MULTI MULTI MEASURING INSTRUMENTS Co.,Ltd. Japan

Global leader in precision current measurement since 1985

Leakage current measurement

OVERVIEW

High Voltage assets in electrical systems, responsible for the efficient transfer of electrical energy between different voltage levels , generation , protections etc. To ensure the safe and reliable operation of transformers, it is essential to monitor various parameters, and one of the most vital aspects is the measurement is insulation health assessment. In transformers leakage current gives valuable information about the state of the main insulation, bushings insulation and transformer core. Leakage current is also giving valuable information for the insulation state in all other system assets, as: generators, motors, surge arresters, circuit breakers, etc.

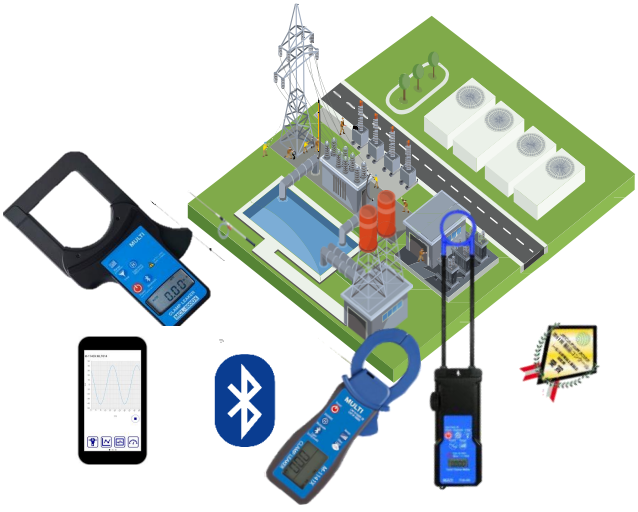
UNDERSTANDING LEAKAGE CURRENTS

Safety Assurance: Leakage currents in power system assets can indicate insulation degradation or contamination, which can lead to catastrophic failures, fires, or electrical shocks. Routine measurement of leakage currents helps detect issues early, preventing dangerous situations and ensuring the safety of both personnel and equipment.

Equipment Reliability: Excessive leakage currents can result in increased losses and reduced operational efficiency. Continuously monitoring these currents allows maintenance teams to identify and address problems before they escalate, thereby extending the operational life of the assets.

Early Fault Detection: Leakage current measurements can detect minor faults in the assets, such as insulation deterioration or partial discharges, before they progress to full-scale failures. This early warning system can help utilities and industries avoid costly unplanned outages and downtime.

Applicable for:
-**Transformers**
-**Generators**
-**Motors**
-**Circuit Breakers**
-**Surge Arresters**

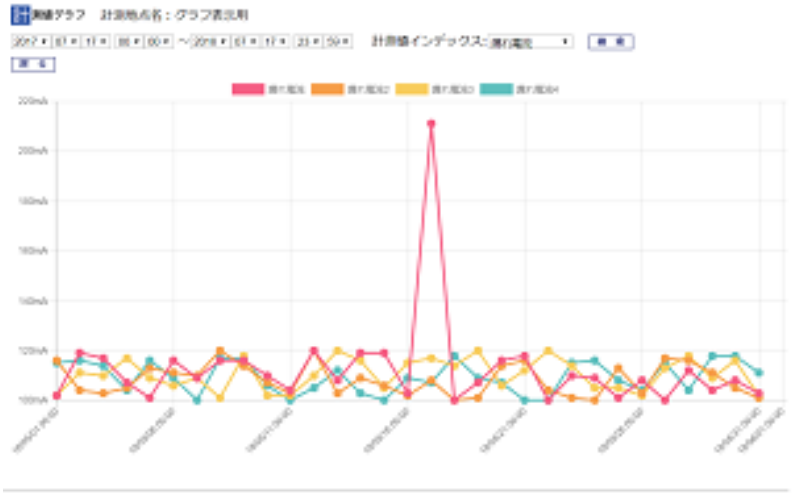


Regulatory Compliance: Many regulatory bodies mandate the monitoring of assets leakage currents. Compliance with these requirements ensures that transformers meet safety and environmental standards, protecting against legal liabilities.

Optimal Operation: By regularly measuring leakage currents, operators can optimize the performance of their assets. Detecting changes in leakage current levels allows for proactive maintenance and corrective actions, maintaining the asset's efficiency and performance.

Cost Savings: Early detection and timely maintenance based on leakage current measurements reduce the need for expensive emergency repairs or transformer replacement, resulting in significant cost savings over the assets lifetime.

Asset Management: Leakage current data is invaluable for asset management and planning. It helps operators make informed decisions about when to repair, replace, or upgrade assets, thereby enhancing overall asset management.



SPECIFICATIONS	
Measuring method	Dual slope integration mode
Measurement range	AC20mA/200mA/2A/20A/200A/1000A/Auto
Accuracy	23℃±5℃ 80%RH or less (50/60Hz) Range/Resolution/Accuracy AC 20mA/0.01mA/±2.0% rdg ± 5 dgt AC 200mA/0.1mA/±2.0% rdg ± 5 dgt AC 2A/1mA/±2.0% rdg ± 5 dgt AC 20A/10mA/±2.0% rdg ± 5 dgt AC 200A/0.1A/±2.0% rdg ± 5 dgt AC 1000A/1A/±2.0% rdg ± 5 dgt
Filter function	Low pass filter : 150Hz
Max Memory function	"Max" mark on LCD with maximum value
Auto power function	"It power-off approximately 10-minutes after final operation. This function will be disabled during MAX-hold/ Bluetooth is on."
Over range indication	Only the manual ranges are displayed up to 110% of the setting range (Excluding 1000A range). "OL" mark on LCD
Data hold indication	"DH" mark on LCD with data hold value
Low battery indication	"Battery" icon on LCD
Sampling	2 times/sec
Jaw opening capability	80mm x 74mm
Withstanding Voltage	AC 3700V 1 minute max. (Between the core of CT and outer case)
Limitation of circuit voltage	Less than AC 600V (EN61010 Installation category CAT III 300V)
Operating Temperature	0℃ to 50℃, 85%RH max. (Without condensation)
Storage Temperature	-10℃ to 60℃, 80%RH max. (Without condensation)
Power supply	1.5V (AM-4, LR03 or AAA)×3
Size	138(W)×237(H)×46(D)mm
Weight	Approx. 650g
Accessories	Hard carrying case:1 Instruction manual:1 Batteries:3
Interface	Bluetooth 4.2

MCL-800DX is a digital clamp meter with integrated Bluetooth connectivity. The clamp meter sends the measurement results to an app on a smartphone. Also, the data can be remembered to a .csv file. The mobile app visualizes the data on a user-friendly interface. The app shows the measurement results, and the measured waveform.

The MCL-800DX measures currents from 0.01 mA to 1000 A with an auto range capability. Also, it cuts off high frequency interferences with a 150 Hz low pass filter. The instrument has integrated large easy to read lcd display.

MCL-800DX is shock and drop resistant, and it has withstand voltage of 3700 V for one minute.

This clamp can be used in transmission and distribution substations, as well in overhead lines for leakage current measurement. Also heavy industries and power plants can find great use of this clamp. This clamp can be used to assets the insulation condition of transformer, motors, generators, surge arresters. For low voltage systems MCL-800DX can be used for load current measurements.

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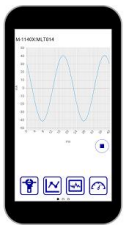
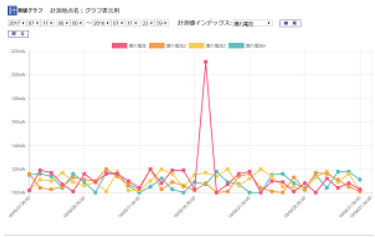
SPECIFICATIONS	
Measuring function	Line current Leakage current
CT inside diameter	ϕ40mm
AC current range	30mA / 300mA / 3A / 30A / 300A RMS
Minimum resolution	0.01mA
Accuracy	AC 30mA / 300mA / 3A / 30A ±1.2%rdg±5dgt AC 300A 0～200A : ±1.2%rdg±5dgt 200～250A : -3.0%rdg±5dgt 250～300A : -5.0%rdg±5dgt 23℃±5℃ 80%RH or less (50 / 60Hz)
Interface	Bluetooth 4.2
Filter function	Band pass filter fo=55Hz (Automatically starts when the power is turned on)
Max memory function	"Max" mark on LCD with maximum value
Other function	Over range display, Data hold, Low battery indication, Auto power off
Sampling rate	Two times / second
Safety standard	EN61010 Installation category IV 600V or category III 1000V
Operating circuit voltage	Less than AC500V (Isolated electric wire)
Operating temp & humidity Range	0~50℃ Less than 85%RH (w / o condensation)
Power supply	CR2450×1
Dimension / Weight	W61×H206×D35mm Approx.260g
Accessories	Carrying case, Instruction manual





M-1141XR is digital current clamp with integrated connectivity Bluetooth connectivity. This clamp is smaller than the MCL-800 DX. Additionally, this clamp can be used for load current measurements. Also, this clamp has bandpass filter with middle frequency of 55 Hz.

The clamp meter sends the measurement results to an app on a smartphone. Also, the data can be remembered to a .csv file. The mobile app visualizes the data on a user-friendly interface. The app shows the measurement results, and the measured waveform.

M-1141XR is shock and drop resistant, and it has max circuit voltage of 500 V.

This clamp can be used in transmission and distribution substations, as well in overhead lines for leakage current measurement. Also heavy industries and power plants can find great use of this clamp. This clamp can be used to assets the insulation condition of transformer, motors, generators, surge arresters. For low voltage systems M-1141XR can be used for load current measurements. Because of the smaller clamp diameter it can be used on earthing, rods, cables with a smaller diameter.

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SPECIFICATIONS	
Range	DC:10A/100A AC:10A/100A
Min resolution	0.001A
Accuracy	DC 10A range ±1.5%rdg±5dgt／0.004～9.999A DC 100A range ±2.0rdg±5dgt／0.04～99.99A AC10A range ±1.5%rdg±10dgt／0.001～9.999A AC100A range ±2.0rdg±10dgt／0.01～99.99A
Jaw opening capability	ϕ45mm
Other functions	Overrange display function Data hold function One push 0 adjustment function Auto power off function Battery voltage drop display function
AC Conversion	True rms responding
Limitation of circuit voltage	Less than AC/DC 500V(Only available insulated cable)
Safety standard	IEC 61010-1, IEC 61010-2-032 Installation CategoryⅢ300V
Power supply	alkaline AAA battery x3
Size	W82×H437×D46.6mm
Weight	Approx.380g

TCM-45E is an AC/DC Digital Clamp Tester, with a special design. This clamp meter is intended to be used in tight spaces.

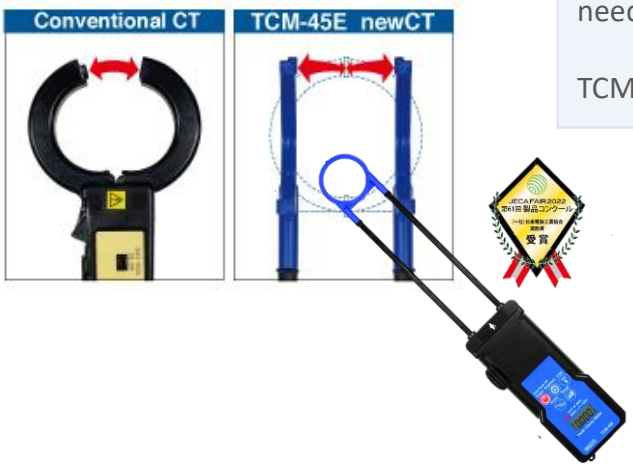
Conventional clamp meters utilize the "principle of leverage" to open and close horizontally by gripping force, but the TCM-45E enables vertical opening and closing by connecting a rod to the current detection part and turning the shaft. Moreover, due to its structure that separates current detection part and display part, it can open and close even in deep places where hands can not reach by just extending the rod. TCM-45E is the first clamp meter in history that made current measurement possible in narrow spaces with an opening and closing mechanism that overturns the concept of clamp meters.

This clamp has high resolution and accuracy. The other advance of this clamp is that it can measure both AC and DC current. Also, as the before mentioned models it has Bluetooth connectivity, so the measurement data is visualized on a smartphone app.

TCM-45E is shock and drop resistant, and it has max circuit voltage of 500 V.

This clamp mostly founds its application in unit type substations (both tranand heavy industries where mostly where deep and tight space measurements are needed.

TCM-45E was awarded at the 2022 JECA FAIR.



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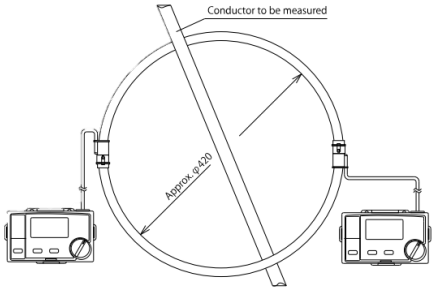
SPECIFICATIONS - MEASURING PART	
Measuring Function	AC Line Current, AC Leakage Current
Measuring Method	Dual Integration Mode
Measuring Range	AC 1000mA/10A/100A/1000A (50/60 Hz)
Range Selection	4 Range Manual by Rotary Switch
Sampling Rate	2 Times/sec.
Display	LCD max. 9999 reading with annunciators
Over Range Indication	"OL" mark on LCD
Data Hold Indication	"DH" mark on LCD

SPECIFICATIONS - CURRENT DETECTION PART	
Sensoring Method	Flexible Split-Core Type
Inside Diameter	ϕ210mm (total length approx. 650mm)
Influence of Residual Current	Less than 0.25A (at AC 50A, the point where influence is most receivable)
Withstanding Voltage	AC 2200V/1 minute
Length of Lead Wire	Approx. 2m between CT and Measuring Part



Another solution for tight spaces and hard to access areas are the flexible current clamps. RLM-10 with a combination of a flexible current clamp can be used to measure leakage and line currents.

The tester has integrated 150 Hz low-pass filter, and it's designed to mitigate external magnetic fields influences. The tester has high sensitivity and accuracy. There are measurement ranges that can be picked with rotary dial.

RLM-10 is shock and drop resistant. Also, it can withstand 2200 V for 1 minute. Additionally, it has integrated back light so it can be used in dark spaces.

This clamp when measuring line current is limited to low voltage systems. Also this clamp can be used for leakage current measurements in both transmission and distribution substation and lines. This clamp finds great used in heavy industries and unit type substations where hard to reach spaces. RLM-10 has a very convenient possibility, for the flexible clamp to be expanded with another RLM-10 cables and rods with extremely high diameter can be measured

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SPECIFICATIONS - GENERAL SPECIFICATION	
Circuit Voltage	Less than AC 600V
Operating Temperature	0～40℃, < 80%RH without condensation
Storage Temperature	-10～60℃, < 70%RH without condensation
Withstanding Voltage	AC 2200V/1 minute
Power Supply	1.5V (“AA” size, UM-3) x 6
Dimension (Measuring Part)	159(W)×105(H)×53(D) mm
Standard accessories	Battery (UM-3 x 6), Instruction Manual , Carrying Case

SPECIFICATIONS - ACCURACY	
Accuracy	23℃±5℃, less than 80%RH ±3%rdg±5dgt (1000mA) ±2.5%rdg±5dgt (10A/100A/1000A) Signal Output ±2% F.S.
Resolution	0.1mA (1000mA) 0.001A (10A) 0.01A (100A) 0.1A (1000A)

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