

Pressure Calibrator  
CA700



Pressure Calibrator

# CA700

*New Standard for Field Calibration*

Bulletin CA700-EN

[www.yokogawa.com/yml](http://www.yokogawa.com/yml)



High Accuracy

# New Standard for Field Calibration

Long Stability

Smart Calibration



# CA700

The CA700 is a highly accurate and highly functional pressure calibrator specifically designed for the calibration of differential pressure and pressure transmitters, which are widely used in plant processes these days and are improving in terms of accuracy and functionality. The CA700 has achieved the highest accuracy and widest range in the portable class, enabling field calibration with greater accuracy than ever before.

## High Accuracy and Long Stability

- Achieves the highest accuracy in the portable class
  - Basic accuracy: Pressure (measurement) / 0.01% rdg.
  - Current/voltage (source/measurement) / 0.015% rdg.

## Rangeability

- Achieves the highest resolution and widest range in the portable class
  - 0.001 kPa (200.000 kPa range)

## User Support

- 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.

## Field Use

- IP54 dustproof and waterproof robust case enables use in harsh environments.

## Accessories

- Three high-performance hand pump models for different pressure ranges are available.





## High Performance and Functionality in a Compact Body

### ■ High Accuracy and Long Stability

The highest accuracy in the portable class achieved with a silicon resonant sensor

The CA700 employs a silicon resonant pressure sensor with which Yokogawa has achieved the highest accuracy in the portable class of a 0.01% of reading for pressure measurement and 0.015% of reading for current and voltage measurement. This calibrator is ideal for input and output testing of differential pressure and pressure transmitters in that it correctly measures the input and output accuracy and calculates the error rate.

### ■ Rangeability

Has the highest resolution and the widest range in its class

The CA700 has achieved a resolution of 0.001 kPa (200,000 kPa range) which is 10-fold higher than that of general field calibrators. The excellent sensing characteristics of a silicon resonant sensor make it possible to achieve a very wide range and enable one CA700 calibrator to replace multiple field calibrators.

*Silicon Resonant Sensor*

### ■ User Support

Strong support for field calibration and maintenance work

Calibration procedures for differential pressure and pressure transmitters are embedded, so routinely used as 50-percent step, up-and-down, 5-point calibration and 25-percent step, up-and-down, as well as 9-point calibration can be performed right out of the box. Calibration operation can be sped up by following the navigation instructions, resulting in increased efficiency of field work. Measurement data is automatically recorded to the calibrator so it can be saved to a USB memory stick or transferred to a PC as text data using a USB cable. Input and output values, error rate, date and time, and pass or fail can be displayed on a PC monitor.



### ■ Field Use

IP54 waterproof and dustproof robust case enables use of this calibrator in harsh environments

Calibration of pressure transmitters is usually carried out in harsh environments where there are many pipes and handrails or in wet areas. The CA700 has a robust case designed according to the IP54 waterproof and dustproof standards. A shoulder strap can be attached to the calibrator to make it easy to carry around in the field. In addition, an easy-to-read LCD and tilt stand suitable for outdoor work exposed to direct sunlight extend the range of use of this calibrator from indoor bench use to outdoor field use.



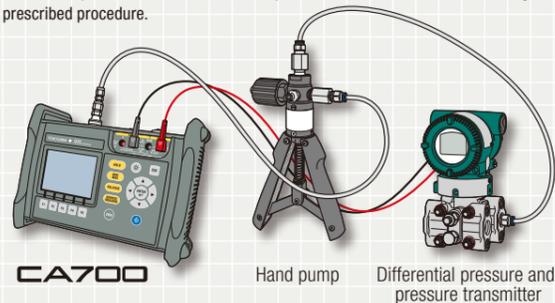


## Supports Various Applications

### 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.

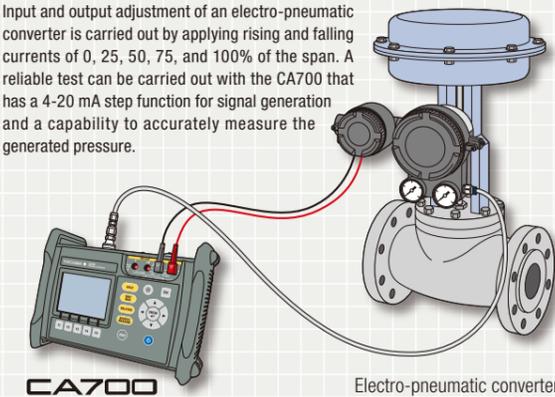
The CA700 ensures reliable calibration with its function to accurately measure the input and output values of pressure and current. Additionally its embedded calibration procedures enable users to perform certain calibration following the prescribed procedure.



CA700 Hand pump Differential pressure and pressure transmitter

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

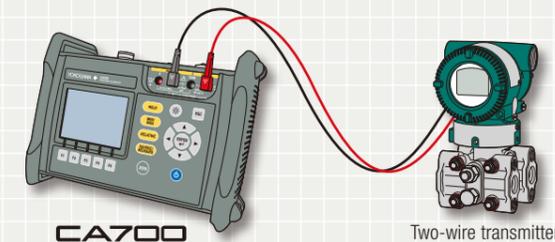
Input and output adjustment of an electro-pneumatic converter is carried out by applying rising and falling currents of 0, 25, 50, 75, and 100% of the span. A reliable test can be carried out with the CA700 that has a 4-20 mA step function for signal generation and a capability to accurately measure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



CA700 Electro-pneumatic converter

### 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.

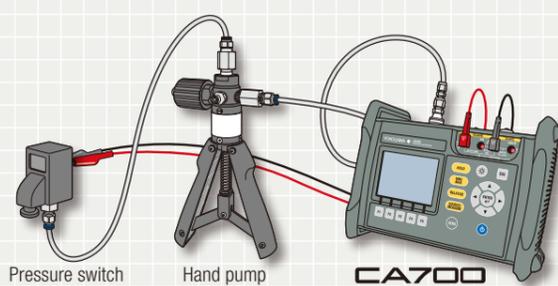


CA700 Two-wire transmitter

### 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.



Pressure switch Hand pump CA700

### 20 mA SIMULATE (Two-wire Transmitter Simulator)

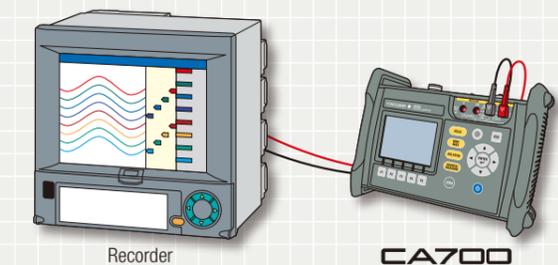
The CA700 can also be used as a transmitter simulator to carry out a loop test. It can absorb (SINK) the set current from an external voltage generating device (e.g., a distributor system or PLC) of instrumentation equipment. 4-20mA current can be sourced with an accuracy of 0.015% of the reading.



Two-wire transmitter Distributor CA700

### 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).



Recorder CA700

## Three High-Performance Hand Pump Models Available



### Low Pressure Hand Pump 91051

- Ultra-compact hand pump
- Pressure generation range: -83 to 700 kPa
- Ideal for pressure adjustment in low pressure range
- Smooth pressurization with less internal leaking
- Strainer preventing debris from entering the pump included



### Pneumatic Hand Pump 91056

- High-performance small hand pump with a wide range of pressure generation
- Pressure generation range: -83 to 4000 kPa
- Pressure generation ranging from low to medium pressures
- Fine adjustment and pressure reduction possible with one hand
- Smooth pressurization with less internal leaking
- Strainer preventing debris from entering the pump included



### Hydraulic Hand Pump 91061

- High-performance hand pump capable of generating a pressure of up to 70 MPa
- Pressure generation range: 0 to 70 MPa
- Easy grip operation to generate high pressures
- Smooth pressurization with less internal leaking
- Strainer preventing debris from entering the pump included



### 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 *1 *2 (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 Negative pressure: ±(0.2% of reading + 0.080 kPa)	Positive pressure: ±(0.01% of reading + 0.04 kPa) Negative pressure: ±(0.2% of reading + 0.08 kPa)	Positive pressure: ±(0.01% of reading + 0.15 kPa) Negative pressure: ±(0.2% of reading + 0.08 kPa)
Measurement accuracy *1 *2 (1 year after calibration) (Tested after zero calibration)	Positive pressure 20 to 200 kPa: ±(0.01% of reading + 0.010 kPa) 0 to 20 kPa: ±0.012 kPa Negative pressure: ±(0.2% of reading + 0.090 kPa)	Positive pressure: ±(0.01% of reading + 0.08 kPa) Negative pressure: ±(0.2% of reading + 0.09 kPa)	Positive pressure: ±(0.01% of reading + 0.30 kPa) Negative pressure: ±(0.2% of reading + 0.09 kPa)
Response time *3	2.5 s or less		
Allowable input	2.7 kPa abs to 500 kPa gauge	2.7 kPa abs to 3000 kPa gauge	2.7 kPa abs to 4500 kPa gauge
Internal volume	Approx. 6 cm <sup>3</sup>		
Temperature coefficient *4	±(0.001% of reading + 0.001% of full scale)/°C or less		
Influence of positional setup	Zero-point drift ±0.3 kPa or less		
Measurement fluid	Gas and liquid (non-corrosive, non-flammable, non-explosive, and non-toxic fluids)		
Measurement fluid temperature *5	-10 to 50°C		
Pressure sensor	Silicon resonant sensor		
Pressure sensor element	Diaphragm		
Pressure display units	kPa and other units (Pa, hPa, MPa, mbar, bar, atm, mmHg, inHg, gf/cm <sup>2</sup> , kgf/cm <sup>2</sup> , mmH <sub>2</sub> O@4°C, mmH <sub>2</sub> O@20°C, ftH <sub>2</sub> O@4°C, ftH <sub>2</sub> O@20°C, inH <sub>2</sub> O@4°C, inH <sub>2</sub> O@20°C, Torr, psi)		
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.

#### Measurement Unit Common Specifications

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

#### Generation Unit Common Specifications

- Generation load condition: C ≤ 0.1 µF  
L ≤ 10 mH
- Generation unit voltage limiter: Approx. 36 V
- Generation unit current limiter: Approx. 36 mA
- Generation unit voltage to ground: 42 V peak
- Sweep function: Step/Linear

\*1: Zero-point calibration condition: Under atmospheric pressure

\*2: Yokogawa's pressure standards accuracy is excluded.

\*3: Conditions of response time measurement:

The response time is defined as the time for the readout to settle within ±1% of the full scale from the time when the positive pressure is released to atmosphere when it is at its full-scale value (where the input unit is under no load).

\*4: Full scale of each model

CA700-E-01: Positive pressure 200 kPa and negative pressure 80 kPa  
CA700-E-02: Positive pressure 1000 kPa and negative pressure 80 kPa  
CA700-E-03: Positive pressure 3500 kPa and negative pressure 80 kPa

\*5: Liquid temperature 5 to 50°C

### General Specifications

Display	Dot matrix LCD (320x240 dots)
Backlight	LED
Display refresh rate	Approx. 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) x 188 (H) x 96 (D) mm, excluding protrusions
Weight	Approx. 2kg (including batteries)
Compliance standards	Safety: EN61010-1, EN61010-2-030, contamination class 2, measurement category 0 (other) EMC: EN61326-1 Class A, EN55011 Class A Group 1
Operating temperature / humidity ranges	-10 to 50°C and 20 to 80%RH (no condensation)
Storage temperature / humidity ranges	-20 to 60°C 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.
Accessories*	A set of 1.7m 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 x 1, ferrite core x 2, R 1/4" - 1/4" NPT female thread x 1, accessory case, instruction manual (CD), startup guide, shoulder strap

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

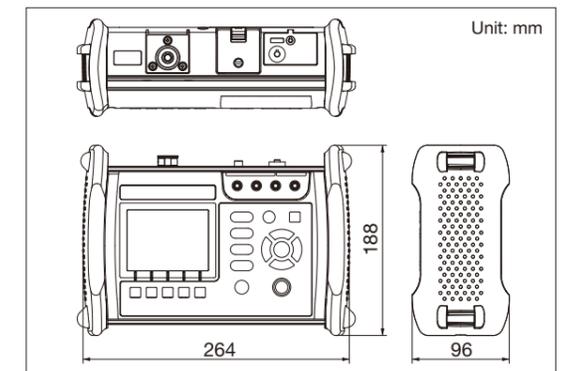
### Number of Data Records

Device operation status	Number of data records that can be saved	Number of files that can be saved
Measurement / Source	Save	2000
	Logging	45
Leak test	2000	45
Transmitter calibration (Number of calibration points: 5)	As Found	9
	As Left	250
Pressure switch calibration	As Found	1
	As Left	250

\* The maximum number of files is 250.

\* The total data capacity is approx. 3.5 MB

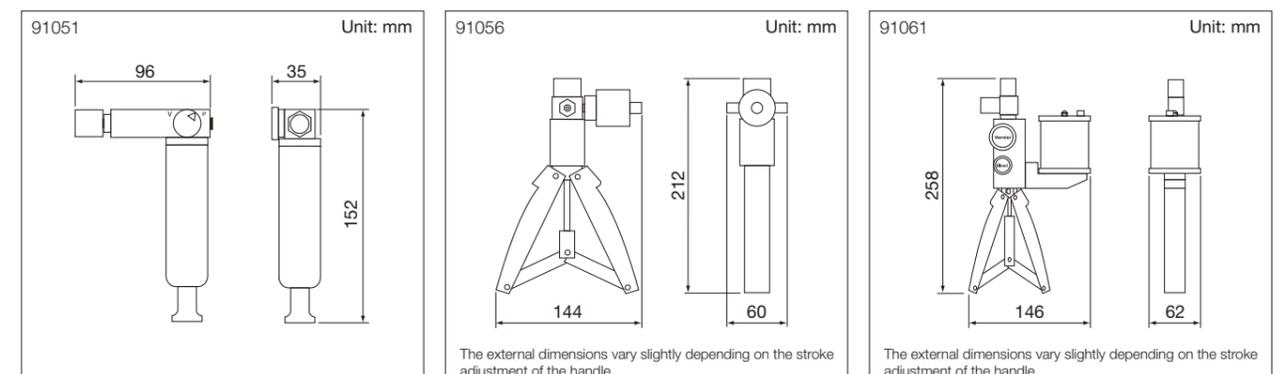
### CA700 External Dimensions



### Hand Pump Specifications

Product name	Model	Pressure generation range	MWP (maximum working pressure)	Connection port	Pressurized media
Hand Pump (Low Pressure)	91051	-83 to 700 kPa	1000 kPa	1/8" NPT female thread	Air
Hand Pump (Pneumatic)	91056	-83 to 4000 kPa	5100 kPa	1/8" NPT female thread / 1/4" NPT female thread	Air
Hand Pump (Hydraulic)	91061	0 to 70 MPa	70 MPa	1/4" NPT female thread / 1/4" NPT female thread	Liquid

### Hand Pump External Dimensions





■ Model and Suffix Code

CA700

Product name	Model	Suffix code	
Pressure Calibrator	CA700	General use type	
		-E	All countries except Japan
		-01	Gauge pressure: 200kPa
		-02	Gauge pressure: 1000kPa
		-03	Gauge pressure: 3500kPa
		-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	98025	A set of separate red and black clips (for 2 m long wires)
Cleaning Unit	91040	For input connection port -P1 (R 1/4" male thread)
Cleaning Unit	91041	For input connection port -P2 (1/4" NPT male thread)

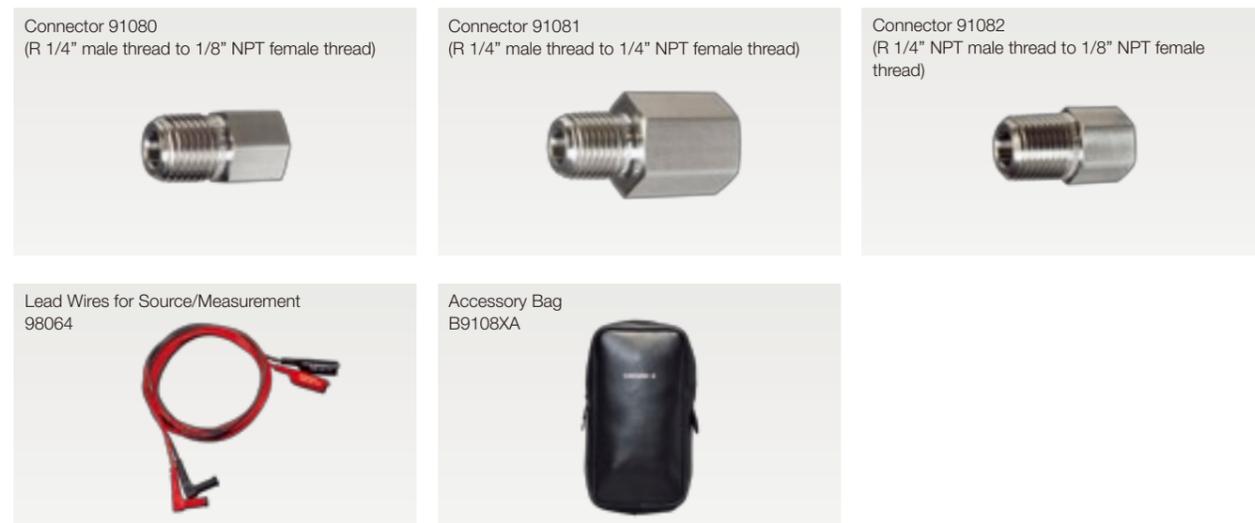
\*2: These accessories are not included in the CA700 calibrator package.



CA700 Accessories \*3

Product name	Model	Specification
Connector *4	91080	R 1/4" male thread to 1/8" NPT female thread conversion connector (for -P1)
Connector *4	91081	R 1/4" male thread to 1/4" NPT female thread conversion connector (for -P1)
Connector *5	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

\*3: Included in the CA700 calibrator package at the time of purchase.  
 \*4: Included in the package when suffix code -P1 is selected.  
 \*5: Included in the package when suffix code -P2 is selected.



■ Model and Suffix Code

Pressure Hand Pump Kits \*6

Product name	Model	Specification
Hand Pump Kit (Low Pressure)	91050	Hand pump (91051), connector set (91052), case (93052)
Hand Pump Kit (Pneumatic)	91055	Hand pump (91056), connector set (91057), case (93053)
Hand Pump Kit (Hydraulic)	91060	Hand pump (91061), connector set (91062), case (93053)

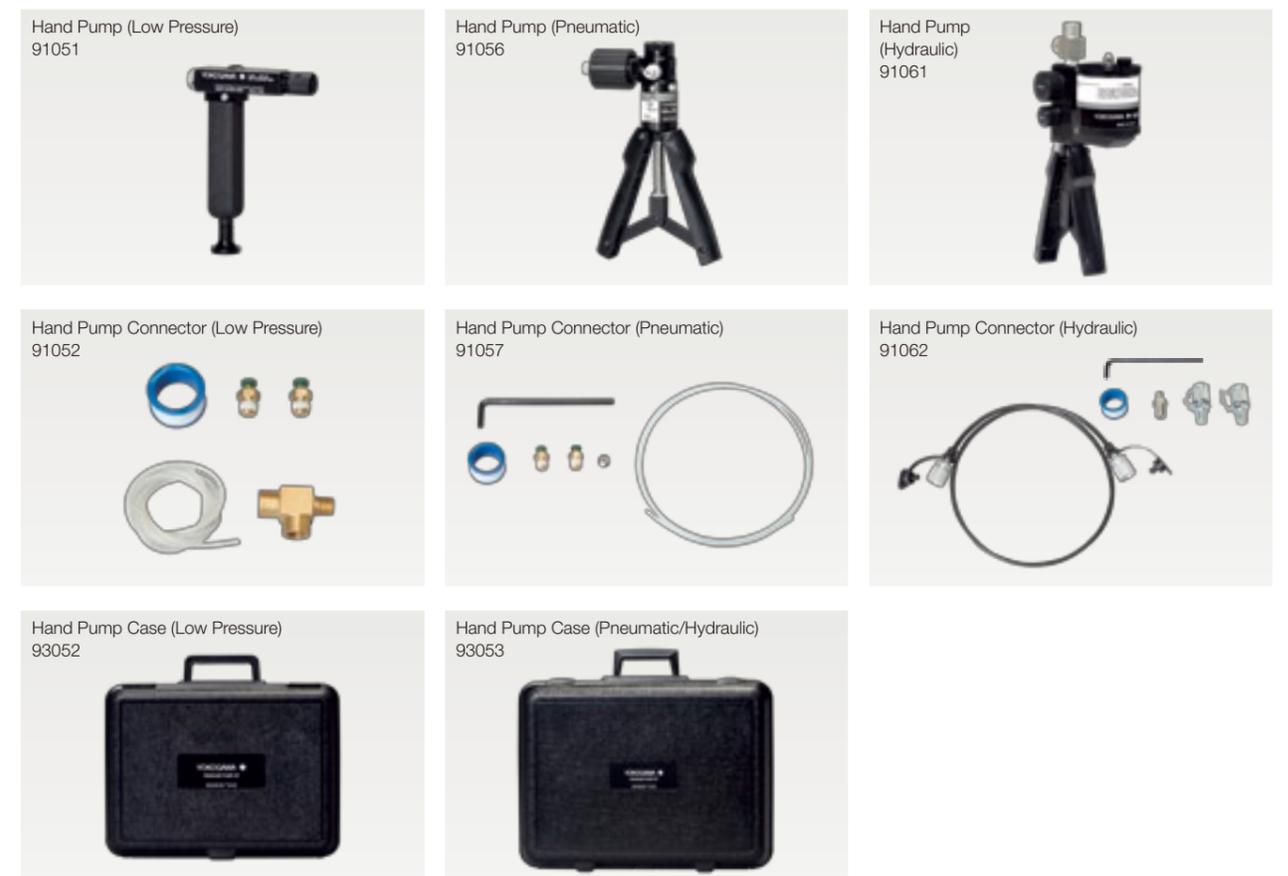
\*6: These accessories are not included in the CA700 calibrator package at the time of purchase.



Hand Pump Kit Accessories \*7

Product name	Model	Specification
Hand Pump (Low Pressure)	91051	Hand pump: -83 to 700 kPa (pressure generation range)
Hand Pump (Pneumatic)	91056	Hand pump: -83 to 4000 kPa (pressure generation range)
Hand Pump (Hydraulic)	91061	Hand pump: 0 to 70 MPa (pressure generation range)
Hand Pump Connector (Low Pressure)	91052	Connector set for the 91051 (quick adapter, pressure conversion adapter, flexible hose, sealing tape)
Hand Pump Connector (Pneumatic)	91057	Connector set for the 91056 (quick adapter, sealing cap, flexible hose, sealing tape, and hex wrench)
Hand Pump Connector (Hydraulic)	91062	Connector set for the 91061 (high-pressure hose, quick adapter, conversion adapter, sealing tape, and hex wrench)
Hand Pump Case (Low Pressure)	93052	Case for the 91051 (91051, 91052, and instruction manual)
Hand Pump Case (Pneumatic/Hydraulic)	93053	Case for the 91056/91061 (91056, 91057, 91061, 91062, and instruction manual)

\*7: These accessories are included in the hand pump kit (91050, 91055, and 91060) at the time of purchase. They can also be purchased separately.



## ■ Related Products

### PC-based field device management tool

- Multi-vendor, multi-protocol support BRAIN, FOUNDATION™ Fieldbus H1, HART®, PROFIBUS and ISA100.11a
- Automatic device data acquisition upon connection to a device or a segment (Segment Viewer)
- Easy acquisition and diagnosis of device status (Device Viewer)
- Categorization, sorting and filtering (History)
- Multi-parameter set-up (Parameter Manager)



**FieldMate**

Versatile Device Management Wizard

### Handheld Terminal for BRAIN Communication

- Online monitoring and communication.
- Easy setup and alteration procedures in English prompting interactive sequences.
- Diagnostics/security with error messages. ( Self-check function, Security code protection of setpoints, Low battery voltage alarm and Automatic power-off)
- Printer prints out tag numbers and other parameters on the spot.



**BRAIN Terminal  
BT200**

### Highly Accurate All-In-One Calibrator

- Dual display of source and measurement with an accuracy of 0.02%
- Multiple sources and measurements of DCV, DCmA, Ω, TC, RTD, Hz, and PULSE
- 24 V loop power supply and output signal measurement at the same time
- Current sink function to simulate a transmitter
- A variety of sweep functions selectable (Step, Linear, Program, and Sweep)
- Three power supply options available (AA batteries, AC adapter [sold separately], and NiMH batteries [sold separately])



**Handy Calibrator  
CA150**

### Best-Selling Field Calibrator Model with High Performance and Low Price

- Small, light, and high performance at a low price
- Source and measurement of DCV, DCmA, Ω, TC, RTD, Hz, and PULSE
- DMM-like operation with a rotary switch
- Source and measurement (counting) of dry contact pulses



**Handy Calibrator  
CA71**

### Clamp-on Measurement of 4-20 mA Instrumentation Signals

- Process signal measurement with no need to disconnect a loop
- Accuracy 0.2% + 5 dgt and resolution 0.01 mA
- Simultaneous display of percentage (%) of the measured value and span
- LED backlight ideal for measuring in dark places
- Thick signal wire with a diameter of up to 6 mm can be clamped easily.



**Clamp-on Process Meter  
CL420**

### Safety DMM Equipped with a Loop Power Supply and 4-20 mA Output

- 24 V loop power supply and measures output signal at the same time
- Resistor (250Ω) for HART and BRAIN communication embedded and selectable.
- Transmitter simulation (current sink) function
- Step, Auto-step, and Linear sweep functions are selectable
- 6,000-count DMM function
- EN61010-1 CATIV600V and CATIII1000V safety design



**Process Multimeter  
CA450**

Yokogawa Meters & Instruments Corporation

World Wide Web site at  
<http://www.yokogawa.com/yml>

#### ⚠ NOTICE

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

**vigilantplant.®**

The clear path to operational excellence

SEE  
CLEARLY

KNOW  
IN ADVANCE

ACT  
WITH AGILITY

VigilantPlant is Yokogawa's automation concept for safe, reliable, and profitable plant operations. VigilantPlant aims to enable an ongoing state of Operational Excellence where plant personnel are watchful and attentive, well-informed, and ready to take actions that optimize plant and business performance.

YOKOGAWA METERS & INSTRUMENTS CORPORATION  
International Sales Dept. Tachih Bld. No.2, 6-1-3 Sakaecho, Tachikawa-shi, Tokyo, 190-8586 Japan  
Phone: +81-42-534-1413 Facsimile: +81-42-534-1438

YOKOGAWA CORPORATION OF AMERICA (U.S.A.)  
YOKOGAWA EUROPE B. V. (THE NETHERLANDS)  
YOKOGAWA ENGINEERING ASIA PTE. LTD. (SINGAPORE)  
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YOKOGAWA ELECTRIC CIS LTD. (RUSSIAN FEDERATION)

Phone: +1-770-253-7000  
Phone: +31-88-4641000  
Phone: +65-6241-9933  
Phone: +55-11-5681-2400  
Phone: +82-2-2628-3810  
Phone: +61-2-8870-1100  
Phone: +91-80-4158-6000  
Phone: +86-21-6239-6363  
Phone: +973-17-358100  
Phone: +7-495-737-7868

Facsimile: +1-770-254-0928  
Facsimile: +31-88-4641111  
Facsimile: +65-6241-2606  
Facsimile: +55-11-5681-4434  
Facsimile: +82-2-2628-3899  
Facsimile: +61-2-8870-1111  
Facsimile: +91-80-2852-1441  
Facsimile: +86-21-6880-4987  
Facsimile: +973-17-336100  
Facsimile: +7-495-737-7869

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