# Product Datasheet - Technical Specifications

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YOKOGAWA ◆

# Process Multimeter

## CA450

## Loop Power and 4 to 20 mA Output function in a DMM

From daily inspection to troubleshooting of measurement instruments—
all in a single unit!

### Features

■ **Loop check functions**
- Simultaneous 24 V loop power and mA measurement
- HART/BRAIN mode setting with loop power
  (Adds 250 ohm resistance internally)

■ **Generation functions**
- SIMULATE (SINK) function simulates transmitters
- 4-20 mA span/step/auto-step/sweep output

■ **Measurement functions**
- High accuracy signal measurement:
  DC mA 0.05%/30.000 mA
- Handheld DMM function
- Peak Hold function for the peak voltage measurement
  of DCS power supply
- Dedicated sensor modes for direct reading of many
  sensor signal types

■ **Enhanced Safety—helps eliminate electric shocks**
- Current terminal shutter prevents incorrect connections
- 1 A or more of AC/DC current can be read directly using
  the optional clamp probe and scaling in SENSOR mode.[*1]
- Measurement categories 600 V CAT. IV, 1000 V CAT. III

■ **Linking with a PC**
- DMM Communication Package can be used to save and
  manage the measurement data.

*1: AC/DC 600 mV range only

3-Year Warranty  CE

* This is a composite picture. The shutter actually opens during current
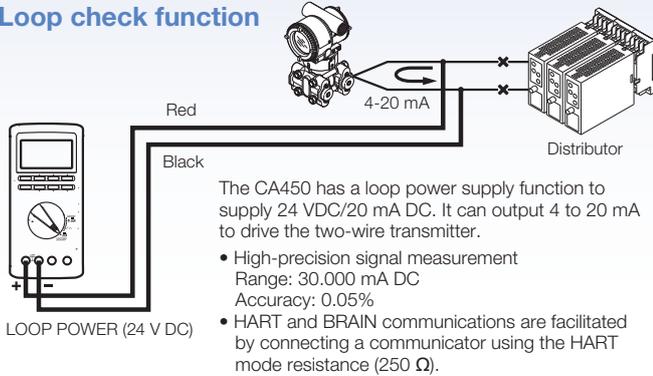  measurement and generation.

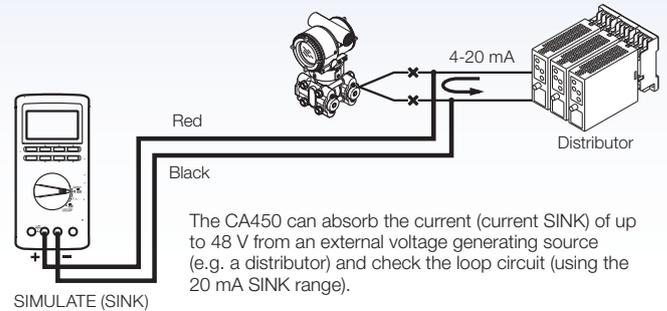## Yokogawa Meters & Instruments Corporation    Bulletin CA450-E

# CA450

## The CA450 can be used in a wide range of applications, such as checking the operation of field devices and maintenance of electrical equipment.

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### Transmitter application

#### Loop check function

Red

Black

4-20 mA

Distributor

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).

LOOP POWER (24 V DC)

#### Transmitter simulation function

4-20 mA

Red

Black

Distributor

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).

SIMULATE (SINK)

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### Valve/Positioner application

#### Span generation function

The span from 0 to 20mA or 4 to 20 mA (0 to 100%) can be switched with one touch. It is easy to adjust the span of the valve and check the operation of the valve.

#### 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.

Step Mode

| 20 mA | 100% |
| 16 mA | 75% |
| 12 mA | 50% |
| 8 mA | 25% |
| 4 mA | 0% |

Selection range:
Fast: 5 seconds,  Slow: 15, 30, 45, or 60 seconds
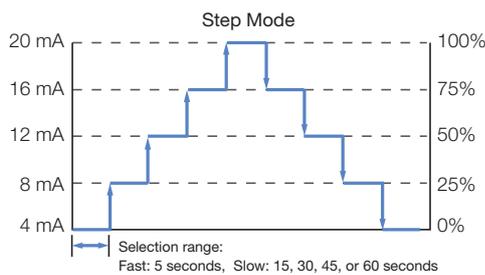
#### Sweep generation function

This function is used to increase or decrease the output value to the setpoint at the specified ramp rate. It is possible to switch between Fast (15 sec) and Slow (40 sec) increase or decrease.

Linear Mode

Fast     Slow

| 20 mA | | 100% |
| 4 mA | 15 sec     40 sec | 0% |
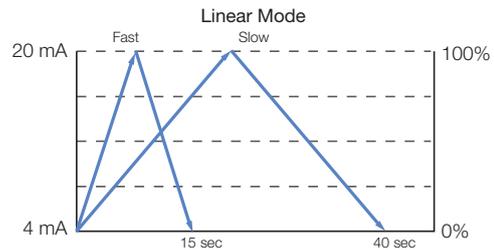
When checking the open-close position of valve and positioner and adjusting it the CA450 supports your maintenance work efficiently
The step generation function is suitable for performing a step response test. The span check mode function enables switching of 4mA (0%) and 20mA(100%) with one key so that it can easily perform zero and span adjustment.

20.000

Valve

Positioner

Black

Red     4-20 mA⇒

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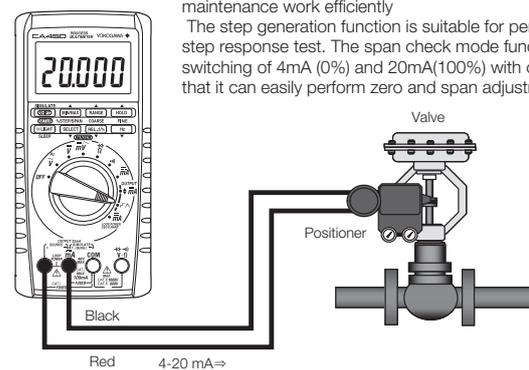
### Electrical equipment check

#### AC/DC Current measurement (SENSOR mode)

The CA450 can directly read the various sensor output signals (mV DC/AC) at any scaling. The units can be changed (16 units are available).

Output signal and scaled value are simultaneously displayed.

Small motor

Power supply

AC/DC clamp-on probe (Model 96095) Reads maximum 60 A when used with the CA450.

AUTO OFF SENSOR     RMS     ~ 55.0 mV

550 m A

Sub-display
Sensor output signal

Main display
Scaled value

# Accuracy

## ● DC Voltage Measurement ⎓V, ⎓mV

Accuracy: ± (% of reading + digits) at 23°C ± 5°C, 80% RH or less

| Range | Resolution | Accuracy | Input Resistance | Maximum Input Voltage |
|---|---|---|---|---|
| 600 mV | 0.1 mV | 0.09%+2 | 10 MΩ or more | |
| 6 V | 0.001 V | | Approx. 11 MΩ | 1000 V DC |
| 60 V | 0.01 V | 0.09%+1 | | |
| 600 V | 0.1 V | | Approx. 10 MΩ | 1000 Vrms AC |
| 1000 V | 1 V | 0.1%+1 | | |

NMRR: 60 dB or more, 50/60 Hz ± 0.1%
CMRR: 120 dB or more, 50/60 Hz (Rs = 1 kΩ)
Response time: Within 1 second

## ● AC Voltage Measurement ∿V, ∿mV
AC coupling, rms value detection: sine wave

| Range | Resolution | Accuracy 50/60 Hz | Accuracy 40 Hz to 500 Hz | Accuracy 500 Hz to 1 kHz | Input Resistance | Maximum Input Voltage |
|---|---|---|---|---|---|---|
| 600 mV | 0.1 mV | | | | 10 MΩ or more, <200 pF | |
| 6 V | 0.001 V | | | 1.5%+5 | Approx. 11 MΩ, <50 pF | 1000 V DC |
| 60 V | 0.01 V | 0.5%+5 | 1%+5 | | | |
| 600 V | 0.1 V | | | | Approx. 10 MΩ, <50 pF | 1000 Vrms AC |
| 1000 V | 1 V | | | — | | |

For a range of 5 to 100%, the accuracy for the 1000 V range is 200 V to 1000 V
CMRR: 60 dB or more, DC to 60 Hz (Rs = 1 kΩ)
For nonsinusoidal waveforms whose crest factor is less than 3, add ±(2% of reading + 2% of range) to the accuracy.
For the 1000 V range, the peak voltage is 1500 V or less
Response time: Within 2 seconds

## ● DC Current Measurement mA

| Range | Resolution | Accuracy | Voltage Drop |
|---|---|---|---|
| 30 mA | 0.001 mA | 0.05%+2 | <0.3 V |
| 100 mA*1 | 0.01 mA | 0.05%+2 | <0.8 V |

*1 Only the 30 mA range can be used during LOOP POWER output.
Response time: Within 1 second

## ● Resistance Measurement Ω

| Range | Resolution | Accuracy | Maximum Measuring Current | Open-Loop Voltage | Input Protective Voltage |
|---|---|---|---|---|---|
| 600 Ω | 0.1 Ω | 0.2%+2 | <1.2 mA | <3.5 V | |
| 6 kΩ | 0.001 kΩ | | <110 µA | | |
| 60 kΩ | 0.01 kΩ | 0.2%+1*1 | <13 µA | | |
| 600 kΩ | 0.1 kΩ | | <1.3 µA | <1.3 V | 1000 Vrms |
| 6 MΩ | 0.001 MΩ | 0.35%+3 | <130 nA | | |
| 60 MΩ | 0.01 MΩ | 1%+2*2 | | | |

*1 The accuracy after ZERO CAL
*2 For 40 MΩ to 60 MΩ, the accuracy is 2% + 2.
Response time: Within 2 seconds for 600 Ω to 600 kΩ,
within 10 seconds for 6 MΩ to 60 MΩ

## ● Continuity Check •))

| Range | Resolution | Operating Range | Measuring Current | Open-Loop Voltage | Input Protective Voltage |
|---|---|---|---|---|---|
| 600 Ω | 0.1 Ω | The buzzer sounds at resistances lower than 50±30 Ω | <1.2 mA | <3.5 V | 1000 Vrms |

## ● Diode Test ⊶

| Range | Resolution | Accuracy | Measuring Current (Vf=0.6 V) | Open-Loop Voltage | Input Protective Voltage |
|---|---|---|---|---|---|
| 2 V | 0.001 V | 1%+2 | Approx. 0.5 mA | <3.5 V | 1000 Vrms |

## ● Frequency Measurement in Hz
AC Coupling

| Range | Resolution | Accuracy | Input Voltage Range |
|---|---|---|---|
| 10.00 Hz to 199.99 Hz | 0.01 Hz | | 0.3 to 600 Vrms |
| 90.0 Hz to 1999.9 Hz | 0.1 Hz | 0.005%+1 | |
| 0.900 kHz to 19.999 kHz | 0.001 kHz | | 0.4 to 600 Vrms |

## ● Peak Hold (P•H)

| Measurement Function | Accuracy | Minimum Detection Width |
|---|---|---|
| DCV | ±100 digits | >6 ms |

## Source
## ● DC Output mA

| Range | Resolution | Accuracy | Load Condition |
|---|---|---|---|
| 20 mA | 0.001 mA | 0.05% of range | SOURCE 0 to 20 mA Compliance voltage 28 V SIMULATE (SINK) 0 to 20 mA External power supply 15 to 48 V overrange up to 25 mA < 10 mH |

## ● 24 V Loop Power Supply (LOOP POWER)

| Range | Load Condition |
|---|---|
| 24 V | 24 VDC (typ.), load current 20 mA |

# General Specifications

**Measurement functions:** DC voltage, AC voltage, DC current, resistance, frequency, continuity check, diode test

**Additional functions:** Data hold (D•H); auto hold (A•H); peak hold (P•H); auto range (Auto); range hold (Range Hold); maximum, minimum, and average value recording and measurement; zero adjustment (Ω); relative measured value display (RELΔ, REL%); 24 V loop power supply; internal resistor on/off for HART communication

**Output functions:** 20 mA DC current for current output SOURCE and current output SIMULATE(SINK)

**Additional functions:** Current span switching and current sweep output

**Operation methods:** Measurement: ΔΣ modulation
Output: Multiplicative DA

**Display:** 5-digit LCD (7 segment)
Numeric display

| Measurement | Output |
|---|---|
| DC current: 33000 | DC current: 25000 |
| Frequency: 19999 | |
| Other: 6600 | |

Subdisplay — Displays supplemental information for various functions

Polarity indicator — Automatic display. Only the minus sign "—" appears.

Over range indicator — "OL"

Low-battery indicator — ➕➖ appears when the battery voltage is below the operating voltage.

**Measurement cycle:** 2.5 to 5 times a second (however, frequency measurement takes place once a second)

**Operating temperature and humidity:** -20°C to 55°C (80% RH or less) with no condensation
Within the range of 40°C to 55°C, the humidity must be 70% RH or less.

**Storage temperature and humidity:** -40°C to 70°C (70% RH or less) with no condensation

**Temperature coefficient (typ.):** In the ranges of -20°C to 18°C and 28°C to 55°C, add the accuracy of 23°C ± 5°C × 0.1/°C.

**Power supply:** Four AA-size alkaline batteries (1.5 V LR6)

**Battery life:** When using alkaline batteries
DC voltage measurement: Approx. 140 hours
DC current output (SIMULATE): Approx. 140 hours
DC current output (SOURCE) 12 mA (500 Ω load): Approx. 10 hours

**Insulation resistance:** 100 MΩ or greater at 1000 VDC

**Withstand voltage:** 6.88 kVAC for five seconds (between the input terminals and the case)

**External dimensions:** Approx. 90 (W) × 192 (H) × 49 (D) mm

**Weight:** Approx. 600 g (including the batteries)

**Compliant standards:**
Safety standards: EN61010-1, EN61010-2-030, EN61010-2-033, EN61010-031
Measurement Categories:
1000 V CATIII, 600 V CATIV
For current measurement and output: 48 V max, 100 mA max
Lead cables (98064): 70 VDC, 100 mA
Pollution degree 2, indoor use
Vibration: Sweep vibration frequencies 10 Hz to 5 Hz to 10 Hz
Amplitude 0.15 mm (peak value)
Duration 30 minutes
Shock: 1 m drop test as defined by the safety standards

**Altitude:** 2000 m or less

**EMC standards:** EN61326-1, EN61326-2-2
EN55011 Class B Group 1
Influence of radiated immunity: In RF electromagnetic fields of 3 V/m
EN61326-1 AC voltage measurement, 600 mV range: 1.5% of range
DC voltage measurement, 600 mV range: 1% of range
DC current measurement, all ranges: 1.5% of range
DC current output: 1.5% of range
EN61326-2-2 AC voltage measurement (6 V range or higher): Within 5 times the accuracy
DC voltage measurement (6 V range or higher): Within 5 times the accuracy

**Standard accessories:**
AA-size alkaline batteries — 4
Test leads (98073) — 1 set
Lead cables (98064) — 1 set
Fuses (inside the CA450) 440 mA/1000 V (99042) — 2
User's manual — 1
Blank cover — 1

## Product Model code

| Name | Model | Suffix code | Descriptions |
|---|---|---|---|
| Process Multimeter | CA450 | -E | With English Instruction manual |

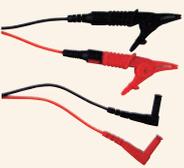## Standard accessories

| Name | Model | Descriptions |
|---|---|---|
| Test leads | 98073 | 1000 V CAT III, 600 V CAT IV Red Black 1 set |
| Lead cables | 98064 | Alligator clip, for control signal only (under 70 V) |
| Fuse | 99042 | 440 mA/1000 V 10 A cut off 1 piece |

## Optional accessories

| Name | Model | Suffix code | Descriptions |
|---|---|---|---|
| Carrying Case | 93029 | | For carrying the CA450, the test leads, and the lead cables |
| Carrying Case | 93043 | -P1 | Carrying case with hanger strap and large size case |
| Magnet hook | 99032 | | Magnet hook (Maximum weight 1.5 kg) |
| DMM Communication Package [1] | 92015 | | USB adapter, USB cable and software |
| Alligator Test leads | 99014 | | 1000 V CAT III, 600 V CAT IV Red Black 1 set |
| 1 to 5 V Adapter Set | 99031 | | 250 Ω resister, terminal adapter and leads |
| AC/DC Clamp-on Probe | 96095 | | DC180 A, AC130 A, output 10 mV/A |
| Current Clamp-on Probe | 96001 | | AC400 A, output 10 mV/A |

[1] : The application software can use only the measurement function. (Logging function only)

## Accessories

Test leads Model:98073 | Lead Cables Model:98064 | Fuse Model:99042 | DMM Communication Package 92015

Alligator Test leads Model:99014 | AC/DC Clamp-on Probe Model:96095 | Current Clamp-on Probe Model:96001 | Carrying Case Model:93029

Magnet hook Model:99032 | The Magnet hook can be attached to magnetic body (e.g. iron). | Carrying Case Model:93043-P1 | The inner case with detachable straps can be hung on piping or handrails.

## Related Products

CA700 | CA150 | CA71/CA51 | CA310 | CA320 | CA330 | CL420

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

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