User's Manual CL420

Clamp-on Process Meter

Thank you for purchasing our Clamp-on Process Meter.
This manual describes the specifications and handling precautions of the Clamp-on Process Meter.
Before using this product, thoroughly read this manual to understand how to use it properly.

The following manuals, including this one, are provided as manuals for the CL420. Please read all manuals.

IM CL420-EN:	User's manual (this manual)
IM 00C01C01-01Z1:	Safety manual (European languages)
IM CL420-93Z2:	Document for Korea

Contact information of Yokogawa offices worldwide is provided on the following sheet.

PIM 113-01Z2:	Inquiries List of worldwide contacts

Store this manual in an easily accessible place for quick reference.

YOKOGAWA ◆
Yokogawa Test & Measurement Corporation

IM CL420-EN
7th Edition
October 2021 (YMI)

1. Regarding the Safe Use of This Product

This product is designed to be used by a person with specialized knowledge. When operating the instrument, be sure to observe the cautionary notes given below to ensure correct and safe use of the instrument.
If you use the instrument in any way other than as instructed in this manual, the instrument's protective measures may be impaired.
This manual is an essential part of the product; keep it a safe place for future reference.
YOKOGAWA is by no means liable for any damage resulting from use of the instrument in contradiction to these cautionary notes.

The following safety symbols are used on the instrument and in this manual.

⚠ WARNING

Indicates a hazard that may result in the loss of life or serious injury of the user unless the described instruction is abided by.

⚠ CAUTION

Indicates a hazard that may result in an injury to the user and/or physical damage to the product or other equipment unless the described instruction is abided by.

⚠ Danger! Handle with Care.
This mark indicates that operator must refer to an explanation in the instruction manual in order to avoid risk of injury or death of personnel or damage to the instrument.

Do not apply around or remove from HAZARDOUS LIVE conductors.

This symbol indicates power on/off.

⎓ This symbol indicates direct current (DC).

■ Strictly observe the following cautionary notes in order to avoid the risk of injury or death of personnel or damage to the instrument due to hazards such as electrical shock.

⚠ WARNING

- This instrument is a current measuring device (sensor). Do not use for any other purpose.
- Do not use the instrument if there is a problem with its physical appearance.
- Do not use this product in a place where an explosive gas or vapor is present.
- To avoid a short-circuit or an accident to personnel, use this product within the RATED circuit-to-earth voltage. If you mistakenly clamp a wire whose voltage exceeds the RATED circuit-to-earth voltage of this product, dangerous high voltage may appear at the analog output terminal. For example, if you short the item under measurement with a metal part of the transformer jaw, an arc discharge may occur, which could damage the item under measurement.
- Do not use the product when there are raindrops or droplets of condensed water on its surface, or if your hands are wet.
- The barrier is there to protect you from touching the HAZARDOUS LIVE conductor. Be careful not to reach the barrier when using the instrument.
- Safety protectors such as rubber-insulated gloves should be worn to prevent electrical shock when using the instrument.
- Do not open the battery cover during a measurement.
- Do not measure AC currents.
- Do not use deteriorated or defective output cables.
- Do not use the instrument if the case or cable is damaged or not attached. Do not attempt to repair/modify the product yourself, as doing so is extremely dangerous. Should an abnormality or failure in the product be found, contact the vendor from which you purchased the product.

⚠ CAUTION

Using this instrument is limited to under residential, commercial and light-industrial environment.
This instrument may not be able to measure accurately if it is near other equipment generating strong electromagnetic interference or a strong magnetic field caused by large current.

⚠ CAUTION

- The clamping jaws are is precision assembled to ensure high performance. When using the clamp, do not apply intense mechanical shock, vibration or force to the clamping jaws.
- If dust or any other foreign matter gets in the clamping jaws, do not close the clamping cores tight. First remove the dust and then make sure the clamping cores on both sides close smoothly.

⚠ CAUTION

- Do not expose the instrument to direct sunlight, high temperature, humidity or dew.
- This instrument is not water/dust proof. Do not use it in a dusty environment or where it will get wet.
- Always turn off power after using the instrument. If the instrument is not used for prolonged period, remove the batteries.
- Use a damp cloth or cotton swab with neutral detergent or water for cleaning the instrument. Do not use abrasives or solvents.

■ Measurement category

⚠ WARNING

The CL420 is designed for measurement category O (Other).
Do not use the CL420 for measurements in locations that fall under measurement categories II, III, and IV.

Measurement category	Description	Remarks
O [None Other]	Other circuits that are not directly connected to MAINS.	Circuits not connected to a mains power source.
CAT II	For measurements performed on circuits directly connected to the low voltage installation.	Appliances, portable equipment, etc.
CAT III	For measurements performed in the building installation.	Distribution board, circuit breaker, etc.
CAT IV	For measurements performed at the source of the low-voltage installation.	Overhead wire, cable systems, etc.

2. Feature

- Instrumentation signal (DC4–20mA) measurement
- DC current (0-100mA) measurement without disconnecting the electrical circuit.
- LED light for illuminating the measurement spot
- Auto-power-off function
- Display (calculation) of Span (%)
- Analog output function to output the measured results to a recorder, digital multimeter (DMM) or logger.
- Data hold function

3. Specifications

3.1 Accuracy

Condition: 23±5ºC, 75% RH or less

(1) DC current (AUTO RANGE)
Accuracy : ±(% of reading + digits)

Range	Display range (mA)	Guaranteed accuracy (mA)	DCA Accuracy
20 mA	0.00 to ±21.49	0.00 to ±21.49	0.2 + 5[*1]
100 mA	±21.0 to ±126.0	±21.0 to ±120.0	1.0 + 5

Condition of accuracy:
After power-on, open and close the jaws two or three times.
After zero-adjustment
*1: The accuracy for the 20 mA range is the result of averaging five measurements.
Response time:
Approx. 1.5 seconds
(Approx. 2.5 seconds at range change)

(2) Analog output function

Range	Display range (mA)	Output voltage (mV)	Accuracy (mV)
20 mA	0.00 to ±21.49	0.0 to ±214.9	Accuracy of DCA Accuracy ± 0.5
100 mA	±21.0 to ±126.0	±210 to ±1260	Accuracy of DCA Accuracy ± 3

Response time:
Add approx. 0.5 s to the current measurement response time.
- Outputs DC voltage (10 mV/mA) corresponding to the reading.
- Outputs 0 mV at range change.
- 1300 mV is output when the display shows "OL". (-1300 mV for "-OL")
- Output impedance : approx. 5 kΩ

3.2 General Specifications

Display: LCD
Measurement cycle: Approx. 0.6 seconds
Operating temperature and humidity:
-10 to +50ºC, 85%RH or less (no condensation)
Storage temperature and humidity:
-20 to +60ºC, 85%RH or less (no condensation)
Power supply: AA-size battery x 4 pcs.
(Using alkaline LR6 is recommended.)
Battery life: Approx. 60 continuous hours
(using alkaline battery, backlight and LED light OFF)

6.3 Span Display (20 mA Range only)

The sub display shows a percentage in the range 4 mA (0%) to 20 mA (100%).

The shows the relationship between span values (%) and the measured values (mA).

Measured values (mA)	Span display (%)
-20.00	100.0
0.00	-25.0
2.00	-12.5
4.00	0.0
12.00	50.0
20.00	100.0
100.0	---

The percentage value is calculated based on the following formula, assuming the measured value as X.

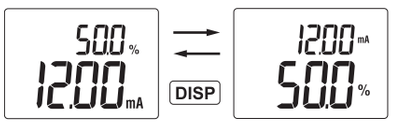
Span display range = (|X| - 4.00) × 6.25 (%)

6.4 Switching between the Main Display and Sub Display (20 mA range only)

⚠ CAUTION

Check that the main display (unit) and sub display (unit) are displaying values properly.

Press the DISP key to switch between the main and sub displays.



6.5 Over Range (Load) Indication

When the input exceeds the maximum measuring range (126.0 mA), “OL” or “-OL (for negative values)” is indicated on the display.

When the range reaches 100 mA, bars “---” are displayed instead of the percentage value.

7. Other Functions

7.1 Data Hold Function

This is a function to freeze the measured value on the display.
Press the Data hold key once to freeze the reading. The reading will be held regardless of subsequent variation in input.
The Data hold mark “ HOLD ” is indicated on the display while the instrument is in the Data Hold mode.
To exit Data Hold mode, press the Data hold key again.

7.2 Auto-Power-Off Function

The instrument automatically powers off about 10 minutes after the last operation.
This function is disabled when a cord is connected to the analog output terminal.

[To cancel the Auto-power-off function]

Hold down the Data hold key while pressing the power key.
The instrument is turned on and then “ P.oFF (P.oFF)” is indicated for about 1 second.

[To enable the Auto-power-off function once again]

Press the power key to turn off the power.
Press the power key (about 2 seconds) to turn on the power.
(The auto-power-off function is enabled again.)

7.3 Backlight and LED Light

Press the Light key to turn on or off the LED light and LCD backlight.
These lights automatically turn off when 2 minutes elapse after the last key operation.

[To cancel the auto off function]

Hold down the Data hold key while pressing the power key.
The instrument is turned on and then “ L.oFF (L.oFF) ” is indicated for about 1 second.

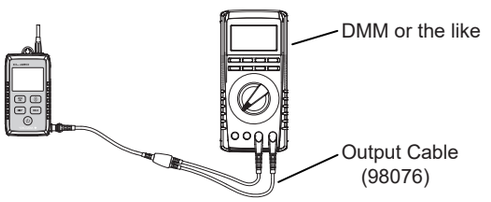
[To enable the Auto-power-off function once again]

Press the power key to turn off the power.
Press the power key (about 2 seconds) to turn on the power.
(The Auto-power-off function is enabled again.)

7.4 Analog Output Function

DC voltage signal corresponding to the measured (display) result is output from the Analog output terminal (10 mV/mA).
The output can be recorded and stored on a recorder, a digital multimeter (DMM) or logger connected to the instrument by using a dedicated output cable (98076 or 98077).
When connecting the output cable to the instrument, the sub display shows “ OUt (OUT)” for 1 second.

When making a long continuous measurement:
- Warm up the instrument for several tens of minutes after powering it on, and then start a recording.
- Readings will vary when the ambient temperature changes.
  The temperature coefficients provided in chapter 3, “Specifications”, and fluctuations at zero (about 20 counts of fluctuation when temperature changes by 10ºC) should be taken into consideration.

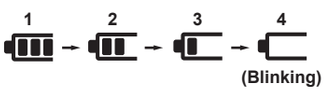


8. Battery Replacement

8.1 Battery State Display

The remaining battery power is displayed using the following four battery levels.

Replace the batteries as soon as the low battery mark “ (blinking) ” appears.



Alkaline batteries (four) are recommended.

8.2 Battery Replacement

⚠ WARNING

Ensure that the clamp sensor is disconnected from the object under test, and that the instrument is powered off when opening the battery cover for battery replacement. (Remove the optional output cable if it is connected.)

⚠ CAUTION

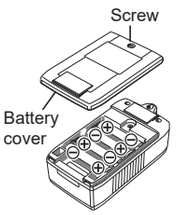
- Do not mix batteries of different types or new batteries with used ones.
- Make sure the polarities of the new batteries are exactly as shown on the battery holder.

When the low battery mark “ (blinking) ” appears, measurement accuracy is not guaranteed.
Replace the batteries quickly.

- If the battery is completely flat, the LCD will not turn on, and the mark will not appear.

[How to replace batteries]

(1) Power off the instrument.
(2) Remove the screw on the back of the casing and remove the battery cover.
(3) Take the batteries out of the housing and replace the batteries with new ones.
(4) Close the casing and fasten it with the screw.



9. Maintenance

[Contacting of Services]

Please contact one of the Yokogawa sales offices listed of this manual or the sales representative from which you purchased the instrument.

[Calibration Cycle]

It is recommended that the instrument be calibrated once a year.

Measurement category	Description	Remarks
O [None Other]	Other circuits that are not directly connected to MAINS.	Circuits not connected to a mains power source.
CAT II	For measurements performed on circuits directly connected to the low voltage installation.	Appliances, portable equipment, etc.
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2. Feature

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- DC current (0-100mA) measurement without disconnecting the electrical circuit.
- LED light for illuminating the measurement spot
- Auto-power-off function
- Display (calculation) of Span (%)
- Analog output function to output the measured results to a recorder, digital multimeter (DMM) or logger.
- Data hold function

3. Specifications

3.1 Accuracy

Condition: 23±5ºC, 75% RH or less

(1) DC current (AUTO RANGE)

Accuracy : ±(% of reading + digits)

Range	Display range (mA)	Guaranteed accuracy (mA)	DCA Accuracy
20 mA	0.00 to ±21.49	0.00 to ±21.49	0.2 + 5*1
100 mA	±21.0 to ±126.0	±21.0 to ±120.0	1.0 + 5

Condition of accuracy:
After power-on, open and close the jaws two or three times.
After zero-adjustment

*1: The accuracy for the 20 mA range is the result of averaging five measurements.

Response time:
Approx. 1.5 seconds
(Approx. 2.5 seconds at range change)

(2) Analog output function

Range	Display range (mA)	Output voltage (mV)	Accuracy (mV)
20 mA	0.00 to ±21.49	0.0 to ±214.9	Accuracy of DCA Accuracy ± 0.5
100 mA	±21.0 to ±126.0	±210 to ±1260	Accuracy of DCA Accuracy ± 3

Response time:
Add approx. 0.5 s to the current measurement response time.

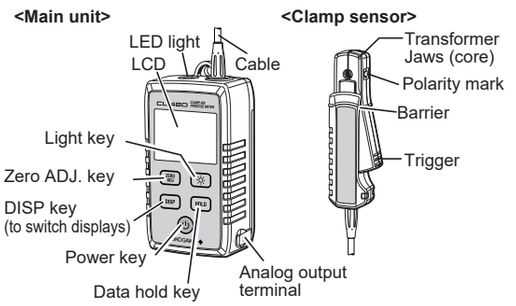
- Outputs DC voltage (10 mV/mA) corresponding to the reading.
- Outputs 0 mV at range change.
- 1300 mV is output when the display shows “OL”. (-1300 mV for “-OL”)
- Output impedance : approx. 5 kΩ

3.2 General Specifications

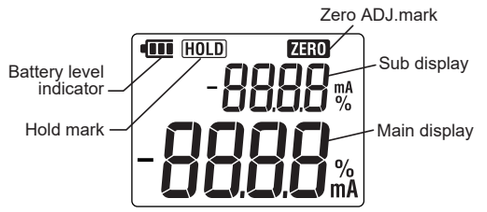
Display: LCD
Measurement cycle: Approx. 0.6 seconds
Operating temperature and humidity:
-10 to +50ºC, 85%RH or less (no condensation)
Storage temperature and humidity:
-20 to +60ºC, 85%RH or less (no condensation)
Power supply: AA-size battery x 4 pcs.
(Using alkaline LR6 is recommended.)
Battery life: Approx. 60 continuous hours
(using alkaline battery, backlight and LED light OFF)
Auto-power-off:
Power off function operates about 10 minutes after the last switch operation. This function is disabled when a cord is connected to the OUTPUT terminal.
Temperature coefficients:
Add 0.1 x specified accuracy/ ºC
(at -10 to 18ºC, 28 to 50ºC)
Insulation resistance:
100 MΩ or more/ 1000 VDC
Between electrical circuit (core) and case
Withstand voltage:
2210 VAC for 5 sec.
Between electrical circuit (core) and case
Measurable conductor diameter :
ϕ 6 mm maximum
The RATED circuit-to-earth voltage : 42 Vpk
Maximum allowed current : 120 mADC
Influence of external magnetic field :
Earth magnetism (0.20 mA) or less
Dimensions:
Main unit Approx. 111 (H) × 61 (W) × 40 (D) mm
Clamp sensor Approx. 104 (H) × 34 (W) × 20 (D) mm
Cable length Approx. 700 mm
Weight: Approx. 290 g (including batteries)
Accessories: Soft case (93045)
AA-size Alkaline battery (LR6) 4 pcs.
User’s manual
Optional accessories: Output cable (98076)
Output cable for screw terminal (98077)
Safety standards: EN 61010-1, EN 61010-2-032
Measurement category O (Other)
Environmental conditions:
Operating altitude 2000 m or less,
indoor use, pollution degree 2
EMC standards: EN 61326-1 Class B Table 1,
EN 61326-2-2,
EN 55011 Class B Group 1
EMC Regulatory Arrangement in Australia and New Zealand
Korea Electromagnetic Conformity Standard
(한국 전자파적합성기준)
Environmental standards: EU RoHS Directive compliant
For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM113-01Z2).

4. Components

4.1 Main Unit and Clamp Sensor



4.2 LCD



5. Before Making Measurements

5.1 Turning On the Power

Hold down the Power key for about 2 seconds.

(1) Check the remaining battery.
For further details, see “8. Battery Replacement”.

(2) Check that Data hold function is not enabled.
(HOLD mark is not displayed.)

5.2 Turning Off the Power

Hold down the Power key again. (for about 2 seconds.)
For further details, see “7.2 Auto-power-off function”.

6. Operating Instructions

⚠ WARNING

- Do not use the instrument if it is damaged. Doing so poses a risk of electrical shock and may result in inaccurate measurements.
- When using the analog output function, only use the dedicated output cable (98076 or 98077).
- Be careful not to across the barrier when using the instrument.

⚠ CAUTION

- Do not use the instrument with currents that exceed the maximum allowed current. Doing so may damage the instrument.
- A dirty clamp sensor can cause large measurement errors. Check that the clamp sensor, the item under measurement, and other relevant items are not dirty before making measurements. We recommend that you use an air blower to clean the clamp sensor jaws (core).
- Take sufficient care to not to apply shock, vibration or excessive force when opening and closing the clamp sensor. Otherwise, accurate measured results may not be obtained. Please open and close the sensor lightly.

6.1 For Precise Measurements

- Before measurement, with the power turned on, open and close the clamp sensor two or three times.
- To reduce the influence of temperature, noise, and other external factors on measurements, perform “ **zero adjustment** ”.
- Drastic changes in input current or excessive current can cause the zero point to drift. Disconnect the clamp sensor from the conductor to perform “ **zero adjustment** ”.
- Position the conductor in the center of the clamp to make measurements.
- Check that the jaws are fully engaged.
- We recommend that you make several measurements and compare the results to reduce the influence of measurement conditions.

[Zero Adjustment]

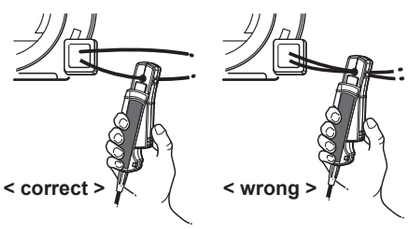
To reduce the effects of external magnetic fields, move the clamp sensor as close to the conductor under measurement as possible, align the polarity arrow with the measurement direction, and press the ZERO ADJ key.
(Do this without clamping the conductor and with the transformer jaws closed.)
The ZERO mark is displayed on the LCD for approximately 1 second.

6.2 Measurement

Before making measurements, be sure to open and close the clamp sensor and perform zero adjustment. See section 6.1, "For Precise Measurements."

Push the trigger to open the transformer jaws.
Clamp one of the conductors that you will measure. (see the figure below)
The measured current appears in the main display of the LCD.

- If the measured current is negative, the current is flowing in the direction opposite to the clamp arrow.



8.2 Battery Replacement

⚠ WARNING

Ensure that the clamp sensor is disconnected from the object under test, and that the instrument is powered off when opening the battery cover for battery replacement. (Remove the optional output cable if it is connected.)

⚠ CAUTION

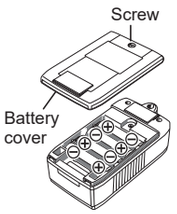
- Do not mix batteries of different types or new batteries with used ones.
- Make sure the polarities of the new batteries are exactly as shown on the battery holder.

When the low battery mark " (blinking) " appears, measurement accuracy is not guaranteed.
Replace the batteries quickly.

- If the battery is completely flat, the LCD will not turn on, and the mark will not appear.

[How to replace batteries]

(1) Power off the instrument.
(2) Remove the screw on the back of the casing and remove the battery cover.
(3) Take the batteries out of the housing and replace the batteries with new ones.
(4) Close the casing and fasten it with the screw.



9. Maintenance

[Contacting of Services]

Please contact one of the Yokogawa sales offices listed of this manual or the sales representative from which you purchased the instrument.

[Calibration Cycle]

It is recommended that the instrument be calibrated once a year.

10. Regulations and Sales in Various Countries and Regions

10.1 Waste Electrical and Electronic Equipment (WEEE)

(EU WEEE Directive valid only in the EEA* and UK WEEE Regulation in the UK)

This product complies with the WEEE marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.
When disposing of products in the EEA or UK, contact your local Yokogawa office in the EEA or UK respectively. (*EEA: European Economic Area)

10.2 Batteries and Waste Batteries

(EU Battery Directive/Regulation valid only in the EEA and UK Battery Regulation in the UK)

Batteries are included in this product.
When you remove batteries from this product and dispose them,discard them in accordance with domestic law concerning disposal.
Take a right action on waste batteries, because the collection systems in the EEA and UK on waste batteries are regulated.

Battery type: Alkaline dry cell

This marking indicates they shall be sorted out and collected as ordained in the EU battery Directive/ Regulation and UK battery Regulation.

How to remove batteries safely:
For further details, see chapter 8, "Battery Replacement."

10.3 Authorized Representative in the EEA

Yokogawa Europe B.V. is the authorized representative of Yokogawa Test & Measurement Corporation for this product in the EEA.
To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

10.4 Disposal

When disposing of this instrument, follow the laws and ordinances of the country or region where the product will be disposed of.
If you are disposing of the product in the EEA or UK, see also section 10.1, "Waste Electrical and Electronic Equipment (WEEE)."

10.5 For the Pollution Control of Electronic and Electrical Products of the People's Republic of China

They are applicable only in China.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅（Pb）	汞（Hg）	镉（Cd）	六价铬（Cr（VI））	多溴联苯（PBB）	多溴二苯醚（PBDE）
框架（塑料）	○	○	○	○	○	○
线路板 ASSY	×	○	×	○	○	○
导线	×	○	○	○	○	○
电池	×	○	○	○	○	○
< 选购 >						
输出 CABLE 98076	×	○	○	○	○	○
输出 CABLE 98077	×	○	○	○	○	○

○： 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×： 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

环保使用期限：

该标识适用于 SJ/T 11364 中所述，在中华人民共和国销售的电子电气产品的环保使用期限。
只要您遵守该产品相关的安全及使用注意事项，在自制造日起算的年限内，则不会因产品中有害物质泄漏或突发变异，而造成对环境的污染或对人体及财产产生恶劣影响。
注）
该年数为"环保使用期限"，并非产品的质量保证期。
零件更换的推荐周期，请参照使用说明书。