A)	3.5 (50/60 Hz)
		4.0 (20 to 1 kHz)

AC/DC Clamp-on Testers CL250/CL255

Wide Range of ACA/DCA Measurement

- ACA/DCA
- 55 mm dia.
- AC/400 to 2000 A, DC/400 to 2000 A
- AC V/DC V/Ω
- DC Output
- Hz, RMS for CL255

■ CL250 Specifications

Accuracy: (23℃ ±5℃, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
DCA	400/2000 A	1.5 + 2
ACA	400 A/2000 A (0 to 1000 A)	1.5 + 2 (50/60 Hz)
		3.0 + 4 (40 to 500 Hz)
		5.0 + 4 (500 to 1 kHz)
	2000 A (1001 to 2000 A)	3.0 + 2 (50/60 Hz)

■ CL255 Specifications

Accuracy: (23℃ ±5℃, Less than 75% RH), ±(% rdg + dgt)

Item	Range	Accuracy
DCA	400/2000 A	1.5 + 2
ACA	400 A/2000 A (150 to 1700 A)	1.5 + 3 (50/60 Hz) 3.0 + 4 (30 to 1 kHz)
	2000 A (1701 to 2000 A)	3.5 + 3 (50/60 Hz)
Frequency	10 to 3999 Hz	1.5 ± 5

Leakage and Load Clamp-on Tester CL320

Compact Design of Leakage Current Measurement

- ACA
- 24 mm dia.
- AC/20 mA to 200 A

■ **Specifications**

Accuracy: (23℃ ±5℃, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (40 to 400 Hz)	50/60 Hz
ACA	20 mA/200 mA 200 A (0 to 100 A)	2.0 + 4 (50/60 Hz) 5.0 + 6 (40 to 400 Hz)	3.0 + 5 (50/60 Hz)
	200 A (100.1 to 200 A)	5.0 + 4 (50/60 Hz)	5.0 + 5 (50/60 Hz)

Leakage and Load Clamp-on Testers CL340/CL345

Leakage Current Measurement

- ACA
- 40 mm dia.
- AC/40 mA to 400 A
- RMS for CL345

■ **CL340 Specifications**

Accuracy: (23℃ ±5℃, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (20 Hz)	50/60 Hz
ACA	40 mA/400 mA	2.5 + 10 (20 to 1 kHz)	1.0 + 5 (50/60 Hz)
	400 A (0 to 350 A)	2.5 + 10 (40 to 1 kHz)	1.0 + 5 (50/60 Hz)
	400 A (350 to 400 A)	5.0 (40 to 1 kHz)	2.0 (50/60 Hz)

■ **CL345 Specifications**

Accuracy: (23℃ ±5℃, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (20 Hz)	50/60 Hz
ACA	40 mA/400 mA	2.5 + 10 (20 to 1 kHz)	1.0 + 5 (50/60 Hz)
	400 A (0 to 300 A)	2.5 + 10 (40 to 1 kHz)	1.0 + 5 (50/60 Hz)
	400 A (300 to 400 A)	5.0 (40 to 1 kHz)	2.0 (50/60 Hz)

Accurate Leakage Clamp-on Testers 30031A/30032A

Leakage Currents of 1 mA Measurement

- ACA
- 40 mm dia.
- AC/3 mA to 60 A

■ **Specifications**

Accuracy: (23℃ ±5℃, Less than 80% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		30031 A, 30032 A Filter OFF	30032 A Filter ON
ACA	0 to 30 mA	1.0 + 5 (50±1.0 Hz/60±1.0 Hz)	1.5 + 5 (50±1.0 Hz/60±1.0 Hz)
	0 to 50 A		
	50 to 60 A	5.0 + 5 (50±1.0 Hz/60±1.0 Hz)	5.5 + 5 (50±1.0 Hz/60±1.0 Hz)

Leakage Clamp-on Tester CL360

Wide Range of Leakage Current Measurement

- ACA
- 68 mm dia.
- AC/200 mA to 1000 A
- DC/AC Output

■ **Specifications**

Accuracy: (23℃ ±5℃, Less than 85% RH), ±(% rdg + dgt)

Item	Range	Accuracy	
		WIDE (40 to 1 kHz)	50/60 Hz
ACA	20 mA/2 A/20 A	1.0 + 2 (50/60 Hz) 3.0 + 2 (40 to 1 kHz)	1.5 + 2
	200 A	1.5 + 2 (50/60 Hz) 3.5 + 2 (40 to 1 kHz)	2.0 + 2
	1000 A (0 to 500 A)	1.5 + 2 (50/60 Hz) 3.5 + 2 (40 to 1 kHz)	2.0 + 2
	1000 A (501 to 1000 A)	5.0 (50/60 Hz) 10.0 (40 to 1 kHz)	5.5

Description of Harmonic Filter Function

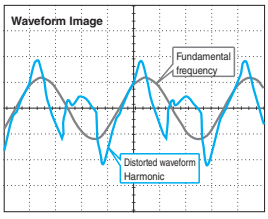
● Harmonic Filter Function (Only Available in the 30032A)

1. What is a Harmonic?

Harmonic refers to sinusoidal quantity having a frequency that is an integral multiple of the fundamental frequency (for example, the commercial frequency). When a harmonic is superimposed on the fundamental frequency, the waveform is distorted.

2. Why is it Necessary to Accurately Measure the Leakage Current of the Fundamental Frequency (Commercial Frequency)?

One problem when measuring the leakage current to check the isolation of electrical circuits in power distribution equipment is that the electrical isolation cannot be correctly understood due to the influence of a harmonic current. That is, the leakage current flowing from the electrical circuit to ground is very small so that, in order to check the isolation of electrical circuits by means of the leakage current, it is necessary to remove the harmonic component of the leak current and measure only the current of the fundamental frequency (commercial frequency).



*Waveforms obtained when measuring a distribution board of a Yokogawa Meters & Instruments Corporation office

3. The 30032A Employs a Harmonic Filter

Conventional leakage clamp-on testers could not sufficiently remove harmonic current components so measured leakage current values were often larger than the specified value due to the influence of a harmonic current. In this case, retesting with an insulation tester was required, resulting in increased effort and cost for the test. Under these circumstances, Yokogawa Meters & Instruments Corporation has developed the leakage clamp-on tester 30032A, which employs a high-performance harmonic filter that can accurately measure just the fundamental frequency component of the leakage current.

● Characteristics of Harmonic Filter

1. Filter Characteristic of the 30032A

When the frequency is more than 60 Hz, the sharp filter removes the harmonic component, leaving the fundamental frequency. For example, the level of 100 Hz is attenated to approx. 1%.

<Reference Figure 1: Harmonic Filter Characteristic 1>

2. Filter Comparison (between the On and Off States)

This is the filter characteristic in the On and Off states.

<Reference Figure 2: Harmonic Filter Characteristic 2>

<Reference> When the filter is in the On or Off state
Amplitude ratios in the range between the fundamental frequency and the third frequency
<Fundamental frequency: 60 Hz>

Figure 1: Harmonic Filter Characteristic 1

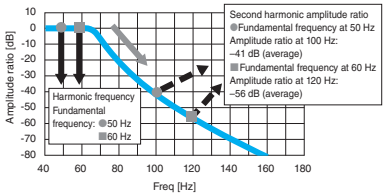
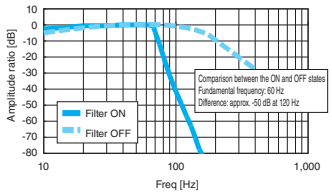


Figure 2: Harmonic Filter Characteristic 2



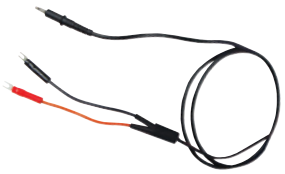
■ Optional Accessories (Sold Separately)

Product name (specifications)		Model	CL120	CL150	CL155	CL220	CL250	CL255	CL320	CL340	CL345	30031A	30032A	CL360	CL420
Lead cables	Measurement lead cable (Angle-type)	98071													
	Measurement lead cable (Straight-type)	98072		*	*		*	*							
	Output cable (For jack terminal)	91020												●	
	Output cable (4 mm dia. banana plug)	98076		●	●		●	●							●
	Output cable (For screw terminal)	98077		●	●		●	●							●
Carrying case	For clamp-on tester	93030								*	*				
		93031												*	
		93032													
		93033	*			*			*						
		93034		*	*		*	*							
		RB057										*	*		
	For clamp-on process meter	93045													*

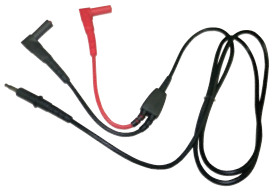
* : Standard accessory
● : Optional accessory (sold separately)

Output cable
91020

Output cable
98077



Output cable
98076



Carrying case
93030

Carrying case
93031

Carrying case
93032

Carrying case
93033

Carrying case
93034

Carrying case (For CL420)
93045

Insulation and Earth Testers

Digital Insulation Tester MY600
Digital Earth Tester EY200

What Is Insulation Resistance?

Insulation resistance represents the state of insulation of electric equipment or circuits. It is one of the important measurement parameters in terms of safety and security. Methods of examining the state of insulation include using a clamp-on leakage tester for live circuits. Under normal circumstances, however, such electric equipment or circuits are shut down temporarily and their insulation is tested with an insulation tester.

Classification of Applications

Applications are roughly classified into low-voltage, high-voltage and ultra-high-voltage circuits. The table below summarizes examples of using rated test voltages. A tester with the rated test voltage of 500 V or 100 V/250 V is used for low-voltage circuits.

Rated test voltage	Example of use
25 V/50 V	Insulation testing of telephone line equipments and telephone line circuits
100 V/125 V	Maintenance of low voltage circuits or equipment handling 100 V line
	Insulation testing of control equipment
250 V	Maintenance of low voltage circuits or equipment handling 200 V line
500 V	Maintenance of low voltage circuits or equipment handling 600 V line or lower
	Inspection of low voltage circuits or equipment when installing handling 600 V line or lower
1000 V	Insulation testing of circuits or equipment handling 600 V line or over
	Insulation testing of circuits or equipment handling constantly high operating voltage (e.g. high voltage cables, high voltage equipment and communication equipment or cables handling high voltages)

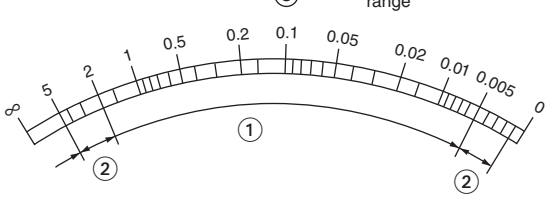
Test Methods for Low-voltage Circuits

Insulation resistance between cables of a low-voltage circuit and between the circuit and ground is tested for each circuit that can be separated by a switch or overcurrent breaker installed as specified by the electrotechnical equipment standards.
The low-voltage circuit is shut down by opening the switch and insulation between cables of the circuit and between the circuit and ground is tested. If the measured value is below the rated resistance, all shunt switches of a trunk line are opened and insulation is tested separately for each shunt circuit.
The comparator function of the MY600 insulation tester allows for smooth judgment when checking the insulation of electric circuits.

Methods of Scaling the 1st and 2nd Effective Measuring Ranges of Moving-pointer Insulation Testers

Rated test voltage: 25 V
Maximum effective reading: 5 MΩ

◎ = Central scale value
① = First effective measuring range
② = Second effective measuring range



Maximum effective reading:
The maximum reading that is indicated on the insulation tester and falls within the range with which the intrinsic error of the insulation tester is guaranteed.

Effective test range:
A test range or ranges, among those of the insulation tester, over which intrinsic error specified in the standards is guaranteed. In moving-pointer insulation testers, the range from a resistance value one-thousandth (1/1000) the maximum effective reading to the resistance value that is nearest to half (1/2) the maximum effective reading and equal to the maximum effective reading multiplied by 1, 2 or 5 or by any of these values multiplied by ten (10) raised to a whole-number power, shall be referred to as a first effective measuring range. In addition, the range from the upper limit of the first effective measuring range to the maximum effective reading and the range from the lower limit of the first effective measuring range to the zero (0) reading shall be referred to as second effective measuring ranges (see the figure above). (Excerpt from JIS C1302-2014).

Insulation and Earth Testers

Digital insulation Tester MY600

Improve Efficiency of Inspection Work by High Speed Measurement and 6 Ranges

■ Main Features

- 6 Ranges
- Approximately 0.5 s high-speed measurement*
- Two colors for judging measurement results
- USB communication and memory function
- Line probe with switch is provided as a standard accessory
- Insulation deterioration diagnosis (PI and DAR measurement*)
- Auto LED light

*Under the conditions specified by Yokogawa, it may take time to measure due to the influence of capacitive component of a measuring target.

■ General Specifications

- Dimensions: Approx. 156 (W) × 46 (H) × 97 (D) mm
- Weight: Approx. 490 g (with battery)
- Power source: Four size AA batteries

■ Main Specifications Accuracy (tolerance): Within 1 year of shipment

Rated Measuring Voltage	50 V	100 V*	125 V*	250 V	500 V	1000 V
Maximum Effective Reading	100 MΩ	200 MΩ	250 MΩ	500 MΩ	2000 MΩ	4000 MΩ
First Effective Measurement Range Accuracy	0.100 to 10.00 MΩ	0.100 to 20.00 MΩ	0.100 to 25.00 MΩ	0.100 to 50.0 MΩ	0.100 to 500 MΩ	0.100 to 1000 MΩ
	±2% reading ±2 digit					
Second Effective Measurement Range Accuracy	10.01 to 100.0 MΩ	20.01 to 200.0 MΩ	25.01 to 250.0 MΩ	50.1 to 500 MΩ	501 to 2000 MΩ	1001 to 4000 MΩ
	±5% reading					
Other Ranges Accuracy	0.050 to 0.099 MΩ: ±2% reading ±4 digit					
	0.000 to 0.049 MΩ: ±2% reading ±6 digit					

*Switching method

■ Other Features

Voltage Measurement	AC	2.0 to 600 Vrms (45 to 65 Hz)
	DC	±(2.0 to 600) V
	Accuracy	±1% reading ±4 digit
		AC/DC auto detection (2 V or more)
Low resistance Measurement	Range	40.00/400.0/4000 Ω (Auto range)
	Accuracy	±2.5% reading ±8 digit (0.20 to 4000 Ω) ±8 digit (0.00 to 0.19 Ω)
Display		Bar graph, 4000 digital count display
Measurement Categories		CAT III 600 V
Standard		EN61557-1, 2, 4, 10 EN61326-1 ClassB, EN61326-2-2 EN61010-1, EN61010-031, EN61010-2-30, IEC61010-2-034

■ 91030 USB Communication Adaptor Specification

Communication cable	Infrared communication adaptor and Communications cable (USB) 1 set
Cable length	1.9 m
Interface	USB ver. 1.1
Supported model	MY600
Included accessories (attached)	CD Packing contents: Communication driver, User's manual, Install manual

Quick-reference Table of Accessories

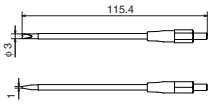
Model		MY600
Spare Probe Tip	Extended	99013
	Hook type	99012
Probe	Line probe	98008
	Earth probe	98009 Earth probe and Alligator clip adaptors
Case *1	Carrying case	93045 (Soft case) Store main unit and accessories
Others	Shoulder strap	99018
	USB communication adaptor	91030

*1 Regarding external dimensions of cases, Please refer to each product specification.

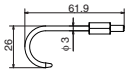
Spare Probe Tips

Unit: mm

99013



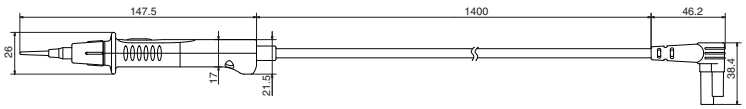
99012



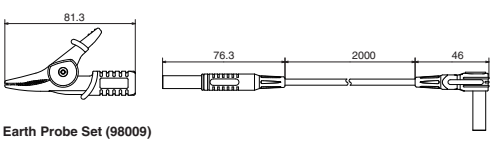
Probes

Unit: mm

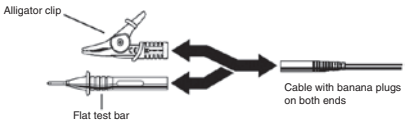
98008



98009



Earth Probe Set (98009)



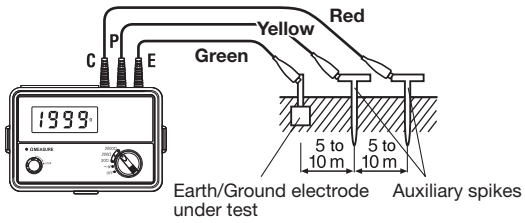
Digital Earth Tester EY200

■ Specifications

- Designed to safety standard IEC 61557
- Reference to IEC 60529: Degrees of protection provided by enclosures (IP54). Measurement can be made even under adverse weather conditions
- Large, easy-to-read LCD digital display
- Convenient carrying soft bag for accessories etc.

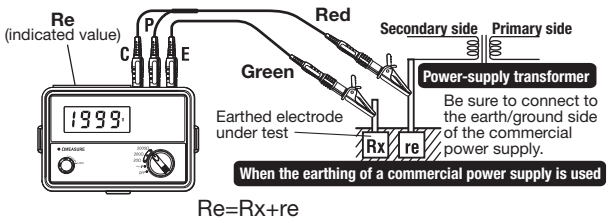
3-pole earth resistance measurement (precise measurement)

Connect the earth/ground electrode (E) and auxiliary spikes (P, C) to the main body using the accessory test lead. Put apart 5 to 10 m between E and P, and P and C, respectively. E, P, and C should be approximately in a line.



2-pole earth resistance measurement (simplified measurement)

A simplified 2-pole measuring method can be used if there is an almost perfectly earth/ground object such as a lead or iron water-pipe (plastic pipes cannot be used) or if there is an object with a known value of earth resistance, near the measurement site.



■ Model Code

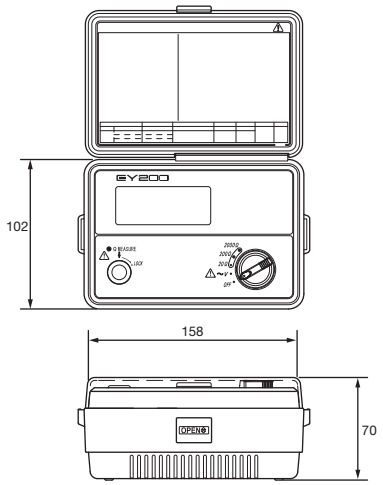
Name	Model
Digital Earth Tester	EY200

■ EY200 General Specifications

Name	Model
Display	LCD Digital Display:1999-count digital reading
Measuring Range	Earth Resistance: 2000 Ω LSD:0.01 to 1 Ω Earth Voltage: 200 V
Accuracy	Earth Resistance: 20 Ω range: ±2% rdg ±0.1 Ω 200 Ω range: ±2% rdg ±3 dgt 2000 Ω range: ±2% rdg ±3 dgt Earth Voltage: ±1% rdg ±4 dgt
Measuring Frequency	Approx. 820 Hz
Measuring Current	Approx. 3 mA (at 20 Ω range)
Battery Life	Approx. 4.5 hours (at 5 second measuring 3300 times)
Operating Temp. and Humidity	0~40°C, 85% Rh or less
Dimensions	Approx. 102 × 158 × 70 mm
Weight	Approx. 550 g
Standard Accessories	3-pole Test Lead (Model 98074), Earth Spikes (for EY200) (Model 98070), 2-pole Test Lead Set (Model 98075), Soft Case (Model 93041), Shoulder Belt (for EY200) (Model 99018), Six AA (R6) dry cells, User's manual

External Dimensions

Unit: mm



Clamp-on Power Meters

Power Quality Analyzer CW500

Selection Guide

Model		CW500
Wiring	1P2W	YES
	1P3W	YES
	3P3W	YES
	3P3W3current	YES
	3P4W	YES
Supporting multiple system (same Voltage)		1P2W 4 system/1P3W 2 system/3P3W 2 system
Input channels	Voltage channels	3
	Current channels	4
Input range	AC voltage	600 V/1000 V
	AC current	2-3000 A *
	DC voltage	100 mV/1 V/10 V
	DC current	NA
Accuracy	AC voltage	±(0.2% rdg + 0.2% rng)
	AC current	±(0.2% rdg + 0.2% rng) ±current clamp-on probe accuracy
	AC power	±(0.3% rdg +0.2% fs) ±current clamp-on probe accuracy
	DC voltage	±0.5% f.s
	DC current	NA
Measurement items	AC voltage/current	YES
	Active power	YES
	Reactive power	YES
	Apparent power	YES
	Active energy	YES
	Reactive energy	YES
	Apparent energy	YES
	Demand	YES
	Harmonics measurement	YES
	Swell	YES
	Dip	YES
	Interrupt	YES
	Transient overvoltage	YES
	Inrush current	YES
	Flicker	YES
	Voltage unbalance rate	YES
	Current unbalance rate	YES
	Advanced phase condenser	YES
Others	Memory	2 GB SD
	Communication	USB
	Operating temperature and humidity range	0-45℃, 85% Rh or less
	Safety standards	600 V CAT III, 1000 V CAT II
	External dimensions/weight	175 × 120 × 68/approx. 900 g

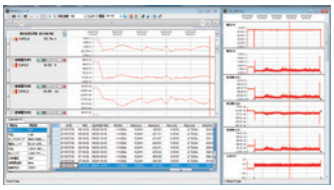
* A clamp-on probe is required in addition to the main unit.

Power Quality Analyzer **CW500**

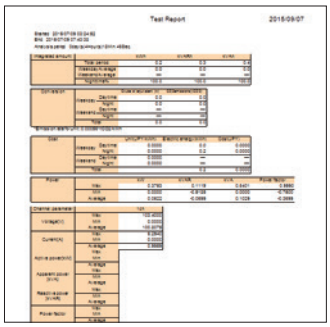
High-end Model for Measuring Power Consumption and Power Quality

■ Features

- Achieves various power measurements with simple operations
  - One press on direct keys switches to any of five measurement displays.
- Identifies power source malfunctions
  - Sampling with a 24-µs resolution can identify temporary malfunctions.
  - Measures harmonics and flickers
- User support
  - Easy wiring and setting with the start navigation function and automatic detection of clamp-on probes
- PC software for analysis and setting comes as standard.
  - Data can be compiled into graphs and reports with one click.



Trend analysis graph



Sample of report

■ Specifications

Wiring connection	1P2W (max. 4 systems*1), 1P3W (max. 2 systems*1), 3P3W (max. 2 systems*1), 3P3W3current, 3P4W	
Input	3 channels for voltage, 4 channels for current, 2 channels for DC voltage	
Range	AC voltage	600.0/1000 V
	AC current	2000 mA to 3000 A (depending on a clamp-on probe)
	AC power	3000 W to 3000 kW (depending on a clamp-on probe)
	DC voltage	100.0 mV/1.000 V/10.00 V
Accuracy	Voltage	±0.2% rdg ±0.2% rng
	Current	±0.2% rdg ±0.2% rng + accuracy of clamp-on probes
	Power	±0.3% rdg ±0.2% rng + accuracy of clamp-on probes
	Effect of power factor	±1.0% rdg (reading at power factor 0.5 against 1.0)
Measurement items	• Voltage, current, frequency, power factor, effective/reactive/apparent power • Consumption/generation of effective/apparent power, delay/progress of reactive power • Demand, maximum demand, load factor, estimated demand value • Temporary malfunction: voltage swell, voltage dip, voltage interrupt, transient overvoltage, inrush current • Continuous malfunction: components of up to the 50th harmonic (RMS, content rate, and phase angle of voltage, current, and power), total harmonic distortion rate, IEC flicker, voltage unbalance rate, current unbalance rate	
Measurement display	Measurement values, trend graphs for all or each channel from the start of measurement, measured demand values, demand trend over a specific period or a whole period	
Record interval	1/2/5/10/15/20/30 sec, 1/2/5/15/20/30 min, 1 h/2 h	
General specification	Dimensions	120 (W) × 175 (H) × 68 (D) mm
	Weight	Approx. 900 g (including batteries)
	Power source	100 to 240 V AC /50 to 60 Hz/Alkaline AA battery × 6/Power supply adaptor (option)
Accessories	Voltage probe, USB cable, Power cord, Carrying bag, SD card, Startup guide, Alkaline AA battery × 6, Input terminal plate × 6, PC software	

*1 Multiple systems can be measured only when they share a common voltage input. Current clamp type and CT ratio are set in common for all systems and cannot be specified individually for each system.

■ Clamp-on probes for the CW500 power meter

Model			96060	96061	96062	96063	96064	96065	96066
Clamp-on probe									
Measurable diameter [mm]			40 dia.	18 dia.	24 dia.	30 dia.	40 dia.	110 dia.	150 dia.
Measuring range			2 A AC	50 A AC	100 A AC	200 A AC	500 A AC	1000 A AC	300 A AC 1000 A AC 3000 A AC
Output voltage			50 mV AC (25 mV/A)	500 mV AC (10 mV/A)	500 mV AC	500 mV AC	500 mV AC	500 mV AC	500 mV AC For each range
Accuracy	Level	50 Hz/ 60 Hz	±1.0% rdg ±0.05 mV	±0.5% rdg ±0.1 mV	±0.5% rdg ±0.1 mV	±0.5% rdg ±0.1 mV	±0.5% rdg ±0.1 mV	±0.8% rdg* ±0.2 mV	±1.0% rdg*
		40 Hz to 1 kHz	±2.0% rdg ±0.1 mV	±0.8% rdg ±0.2 mV	±1.0% rdg ±0.2 mV	±0.8% rdg ±0.2 mV	±1.0% rdg ±0.2 mV	±1.5% rdg ±0.4 mV	—
		1 kHz to 3.5 kHz	±3.0% rdg ±0.2 mV	±1.0% rdg ±0.4 mV	—	±1.0% rdg ±0.4 mV	—	—	—
	Accuracy Degree		—	Less than ±2.0° (0.5 to 50 A, 40 Hz to 3.5 kHz)	Less than ±2.0° (1 to 100 A, 45 Hz to 65 Hz)	Less than ±1.0° (2 to 200 A, 40Hz to 3.5 kHz)	Less than ±1.0° (5 to 500 A, 45 Hz to 65 Hz)	Less than ±2.0° (45 Hz to 65 Hz) Less than ±3.0° (40 Hz to 1 kHz)	Less than ±1.0° (for each range/ 45 to 65 Hz)
Max Circuit voltage			AC 300 Vrms	AC 300 Vrms	AC 300 Vrms	AC 600 Vrms	AC 600 Vrms	AC 600 Vrms	AC 600 Vrms
Dimensions			70 × 120 × 25 mm	52 × 106 × 25 mm	60 × 100 × 26 mm	73 × 130 × 30 mm	81 × 128 × 36 mm	73 × 130 × 30 mm	61 × 111 × 43 mm
Weight			Approx. 250 g	Approx. 170 g	Approx. 160 g	Approx. 250 g	Approx. 260 g	Approx. 170 g	Approx. 950 g
Remarks			These probes are dedicated for the CW500 and cannot be used for the CW240/CW120/CW121.						

*1 45 to 65 Hz (measuring at the center of sensor)
*2 Clamp-on probe 96060 can not be used for power measurement

Precision Measuring Instruments

Decade Resistance Box 2793 Series, 2786 Series
Standard Resistor 2792A Series

Decade Resistance Box 2793 Series

High-accuracy, DC variable resistor with 6 dials

■ 279301

- High accuracy and stability
- High reproducibility
- 1 mΩ resolution

■ 279301 Specifications

Resistance Range:
0.100 to 1111.210 Ω (Minimum resistance is 0.100 Ω).
Dial Composition:
0.001 × 10 + 0.01 Ω × 10 + 0.1 Ω × 11 + 1 Ω × 10 +
10 Ω × 10 + 100 Ω × 10
Resolution: 0.001 Ω
Accuracy:
±(0.01% + 2 mΩ) at temperature 23±2°C,
humidity 45 to 75%, and 0.1 W power application
Dimensions: Approx. 497 mm × 116 mm × 140 mm (W×H×D)
Weight: Approx. 4.8 kg
Accessory: User's Manual 1 copy

■ 279303

- Up to 100 MΩ in 100 Ω step
- Low voltage coefficient
- Shock- and vibration-proof construction

■ 279303 Specifications

Resistance Range: 0 to 111. 1110 MΩ.
Dial Composition:
100 Ω × 10 + 1 kΩ × 10 + 10 kΩ × 10 + 100 kΩ × 10 +
1 MΩ × 10 + 10 MΩ × 10.
Accuracy:
100 Ω, 1 kΩ, 10 kΩ and 100 kΩ steps ... ±(0.05% + 0.05 Ω)
1 MΩ and 10 MΩ steps ... ±0.2%
(At temperature 23±2°C, humidity below 75%, including residual resistance of approx. 0.05 Ω).
Dimensions: Approx. 497 mm × 116 mm × 140 mm (W×H×D)
Weight: Approx. 4.8 kg
Accessory: User's Manual 1 copy

Decade Resistance Box 2786 Series

Quick and easy setting

■ 278610/278620

Six-dial decade resistance boxes allow quick and easy setting of a wide range of resistance. These resistance boxes are used in combination with voltage or current standards to adjust voltage or current, as dummy load resistances or as an arm of AC bridges.

■ Specifications

Model	Resistance Range
278610	0.1 to 111.111 Ω
278620	1 to 1111.110 Ω

Residual Resistance: Less than 23 mΩ.
Power Rating: 0.3 W/step, within 3 W for overall instrument.
Maximum Allowable Input: 0.5 W/step, 5 W for overall instrument.
Maximum Circuit Voltage: 250 V.
Operating Temperature Range: 0 to 40°C
Storage Temperature Range: -10 to 50°C
Humidity Range: 25 to 85%, relative humidity.
Insulation Resistance: More than 500 MΩ at 500 V DC.
Dielectric Strength: 1500 V AC for one minute.
Dimensions: Approx. 497 mm × 116 mm × 140 mm (W×H×D)
Weight: Approx. 3.5 kg
Accessory: User's Manual 1 copy

Standard Resistor 2792A Series

Metal foil resistors

- Traced to the national standard for high accuracy; test (calibrated) accuracy of ±5 ppm
- Resistance temperature coefficient
- A variety of models
  Eight models with nominal resistance values ranging between 0.001 Ω and 10 kΩ
- Precision temperature control equipment, such as an oil bath, not needed for calibration due to marked improvement in resistance temperature coefficient
- Included document: Test certificate

■ Specifications

Model	Nominal value	Accuracy 23˚C±2˚C
2792A01	0.001 Ω	±100 ppm
2792A02	0.01 Ω	±75 ppm
2792A03	0.1 Ω	±50 ppm
2792A04	1 Ω	±30 ppm
2792A05	10 Ω	±30 ppm
2792A06	100 Ω	±30 ppm
2792A07	1 kΩ	±30 ppm
2792A08	10 kΩ	±30 ppm

Operating temperature and humidity ranges: 0 to 50°C / 20 to 80% RH
Maximum allowable power: 3 W
Test (calibrated) accuracy: ±5 ppm
Power characteristics: ±100 ppm/W
Insulation resistance: More than 1000 MΩ at 500 V DC
Withstand voltage: 1.5 kV for one minute between measurement terminal and casing
Terminal construction: 4 terminals
External dimensions: Approx 104 mm dia. × 150 mm
(current terminal width: approximately 174 mm)
Weight: Approx 1.2 kg
Accessories: User's Manual, One Test Certificate

NOTICE

- Before using the product, read the instruction manual carefully to ensure proper and safe operation.

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https://tmi.yokogawa.com/

YMI-N-MI-M-E03

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