User's Manual

CL345
Leakage Clamp-on Tester

IM CL345

Thank you for purchasing our Leakage Clamp-on Tester.

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 ◆ IM CL345
Yokogawa Test & Measurement Corporation 8th Edition: Feb. 2021 (YMI)

The instrument and this manual use the following safety symbols:

⚠ Danger! Handle with Care.
This symbol indicates that the operator must refer to an explanation in the User's Manual in order to avoid the risk of personal injury or death and/or damage to the instrument.

⧈ This symbol indicates double insulation.

~ This symbol indicates AC voltage or current.

⏚ This symbol indicates ground (earth).

This symbol indicates that this instrument designed to be applied around or removed from HAZARDOUS LIVE conductors provided if the RATED circuit-to-earth voltage does not exceed the value indicated in the measurement category.

⚠ WARNING

Indicates that there is a possibility of serious personal injury or loss of life if the operating procedure is not followed correctly and describes the precautions for avoiding such injury or loss of life.

⚠ CAUTION

Indicates that there is a possibility of serious personal injury of damage to the instrument if the operating procedure is not followed correctly and describes the precautions for avoiding such injury or damage.

NOTE
Calls attention to information that is important for the proper operation of the instrument.

■ Precautions for Safe Use of the Instrument

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.

⚠ WARNING

- Never make measurement on a circuit above 300 VAC.
- Do not use the instrument in an atmosphere where any flammable or explosive gas is present.
- The tip of the transformer jaw is constructed so that it will not short the equipment under test, but when measuring an uninsulated conductor, be careful not to short the EUT with the transformer jaw.
- Avoid using the instrument if it has been exposed to rain or moisture or if your hands are wet.
- Do not exceed the maximum allowable input of any measurement range.

⚠ WARNING

- 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.
- Never open the battery compartment cover when making measurement.
- Always switch off the instrument before opening the battery compartment cover for battery replacement.
- Do not use the instrument if the case 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.

■ Measurement category

Function	Maximum Allowable Input
	Measurement Category III
~ A	400 ArmsAC Measuring circuit voltage : 300 VrmsAC

The CL340 is designed for measurement category III.
Do not use the CL340 for measurements in locations that fall under Measurement Category IV.

CAT O (Other) applies to measurement of circuits that are not directly connected to a main power supply.

CAT II applies to measurement of circuits that are connected to low-voltage installations.

CAT III applies to measurement of facility circuits.

CAT IV applies to measurement of power source circuits for low-voltage installations.

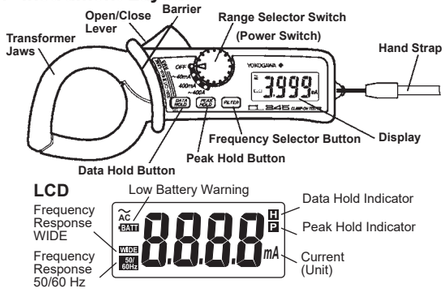
⚠ CAUTION

- Be sure to set the range switch to the "OFF" position after use. When the instrument will not be in use for a long period of time, place it in storage after removing the battery.
- Use a damp cloth and detergent for cleaning the instrument. Do not use abrasives or solvents.

⚠ 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.

1. Instrument Layout



2. Measurement

2.1 Preparation for Measurement

⚠ WARNING

- Never use the instrument on a circuit above 300 VAC.
- When measuring current is 300 A or more (400 Hz or more), be sure to stop measurement within 5 minutes. Otherwise, transformer jaws may heat to cause a fire or deformation of molded parts, which will degrade insulation.

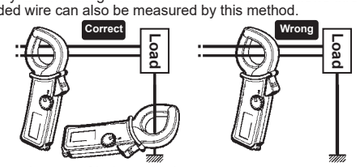
⚠ CAUTION

- The jaw section is a delicate, precision sensor. Do not subject the jaw to unreasonably strong shock, vibration, or force when using it.
- If dust gets into the tops of the jaws, remove it immediately. Do not close the jaws when dust is trapped in its joints as the sensor may break.
- Please check that the range switch is set to the desired position before measurement.

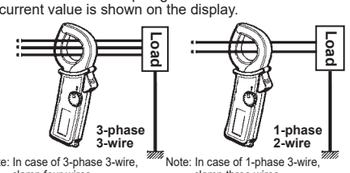
NOTE
- During current measurement, keep the transformer jaws fully closed. Otherwise, accurate measurements cannot be taken. Maximum conductor size is 40 mm in diameter.
- When measuring large current, the transformer jaws may buzz. This has no effect on the instrument's performance or safety.

2.2 AC Current Measurement

(1) Set the range switch to the desired position.
Current to measure should be within the selected measuring range.
(2) Normal measurement:
Press the open/close lever to open the transformer jaws and close them over one conductor only. Measured current value is shown on the display. Earth leakage current or small current that flows through a grounded wire can also be measured by this method.



(3) Measuring out of balance leakage current:
Clamp onto all conductors except a grounded wire.
Measured current value is shown on the display.



Note: In case of 3-phase 3-wire, clamp four wires for measurement.
Note: In case of 1-phase 3-wire, clamp three wires for measurement.

2.3 How to Use Frequency Selector Button

When high frequency from such equipment as inverters are present in the circuit under test, the instrument measures AC current of not only 50 Hz or 60 Hz of fundamental frequency but also of these high frequencies and harmonics. To eliminate the effect of such high frequency noise and measure AC current of 50 Hz or 60 Hz fundamental frequency, a "high-cut" filter circuit in incorporated into the instrument which works when "50/60 Hz" frequency response is selected with the frequency selector button. Cut-off frequency of "high-cut" filter is about 160 Hz with attenuation characteristic of approx. -24 dB/octave*.

*: Characteristic of -24 dB/octave means that signal magnitude declines to about one sixteenth of that at the initial frequency when frequency doubles.

The frequency selector button has the following two positions.
• WIDE (20 Hz or more)
Permits measurement of currents of fundamental frequencies as well as currents of high frequencies generated by such equipment as inverters.
• 50/60 Hz (20 Hz to approx. 160 Hz)
Filters out high frequency currents and measure current of fundamental frequency only.

When the FILTER button is pressed, 50/60Hz mark is shown on the left side of the display.
When the FILTER button is pressed again, frequency response is switched to WIDE with WIDE mark shown on the display.

Frequency characteristics

Recently there has been increased use of power though inverters, switching regulator, etc. When the high frequency noise from such appliances leaks or flows into the ground through capacitors not filtering completely, the earth leakage breaker may trip even though there is no "actual" leakage. In such a case, the instrument does not give leakage current reading if "50/60 Hz" frequency response is selected.
Take care readings with the 50/60 Hz and WIDE frequency responses respectively to make effective use of the frequency selector button.

2.4 Peak Current Measurement

(1) Set the range switch to the desired position.
Current to measure should be within the selected measuring range.
(2) Select WIDE or 50/60Hz within the FILTER button.
(3) With the transformer jaws clamped on to the conductor under test, press the PEAK HOLD button to set the instrument to the peak measurement mode. P is shown on the display.
(4) The display read $1/\sqrt{2}$ of the peak current value.
Therefore an rms reading is shown when current of sinusoidal waveform is measured.
(5) After peak measurement, press the PEAK HOLD button to return to the normal measurement mode.

NOTE
When leakage current is measured in the peak measurement mode, the reading may change if the transformer jaws are opened and closed. Please read the display with the conductor under test clamped, otherwise, after fixing the display by using the data hold function, please remove the instrument from the conductor to be measured and read the display.
To measure the peak current again, please release the data hold, and return the instrument to the normal measurement mode once with the PEAK HOLD button, then set in the peak measurement mode.

3. Other Functions

3.1 Auto-Power-Off Function

This is a function to prevent the instrument from being left powered on and conserve battery power. The instrument automatically turns off about 10 minutes after the last switch operation. To return to the normal mode, turn the range switch to OFF, then to the desired position.
Disabling Auto-Power-Off Function:
To disable the auto-power-off function, power on the instrument with the data hold button pressed. About 3 seconds after powering on the instrument, "P.OFF" is shown on the display.
To enable the auto-power-off function, turn on the instrument without pressing the data hold button.

NOTE
The auto-power-off function is disabled in the peak measurement mode.

3.2 Data Hold Function

This is function to freeze the reading on the display.
When the DATA HOLD button is pressed once, the current reading is held even though current under test varies.
H mark is shown on the upper right corner of the display.
To exit the data hold mode, press the DATA HOLD button again.

NOTE
When the auto-power-off function works while the instrument is in the data hold mode, data hold is cancelled.

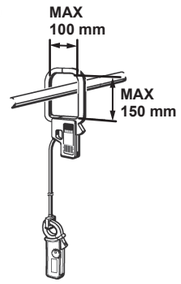
3.3 Optional Accessories

Clamp Adapter Model 99025 (For AC current measurement only)

NOTE
Model 99025 has been discontinued.

Clamp Adapter Model 99025 is designed to increase the measuring capability of a clamp meter. With the use of the clamp adapter, you can not only extend current range over 3000 A, but also clamp on a large bus-bar or conductor.

(1) Set the range switch to the ~ 400 A position.
(2) As shown in the figure right, clamp CL345 onto the pickup coil of the 99025.
(3) The 99025 onto the bus-bar or conductor under test.
(4) Take the reading on the CL345 and multiply it by 10.



4. Battery Replacement

⚠ WARNING

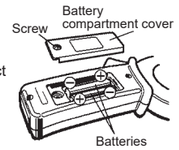
To avoid electric shock hazard, never try to replace batteries during measurement.

⚠ CAUTION

- Do not mix new and old batteries.
- Make sure to install battery in correct polarity as indicated in battery compartment.

If the battery voltage becomes too low for the instrument to operate normally, BATT is shown on the display. Then, replace the battery. Note that when the battery is completely exhausted, the display blanks without BATT shown.

(1) Set the range switch to the "OFF" position.
(2) Unscrew and remove the battery compartment on the bottom of the instrument.
(3) Replace the battery observing correct polarity.
Use two new R03 (UM-4) batteries.
(4) Re-place and screw the battery compartment cover.



NOTE
For use for a long period of time, use alkaline batteries.

5. Specifications

■ Instrument Specifications

• Measuring Ranges and Accuracy
(at 23 ± 5ºC, relative humidity up to 85%)

[1] AC Current ~
Conversion method: AC coupled, true rms responding, calibrated to the rms

Range	Measuring Range	Accuracy (frequency range)	
		Frequency response	
		WIDE	50/60Hz
40 mA	0 to 41.99 mA	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (20 Hz to 1 kHz)	±1.0% rdg ± 5 dgt (50/60 Hz)
400 mA	0 to 419.9 mA	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (20 Hz to 1 kHz)	
400 A	0 to 100.0 A	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (20 Hz to 1 kHz)	
	100.1 to 300.0 A	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (40 Hz to 1 kHz)	
	300.1 to 419.9 A	±2.0% rdg (50/60 Hz) ±5.0% rdg (40 Hz to 1 kHz)	±2.0% rdg (50/60 Hz)

The following notes are common to [1] and [2].
- Accuracy-guaranteed frequency range at 50/60 Hz mode is 50/60 Hz.
- When measuring current which pulse element is superposed, differences of the indicated value may be caused between ranges, if the peak value exceeds the measurement range to a large extent.
  In this case, the reading at the bigger range should be taken as a right value.
- Counts equal to or less than 5 counts are corrected to zero.
- The max indicator at the 40 mA/400 mA range is 6000 counts.
  Minute current may exist while zero is displayed at 400 A/ 400 mA range. Measurement should be made also at a lower range.

[2] Peak Current (10 ms)

Range	Measuring Range	Accuracy (frequency range)	
		Frequency response	
		WIDE	50/60Hz
40 mA	0 to 41.99 mA	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (20 Hz to 1 kHz)	±1.0% rdg ± 5 dgt (50/60 Hz)
400 mA	0 to 419.9 mA	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (20 Hz to 1 kHz)	
400 A	0 to 100.0 A	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (20 Hz to 1 kHz)	
	100.1 to 300.0 A	±1.0% rdg ± 5 dgt (50/60 Hz) ±2.5% rdg ± 10 dgt (40 Hz to 1 kHz)	
	300.1 to 419.9 A	±2.0% rdg (50/60 Hz) ±5.0% rdg (40 Hz to 1 kHz)	±2.0% rdg (50/60 Hz)

■ General Specifications

• Operating System:	Sequential comparison
• Measurement Function:	AC current
• Display:	LCD with max. reading of 1200 (400 A range), 6000 (40/400 mA range)
• Overrange Indication:	"OL" is shown on the display
• Response Time:	Approx. 2 seconds
• Sample Rate:	Approx. 2.5 times per second
• Temperature and Humidity for Guaranteed Accuracy:	23ºC ± 5ºC, relative humidity up to 85% without condensation
• Operating Temperature and Humidity:	0 to 40ºC, relative humidity up to 85% without condensation
• Storage Temperature and Humidity:	−20 to 60ºC, relative humidity up to 85% without condensation
• Effect of conductor position:	(at every part inside the jaws)
40/400 mA range:	Within ±5 dgt
400 A range,	0 to 250 A: Within ±0.5% rdg ± 5 dgt
	251 to 300 A: Within ±4.0% rdg ± 5 dgt
	301 to 400 A: Within ±7.0% rdg ± 5 dgt
• Effect of external magnetic field:	10 mA or less in proximity to a 15 mm-dia conductor carrying 100 A
• Effect of residual current:	12 mA or less when clamping on two 10 mm-dia conductors, each carrying supply or return 100 AAC current
• Power Source:	Tow R03 (UM-4) batteries
• Battery Life:	Approx. 24 hours (continuous)
• Current Consumption:	Approx. 21 mA
• Auto-power-off function:	Turns power off approx. 10 minutes after the last switch operation
• Withstanding Voltage:	4240 VAC for 5 sec. between electrical circuit and housing case or metal part of jaws
• Insulation Resistance:	50 MΩ or greater at 1000 V between electrical circuit and housing case or metal part of jaws
• Conductor Size:	Approx. 40 mm diameter max.
• Dimensions:	Approx. 81 (W) × 185 (H) × 40 (D) mm
• Weight:	Approx. 270 g (batteries included)
• Safety standards:	EN 61010-1, EN 61010-2-032 (300 VAC CAT III, Pollution degree 2, indoor use)
• 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
• Accessories:	R03 battery 2
	Carrying case (Model 93033) 1
	User's Manual. 1

6. Calibration and After-sales Service

Should any failure occur while you are using the tester, follow the instructions given below.
If the instrument still fails to operate correctly and needs repair, or calibration contact the vendor from whom you purchased the instrument or the nearest YOKOGAWA dealer.
● Turn off the POWER switch once, then turn it back on again.
● If the tester does not turn on, replace the battery with a new one.

Calibration
It is recommended that the instrument be calibrated once every year.

Waste Electrical and Electronic Equipment (WEEE), Directive
(This directive is valid only in the EU.)

This product complies with the WEEE directive marking requirement.
This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category
With reference to the equipment types in the WEEE directive, this product is classified as a "Monitoring and Control instruments" product. When disposing products in the EU, contact your local Yokogawa office in Europe.
Do not dispose in domestic household waste.