Pressure Calibrator

CA700

New Standard for Field Calibration

NEW **New release of 2 high-performance hand pump models**

Bulletin CA700-EN

New Standard for Field 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

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

High Performance and Functionality in a Compact Body

■ High Accuracy and Long Stability

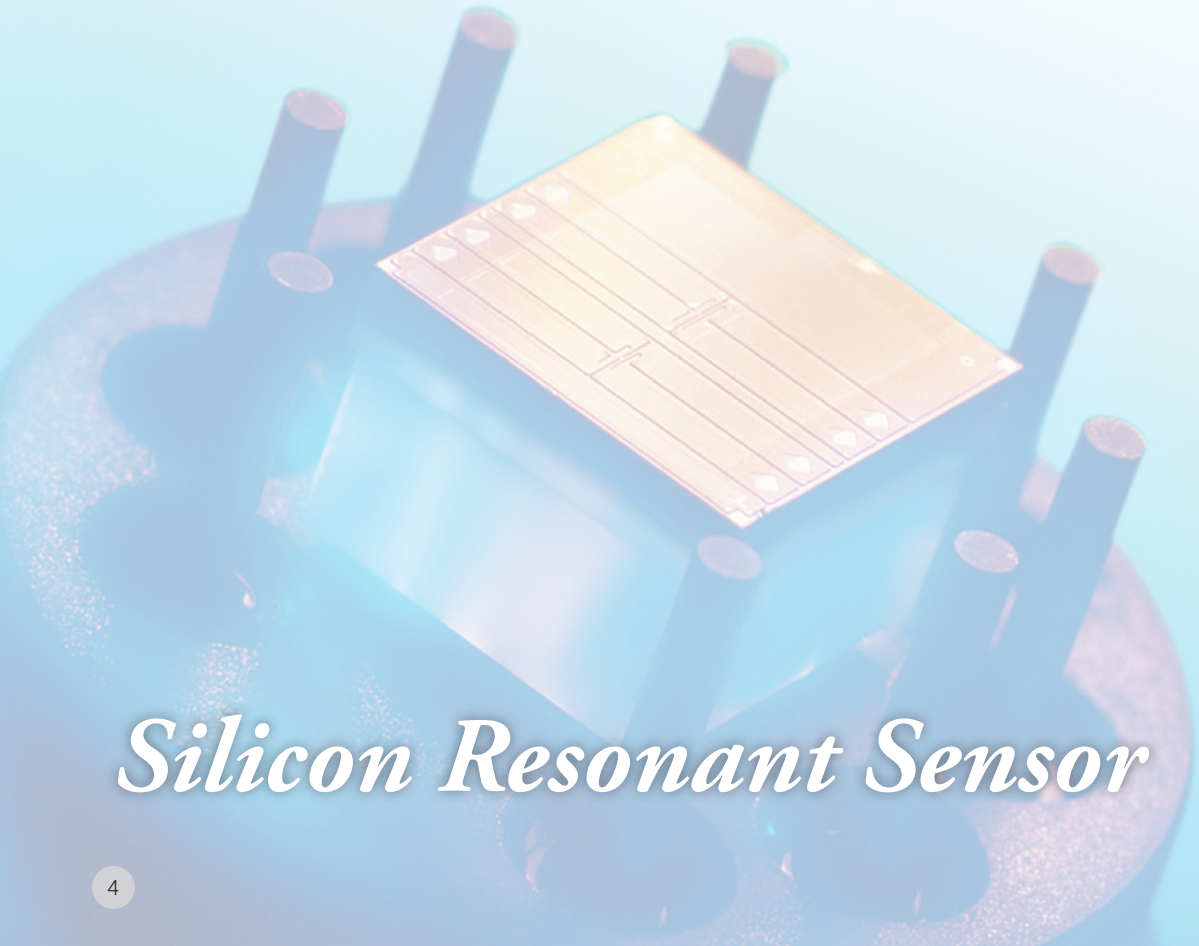
The highest accuracy in the portable class achieved with a silicon resonant sensor

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 as it accurately measures the input and output and calculates the error rate.

■ Rangeability

Has the highest resolution and the widest range in its class

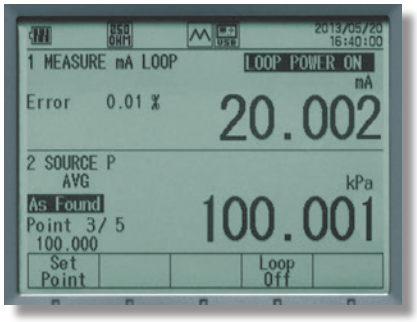
The CA700 has achieved a resolution of 0.001 kPa (200.000 kPa range) which is 10-fold higher than that of general field calibrators. The excellent sensing characteristics of a silicon resonant sensor make it possible to achieve a very wide range and enable one CA700 calibrator to replace multiple field calibrators.

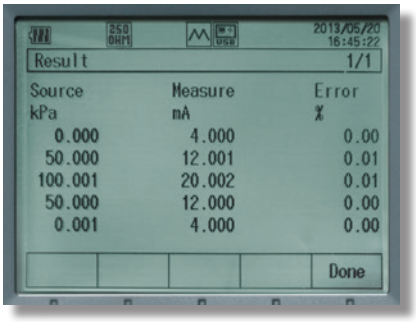


■ User Support

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

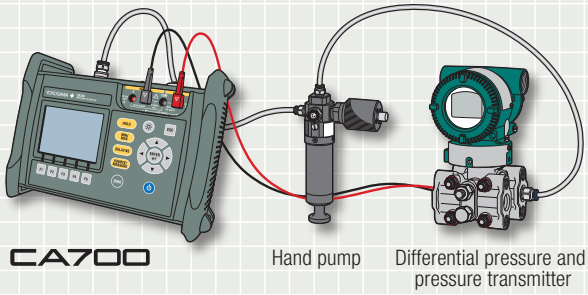
IP54 waterproof and dustproof robust case enables use of this calibrator in harsh environments

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

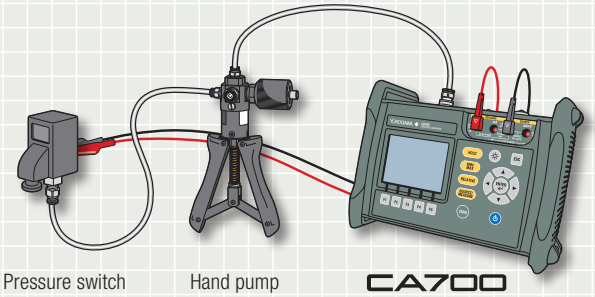
■ Field Calibration of Differential Pressure and Pressure Transmitters

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.



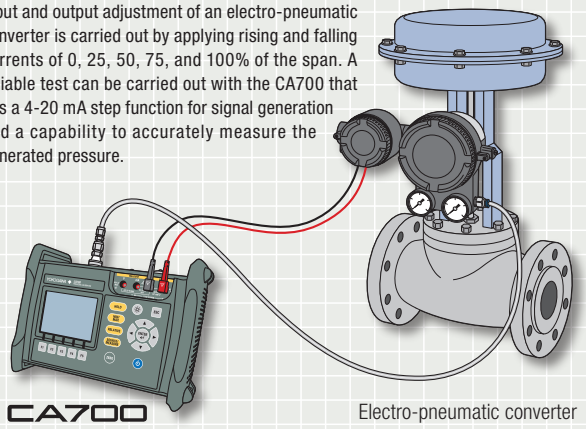
■ Pressure Switch Test

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.



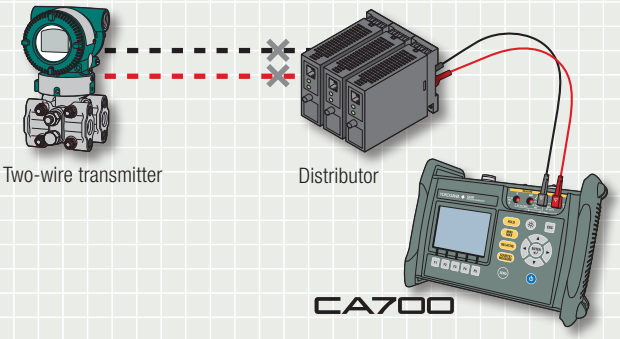
■ Check and I/O Adjustment of an Electro-pneumatic Converter

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.



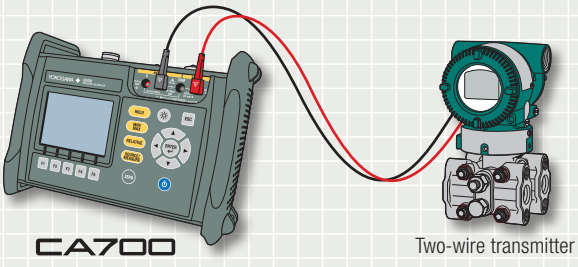
■ 20 mA SIMULATE (Two-wire Transmitter Simulator)

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.



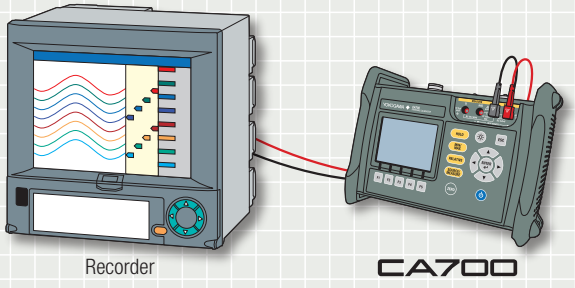
■ Two-wire Transmitter Loop Check

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).



Two High-Performance Hand Pump Models Available

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

■ 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	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)
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	Positive pressure: ±(0.01% of reading + 0.08 kPa)	Positive pressure: ±(0.01% of reading + 0.30 kPa)
	Negative pressure: ±(0.2% of reading + 0.090 kPa)	Negative pressure: ±(0.2% of reading + 0.09 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^3		
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^2, kgf/cm^2, mmH_2O@4°C, mmH_2O@20°C, ftH_2O@4°C, ftH_2O@20°C, inH_2O@4°C, inH_2O@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 ±50.000 V	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 (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°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	The dedicated external sensor PM100 (optional) can be connected to the CA700 via a connector
Accessories*	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

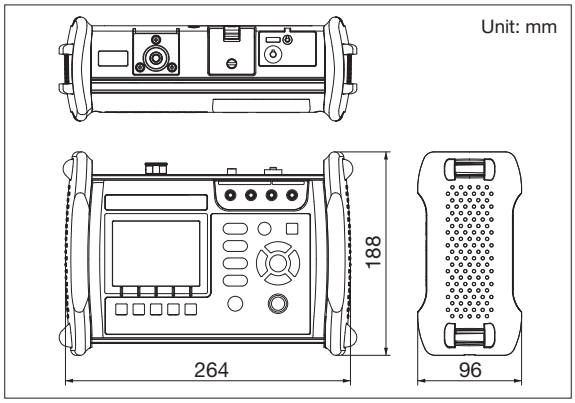
* The type of the included conversion connector varies depending on the suffix code (–P1 and –P2). For details, refer to "CA700 Accessories" on the next page.

■ 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	45
	Logging	2000	45
Leak test		2000	45
Transmitter calibration (Number of calibration points: 5)	As Found	9	250
	As Left	9	250
Pressure switch calibration	As Found	1	250
	As Left	1	250

* The maximum number of files is 250.
* The total data capacity is approx. 3.5 MB

■ CA700 External Dimensions

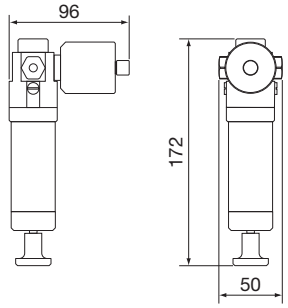


■ Hand Pump Specifications

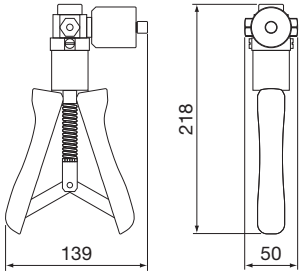
Product name	Model	Pressure generation range	MWP (maximum working pressure)	Connection port	Pressurized media
Low Pressure Hand Pump	91071	-83 to 700 kPa	1000 kPa	Rc1/8" female thread, Rc1/4" female thread	Air
Pneumatic Hand Pump	91075	-83 to 4000 kPa	5100 kPa	Rc1/8" female thread, Rc1/4" female thread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

■ Hand Pump External Dimensions

91071 Unit: mm



91075 Unit: mm



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

■ 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

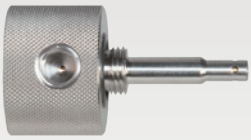
Product name	Model	Specification
Carrying Case	93050	Bag for the calibrator, accessories, and peripheral devices
Grabber Clip	98026	A set of separate red and black clips (for 2 m long wires)
Cleaning Unit *3	91040	Can connect to –P1 or –P2, input and output port are Rc1/8” female thread
Cleaning Unit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



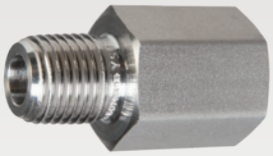
CA700 Accessories *4

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

■ Model and Suffix Code

Pressure Hand Pump Kits *7

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)

*7: 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 *8

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 *9	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 *10	91045	Valve set for low pressure and pneumatic (Valve, O-ring, spring, cap each 2 pcs)

*8: These accessories are included in the hand pump kit (91070, 91074) at the time of purchase. They can also be purchased separately.
*9: 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.
*10: 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

■ 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

Highly Accurate All-In-One Calibrator

- Two models (CA500 and CA550)
- Multiple sources and measurements of DCV, DCmA, Ω, TC, RTD, Hz and PULSE
- Corresponds to 17 types of TC standard (JIS/IEC/DIN/ASTM/GOST R)
- Corresponds to 14 types of RTD standard (JIS/IEC/GOST R)
- 24 V loop power supply and output signal measurement at the same time
- A variety of sweep functions selectable

Multi-function Process Calibrator
CA500/CA550

Single-function Calibrator Excellent in Portability

- Volt mA model CA310
  Basic accuracy 0.015%
  20 mA SIMULATE (SINK) function
- TC model CA320
  Basic accuracy 0.5°C (Typical of type K)
  Corresponds to the TC mini plug
- RTD model CA330
  Basic accuracy 0.3°C (Typical of Pt100)
  Corresponds to 2, 3, 4 wire

Process Calibrator
CA310/CA320/CA330

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

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

YOKOGAWA

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