# DCM301

## DIGITAL CLAMP METER

## INSTRUCTION MANUAL

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- MEMO -

## [1] SAFETY PRECAUTIONS

***Before use, read the following safety precautions.**

This instruction manual explains how to use your digital clamp meter DCM301. Before use, please read this manual thoroughly to ensure correct and safe use. After reading it, keep it together with the product for reference to it when necessary.
Using the product in a manner not specified in this manual may cause damage to the protection function of the product.
The instructions given under the headings of ⚠ WARNING and ⚠ CAUTION must be followed to prevent accidental **burn** and **electric shock**.

### 1-1 Explanation of Warning Symbols

The meanings of the symbols used in this manual and attached to the product are as follows:

⚠ : Very important instructions for safe use.
- The warning messages are intended to prevent accidents to operating personnel such as burn and electric shock.
- The caution messages are intended to prevent incorrect handling which may damage the product.

: High voltage hazard　: Ground
Ω : Resistance　: Buzzer
: Light　: Capacitor
: Double insulation or reinforced insulation

### 1-2 Warning Messages for Safe Use

**⚠ WARNING**

The following instructions are intended to prevent personal injury such as burn and electric shock.
Be sure to follow them when using the meter.
1. This is a clamp meter for low-voltage circuits. Never use it on a power line that exceeds 1000 Vrms voltage to ground.
2. Voltages over AC 30 Vrms (42.4 Vpeak) or DC 60 V are hazardous to human body. Take care so as not to touch them.
3. Never input signals exceeding the maximum rated input value (see 1-3).
4. Never use the meter near equipment which generates strong electromagnetic waves or is charged.
5. Never use the meter if the meter or test leads are damaged or broken.
6. Never use the meter with the case or battery lid removed.
7. During measurement, keep your fingers behind the finger guard of test leads and the barrier of the meter.
8. During measurement, do not change function switch of the meter.
9. Before starting measurement, make sure that the function and range are properly set.
10. Never use the meter when it is wet or with wet hands.
11. Be sure to use the specified type of test leads.
12. Never attempt repair or modification, except for battery replacement.
13. Always conduct start-up inspection and check the meter at least once a year.
14. This meter is for indoor use only.



### 1-3 Maximum Overload Protection Input

The maximum rated input value and overload protection have been established for the input terminals of each function.

| Function | Signal Input Terminal | Max. Rated Input Value | Max. Overload Protection |
|---|---|---|---|
| ACA | Clamp type current sensor (CT) | AC 1000 Arms | AC 1000 Arms |
| , Ω , | Between + and – terminals | Do not input voltage | DC/AC 1000 Vrms |
| ACV, DCV, EF | | DC/AC 1000 Vrms | |

## [2] APPLICATIONS AND FEATURES

### 2-1 Applications

This is a digital AC clamp meter designed for measurement of low-voltage circuits in the application range of 1000 V CAT. III, 600 V CAT. IV. It is suited to current and voltage measurement of power lines, electrical equipment, and electrical facilities less than 1000 Vrms to ground.

### 2-2 Features

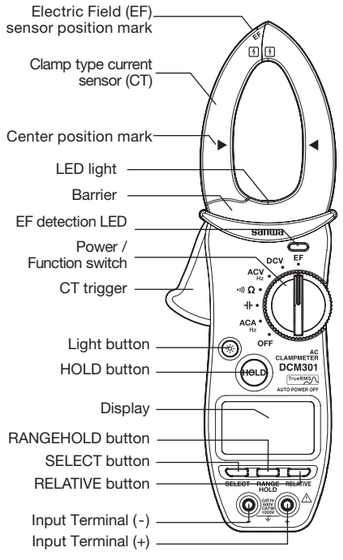
- The CT shape makes it easier to clamp cable in crowded.
- Complies with IEC61010 CAT. IV and can measure up to 1000 A AC for use in various sites.
- True RMS reading for measurement of even distorted waveforms.
- An electric field (EF) function is incorporated in the tip of the CT to enable detection of about AC 90V or more.
- Clamp opening diameter of 34 mm at maximum.
- Large, easy-to-press HOLD button.
- Equipped with LCD backlight convenient for measurement in dark places. Also incorporates an LED light to illuminate the measurement target.

**Measurement categories (Overvoltage categories)**

CAT. II : Primary circuit of equipment with a power cord to be connected to a mains socket.
CAT.III : Primary circuit of equipment that inputs power directly from the distributor and the circuit from the distributor to the mains socket.
CAT.IV : Circuit from the leading wire to the distributor.

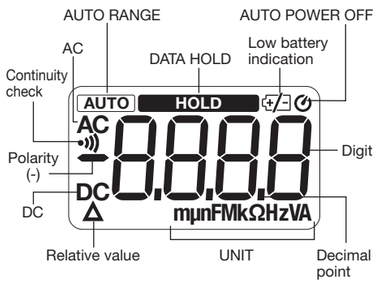
## [3] NAMES OF COMPONENT UNITS

### 3-1 Main unit

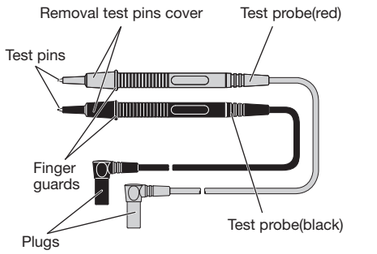





### 3-2 Display




### 3-3 Test Lead




In case of test pins cover attached:
CAT.IV 600 V, CAT.III 1000 V
In case of test pins cover removed:
CAT.II 1000 V

## [4] DESCRIPTION OF FUNCTION

### 4-1 Power Switch and function switch (for all functions)

Turn this switch to turn on and off the power and select a measuring function.

### 4-2 Data Hold function: HOLD button (for functions except EF)

When the HOLD button is pressed, the reading indicated will be held with **HOLD** on the display. The indicated reading will not change if the input signal is changed. When this button is pressed again, the function will be disabled and the meter will return to the measurement mode.

**Remarks:**
- The function will be canceled at changing measurement functions.

### 4-3 LIGHT function: Light button

Press the LIGHT button to turn on the display's backlight and the LED light. Press it again to turn them off. The lights will go off automatically after 30 seconds.

### 4-4 How to select the measurement function: SELECT button (ACA, Ω , ACV)

Press the SELECT button to cycle through the functions in the order shown below.

ACA : ACA → Hz → ACA
Ω : Ω → ·)) → Ω
ACV : ACV → Hz → ACV

### 4-5 Range Hold function: RANGE HOLD button (ACA, Ω , ACV, DCV)

Press the RANGE HOLD button to enter the



Manual mode and set the range ( **AUTO** in the display disappears). In the Manual mode, the range changes every time this button is pressed. Select the appropriate range while checking the displayed unit and position of the decimal point in the digits. To restore the Auto Range mode, press and hold this button for more than 1 second ( **AUTO** is displayed in the display).

### 4-6 Relative function: RELATIVE button (ACA, , ACV, DCV)

Press the RELATIVE button; " Δ " will be displayed in the display and the digits will show a relative value — which is derived from the input value when the button is pressed set at 0 (reference). Press the button again to cancel this function.

### 4-7 AUTO POWER OFF function

The meter will go to AUTO POWER OFF function to save battery life about 10 minutes after the last function switch or button operation. To wake up the meter, press any button or re-power on. turns on while activating the function.

**Remarks:**
- Even in the AUTO POWER OFF mode, the tiny power is still consumed. When the meter is not going to be used for an extended period of time, be sure to turn off the power switch.
- To disable the function, turn on the power of meter while holding the SELECT button pressed. on the display is turned off when the AUTO POWER OFF function is disabled.

### 4-8 Low Battery indication

When the built-in batteries have been discharged and the voltage has dropped to below about 3.6 V, appears on the display.

When the mark flickers or lights, replace both three batteries with new ones.

## [5] MEASURING PROCEDURE

### 5-1 Start-up Inspection

Always perform the following start-up inspection to ensure safety.
- External appearance: Make sure that there are no visible abnormalities on the meter that may have been caused by dropping it or other mishandling.
- Accessories: Make sure that the test leads and other accessories are free from breakage, cracks, or any damage.
- Make sure that the low battery indication is not displayed in the display. If is displayed, replace the batteries with new ones. Before first use, install the batteries.
- Make sure that neither the meter nor your hand is wet.

* If nothing is displayed in the display, the batteries may be drained.

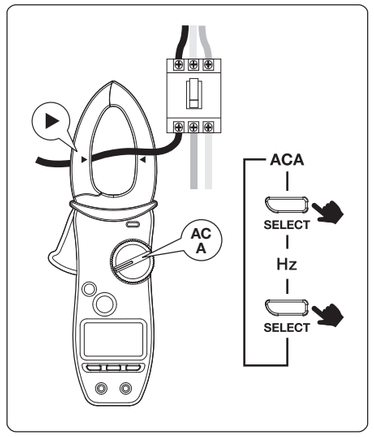
### 5-2 AC Current / Frequency Measurement: ACA / Hz

**⚠ WARNING**

Remove the test leads from the measuring terminals to avoid electric shock.

| Function | Max. Rated Input Value |
|---|---|
| ACA | 1000 A |
| Hz | 2 kHz |






**Remarks:**
- Clamp the conductor (cable) to measure in the middle of the center position mark on the CT.
- Clamp only one cable. If several cables are clamped together or duplex, triplex or quadruplex cable are clamped, current cannot be measured accurately.
- The meter may malfunction in places where a strong magnetic field is present.
- Do not apply voltage and current at the same time.

### 5-3 Capacitance Measurement:

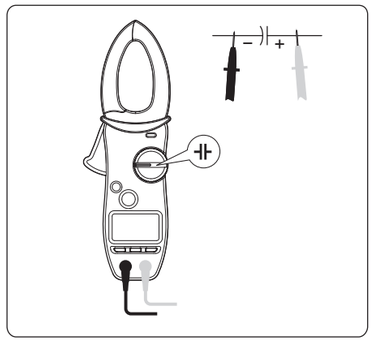
**⚠ WARNING**

Never apply a voltage to the input terminals.

**⚠ CAUTION**

1. Discharge the capacitors before measurement.
2. This meter uses a measurement method that applies currents to the measured capacitor. It is not suitable for measurement of electrolytic capacitors with high leakage currents since errors will be too large.
3. It takes longer to measure capacitors with large capacitance.

| Function | Max. Rated Input Value |
|---|---|
| | 60.00 mF |

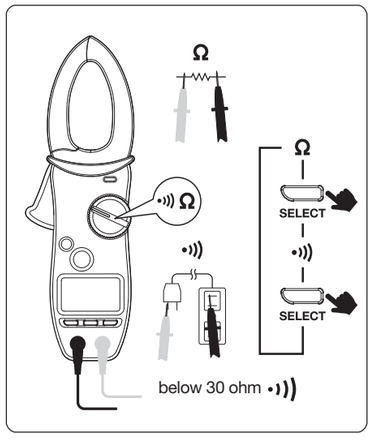



### 5-4 Resistance Measurement, Continuity Check: Ω • ·))

**⚠ WARNING**

Never apply a voltage to the input terminals.

| Function | Max. Rated Input Value |
|---|---|
| Ω | 60.00 MΩ |
| ·)) | 600.0 Ω |



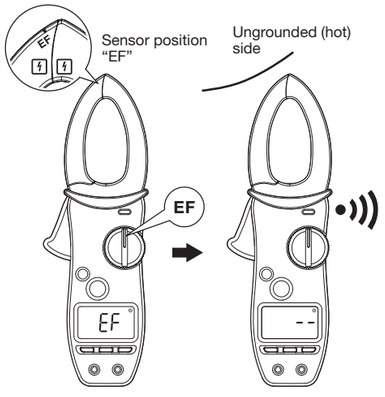

### 5-5 AC Voltage / Currency Measurement: ACV / Hz
### DC Voltage Measurement: DCV

**⚠ WARNING**

Never use the meter in power lines exceeding 1000 V to ground.

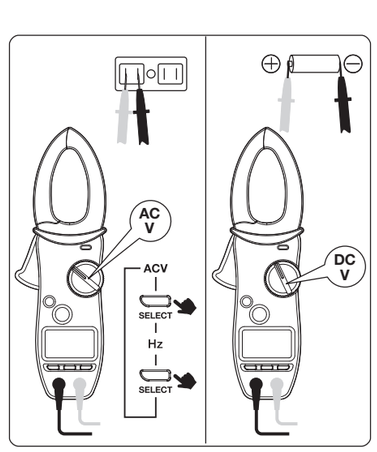
| Function | Max. Rated Input Value |
|---|---|
| ACV | 1000 V |
| Hz | 10 kHz |

| Function | Max. Rated Input Value |
|---|---|
| DCV | 1000 V |




Bring the "EF" marking on the CT close to or in contact with the object to be measured. When the sensor is brought to the ungrounded (hot) side, "-" is displayed in front of the digits in the display, the buzzer sounds, and the EF detection LED flickers. On the grounded side, "EF" remains displayed and the buzzer does not sound. The higher the voltage to be detected, the larger the "-" digits in the display. The rate of intermittent activation of the buzzer and LED will also increase.

Notes:
- In case the wiring is long, etc, EF may switch to "-" digits even on the ground wire.
- If the EF sensor is brought in contact with the housing of ungrounded measured equipment or if you touch it with your hand when "EF" displayed in the display, "-" digits may be displayed and the buzzer may sound.
- The "-" may be displayed even tens of cm away from equipment such as a high-frequency devices since the function is high sensitivity.




### 5-6 Detection of Electricity: EF (Electric Field)

**⚠ WARNING**

1. Before performing detection of electricity, check that the meter works properly with a known power source.
2. When performing detection of electricity, do not hold the meter at any point beyond the barrier.
3. Even if no voltage is detected, do not touch the conductors or devices because a voltage below sensing threshold may be present. Always use caution.

## [6] MAINTENANCE

**⚠ WARNING**

1. The following instructions are very important for safety. Read this manual thoroughly to ensure correct maintenance.
2. Calibrate and inspect the meter at least once a year to ensure safety and maintain its accuracy.

### 6-1 Maintenance and Inspection

1) Appearance:
   - Is the meter not damaged due to falling or other cause?

2) Test leads:
   - Are the core wires not exposed at any place of the test leads?
   - Is the plug when inserted to the input terminal not loose?

If any of the above problems exists, stop using the meter and request for repair.

### 6-2 Calibration and Inspection

For more information, please contact Sanwa' s authorized agent / distributor service provider, listed in our website. See section 7-3.

### 6-3 Storage

**⚠ WARNING**

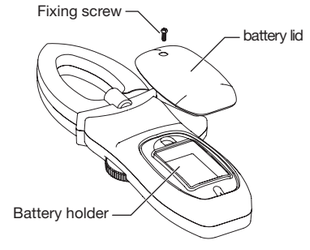
1. The panel and case are not resistant to volatile solvent and must not be cleaned with thinner or alcohol.
2. The panel and case are not resistant to heat. Do not place the meter near heat-generating devices.
3. Do not store the meter in places where it may be subjected to vibration or from where it may fall.
4. Do not store the meter in places under direct sunlight, or hot, cold or humid places or places where condensation is anticipated.
5. If the meter will not be used for a long time, remove the batteries.

### 6-4 Battery Replacement

**⚠ CAUTION**

To avoid electric shock, do not remove the battery lid with an input being applied to the measuring terminals. Also, before starting replacement, make sure the power of the meter is OFF.

1. Turn the fixing screw (x1) on the battery lid with a Phillips screwdriver.
2. When the battery lid becomes loose, remove it.
3. Replace all 3 batteries in the battery holder with new ones. Ensure correct polarity.
4. Place the battery lid on the battery holder and tighten the fixing screw to secure.




## [7] AFTER-SALE SERVICE

### 7-1 Warranty and Provision

Sanwa offers comprehensive warranty services to its end-users and to its product resellers. Under Sanwa's general warranty policy, each instrument is warranted to be free from defects in workmanship or material under normal use for the period of one (1) year from the date of purchase.

This warranty policy is valid within the country of purchase only, and applied only to the product purchased from Sanwa authorized agent or distributor.

Sanwa reserves the right to inspect all warranty claims to determine the extent to which the warranty policy shall apply. This warranty shall not apply to disposables batteries, or any product or parts, which have been subject to one of the following causes:

1. A failure due to improper handling or use that deviates from the instruction manual.
2. A failure due to inadequate repair or modification by people other than Sanwa service personnel.
3. A failure due to causes not attributable to this product such as fire, flood and other natural disaster.
4. Non-operation due to a discharged battery.
5. A failure or damage due to transportation, relocation or dropping after the purchase.

### 7-2 Repair

Customers are asked to provide the following information when requesting services:
1. Customer name, address, and contact information
2. Description of problem
3. Description of product configuration
4. Model Number
5. Product Serial Number
6. Proof of Date-of-Purchase
7. Where you purchased the product

Please contact Sanwa authorized agent / distributor / service provider, listed in our website, in your country with above information. An instrument sent to Sanwa / agent / distributor without above information will be returned to the customer.

**Remarks:**
1) Prior to requesting repair, please check the following: Capacity of the built-in battery, polarity of installation and discontinuity of the test leads.
2) Repair during the warranty period: The failed meter will be repaired in accordance with the conditions stipulated in 7-1 Warranty and Provision.
3) Repair after the warranty period has expired: In some cases, repair and transportation cost may become higher than the price of the product. Please contact Sanwa authorized agent / distributor / service provider in advance.
   The minimum retention period of service functional parts is 6 years after the discontinuation of manufacture. This retention period is the repair warranty period. Please note, however, if such functional parts become unavailable for reasons of discontinuation of manufacture, etc., the retention period may become shorter accordingly.
4) Precautions when sending the product to be repaired.
   To ensure the safety of the product during transportation, place the product in a box that is larger than the product 5 times or more in volume and fill cushion materials fully and then clearly mark "Repair Product Enclosed" on the box surface. The cost of sending and returning the product shall be borne by the customer.

### 7-3 SANWA web site

https://www.sanwa-meter.co.jp
E-mail: exp_sales@sanwa-meter.co.jp

## [8] SPECIFICATIONS

### 8-1 General Specifications

| | |
|---|---|
| Operation method | Δ—Σ method |
| AC measuring | True RMS method |
| Display | 6000 counts max. (ACA, ⊣⊢, Ω, ⋯, ACV, DCV functions) 9999 counts max. (Hz function) |
| Sampling rate | Approx. 3 times / sec. |
| Over-range | "OL" indication |
| Range selection | Auto and Manual |
| Polarity switching | Auto (- indication) |
| Low Battery indication | lights when built-in battery voltage is 3.6 V or below |
| Current measurement system | Clamp type current sensor (CT) |
| Max. clamp conductor diameter | Opening diameter — Approx. ø34 mm |
| Environmental condition | Altitude — 2000 m or less, indoor use, environmental pollution degree II |
| Operating temperature | 5 °C to 40 °C. Humidity range is as follows (without condensation): Max. 80 %RH for temperatures up to 31 °C decreasing linearly to 50 % RH at 40 °C |
| Storage temperature | -10 °C to 40 °C: ≤80 %RH (without condensation). 40 °C to 50 °C: ≤70 %RH (without condensation). |
| Power supply | LR03 (AAA alkaline battery) x 3 |
| Auto Power Off | Power turned off approx. 10 min. after last operation TYP 15 μA or less |
| Current consumption/ Battery life | Approx. 3.8 mA TYP / Approx. 200 hours ACA function, no load, when backlight is off |
| Dimensions & mass | *H*252 x *W*85 x *D*40 mm Approx. 360 g (batteries included) |
| Safety standards | IEC61010-1 CAT. Ⅲ 1000 V, CAT. Ⅳ 600 V IEC61010-2-032 IEC61010-031 |
| EMC Directive/ RoHS Directive | IEC61326-1 (EMC) EN50581 (RoHS) |
| Standard Accessories | Manual, LR03 (AAA alkaline battery) x 3 Test leads (ATL101), Carrying case (C202) |

### 8-2 Measuring Range and Accuracy

Accuracy assurance temperature/humidity range:
23 ±5 °C, 80 % RH or less (no condensation)
Battery voltage — 3.6 V or more
rdg (reading): Read value
dgt (digit): Number of counts of last digit

**ACA**

| Function | Range | Accuracy |
|---|---|---|
| ACA | 60.00 A | 50 / 60 Hz : ± (2.5 %rdg + 5 dgt) 45 Hz ～ 400 Hz ± (3.0 %rdg + 5 dgt) |
| | 600.0 A | |
| | 1000 A | |

Notes:
- The accuracy shown above is when the conductor to be measured is in the center of the CT.
- If it is not in the center, add 3 % to the above accuracy values.
- ACA : Less than 10 % of each range's full scale value is not subject to accuracy assurance.
- Crest factor : 2 or less (full scale)
  4 or less (half scale)

**Capacitance : ⊣⊢**

| Function | Range | Accuracy |
|---|---|---|
| ⊣⊢ | 60.00 nF | ± (4.0 %rdg + 3 dgt) |
| | 600.0 nF | |
| | 6.000 μF | |
| | 60.00 μF | |
| | 600.0 μF | |
| | 6.000 mF | |
| | 60.00 mF | ± (6.0 %rdg + 3 dgt) |

**Resistance : Ω**

| Function | Range | Accuracy |
|---|---|---|
| Ω | 6.000 kΩ | ± (2.0 %rdg + 5 dgt) |
| | 60.00 kΩ | |
| | 600.0 kΩ | |
| | 6.000 MΩ | |
| | 60.00 MΩ | ± (5.0 %rdg + 5 dgt) |
| ⋯ | 600.0 Ω | Buzzer sounds at approx. 30 Ω or less |

Note:
- Open-circuit voltage: Approx. 1 V or less.

**ACV**

| Function | Range | Accuracy |
|---|---|---|
| ACV | 6.000 V | 45 Hz ～ 1 kHz : ± (1.5 %rdg + 3 dgt) |
| | 60.00 V | |
| | 600.0 V | |
| | 1000 V | |

Notes:
- ACV: Less than 10% of each range's full scale value is not subject to accuracy assurance.
- Crest factor : 2 or less (full scale)
  4 or less (half scale)

**DCV**

| Function | Range | Accuracy |
|---|---|---|
| DCV | 6.000 V | ± (1.0 %rdg + 3 dgt) |
| | 60.00 V | |
| | 600.0 V | |
| | 1000 V | |

**Frequency: Hz**

| Range | Input sensitivity | Measurable frequency | Accuracy |
|---|---|---|---|
| 6.000 V | 3 V | 10 Hz ～ 10 kHz | ±(1.0 %rdg + 5 dgt) |
| 60.00 V | 10 V | | |
| 600.0 V | 100 V | | |
| 1000 V | 100 V | | |
| 60.00 A | 2 A | 10 Hz ～ 2 kHz | |
| 600.0 A | 10 A | | |
| 1000 A | 100 A | | |

Note:
- The input sensitivity is specified as the RMS value of the sine wave.

**Detection of Electricity: EF (Electric Field)**

Detects AC voltage and electric field of approx. 90 V or more

Note:
- Detectable frequency: 50 Hz / 60 Hz.

**Accuracy calculation method**

Example) AC voltage measurement (ACV)
Displayed value: 100.0 V
Range accuracy: 600.0 V range ±(1.5 %rdg + 3 dgt)
Error: ±(100.0 V x 1.5% + 3 dgt) = ±1.8 V
True value: 100.0 V ±1.8 V (between 98.2 ~ 101.8 V)
* In the 600.0 V range, 3 dgt corresponds to 0.3 V

Specifications and external appearance of the product described above may be revised for modification without prior notice.