MEASURING INSTRUMENTS GENERAL CATALOG

Ver.9

one step beyond tomorrow

MULTI MEASURING INSTRUMENTS CO.,LTD.

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Clamp Tester Selection Guide

(1) CLAMP TESTERS FOR LINE CURRENT (HIGH-VOLTAGE)

Model	CT (Jaw) Size	Display	AC Current	Resolu-tion(ACA)	DC Current	Resolution (DCA)	Data Hold	Max. Hold	A/D Convertion	CE Conformity	Remarks	Page
HCL-3000D	35mmϕ	LCD 1999	200mA/20A	1mA	—	—	○	—	Average	pending	Leakage for high voltage circuit	5
HCL-5000D	35mmϕ	LCD 1999	20A/500A	0.01A	—	—	○	—	Average	pending	For high voltage circuit	5
HCL-1000DM	35mmϕ	LCD 1999	20A/600A	0.01A	—	—	—	○	Average	pending	For high voltage circuit w/ adapter	5
HCL-9000S	35mmϕ	LCD 1999	20A/600A	0.01A	—	—	○	—	Average	pending	For high voltage circuit, Optical isolation	6

(2) CLAMP TESTERS FOR AC/DC CURRENT

Model	CT (Jaw) Size	Display	AC Current	Resolution (ACA)	DC Current	Resolution (DCA)	Data Hold	Max. Hold	A/D Conversion	CE Conformity	Remarks	Page
230	23mmϕ	LCD 1999	20A/200A	0.01A	20A/200A	0.01A	○	—	Average	—	Mini size, High accuracy	15
240	30mmϕ	LCD 1999	20A/200A	0.01A	20A/200A	0.01A	○	—	Average	○	Mini size, Economy	15
250	40mmϕ	LCD 1999	200A/1000A	0.1A	200A/1000A	0.1A	○	—	Average	○	Mini size, Economy	15
260	55mmϕ	LCD 4000	400A/1000A	0.1A	400A/1000A	0.1A	○	—	Average	○	AC/DCA , AC/DC V,Ω, Hz	16
270	55mmϕ	LCD 4000	400A/1000A	0.1A	400A/1000A	0.1A	○	—	True RMS	○	AC/DCA , AC/DC V,Ω, Hz	16
280	40mmϕ	LCD 9999	1000A	0.1A	1000A	0.1A	○	○	Average	○	AC/DCA , AC/DC V,Ω	17
290RMS	30mmϕ	LCD 4000	40A/400A	0.01A	40A/400A	0.01A	○	—	True RMS	○	AC/DCA, AC/ DCV, Ω	17
600	20mmϕ	LCD 1999	200mA/2000mA/10A	0.1mA	200mA/ 2000mA/10A	0.1mA	○	○	Average	○	High resolution, CT:Double Shielding	18
700	5mmϕ	LCD 9999	100mA/1000mA/10A	0.01mA	100mA/ 1000mA	0.01mA	○	—	Average	○	High precision	19
730	30mmϕ	LCD 9999	100mA/1000mA/10A	0.01mA	100mA/ 1000mA	0.01mA	○	—	Average	○	High precision	19
740	40mmϕ	LCD 9999	100mA/1000mA/10A	0.01mA	100mA/ 1000mA	0.01mA	○	—	Average	○	High Precision	19
800P	23mmϕ	LCD 9999	15A/150A	0.01A	15A/150A	0.01A	○	—	True RMS	○	Detection DC current in AC	21
FCM-100	200mmϕ	LCD 3200	3A/30A/300A/2500A	1mA	3A/30A/300A/ 2500A	1mA	○	—	RMS	pending	Flexible CT	8
FAD-100	200mmϕ	LCD 1100	10A/100A/1000A	0.01A	10A/100A/1000A	0.01A	—	—	RMS	pending	Flexible CT Probe	8

Clamp Tester Selection Guide

(3) MINI CLAMP TESTERS FOR LEAKAGE CURRENT

Model	CT (Jaw) Size	Display	AC Current	Resolution (ACA)	DC Current	Resolution (DCA)	Data Hold	Max. Hold	A/D Conversion	CE Conformity	Remarks	Page
100	18mmϕ	LCD 1999	200mA/20A	0.1mA	—	—	○	—	Average	○	Mini size,Earth Leakage	22
102	23mmϕ	LCD 1999	200mA/100A	0.1mA	—	—	○	—	Average	—	Mini size,Earth Leakage	22
104	33mmϕ	LCD 1999	200mA/150A	0.1mA	—	—	○	—	Average	—	Mini size,For small current measurement	22
110	30mmϕ	LCD 1999	2mA/20mA/60A	1μA	—	—	○	—	Average	○	Mini size,High resolution	23
140	40mmϕ	LCD 3200	30/300mA/ 30/300A	0.01mA	—	—	○	—	Average	○	Mini size, Wide ranges	24
140HC	40mmϕ	LCD 3200	320mA/320A	0.01mA	—	—	○	—	Average	○	Mini size, Wide Phase Current	25
2002	40mmϕ	LCD1999	200mA/2A/20A/ 200A	0.1mA	—	—	○	—	True RMS	pending	2CT method	26
310	40mmϕ	LCD 3200	30/300mA/ 30/300A	0.01mA	—	—	○	—	Average	—	Mini size, w/direct touch CT	27
340	40mmϕ	LCD 1999	2mA/20mA/60A	1μA	—	—	○	—	Average	○	Mini size,High resolution	28

(4) CLAMP TESTERS FOR LEAKAGE CURRENT

Model	CT (Jaw) Size	Display	AC Current	Resolution (ACA)	DC Current	Resolution (DCA)	Data Hold	Max. Hold	A/D Conversion	CE Conformity	Remarks	Page
MCL-350	40mmϕ	Taut band meter	10mA/50mA/500mA/ 1/5/50/500A	0.01mA	—	—	○	—	Analog meter	○	ACA, ACV,Ω	29
MCL-500DFN	40mmϕ	LCD 4000	40/400mA/ 4/40/500A	0.1mA	—	—	○	—	True RMS	pending	ACA, ACV,Ω	29
MCL-800D	80mmϕ	LCD 1999	200mA/2/20A/ 200/1000A	0.1mA	—	—	○	—	Average	—	80mmCT, Data output	30
MCL-1100D	108mm	LCD 3200	300mA/3/30A/ 300/3000A	0.1mA	—	—	○	—	True RMS	○	Big Jaw	31
MCL-4000F	36mmϕ	LCD 1999	200/2000mA/ 800A	0.1mA	—	—	○	—	Average	—	3CT/4CT Method	32
MCL-550D	55mmϕ	LCD 1999	2000mA/ 200A/1000A	1mA	—	—	○	—	Average	○	ACA , AC/DC V,Ω	35
RLM-10	210mmϕ	LCD 3200	3000mA/30A/ 300A/3000A	1mA	—	—	○	—	True RMS	○	Flexible CT, Signal Output,Back Light	7

(5) CLAMP TESTERS FOR IOR LEAKAGE CURRENT

Model	CT (Jaw) Size	Display	AC Current	Resolution (ACA)	DC Current	Resolution (DCA)	Data Hold	Max. Hold	A/D Conversion	CE Conformity	Remarks	Page
340IRV	40mmϕ	LCD 9999	2mA/100mA/60A	0.001mA	—	—	○	—	Average	pending	Non-contact voltage input, compact size	34
MCL-500IRV	40mmϕ	LCD 4000	40mA/400mA/ 4A/40A/500A	0.01mA	—	—	○	—	True RMS	pending	Non-contact voltage input, wide range	34
MCL-800IRV	80mmϕ	LCD 9999	10mA/100mA/ 1000mA/10A	0.001mA	—	—	○	—	True RMS	pending	Non-contact voltage input, big window CT	34
MCL-400IR	40mmϕ	LCD 4000	40/400mA/ 4/40/300A	0.01mA	—	—	○	—	True RMS	pending	Harmonic Current, Voltage	35

(6) CLAMP TESTERS FOR LINE CURRENT

Model	CT (Jaw) Size	Display	AC Current	Resolution (ACA)	DC Current	Resolution (DCA)	Data Hold	Max. Hold	A/D Conversion	CE Conformity	Remarks	Page
200	23mmϕ	LCD 1999	20A/200A	0.01A	—	—	○	—	Average	—	Mini size, w/direct touch CT	37
210	23mmϕ	LCD 1999	20A/200A	0.01A	—	—	○	—	Average	—	Mini size, Economy	37
220	33mmϕ	LCD 1999	20A/200A	0.01A	—	—	○	—	Average	○	Mini size, Economy	38
225	40mmϕ	LCD 1999	200A/600A	0.1A	—	—	○	—	Average	○	Mini size, Economy	38
2020	40mmϕ	LCD 3200	30/300A	0.01A	—	—	○	—	Average	○	ACA , AC/DC V,Ω	39
3000	40mmϕ	Taut band meter	6A/15A/50A/ 150A/600A	0.1A	—	—	○	—	Analog meter	○	ACA, ACV,Ω	39
2010	40mmϕ	LCD 1999	20A/200A/600A	0.01A	—	—	○	—	Average	○	ACA , AC/DC V,Ω •)) ⊣◄	40
2100	55mmϕ	LCD 1999	20A/200A/2000A	0.01A	—	—	○	—	Average	○	ACA , AC/DC V,Ω •)) ⊣◄	40
M-1800	80mmϕ	LCD 1999	20/200A/1800A	0.01A	—	—	○	—	Average	—	80mmCT, Data output	30
MCL-3000D	108mm	LCD 3200	30/300/3000A	0.01A	—	—	○	—	True RMS	○	Big Jaw	31

*The accuracies stated in this catalog are under the following temperature and humidity conditions:
"±23℃±5℃ less than 80%RH without condensation.

LEAKAGE CLAMP METER FOR ARRESTER

Model ALCL-40/ALCL-40H/ALCL-40L

φ 37 | AC 30mA | DATA HOLD | AUTO POWER OFF | RMS

Model ALCL-40L

Model ALCL-40
Model ALCL-40H

GENERAL

This model ALCL-40 mainly measures very small leakage current of grounding line connected with Arrester, etc. The CT which is applied to this model is hardly affected by external magnetic field and therefore, model ALCL-40 can measure leakage current very accurately in high magnetic and electric field.

SPECIFICATIONS

1) CT Sensor
- Inside Diameter of CT : 37㎜
- Structure : Apart from Measuring Part

2) Measuring Part
- Measuring Function : Leakage Current, Harmonic Current (Dominant & Third Wave)
- Measuring Method : CT Clamp-on Method
- Measuring Range : 0-300μA/3mA/30mA (3range manual)
- Input Frequency : 45-60Hz (Dominant Wave Frequency)
- AC Conversion : RMS Detection Method
- A/D Conversion : Double Integration Method
- Display : 3200 count max.,LCD
- Sampling Rate : 2 times/second
- Over Indication : "OL" on the display
- Low Battery Indication : "B" sign on the display
- Data Hold Function : "DH" sign on the display
- Auto Power Off : Approx.10 minutes after power on
- Other Function : Manually CT open/close (ALCL-40,ALCL-40H)
  Motor Drive Switch for CT open/close (ALCL-40L)
  Wave Form Signal Output(ALCL-40H)

3) General Specs.
- Power Supply : 9V Alkaline Battery (6LR61) × 1 (ALCL-40,ALCL-40H)
  AA size Alkaline battery×4 (ALCL-40L)
- Operating Circuit Voltage : Less than 500V AC
- Operating Temperature : 0～40℃, less than 80%RH, w/o condensation
- Storage Temperature : -10～60℃, less than 70%RH, w/o condensation

4) Accuracy

4-1 AC Current

Range	Resolution	Accuracy(45～65Hz)	Max.Applicable Current
300μA	100nA(0.1μA)	1.2%±8digit	40A rms
3mA	1μA(0.001mA)		
30mA	10μA(0.01mA)		

AC Conversion : RMS Detection Method
Crest Factor : <3 (0～50% of the range)
<2 (50～100% of the range)

4-2 Harmonic Current(Dominant Current, 3rd Harmonic Current)
Detection Method : Automatic Tuned Filter
Min. Dominant Current Input : more than 3% of each range
Accuracy : (1%±5digit)±(AC Current Accuracy) – (Tolerance influenced by adjacent frequency)

* In case that the harmonic current is more than 4% of the dominant wave
Tolerance influenced by adjacent frequency : 1.5%

5) Dimension & Weight
- ALCL-40 / ALCL-40H CT Part : 135(W)×166(H)×61(D)mm, Approx. 1000g
- Display Part : 95(W)×160(H)×334(D)mm, Approx. 260g
- ALCL-40L 160(W)×950(H)×84(D)mm (when retracted rod)
  160(W)×2680(H)×84(D)mm (when extended rod)
  Approx. 2600g

LEAKAGE CLAMP METER FOR ARRESTER

THE MOST PRECISE LEKAGE CURENT CLAMP TESTER IN THE WORLD

Generally, it is said that the metal oxide surge arresters in high voltage lines should be replaced within 15 years after the start of use under the normal conditions:

Of course, the duration of arresters would be shortened by various causes like as direct surge attack, internal abnormal voltage, vibration & shock to outer pole component, etc. and the regular & adequate inspections are required in order to avoid serious accidents in high voltage distribution networks.

In European standard IEC60099-5 Section 6 “Diagnostic indicators of metal-oxide surge arresters”, the following inspection methods are introduced:

*Fault Indicators *Disconnectors *Surge Counters *Monitoring Spark Gaps *Temperature Measurements
*Insulation Resistance Measurements *Leakage Current Measurements (Capacitive, Resistive, Harmonics, etc.)

Among various methods, the leakage current measurements (except for resistive) are only effective, as others are mostly unreliable under the very severe field conditions and some are impracticable due to impossibility of power line off for inspections.
ALCL-40/ALCL-40L are adapted to "B1" method of IEC60099-5 Section 6.

ACTUAL MEASURING FIELDS

Transformer Substation

Power Line

Railway Station

The most important factor for measuring leakage current is how to detect the real & accurate values (less than 1mA) free from influences of strong magnetic & electric fields in the actual measuring places as above.

Models ALCL-40/ALCL-40L have quite unique & sophisticated CT which enables to measure very low range current with minimum resolution of 0.1μA, defending such outer electric noises.

For example, the comparison list for ordinary & ALCL CT is as followings:

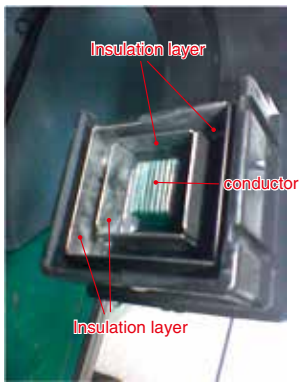
Range	ALCL-40/-40L	Ordinary Model
Accuracy	1.2%	±5%±10%
Minimum Resolution	0.1μA	10μA
Influence of Outer Magnetic Fields	Less than 10μA (400A turn/15cm)	Less than 1mA (20A turn/5cm)

CT CORE STRUCTURE Ordinary ALCL-40

Ordinary

Plane clamp head is easily to become dirty. Magnetic can not coherent with single isolation layer easily.

ALCL-40



Clamp head coherent mutually. Magnetic line is easily to be Conducted.
Double-deck isolation & insulation will not be interfered easily.

The operation of such field measuring instruments must be rather simple and easier.so that the inspection & maintenance can be made more frequently and the measured data compared correctly, which will lead to find out the problems of surge arresters adequately.

DIGITAL CLAMP TESTER

AC LEAKAGE/LINE CURRENT FOR HI-VOLTAGE CIRCUIT

Model HCL-3000D

φ 35 | AC 20A | DATA HOLD | AUTO POWER OFF

FEATURES

- Low Range Measurement of 1mA~20A in Hi-Voltage Circuit up to 7KV
- Easy Operation - Push & Pull Auto Opening/ closing CT
- Safety Design & Function
- Auto Power off Function & Waterdrop Proof Structure

SPECIFICATIONS

Measuring Function	: AC leakage/line current
Measuring Method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 1999 with annunciators
Measuring Range	: 0~2000mA/20A manual (50Hz or 60Hz)
Jaw opening Capability	: φ35mm
Data hold Function	: "DH" mark on LCD
Auto Power off	: Automatically power off mode, approx. 5minutes after the power switch on.
Sampling time	: 2 times/sec
Low Battery Indication	: [B]mark on LCD.
Operating Temperature	: 0~40℃, less than 80%RH without condensing
Power supply	: Battery UM-4×2
Size & Weight	:70(W)×356(H)×68(D)mm,approx. 370gs.
Accessories	: Batteries, UM-4 ·····2pcs. Carrying Case·····1pce. Instruction manual·····1pce.

Accuracy

Range	Resolution	Accuracy
2000mA	1mA	±2%rdg±8dgt
20A	0.01A	±2%rdg±8dgt

Model HCL-5000D

φ 35 | AC 600A | DATA HOLD | AUTO POWER OFF

FEATURES

- Wide Range Measurement of 0.1A~600A.
- Easy Operation - Push & Pull Auto Opening/ closing CT
- Safety Design & Function
- Auto Power off Function & Waterdrop Proof Structure.

SPECIFICATIONS

Measuring Function	: AC line current
Measuring Method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 1999 with annunciators
Measuring Range	: 0~20A/600A manual (50Hz or 60Hz)
Jaw opening Capability	: φ35mm
Data hold Function	: "DH" mark on LCD
Auto Power off	: Automatically power off mode, approx. 5minutes after the power switch on.
Sampling time	: 2 times/sec
Low Battery Indication	: [B] mark on LCD.
Operating Temperature	: 0~40℃, less than 80%RH without condensing
Power supply	: Battery UM-4×2
Size & Weight	: 70(W)×356(H)×68(D)mm, approx. 400gs.
Accessories	: Batteries, UM-4 ·····2pcs. Carrying Case·····1pce. Instruction manual ·····1pce.

Accuracy

Range	Resolution	Accuracy
20A	0.01A	±2%rdg±8dgt
600A	1A	0~400A~±2%rdg±8dgt 400A~600A~±3%rdg±8dgt

DIGITAL CLAMP TESTER

AC CURRENT FOR HI-VOLTAGE CIRCUIT

Model HCL-1000DM

ϕ 35 | AC 600A | PEAK HOLD

FEATURES

- Safe AC current measurement by hot stick on circuit having internal voltage from AC 80V to AC 46KV.
- Provides wide range of current measurement from AC 0.01A to 600A.
- Peak Hold Function and with UNIVERSAL adapter for attachment of hot stick.

SPECIFICATIONS

Measuring method	: Dual integration mode
Measuring function	: AC line current
Display	: 3.5 digit LCD, max. reading of 1999 with annunciators
Range	: 0-20A / 600A (50/60Hz)
Ranging	: 2 manual ranging
Jaw opening capability	: 35㎜ϕ
Low battery indication	: "B" mark on LCD readout
Over range indication	: Blanking of all digits except MSD1 (Except 600A range)
Sampling	: 2 times/sec.
Peak Hold Function	: LED lamp is lightning when push the peak hold switch.
Insulation resistance	: 100MΩ or more by DC 1000V insulation tester (Between operation handle and core of CT)
Withstanding voltage	: AC 100kV, 5 minute (Between operation handle and core of CT)
Limitation of circuit voltage	: AC 80V to 46kV (with hot stick)
Power supply	: 1.5V ("AAA" size)×2
Size	: 70(W)×290(H)×32(D)㎜ (When retracted)
Weight	: Approx. 350gs including batteries
Accessories	: Carrying case ····· 1 Instruction manual ····· 1 Batteries ····· 2
Option	: Hot Stick(2m,5m,10m,12m)

Accuracy

Range	Resolution	Accuracy
20A	0.01A	±2%rdg±8dgt
600A	1A	0~400A ±2.5%rdg±8dgt 400A~600A ±3%rdg±8dgt

Model HCL-9000S

ϕ 35 | AC 600A | DATA HOLD | SIGNAL OUTPUT

FEATURES

- Safe AC current measurement by optical isolated transmission method on circuit having internal voltage from AC 80V to AC 23kV.
- Useful analog signal data output for the recorder.
- Sealed to withstand water and contaminants.
- Provides the smooth and easy clamping for the cable with special made "PUSH TO OPEN" mechanism.

SPECIFICATIONS

Measuring method	: Dual integration mode
Measuring function	: AC line current
Display	: 3.5 digit LCD, max. reading of 1999 with annunciators
Range	: 0~20A/600A (50/60Hz)
Ranging	: 2 manual ranging
Jaw opening capability	: 35㎜ϕ
Low battery indication	: CT part;Red LED lamp Display/grip part;"B" mark on LCD readout
Optical transmission	: Infrared LED and photo diode
Over range indication	: Blanking of all digits except MSD1(Except 600A range)
Sampling	: 2 times/sec.
Data hold indication	: "DH" mark on LCD readout
Data output	: DC 100mA (full scale to 20A range) DC 30mA (full scale to 600A range)
Insulation resistance	: 100MΩ or more by DC 1000V insulation tester (Between operation handle and core of CT)
Withstanding voltage	: AC 46kV, 5 minute (Between operation handle and core of CT)
Power supply	: CT part;1.5V ("AAA" size)×3 Display/grip part; 1.5V ("AAA" size)×2
Power consumption	: CT part; 5mA Display/grip part; 3mA
Size	: 70(W)×550(H)×48(D)㎜ (When retracted) 70(W)×1110(H)×48(D)㎜ (When steretched)
Weight	: Approx. 800g
Accessories	: Carrying case ····· 1 Instruction manual ····· 1 Batteries ····· 5

Range	Resolution	Accuracy
20A	0.01A	±2.5% rdg ±8 dgt
600A	1A	0~400A±2.5% rdg ±8 dgt 400~600A±3% rdg ±8 dgt

FLEXIBLE LEAKAGE/LINE CURRENT TESTER

AC CURRENT

Model RLM-10

ϕ 210 | AC 3000A | DATA HOLD | AUTO POWER OFF | RMS | FILTER SWITCH | SIGNAL OUTPUT

FEATURES

- Freely Bending with Rogowski Method Flexible Clamp Sensor
- Useful for Difficult Access Locations with Wide Rages
- Even Coreless Coil but Least Influence from External Magnetic Field and Residual Current
- Superior Flexible CT enables Leakage Current Measurement
- DC mV Signal Output for Recorder
- Back Light Functiom

SPECIFICATIONS

1) CURRENT DETECTION PART (CT SENSOR)

Sensoring Method	: Flexible Split-Core Type
Inside Diameter	: ϕ210㎜(total length approx. 650㎜)
Influence of Residual Current	: Less than 0.5A (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

2) MEASURING PART

Measuring Function	: AC Line Current, AC Leakage Current
Measuring Method	: Dual Integration Mode
Measuring Range	: AC 3000mA/30A/300A/3000A (50/60 Hz) RMS Detection Method
Range Selection	: 4 Range Manual by Rotary Switch
Sampling Rate	: 2 Times/sec.
Display	: LCD max. 3200 reading with annunciators
Over Range Indication	: "OL" mark on LCD
Data Hold Indication	: "DH" mark on LCD
Low Battery Indication	: "B" mark on LCD
Data Hold Function	: by "DH" Switch
Filter Function	: by Filter Switch to cut hi-frequency (Low Pass Filter for cut off 150 Hz)
Signal Output	: DC 300mV full scale to each range (Output impedance : less than 10KΩ)
Auto Power Off	: Approx. 10 minutes after power on (this function is cancelled in case of using recorder cable for signal output)

3) GENERAL SPECIFICATION

Circuit Voltage	: Less than AC 600V
Operating Temperature	: 0~40℃, < 85%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)×6
Dimension (Measuring Part)	: 159(W)×105(H)×53(D) ㎜
Standard accessories	: Battery (UM-3×6), Instruction Manual, Carrying Case

4) ACCURACY

Range	Resolution	Accuracy
3000mA	1mA	±3% rdg ± 10dgt
30A	0.01A	±2.5% rdg ± 5dgt
300A	0.1A	
3000A	1A	
Signal Output		±2% FS

FLEXIBLE LEAKAGE/LINE CURRENT TESTER/PROBE

AC/DC CURRENT

Model FCM-100

ϕ 200 | AC 2500A | DC 2500A | DATA HOLD | AUTO POWER OFF | RMS

FEATURES

- Freely Bending with Flexible Clamp Sensor
- Useful for Difficult Access Locations with Wide Rages up to AC/DC 2500A With Minimum Resolution of 1mA
- Large Inside Diameter CT with 200㎜

SPECIFICATIONS

1) CURRENT DETECTION PART (CT SENSOR)

Sensoring Method	: Flexible Split-Core Type
Inside Diameter	: ϕ200㎜ (total length approx. 700㎜, approx. 270g)
Withstanding Voltage	: AC 2200V/1 minute
Length of Lead Wire	: Approx. 2m between CT and Measuring Part

2) MEASURING PART

Measuring Function	: AC/DC Leakage/Line Current
Measuring Method	: Dual Integration Mode
Measuring Range	: AC/DC 3A/30A/300A/2500A(AC50/60 Hz & DC)
Range Selection	: 4 Range Manual by Rotary Switch
Sampling Rate	: 2 Times/sec.
Display	: LCD max. 3200 reading with annunciators
Over Range Indication	: "OL" mark on LCD
Data Hold Indication	: "DH" mark on LCD
Low Battery Indication	: "B" mark on LCD
Data Hold Function	: by "DH" Switch
Zero Adjustment	: for DC current range, by "0 SET" switch
Auto Power Off	: Approx. 10 minutes after power on

3) GENERAL SPECIFICATION

Circuit Voltage	: Less than AC 600V
Operating Temperature	: 0-40℃,< 85%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)×6
Dimension (Measuring Part)	: 159(W)×105(H)×53(D) ㎜
Standard accessories	: Battery (UM-3×6), Instruction Manual, Carrying Case

4) ACCURACY

AC/DC Range	Resolution	Accuracy	
3A	0.001A	±3% rdg ± 10dgt	
30A	0.01A		
300A	0.1A		
2500A	1A	300A~2000A	±3% rdg ± 10dgt
		2001A~2500A	±10% rdg ± 10dgt

Model FAD-100

ϕ 200 | AC 1000A | DC 1000A | RMS | SIGNAL OUTPUT

FEATURES

- Long Time Record of Measurement by Input Power Supply
- Detection of Both AC Current (RMS Conversion) and DC Current At Once
- Detection of Small DC Current Inside Large AC Current
- Freely Bending with Flexible Clamp Sensor of Inside Diameter 200mm
- Useful for difficult Access Locations with Wide Ranges up to AC/DC 1000A

SPECIFICATIONS

Measuring Range	: AC/DC 10A / 100A / 1000A (AC 50/60 Hz & DC)
Range Selection	: 3 Range Manual by Rotary Switch of Controller
Sampling Rate	: 2 Times/sec
AC/DC Output Voltage	: 1500mV / F.S. of Respective Range
Accuracy	: ±3% rdg ±10dgt
Power Supply Voltage	: DC 12V
Current Consumption	: Approx. 100mA
Applicable Circuit Voltage	: Less than AC/DC 600V (insulated coating wire)
Withstanding Voltage	: AC2200V/1 minute
Ambient Operating Temperature	: 0℃~40℃ (<85%RH, w/o condensation)
Ambient Storage Temperature	: -10℃~60℃ (<70%RH, w/o condensation)
Power Supply Lead wire	: Double Conductor Cabtyre Wire (White: (+)Plus side, Black: (-)Minus side) ϕ4.5mm Length 1m
Output Lead wire	: Single Shield Wire ϕ4.5mm Length 1m *AC/DC separated
Dimension of Controller	: 135 x 76 x 35mm
Weight	: CT : Approx. 270g Controller : 250g

LIVE LINE CLAMP INSULATION RESISTANCE TESTER

The World First Live Line Clamp Insulation Resistance Tester

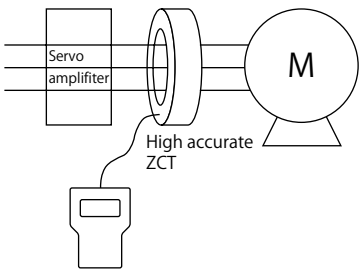
Model MLIT-1

φ 30 | AC 200mA | DATA HOLD | AUTO POWER OFF | Ior | AC V | MΩ

FEATURES

- Easy and convenient live line insulation measurements for servomotor, equipments and power line.
- 10MΩ~20MΩ insulation resistance measurements with super accurate ZCT.
- The least influence from external magnetic field and noise.
- Phase voltage and leakage is also measurable.
- 99 sets of memory storage function for measured data.

Measuring example



For insulation resistance measurements of industrial robots

LIVE LINE CLAMP INSULATION RESISTANCE TESTER

The World First Live Line Clamp Insulation Resistance Tester

Model MLIT-1

PRIMARY SPECIFICATIONS

1. VOLTAGE INPUT SECTION

Voltage Input : Phase voltage (AC 50～500V)
Single phase detection
Phase Detection Method : (Single phase detection is also used for three phase circuit)
Input Impedance : More than 1MΩ
Input Frequency : 50Hz or 60Hz switchable
Resolution : 0.1V
Input Method : Direct input by test lead

2. CURRENT DETECTION SECTION

Detection Method : Split core type ZCT
CT Inside Size : φ30㎜
CT Opening/Closing : Manual slide method
Withstanding Voltage : AC 2000V, 1 minute

3. MEASUREMENT SECTION

Measuring Function : AC Leakage current/line current, AC voltage, Insulation resistance
Measuring range
AC Leakage/Line Current : 0～AC 200.0μA/2mA/20mA/200mA (Auto-ranging)
AC Voltage : 0～500.0V (1 range)
Resolution
AC Leakage/Line Current : 0.1μA
AC Voltage : 0.1V

Insulation Resistance : Computation by current and voltage
Input Frequency : 45Hz 65Hz (50Hz/60Hz switchable)
A/D Conversion : Dual slope integration method
AC Conversion : Average sensing, true rms reading method
Display : LCD, max. 1999 count with annunciator
Over Range Indication : “OL” mark on LCD
Data Hold Indication : “DH” mark on LCD
Low Battery Indication : “B” mark on LCD
Sampling Rate : 2 times/sec (Without internal calibration)
Memory Storage : Measuring Data 99 sets
Operating Temperature : 0～40°C, < 85%RH (without condensation)
Storage Temperature : -10～60°C, < 70%RH (without condensation)
Withstanding Voltage : AC 2000V/1 minute (between CT and handle)
Limitation of Circuit Voltage : Less than AC 500V for insulated cable
Auto Power Off : Approx. 10 minutes after last key operation
Power Supply : LR6, AM-3 or AA size Alkaline battery×4

4. ACCURACY

Leakage (Io), Line (I), Resistive (Ior)

Rang		Min Resolution	Accuracy (50/60Hz)
Voltage		0.1V	0～499.9V±1.0%rdg±10dgt
I,Io	200μA	0.1μA	0～199.9μA±1.0%rdg±10dgt
	2mA	0.001mA	0.200～1.999mA±1.0%rdg±10dgt
	20mA	0.01mA	2.00～19.99mA±1.0%rdg±10dgt
	200mA	0.1mA	20.0～220.0mA±1.0%rdg±10dgt
Ior	200μA	0.1μA	0～199.9μA±1.5%rdg±15dgt
	2mA	0.001mA	0.200～1.999mA±1.5%rdg±15dgt
	20mA	0.01mA	2.00～19.99mA±1.5%rdg±15dgt
	200mA	0.1mA	20.0～220.0mA±1.5%rdg±15dgt

CLAMP EARTH TESTER

Model MET-1

Model MET-2

FEATURES

- Completely different method from the ordinary Earth Testers.
- Just clamping two CTs to the earthing conductor and no need to use auxiliary earth rod.

SPECIFICATIONS

Measuring function : Earth Resistance, AC Current (Line & Leakage)
Measuring method : Dual integration mode, Clamping Two CTs
Display : LCD, 16 letters/characters × 2 lines with contrast adjustor
Safety standard : Installation Category Ⅱ. 600V
Sampling : Approx. 2 times/second for AC current
Measuring Time : Approx. 30 second for earth resistance
Over range indication : "OVER" on LCD readout both for AC current & earth resistance
Low battery indication : "B" mark on LCD readout
Auto power off : The meter is set to power off mode, approx. 5 minutes after the power switch on.
Data hold function : "DH" mark on LCD readout.

Accuracy

Earth Resistance (MET-1)

Range	Resolution	Accuracy
200Ω	0.1 Ω	0~10Ω : ± 0.2 Ω 10~50Ω : ± 1.0 Ω 50~200Ω : ± 5.0 Ω

Earth Resistance (MET-2)

Range	Resolution	Accuracy
10Ω	0.01Ω	0.1~1Ω : ±0.1Ω 1~10Ω : ±0.5Ω
300Ω	0.1 Ω	10~50Ω : ±2.0Ω 50~150Ω : ±5.0Ω 150~200Ω : ±20Ω 200~300Ω : ±30Ω

AC Current (Max. applicable current : 20A rms)

Range	Resolution	Accuracy
200mA	0.1mA	2%rdg±8dgt
2000mA	1mA	
20A	0.01A	

AC Current (Max. applicable current : 20A rms)

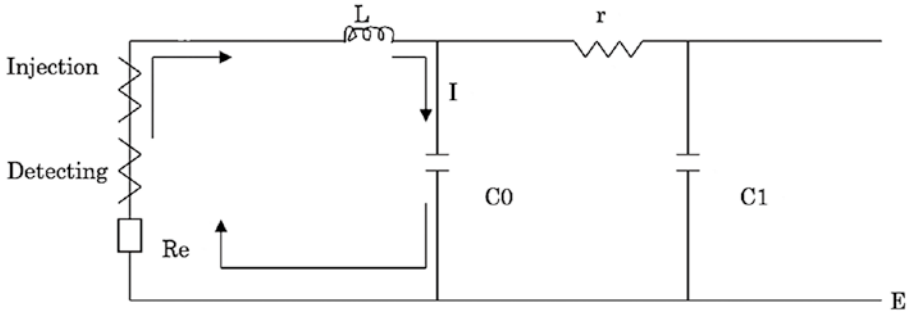
Range	Resolution	Accuracy
200mA	0.1mA	3%rdg±8dgt
2000mA	1mA	2%rdg±8dgt
20A	0.01A	2%rdg±8dgt

CT for detection : ϕ34mm
CT for superposition : ϕ34mm, auto sweep 4KHz~400KHz (MET-1) 4KHz~200KHz(MET-2)
superposing level : approx.160mVp(MET-1) approx.. 320mVp(MET-2)
Power Supply : AC100V~240V (50/60Hz) with adaptor Internal NiMH battery (1.2V × 5)
Battery life : 400 times measurement under full charged condition (according to the times of charging and discharging).
Size & weight : CT for detection 90.5(W)× 165(H)× 38(D)mm, approx. 460g
CT for superposition 90.5(W)× 165(H)× 38(D)mm, approx. 440g
Instrument body 190(W)× 140(H)× 42(D)mm, approx. 800g
Standard accessories : Detection Clamp CT····· 1 Superposition Clamp CT···· 1
AC Adaptor····· 1 Carrying case····· 1
Instruction Manual····· 1 Subsidiary lead wire..... 1

CLAMP EARTH TESTER

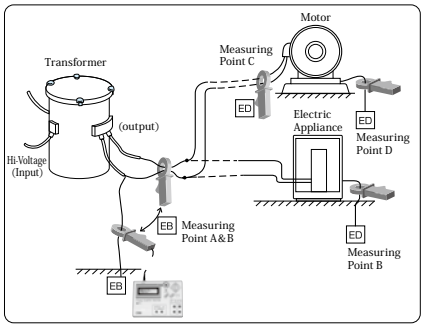
MEASURING METHOD of MET-1/MET-2 Clamp Earth Tester

In the equivalent circuit, approx.160mV p-p (MET-1) or approx.. 320mV p-p (MET-2) is injected from Injection CT by changing frequency from 4 KHz to 400 KHz (MET-1) or 4KHz to 200KHz (MET-2).
Then, the resonance will happen by L & C0 or r & C1 in the circuit and the resonance current will flow.
At the time of resonance, the current will be maximum.
By detecting this resonance current, the current value at resonance point (IZ) and synchronous current at injected frequency can be calculated and the earth resistance can be displayed.



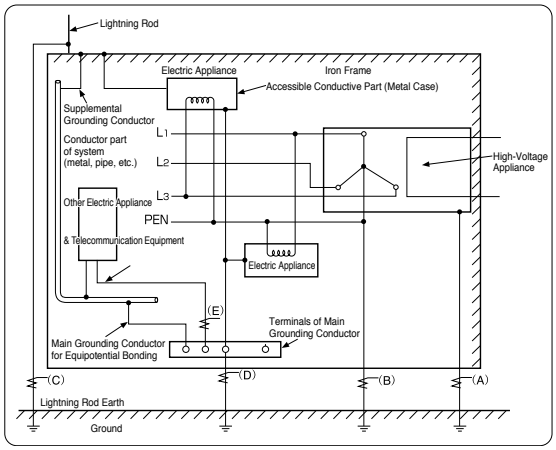
At the time of resonance by L & C0, current I will flow as the above route and can measure Re (Earth Resistance).
*Cannot measure the resistance in no-looping circuit like as grounding line connected with lightening rod but can get the value by connecting with other grounding lines, using the subsidiary lead wire.

Application Example
①Measurements for the active line



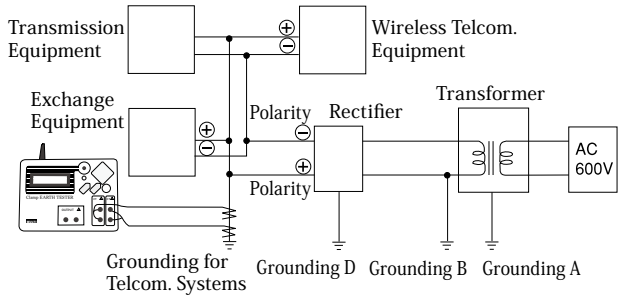
The earth resistance can be measured by clamping 2 CTs near at transformer (point A or B) and near at the electrical loading part (motor, electric appliance, etc.)

②Electric installation



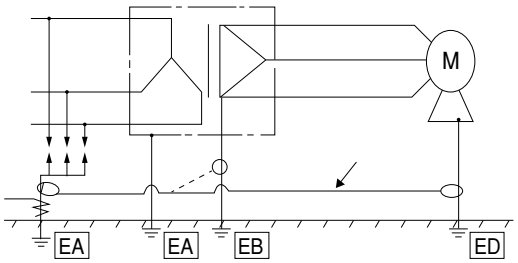
"⟿" shows the clamping point of the injection CT and the measuring CT.

③Earth resistance measurements for telecommunication system



④Measurements where L (inductance) & C (capacitance) are low

Where L & C resonance has not been gotten, this instrument may show "OVER" at the display. In this case, connect the objective grounding line (EA) to other grounding lines (EB or ED) by the subsidiary lead wire and clamp 2 CTs at the measuring point (EA). Even in the case of no resonance between L & C, the multiple earth resistance can be measured.



DIGITAL POWER RECORDER

Model MPR-601W

GENERAL

This digital power recorder can measure voltage, current, active power, power factor which are necessary for power line management and can store all measured data to USB flash memory.
After finished the measurement, pull out the flash memory from the instrument and insert it to the USB port of PC, so that you can take all data into PC and can manage them very easily.

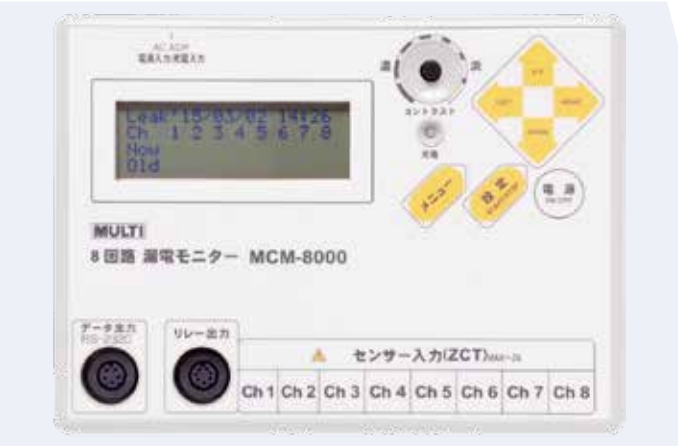
SPECIFICATIONS

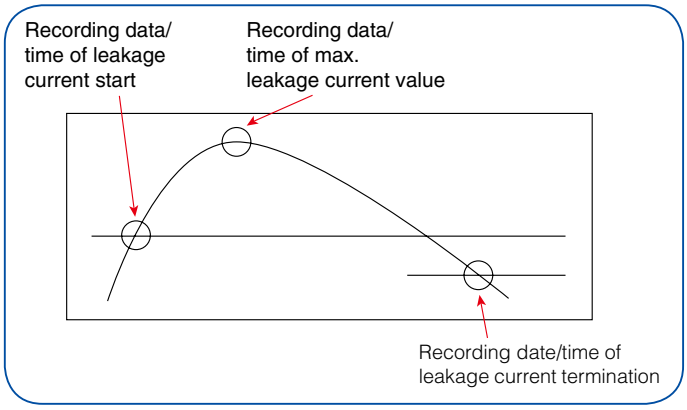
Measurement Line	: Single-phase/two wires, Single-phase/three wires, Three-phase/three wires, Three-phase/four wires
Measurement Items	: Voltage, Current, Active Power, Apparent Power, Power Factor, Frequency, Power integral (KWh).
Measuring Method	: Voltage : Standard Clip Sensor for direct source Current : CT Clamp sensor Standard/CT-40PB ϕ40㎜ max. 600A Option/CT-80PB ϕ80㎜ max. 1000A
Measurement Range	: Voltage : 0~500V Current 10/50/100/600A (Auto-range) Active Power : depends on combination of V & A range Power Factor : 0~100% Frequency : 45~65Hz Setting of PT : 1~9999 Setting of CT : 1~9999
Sampling Rate	: 2 times/sec.
AC/DC conversion	: True RMS
Crest Factor	: Voltage/less than 2 at input voltage more than AC400V Current/less than 2 at full scale input
Display	: LCD 20 letters×2 lines
Measurement Interval	: 1/5/10/15/30/60 minutes
Memory factor	: Measuring Time, Conditions and Average Voltage/Current/Active Power/Power integral/Power Factor or measuring interval. Memory Output : USB Flash Memory
Other Functions	: Measurement Start/End setting, Clock display, Battery Power Warning display, PT/CT ratio setting
Power supply	: ①AC Adaptor ②LR-6×4
Measurement Temp. & Hum.	: 0℃~50℃ /under 80%RH (without condensing)
Storage Temp. & Hum.	: -10℃~60℃ /under 80%RH (without condensing)
Dimension & Weight	: 90(W)×140(H)×42(D)㎜, approx. 800gs
Standard Accessories	: Voltage Clip Sensor (Red, Black, White, Green) /1 set Clamp-on CTϕ40㎜ /3 pcs. AC adaptor/1pce. Instruction Manual/1 pce. Hand Carrying Case/1pce.
Optional Accessories	: CT-80PB Current Sensor

MULTI CIRCUIT LEAKAGE CURRENT MONITOR

Model MCM-8000

MEASURE・MEMORIZE・DISPLAY THE LEAKAGE CURRENT OF MAX.8 CIRCUITS AT THE SAME TIME.
EASY FOR DATA MANAGEMENT（STORAGE BY CSV FORMULA）.
COST PERFORMANCE・HI-SPEED SAMPLMG W/HI FREQUENCY CUT FUNCTION.





MEASURING FUNCTION

By connecting optional CT sensors, the instrument can measure and memorize leakage current of 8 circuits at the same time and the memorized data can be seen even during measurement.

LOGGING MEASURING FUNCTION

This instrument displays and memorizes the average leakage current between the selected intervals.
Interval : 1 / 5 / 10 / 15 / 30 / 60 minutes
Contents of Memory : Measuring Time / Measuring Circuit / The average current value
Capacity of Memory : Approx. 28 days with 10 minutes interval

PEAK VALUE MEASURING FUNCTION

In case of exceeding the setting value, the instrument displays and memorizes year, month, date, time of the leakage generation & termination as well as the peak values by each circuit.
High speed sampling, comply with ELB.
Range of Setting Current : 10 ~ 1000mA
Contents of Memory : Circuit No. of generation, setting current value and times of generation.
Year / Month / Date / Time of exceeding the setting value and recovery.
Capacity of Memory : generation·recovery Year / Month / Date / Time·Peak Value 2,040 times

ELECTRICITY FAILURE COUNTING

In case of electricity failure, the instrument memorizes Year / Month / Date / Time of failure and recovery.
Capacity of Memory : Failure and recovery Year/Month / Date / Time 4,000 times

ALARM SIGNAL OUTPUT FUNCTION

In case of exceeding the setting current value, output the signal of non-voltage contact.

TRANSMISSION SOFTWARE

The memorized data can be transmitted to PC by RS-232C.
Complying Software : Windows 95/98/2000/ME/XP.
Output Data: logging measured data/peak value/ electricity failure data.

SPECIFICAIONS

No. of Circuit	8 channels
Measuring Range	0-2000mA
Min. Resolution	1mA
Sempling	approx. 20ms
Filter Function	130Hz low pass filter
Power Supply	NiMH battery or AC adapter
Dimention	190(W)×140(H)×42(D)mm
Weight	approx. 700g
Accessories	Carrying Case,AC adapter, RS232C cable,software, Instruction manual
Option	CT sensor,CT case

OPTIONAL CT SENSORS & CASE

ZCT-18SCM	ZCT-30SCM	ZCT-40SCM	ZCT-40QSCM	ZCT-80SCM	ZCT-1100SCM	CTcase (MK-001)
						
CT IDφ18mm	CT IDφ30mm	CT IDφ40mm	CT IDφ40mm	CT ID74×80mm	CT ID108×128mm	——

MINI DIGITAL CLAMP TESTER

AC/DC CURRENT

Model 230

φ 23 | AC 200A | DC 200A | DATA HOLD

FEATURES

- Useful for DC A measurement for automobile service.
- Data-hold function. Especially useful when working in dark or hard to get areas.
- Accurate gearing mechanism for closing of CT.
- Ultra compact size.

Model 240

φ 30 | AC 200A | DC 200A | DATA HOLD

FEATURES

- Ultra compact size and high accuracy AC/DC clamp-on tester.
- Data hold function. Especially useful when working in dark or hard to get areas.
- Wide range of current measurments from AC/DC 0.01A to 200A with 30㎜φ CT and up to 1000A with 40㎜φ CT.

Model 250

φ 40 | AC 1000A | DC 1000A | DATA HOLD

SPECIFICATIONS

Model	230		240		250	
Safety standard			IEC 61010-1, IEC61010-2-032 CAT.Ⅱ 600V or CAT.Ⅲ 300V			
EMC standard			EN61326			
Measuring method	Dual integration mode					
Display	3.5 digit LCD					
Range (AC/DC Current)	20A	200A	20A	200A	200A	1000A
Resolution	10mA	100mA	10mA	100mA	100mA	1A
Accuracy AC Current (50/60Hz)	±1.0%rdg±5dgt	±1.5%rdg±5dgt (0~150.0A) ±2.5%rdg±5dgt (150.0~199.9A)	±1.5%rdg±5dgt	±2.0%rdg±5dgt (0~150.0A) ±3.0%rdg±5dgt (150~199.9A)	±1.5%rdg±5dgt	±1.5%rdg±5dgt
Accuracy DC Current	±1.0%rdg±3dgt	±1.5%rdg±3dgt (0~±150.0A) ±2.5%rdg±3dgt (±150~±199.9A)	±1.5%rdg±3dgt	±2.0%rdg±3dgt (0~150.0A) ±3.0%rdg±3dgt (150~199.9A)	±1.5%rdg±5dgt	±1.5%rdg±5dgt
Jaw opening capability	23㎜φ		30㎜φ		40㎜φ	
Overload indication	Blanking of all digits except MSD1					
Maximum indication	1999					
Low battery indication	"B" mark on LCD readout					
Sampling	2 times/s					
Limitation of circuit voltage	Less than AC 600V					
Operating temperature	0 ℃ to 40℃,<80% RH					
Storage temperature	-10 ℃ to 60℃,<70% RH					
Power supply	SR-44(1.55V)×2 or LR-44×2					
Power consumption	3mW					
Battery life	SR-44 : 200 hours,LR-44 : 100 hours					
Size	48(W)×146(H)×20(D)㎜		44(W)×146(H)×20(D)㎜(H)		68.5(W)×175(H)×23(D)㎜	
Weight	Approx. 100g		Approx. 80g		Approx. 166g	
Accessories	Soft case ……1 Instruction manual ……1 Batteries(LR-44) ……2					

DIGITAL CLAMP TESTER

AC/DC CURRENT, AC/DC VOLTAGE, RESISTANCE, FREQUENCY

Model 260

φ 55 | AC 2000A | DC 2000A | DATA HOLD | AUTO POWER OFF

AC DC V | Ω | ●)) | Hz | →|—

Model 270

φ 55 | AC 2000A | DC 2000A | DATA HOLD | AUTO POWER OFF | RMS

AC DC V | Ω | ●)) | Hz | →|—

FEATURES

- Low cost high performance and average reading AC/DC clamp tester.
- 4000 count full scale display.
- Additional AC/DC voltage, resistance, frequency test, continuity check and diode test function.
- Auto power off and data hold function.
- Convenient push switch for auto zero adjustment in DC current measurement.

SPECIFICATIONS

AC conversion	: Average sensing RMS reading
Safety standard	: IEC 61010-1, IEC 61010-2-032 CATⅢ 600V
E.M.C. standard	: EN 61326.
Withstanding voltage	: AC 5500V, 1minute (Between outer case and core of CT)
Measuring method	: Dual integration mode
Jaw opening capability	: 55㎜φ
Display	: 3.5 digit LCD max. reading of 3999 and annunciators
Over renge indication	: Blanking of all digits except MSD1 (Except AC/DC 2000A range)
Low battery indication	: "⊟" mark on LCD readout
Sampling	: 2 times/s
Data hold indication	: "DH" mark on LCD readout
Auto power off	: The meter is set to power off mode approx. 10 minutes after the power swich on.
Operating temperature	: 0℃ to 40℃, <80%RH (Non-condensing)
Storage temperature	: -10℃ to 60℃, <70%RH (Non-condensing)
Power supply	: 1.5V ("AAA" size R03)×2
Power consumption and battery life	: Approx. 14mW, 100 hours continuous.
Size	: 85(W)×240(H)×34(D)㎜
Weight	: Approx. 350g
Accessories	: Carrying case……1 Instruction manual……1 Batteries……2 Test lead……1 set

Measuring ranges

Range		Resolution	Accuracy	Max. input
~A (50/60Hz) ⎓ A Manual range	40A	0.01A	± 2% rdg ± 8 dgt	AC/DC 2000A
	400A	0.1A	± 1.5% rdg ± 8dgt	
	2000A	1A		
~V (50/60Hz) ⎓ V Auto/Manual range	400mV	0.1mV	± 1.2% rdg ± 8dgt (50/60Hz)	AC/DC 600V rms
	4V	0.001V		
	40V	0.01V		
	400V	0.1V		
	600V	1V		
Hz Frequency Auto range	100Hz	0.01Hz	± 0.5% rdg ± 3dgt	AC/DC 600V rms
	1000Hz	0.1Hz		
	10kHz	0.001kHz		
	100kHz	0.01kHz		
	1000kHz	0.1kHz		
Ω (Resistance) Auto/Manual range	400Ω	0.1Ω	± 1.5% rdg ± 8dgt	input protection
	4kΩ	0.001kΩ		
	40kΩ	0.01kΩ		250V rms
	400kΩ	0.1kΩ		
	4000kΩ	1kΩ		
	40MΩ	0.01MΩ	± 3% rdg ± 10dgt	
Continuity check	400Ω	0.01Ω	Cntinuity beeper Approx. <40Ω	250V rms
Diode test	3V	0.001V	± 10% rdg ± 3dgt	250V rms

MINI DIGITAL CLAMP TESTER

AC/DC CURRENT, AC/DC VOLTAGE, RESISTANCE

Model 280

φ 30 | AC 1000A | DC 1000A | AC DC V | Ω | DATA HOLD | MAX/MIN HOLD

FEATURES

- 30㎜φ CT window and ultra compact size
- Low cost and multi-function clamp tester.
- Max. & Min.hold function
- Data-hold function and auto power off.
- One push zero adjust function for DC current range

SPECIFICATIONS

Safety Standard	: IEC 61010-1, 61010-2-032 CAT Ⅱ 600V
Measuring method	: Successive approximation mode
Display	: 4 digit LCD max. reading of 9999
Measuring range	: AC Current 1000A DC Current 1000A AC Voltage 500V DC Voltage 500V Resistance 600Ω
Jaw opening capability	: 30㎜φ
Over range indication	: "OL" mark on LCD.
Low battery indication	: "B" mark on LCD
Data hold indication	: "DH" mark on LCD
Max. display function	: "Max" mark on display, indicating max. value during measurement.
Min. display function	: "Min" mark on display, indicating min. value during measurement.
O adjustment	: for DC current range, can make display to 0 by ADJ switch.
Sampling time	: 2 times/sec
Circuit voltage	: less than AC/DC 500V.
Withstanding voltage	: AC 3700V 1 minute max. (Between the core of CT and outer case)
Operating temperature	: 0℃to~40℃<80%RH (without condensing)
Storage temperature	: -10℃to~60℃<70%RH (without condensing)
Power supply	: SR-44(1.55V)×2 or LR-44×2
Battery life	: SR-44, LR-44
Power Consumption	: Approx.12mW
Size	: 44.5 (W)×177(H)×24(D)㎜
Weight	: Approx. 95g
Accessories	: Soft case·····1 Instruction manual ·····1 Batteries, LR-44(1.55V)·2 Test Lead·····1

Accuracy (AC: 50/60Hz)

Range	Resolution	Accuracy
DC 0~600A	0.1A	±1.5%rdg±6dgt
DC 600.1~999.9A	0.1A	±3.0%rdg±6dgt
AC 0~600A	0.1A	±1.5%rdg±8dgt
AC 600.1~999.9A	0.1A	±3.0%rdg±8dgt
AC 0~500V	0.1V	±1.0%rdg±8dgt
DC 0~500V	0.1V	±1.0%rdg±6dgt
Ω 0~600	0.1Ω	±1.5%rdg±8dgt

Model 290 RMS

φ 30 | AC 400A | DC 400A | DATA HOLD | AUTO POWER OFF | RMS | AC DC V | Ω

FEATURES

- 30㎜φ CT window and compact size.
- 4000 count full scale display and true-rms reading for AC current.
- One push zero adjust function for DC current range.

SPECIFICATIONS

Safety Standard	: IEC 61010-1, 61010-2-032 CAT Ⅱ 600V
Measuring function	: AC/DC current, AC/DC voltage and Resistance
Measuring method	: Clamp CT
Jaw opening capability	: 30㎜φ
Measuring ranges	: AC/DC 40A/400A manual, AC/DC 60V/600V auto, Resistance 0-1000Ω
Change of measuring range	: By rotary switch
AC current detection	: True RMS detection
A/D conversion	: Successive approximation method
Display	: Max. 4000 count on LCD with annunciator
Over range indication	: "OL" mark on LCD
Data hold indication	: "DH" mark on LCD
Zero adjustment	: For DC current range, by "O ADJ" switch
Sampling rate	: 2 times/sec.
Low battery indication	: "B" mark on LCD
Circuit voltage	: less than AC/DC 500V
Operating temperature	: 0~40℃, < 80%RH (without condensation)
Storage temperature	: -10~60℃, < 70%RH (without condensation)
Withstanding voltage	: AC 3700V/1 minute between CT and outer case
Auto power off	: Approx. 10 minutes after power on
Power supply	: UM-4×3
Dimension	: 44(W)×180(H)×24(D)㎜
Accessories	: Soft Case, Test Lead, Batteries, Instruction Manual

Accuracy (AC: 50/60Hz)

Range	Resolution	Accuracy
DC 40A	0.01A	±1.5%rdg±3dgt
DC 400A	0.1A	±1.5%rdg±5dgt
AC 40A	0.01A	±1.5%rdg±5dgt(50/60Hz)
AC 400A	0.1A	±1.5%rdg±8dgt(50/60Hz)
AC 60/600V	0.01V	±1.0%rdg±8dgt
DC 60/600V	0.01V	±1.0%rdg±6dgt
Ω	0.1Ω	±1.5%rdg±8dgt

Crest Factor : less than 2.5

DIGITAL CLAMP TESTER

AC/DC CURRENT/LEAKAGE

Model 600 The world first high accurate AC/DC leakage current clamp-on tester.

ϕ 20 | AC 10A | DC 10A | DATA HOLD | AUTO POWER OFF | RMS | MAX/MIN HOLD

FEATURES

- Wide application for process control and automotive service.
- The world first AC/DC leakage current clamp tester with 0.1mA resolution.
- The least influence from the external magnetic field and noise with double shielding CT.
- Memory Function for MAX. and MIN. Value.
- For measurements of 4～20 mA current loop signal of transmission control.

SPECIFICATIONS

Safety standard	: IEC 61010-1, IEC 61010-2-032 CATⅡ 300V.
Measuring method	: Dual integration method with true RMS reading.
Measuring function	: DC current, AC current (true RMS reading) with automatic zero adjustment, max. hold, min. hold, data hold, auto power off
Display	: 3.5 digit LCD, max. reading of 1999
Range	: AC/DC 200mA, 2000mA, 10A
Jaw opening capability	: 20㎜ϕ
Sampling	: 1.6 times/s
Over range indication	: ”OL” mark on LCD
Data hold indication	: ”DH” mark on LCD
Low battery indication	: ”B” mark on LCD
Resolution	: 0.1mA/1mA/0.01A
Limitation of circuit voltage	: Less than AC/DC 300V
Withstanding voltage	: AC 2300V/1 minute max. between the core of CT and outer case.
Operating temperature	: 0℃～50℃, <80% RH (Non-condensing)
Storage temperature	: -20℃～60℃, <75% RH (Non-condensing)
Power supply	: 1.5V (“AA” size, UM-3)×2
Battery life	: 120 hours or more (Alkalin)
Auto power off	: The meter is set to power off mode approx. 10 minutes after the power switch on.
Size	: 76(W)×194(H)×30(D)㎜
Weight	: Approx. 340g
Accessories	: Carrying case ····· 1 Instruction manual ····· 1 Batteries ····· 2

Accuracy (AC: 50/60Hz)

Range	Resolution	Accuracy
DC 200/2000mA	0.1mA/1mA	±1.0%rdg±3dgt
DC 10A	0.01A	±1.0%rdg±10dgt
AC 200/2000mA	0.1mA/1mA	±1.0%rdg±5dgt
AC 10A	0.01A	±1.0%rdg±10dgt

PRECISE AC/DC LEAKAGE CURRENT TESTER

AC/DC CURRENT

Model 700/730/740

φ 5 | φ 30 | φ 40 | AC 10A | DC 1000mA | DATA HOLD | AUTO POWER OFF | SIGNAL OUTPUT

INSTRUMENT BODY | CTP-05DC For M-700 | CTP-30DC For M-730 | CTP-40DC For M-740

FEATURES

- The World First High Accurate AC/DC Leakage Current Testers.
- High Sensitive for Low Range Leakage Current.
- Suitable for Measurement of 4-20mA DC Controlled Circuit.
- DC mV Analog Signal Output.
- Lowest Influence from Magnetization & Terrestrial Magnetism.
- Wide Measuring Ranges - up to DC 1000mA & AC 10A.

SPECIFICATIONS

Safety Standard	: IEC61010-1/61010-2-032 CATⅡ 600V or CATⅢ 300V
Measuring function	: AC/DC current
Measuring method	: Clamp CT (CTP-05DC:Slide/Hook Type)
Jaw opening capability	: 5㎜φ (CTP-05DC), 30㎜φ (CTP-30DC), 40㎜φ (CTP-40DC)
Measuring ranges	: DC 100mA/1000mA, AC 100mA/1000mA/10A (45Hz~65Hz)
AC current detection	: Average sensing
A/D conversion	: Dual integration method
Display	: Max. 2000 count on LCD with annunciator
Over range indication	: "OL" mark on LCD
Data hold indication	: "DH" mark on LCD
Zero adjustment	: For DC current range, by "0 ADJ" switch
Sampling rate	: 1 time/sec. for DC and 6 times/sec. for AC
Low battery indication	: "B" mark on LCD
Signal Output	: DC 100mV full scale to each range (output impedance: less than 10KΩ)
Circuit voltage	: less than AC/DC 500V
Operating temperature	: 0~50℃, < 85%RH (without condensation)
Storage temperature	: -10~60℃, < 70%RH (without condensation)
Withstanding voltage	: AC 3700V/1 minute between CT and outer case
Auto power off	: Approx. 10 minutes after power on and can absolve this function by switch
Power supply	: UM-4×4
Consumption Current	: Approx. 9mA (approx. 200h for continuous use)
Dimension	: Display Part 78(W)×155(H)×32(D)㎜, approx. 280g CT (CTP-05DC) 19(W)×133(H)×28(D)㎜, approx. 100g CT (CTP-30DC) 33(W)×170(H)×24(D)㎜, approx. 165g CT (CTP-40DC) 64(W)×162(H)×23(D)㎜, approx. 130g
Accessories	: Soft Case, Batteries, Instruction Manual
Option	: Cable for Recorder

Accuracy

DC Current (After zero adjustment by 0 ADJ switch)

Range	Measuring Range	Resolution	Accuracy
100mA	0.1~±99.99mA	0.01mA	±1%rdg±10dgt
1000mA	1.0~±300mA	0.1mA	±1%rdg±10dgt
	±300.1~±700.0mA		±2%rdg±10dgt
	±700.1~±999.9mA		±3%rdg±10dgt

※ Influence of Terrestrial Magnetism : Less than ±2.0mA
※ Influence of Magnetization : Less than ±2.0mA by DC 1.5A on/off
※ Influence of CT Open/Close : Less than ±3.0mA
※ Max Input Curret : DC 1.5A (In case of over input more than DC 1.5A, output of CT will be lowered and the display will not become "OL")

AC Current

Range	Measuring Range	Resolution	Accuracy
100mA	0~99.99mA	0.01mA	±1%rdg±10dgt (50/60Hz)
1000mA	0~999.9mA	0.1mA	±1%rdg±10dgt (50/60Hz)
10A	0~9.999A	0.001A	±1%rdg±10dgt (50/60Hz)

※ Max Input Current : AC 20A

GROUND FAULT DC CURRENT MEASUREMENT IN PV SYSTEM By Model 730

1. About DC Ground Fault Current in PV System

When the ground fault occurs at the DC current side of power conditioner, DC ground fault current will circulate from the earth to the DC current side of power conditioner via grounding line of boosting transformer & AC current side of power conditioner and then, through the inverter switching circuit. Consequently, DC ground fault current will be superposed to AC current and the current disparity will occur at P&N phase by the content of ground fault current.

2. About Detection of DC Ground Fault Current in Power Conditioner

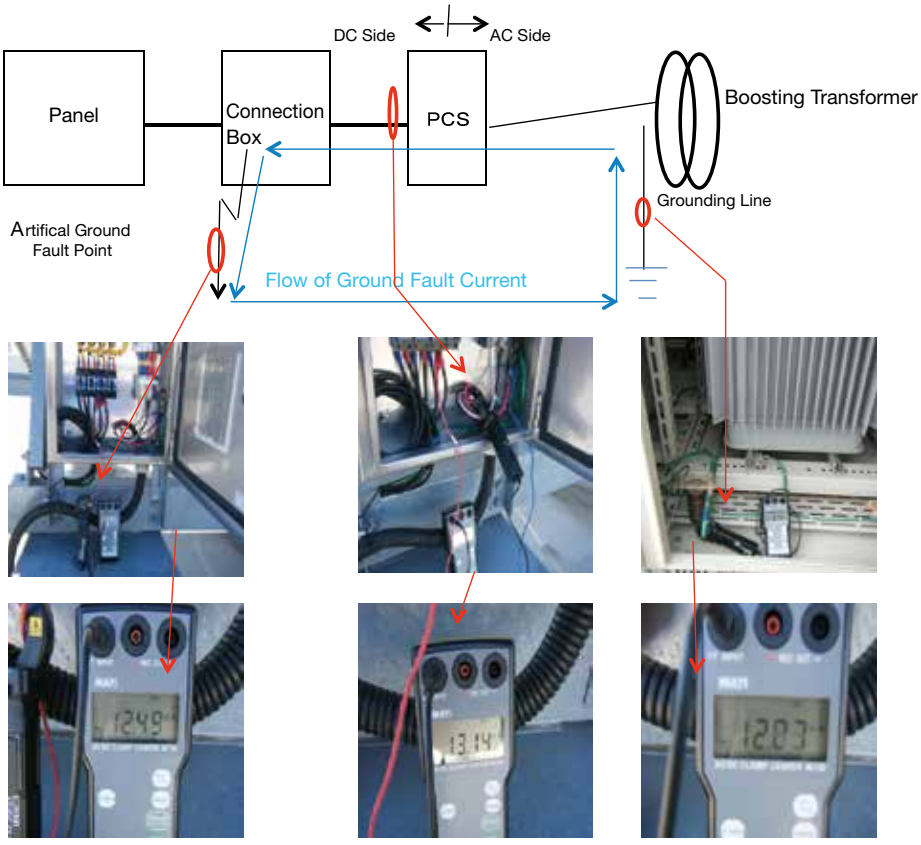
ZCT built in DC current side of the internal power conditioner is monitoring current difference between P&N phase and power conditioner will stop, when the difference exceeds the limited value.

Those limited values are different according to the power conditioner manufactures but they are generally 30mA~100mA.

3. About Measurement of DC Ground Fault Current by DC Current Clamp Tester

After making artificial ground fault (approx. 12mA), measurements of DC current at three places (grounding line of boosting transformer, DC current side of power conditioner and artificial ground fault point) were implemented by DC clamp tester (M-730).

Consequently, the measured values of these three places were almost same, which means that all the DC ground fault current flowed out to AC current end and the current difference of P&N phase at DC current side of power conditioner was almost same as DC ground fault current.



DC IN AC CLAMP TESTER

AC/DC CURRENT, AC/DC VOLTAGE, DC CURRENT IN AC CIRCUIT

Model 800P — The world first clamp tester which can detect DC current component in AC circuit

ϕ 23 | AC 150A | DC 150A | DATA HOLD | AUTO POWER OFF | RMS | AC DC V

FEATURES

Model 800P is the world's first clamp meter which can detect small DC current in AC circuit in addition to general AC/DC current measurement.

By using this clamp meter, DC offset surveillance can be made easily in the actual fields like as solar inverters, etc. and it is possible to check if the DC component in AC circuit is less than 1% of the rated AC current or not, according to the regulation.

If DC component flows into transformers

In case, the bias magnetism phenomenon may happen and it may cause DC magnetic flux in the iron core. Consequently, it may possibly have bad influence on the connected apparatus by flowing larger excitation current and there would be possibility of transformer burnout due to the selective heating.

Measuring Function	AC/DC Current (RMS), AC/DC Voltage, DC Current in AC Circuit	
AC Current	15.00A	±1.0%rdg±5dgt
	150.0A	±2.0%rdg±5dgt
DC Current	15.00A	±1.0%rdg±5dgt
	150.0A	±2.0%rdg±8dgt
AC/DC Voltage	150.0V/600V	±1.0%rdg±5dgt
DC Current in AC	% Display	
CT Inside Diam.	ϕ23mm	
Other Functions	Data Hold, Auto Power Off, One Push 0Adjust.	
Circuit Voltage	Less than AC/DC600V	
Safety Standard	IEC1010-1 CATⅡ600V	
Power Supply	AAA Size Alkaline Battery × 3	
Dimension	W48×H178×D24mm	
Weight	Approx. 120g	

MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 100

φ 18 | AC 20A | DATA HOLD

FEATURES

- Model 100 is a clamp-on type ammeter which is least affected by the external magnetic field and which is capable of measuring leakage current.
- Very small electric current flowing into a grounded wire can be measured by high sensitive current transducer.
- The current transducer uses a special alloy that resists rust over long period of use and ensures stable, high accuracy measurements with very slight influence from aging.

Model 102

φ 23 | AC 100A | DATA HOLD

FEATURES

- Useful 200mA and 100A ranges.
- Data-hold function. Especially useful when working in dark or hard to get areas.
- Ultra compact size.

Model 104

φ 33 | AC 150A | DATA HOLD

FEATURES

- 33㎜φ CT enables the leakage measurement for 60㎜ square cabtyre cable.
- Data-hold function. Especially useful when working in dark or hard to get areas.
- Ultra compact size.

SPECIFICATIONS

Model	100		102		104	
Measuring method	Dual integration mode					
Display	3.5 digit LCD					
Range	200mA	20A	200mA	100A	200mA	150A
Resolution	0.1mA	10mA	0.1mA	0.1A	0.1mA	0.1A
Accuracy (50/60Hz)	± 1.0% rdg ± 5 dgt		± 2.0% rdg ± 5 dgt			
Jaw opening capability	18㎜φ		23㎜φ		33㎜φ	
Overload indication	Blanking of all digits except MSD1					
Maximum indication	1999					
Low battery indication	"B" mark on LCD readout					
Sampling	2 times/s					
Limitation of circuit voltage	Less than AC 600V					
Operating temperature	0℃ to 40℃,<80% RH					
Storage temperature	-10℃ to 60℃,<70% RH					
Power supply	SR-44(1.55V)×2 or LR-44×2					
Power consumption	3mW					
Battery life	SR-44 : 200 hours, LR-44 : 100 hours					
Size	45(W)×140(H)×20(D)㎜		48(W)×146(H)×20(D)㎜(H)		54(W)×155(H)×20(D)㎜	
Weight	Approx.80g					
Accessories	Soft case……1 Instruction manual……1 Batteries(LR-44)……2					

MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 110

φ 30 | AC 60A | DATA HOLD

FEATURES

- Model 110 is a clamp-on type ammeter which is least affected by external magnetic fields.
- 30㎜φCT enables the leakage current measurement for SV cable (38㎟)
- Data hold function.Especially useful when working in dark or hard to get areas.
- Pocket sized and light weight.

SPECIFICATIONS

Measuring method	: Dual integration mode
Display	: 3.5 digit LCD, max.reading of 1999
Range	: 0～2mA/20mA/60A (50/60Hz)
Ranging	: Manual ranging
Jaw opening capability	: 30㎜φ
Over range indication	: Blanking of all digits except MSD1
Maximum indication	: 1999
Low battery indication	: "B"mark on LCD readout
Data hold indication	: "DH"mark on LCD readout
Sampling	: Approx. 2 times/s.
Limitation of circuit voltage	: Less than AC 600V
Operating temperature	: 0℃ to 40℃,<70% RH (Non-condensing)
Storage temperature	: -10℃to 60℃,<70%RH (Non-condensing)
Power supply	: LR-44 or SR-44×2
Power consumption	: Approx.3mW
Battery Life	: Approx.100 hours (LR-44) Approx.200 hours (SR-44)
Size	: 58.5(W)×158(H)×23(D)㎜
Weight	: Approx.120g
Accessories	: Batteries (LR-44) ····· 2 Instruction manual ····· 1 Carrying case ····· 1
Accuracy	: 50/60Hz

Range	Mini.Resolution	Accuracy
2mA	1μA	±1.0% rdg ±5 dgt
20mA	10μA	
60A	100mA	±1.0% rdg ±5 dgt(0～50A) ±5% rdg ±5 dgt (50A～60A)

MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 140

φ 40 | AC 300A | DATA HOLD | AUTO POWER OFF

FEATURES

- Wide range of current measurements (AC 0.01A～300A).

SPECIFICATIONS

Safety standard	: IEC 61010-1 , IEC 61010-2-032 CATⅡ 600V phase to earth, CATⅢ 300V
E.M.C. standard	: EN 61326.
Measuring method	: Dual integration mode
Measuring function	: Leakage current and load current
Display	: 3.5 digital LCD, max. reading of 3200
Range	: 0～30mA/300mA/30A/300A (50/60Hz)
Ranging	: 2 ranges manuals
Jaw opening capability	: 40㎜φ
Over range indication	: ”OL” mark on LCD readout
Maximum indication	: 3200 counts
Low battery indication	: 2.5V～2.7V; ” ⊞ “ mark on LCD readout
Sampling	: Approx. 2 times/s. (Digital display) Approx. 12 times/s. (Bargraph display)
Data hold indication	: ”DH” mark on LCD readout
Auto power off	: The meter is set to power off mode approx. 10 minutes after the power switch on.
Withstanding voltage	: AC3700V 1 minute max. (Between the core of CT and outer case)
Operating temperature	: 0℃ to 40℃, <80% RH (Non-condensing)
Storage temperature	: -10℃ to 60℃, <70% RH (Non-condensing)
Power supply	: LR-44 or SR-44×2
Power consumption	: Approx. 5mW
Battery life	: Approx. 50 hours (LR44)
Size	: 64(W)×162(H)×23(D)㎜
Weight	: Approx. 125g
Accessories	: Carrying case·····1 Instruction manual·····1 Batteries·····2

Accuracy

Range	Mini.Resolution	Accuracy
30/300mA	0.01mA	±1.2% rdg ±5dgt
30/300A	0.01A	0～200A : ±1.2% rdg ±5dgt 200～250A : ±3.0% rdg ±5dgt 250～300A : ±5.0% rdg ±5dgt

MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE WITH PHASE CURRENT DETECTION

Model 140HC

φ 40 | AC 300A | DATA HOLD | AUTO POWER OFF

FEATURES

- Can measure load current of CVT cable just by putting CT head without clamping
- Can measure load current of 3 phase CV cable by clamping CT in a lump
- Can judge approximate cable length from charging current & cable diameter (no loading condition)

SPECIFICATIONS

Measuring Functions	: AC Leakage Current, AC Line Current Phase Current of High Voltage Circuit(at shielded part with grounding)
Max. Applicable Conductor Diameter	: φ40m
Measuring Range	: AC Current: 0~300mA/300A(50/60Hz) Phase Current: CVT Cable 0~16A, CV Cable 0~48A
Range Switch	: mA, A, CVT Phase Current, CV Phase Current
Measuring Method	: Dual Integration Mode
Display	: Max.3200 reading with annunciators
Sampling Rage	: 2 times/sec.
Length Display Switch	: At Phase current range, approx. length of high voltage line will be displayed according to phase current value at the time of cutting off load.
Other Functions	: Data Hold, Low Battery Indication, Auto Power Off, Over Range Display
Circuit Voltage	: Less than AC600V (insulated conductors)
Withstanding Voltage	: AC2000V/1 minute between outer case & core
Operating Temperature	: 0~40℃, less than 80%RH (w/o condensation)
Power Supply	: AAA alkali battery×3
Dimension/Weight	: 64(W)×193(H)×24(D)㎜, approx. 190gs.
Standard Accessories	: Battery×3 (installed), soft carrying case, instruction manual

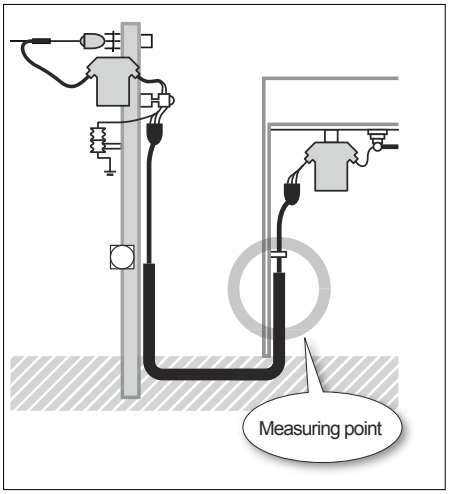
Accuracy

Range	Mini.Resolution	Accuracy
30/300mA	0.01mA	±1.2%rdg±5dgt
30/300A	0.01A	0~200A ±1.2%rdg±5dgt 200~250A ±3%rdg±5dgt 250~300A ±5%rdg±5dgt
Phase Current CVT	Estimated Value	
Phase Current CV	Estimated Value	

Field Measument Examples

	At the time of loading	At the time of no loading
Example 1	13.9A	112.5mA
Example 2	10.6A	131.5mA
Example 3	14.1A	100.5mA

The current values between loading and no loading are largely different and the safety security can be confirmed sufficiently.



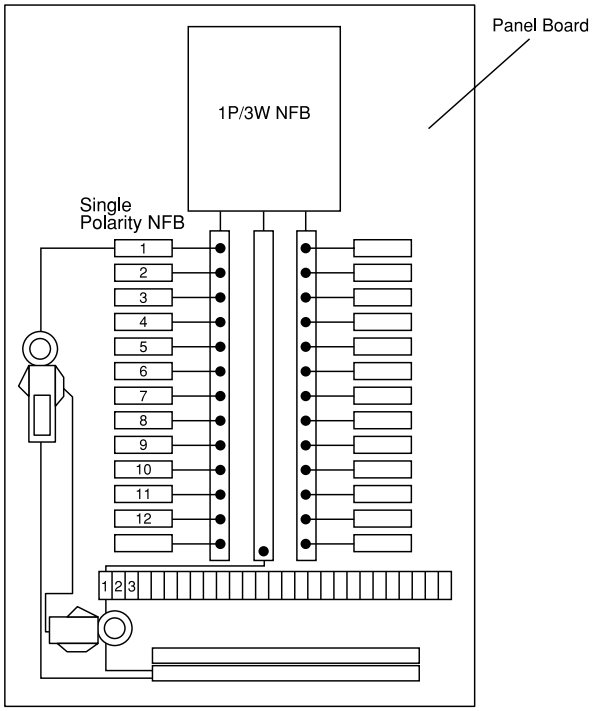
*Current of CV/CVT measurement is estimated value. *Do not apply to high voltage cable without shield.

2CT METHOD MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 2002

ϕ 40 | AC 200A | DATA HOLD | AUTO POWER OFF | RMS



FEATURES

- Leakage current detection by 2CT method
- 40㎜ϕCT window and compact size
- Wide ranges from mA up to 200A and true-rms reading
- Conform to IEC safety requirements (CAT II 600V)

Model 2002 can measure load and leakage current by general method in the same manner as ordinary clamp meters but also can detect leakage current by using 2CT method in combination with optional CT sensor even in the fields where CT cannot be clamped to two wires in the single phase system.

SPECIFICATIONS

1) CURRENT DETECTION PART (Instrument CT)

Inside diameter	: ϕ40㎜
Withstanding voltage	: AC 2000V/1 minute between CT core and grip

2) MEASURING PART

Measuring function	: Line Current, Leakage Current, 2CT Leakage Current
Measuring method	: Clamp CT
Measuring range	: Leakage Current 0～200mA/2000mA (50/60 Hz) Line Current 0～20A/200A (50/60 Hz)
Range selection	: 4 range manual
AC current detection	: True RMS
A/D conversion	: Equivalent dual integration mode
Sampling rate	: 2 times/sec.
Display	: Max. 1999 reading with annunciators
Over range indication	: “OL” mark on LCD
Data hold indication	: “DH” mark on LCD
Low battery indication	: “B” mark on LCD

3) GENERAL SPECIFICATION

Circuit voltage	: less than AC 600V
Operating temperature	: 0℃～40℃ < 85%RH without condensation
Storage temperature	: -10℃～60℃, < 80%RH without condensation
Withstanding voltage	: AC 2000V/1 minute between CT core and grip
Power supply	: LR03×3 pcs.
Dimension	: 64(W)×1950(H)×24(D)㎜
Standard accessories	: LR03 battery…3 (installed in the body case), Instruction manual…1, Soft Case…1, Spare CT (CT-05-2)…1
Option	: Spare CT ZCT-18-2

Spare CT CT-05-2
Inside diameter : ϕ5㎜
Dimension : 25(W)×113(H)×19(D)

Spare CT ZCT-18-2 (Option)
Inside diameter : ϕ18㎜
Dimension : 45(W)×140(H)×20(D)

4) ACCURACY

Range	Resolution	Accuracy(50Hz/60Hz)
AC 1000mA	0.01mA	±1%rdg ±10dgt
AC 10A	0.001A	
AC 20A	0.01A	
AC 200A	0.1A	Primary Current 0～100A±1%rdg±10dgt
		Primary Current 101～150A±3%rdg±10dgt
		Primary Current 151～200A−6%rdg±10dgt

MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 310

ϕ 40 | AC 300A | DATA HOLD | AUTO POWER OFF

FEATURES

- The unique “U” type direct touch CT enables to measure the current of single & three phase circuit just by touching the conductors and it is suitable for the AC current measurement of narrow & congested circuit.

SPECIFICATIONS

Measuring method	: Dual integration mode
Measuring function	: Leakage current and load current
Display	: 3.5 digital LCD, max. reading of 3200
Over range indication	: ”OL” mark on LCD readout
Maximum indication	: 3200 counts
Low battery indication	: 2.5V～ 2.7V; “⊞” mark on LCD readout
Sampling	: Approx.2 times/s. (Digital display) Approx.2 times/s. (Bargraph display)
Data hold indication	: ”DH” mark on LCD readout
Auto power off	: The meter is set to power off mode approx. 10 minutes after the power switch on.
Operating temperature	: 0℃ to 40℃, < 80% RH (Non-condensing)
Storage temperature	: -10℃ to 60℃, < 70% RH (Non-condensing)
Power supply	: LR-44 or SR-44×2
Power consumption	: Approx. 5mW
Battery life	: Approx. 50 hours (LR44)
Size	: 64(W)×180(H)×21(D)
Weight	: Approx.135g
Accessories	: Carrying case·····1 Instruction manual·····1 Batteries·····2

40㎜ϕCT

Range : 0 ～ 30mA/300mA/30A/300A(50/60Hz)
Ranging : 2 ranges manuals
Accuracy

Range	Resolution	Accuracy
30/300mA	0.01mA	±1.2% rdg ±5 dgt
30/300A	0.01A	0～200A : ±1.2% rdg ±5 dgt 200～250A : ±3.0% rdg ±5 dgt 250～300A : ±5.0% rdg ±5 dgt

Jaw opening capability : 40㎜ϕ

“U”Type CT

Range : 300A (Resolutoin 0.1A)
Accuracy

Single Phase IV Conductor	±5%
Parallel VVF Conductor	±5%
Three Phase VVR Conductor	Estimated Value

Max Measurement Conductor : 20㎜ϕ

MINI DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 340

φ 40 | AC 60A | DATA HOLD | AUTO POWER OFF

FEATURES

- Model 340 is a clamp-on type ammeter which is least affected by external magnetic fields.
- Enabled high resolution measurement with 40 ㎜φ CT by our new CT technology.

SPECIFICATIONS

Safety standard	: IEC 61010-1 , IEC 61010-2-032 CATⅡ 600V CATⅢ 300V
Measuring method	: Dual integration mode
Display	: 3.5 digit LCD,max. reading of 1999
Range	: 0～2mA/20mA/60A (50Hz)
Ranging	: Manual ranging
Jaw opening capability	: 40㎜φ
Over range indication	: Blanking of all digits except MSD1
Maximum indication	: 1999
Low battery indication	: ”B”mark on LCD readout
Data hold indication	: ”DH”mark on LCD readout
Sampling	: Approx. 2 times/s.
Operating temperature	: 0℃ to 40℃,<70% RH (Non-condensing)
Storage temperature	: -10℃ to 60℃,<70% RH (Non-condensing)
Power supply	: LR-44 or SR-44×2
Power consumption	: Approx. 3.5mW
Battery life	: Approx. 80 hours (LR-44) Approx.160 hours (SR-44)
Size	: 68.5(W)×175(H)×23(D)㎜
Weight	: Approx. 145g
Accessories	: Batteries (LR-44) ·····2 Instruction manual·····1 Carrying case·····1
Accuracy	: 50/60Hz

Range	Mini.Resolution	Accuracy
2mA	1μA	±1.0% rdg ±5 dgt
20mA	10μA	
60A	100mA	±1.0% rdg ±5 dgt(0～50A) ±5% rdg ±5 dgt (50A～60A)

CLAMP TESTER

AC CURRENT/LEAKAGE

Model MCL-350

φ 40 | AC 500A | DATA HOLD | FILTER SWITCH | SIGNAL OUTPUT | AC V | Ω

FEATURES

- High accuracy analog display with strong taut band meter.
- 3 years long battery life.
- Meter lock function and data output for recorder.
- Filter circuit for high frequency noise rejection.

SPECIFICATIONS

Current	AC 0～10mA/50mA/500mA/1A 5A/50A/500A
Accuracy	±3% of F.S. (50/60Hz)
Voltage	AC 0～500V
Accuracy	±3% of F.S. (50/60Hz)
Resistance	0～1KΩ(25Ωcenter)
Accuracy	±3% of scale length
Data output	DC 100mV (Full scale)
Affection of magnetic field	3mA or less (At 100A near by conductor)
Safety standaed	IEC 61010-1, IEC 61010-2-032CATⅡ 600V CATⅢ 300V
E.M.C. standard	The instrument meets EN 61326 (2004).
Operating temperature	0℃ to 40℃,<80% RH
Storage temperature	-10℃ to 60℃,<70% RH
Power supply	1.5V (“AAA”size,UM-4)×2
Size	65(W)×210(H)×34(D)㎜
Weight	Approx. 400g (Included batteries)
Accessories	Carrying case ·····1 Instruction manual ·····1 Batteries (UM-4) ·····2 Spare fuse ·····1 Test lead·····1set

Model MCL-500DFN

φ 40 | AC 500A | DATA HOLD | FILTER SWITCH | AC V | Ω | AUTO POWER OFF | RMS

FEATURES

- Digital clamp-on tester with wide range of current measurement from 0.01mA to 500A.
- Filter circuit for high frequency noise rejection.

SPECIFICATIONS

Measuring method		Dual integration mode	
Display		3.5digit LCD	
Accuracy		(23℃±5℃, 80% RH or less)	
AC Current	Range	Resolution	Accuracy
	40mA	0.01mA	±1.0% rdg ±8dgt
	400mA	0.1mA	
	4A	0.001A	
	40A	0.01A	
	500A	0.1A	±1.0% rdg ±3%FS
AC Voltage	500V	0.1V	±1.0% rdg ±8dgt
Resistance	2KΩ	0.001KΩ	±1.2% rdg ±5dgt
	20KΩ	0.01KΩ	
	200KΩ	0.1KΩ	
Jaw opening capability		40㎜φ	
Over Range Indication		[OL]mark on LCD readout	
Maximum indication		4000 coumt	
Low battey indication		“B” mark on LCD readout	
Sampling		2 times/s	
Limitation of circuit voltage		Less than AC 600V	
Data hold indication		“D･H” mark on LCD readout	
Power supply		1.5V(“AAA”size,LRO3)×3	
Size		70(W)×223(H)×34(D)㎜	
Weight		Approx. 440g (Included batteries)	
Accessories		Carrying case ·····1 Instruction manual ·····1 Batteries(LRO3) ·····3 Test lead·····1set	

DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model MCL-800D

74×80 | AC 1000A | DATA HOLD | FILTER SWITCH | SIGNAL OUTPUT

FEATURES

- 80㎜φCT window.
- DC mV analog data output for recorder.
- The least affection from external magnetic field.
- Continuous long time measurement and useful data hold function.

SPECIFICATIONS

Measuring method	Dual integration mode	
Display	3.5 digit LCD	
Accuracy		
Range	Resolution	Accuracy
200mA	0.1mA	±2.0% rdg ±5dgt (50/60Hz)
2A	1mA	
20A	10mA	
200A	0.1A	
1000A	1A	
Jaw opening capability	80㎜φ	
Overload indication	Blanking of all digits except MSD1	
Maximum indication	1999	
Low battery indication	"B" mark on LCD readout	
Sampling	2 times/s	
Data hold indication	"D·H" mark on LCD readout	
Data output	DC 100mV (Full count)	
Withstanding voltage	AC2000V	
Limitation of circuit voltage	Less than AC 600V	
Operating temperature	0℃ to 40℃,<80% RH	
Storage temperature	-10℃ to 60℃,<70% RH	
Power supply	UM-4 (1.5V)×2	
Power consumption	3mW	
Battery life	350hours (By alkaline batteries)	
Size	138(W)×225(H)×37(D)㎜	
Weight	Approx. 500g	
Accessories	Carrying case ·····1 Instruction manual ·····1 Batteries(UM-4) ·····2	

Model M-1800

74×80 | AC 1800A | DATA HOLD | SIGNAL OUTPUT

FEATURES

- 80㎜φCT window and continuous long time measurement.
- DC mV analog data output for recorder.

SPECIFICATIONS

Measuring method	Dual integration mode	
Display	3.5 digit LCD	
Accuracy		
Range	Resolution	Accuracy
20A	10mA	±3.0% rdg ±3dgt (50/60Hz)
200A	0.1A	
1800A	1A	
Jaw opening capability	80㎜φ	
Overload indication	Blanking of all digits except MSD1	
Maximum indication	1999	
Low battery indication	"B" mark on LCD readout	
Sampling	2 times/s	
Data hold indication	"D·H" mark on LCD readout	
Data output	DC 100mV (Full count)	
Withstanding voltage	AC2000V	
Limitation of circuit voltage	Less than AC 600V	
Operating temperature	0℃ to 40℃,<80% RH	
Storage temperature	-10℃ to 60℃,<70% RH	
Power supply	UM-4(1.5V)×2	
Power consumption	3mW	
Battery life	350hours (By alkaline batteries)	
Size	138(W)×225(H)×37(D)㎜	
Weight	Approx. 500g	
Accessories	Carrying case ·····1 Instruction manual ·····1 Batteries(UM-4) ·····2	

BIG WINDOW DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model MCL-1100D

108×128 | AC 3000A | DATA HOLD | AUTO POWER OFF | FILTER SWITCH | SIGNAL OUTPUT | RMS

FEATURES

- 108×128㎜ big CT window.
- DC mV analog data output for recorder.
- Wide ranges for 0.1mA～3000A

SPECIFICATIONS

Safety Standard	CAT.Ⅱ 600V	
Measuring method	True RMS reading	
Display	3.5 digit LCD	
Accuracy		
Range	Resolution	Accuracy
300mA	0.1mA	±1.5% rdg ±8dgt (50/60Hz)
3A	0.001A	
30A	0.01A	
300A	0.1A	
3000A	1A	
Jaw opening capability	108㎜φ	
Overload indication	“OL” mark on LCD	
Maximum indication	3200	
Low battery indication	“B” mark on LCD readout	
Sampling	2 times/s	
Data hold indication	“D•H” mark on LCD readout	
Data output	DC 300mV (Full count)	
Withstanding voltage	AC3700V	
Limitation of circuit voltage	Less than AC 500V	
Operating temperature	0℃ to 40℃,<80% RH	
Storage temperature	-10℃ to 60℃,<70% RH	
Power supply	UM-4(1.5V)×2	
Power consumption	6mW	
Battery life	200hours (By alkaline batteries)	
Size	194(W)×341.5(H)×52(D)㎜	
Weight	Approx. 1900g	
Accessories	Carrying case ·····1 Instruction manual ·····1 Batteries(UM-4) ·····2	

Model MCL-3000D

108×128 | AC 3000A | DATA HOLD | AUTO POWER OFF | FILTER SWITCH | SIGNAL OUTPUT | RMS

FEATURES

- 108×128㎜ big CT window.
- DC mV analog data output for recorder.
- Wide ranges for 0.01A～3000A

SPECIFICATIONS

Safety Standard	CAT.Ⅲ 600V	
Measuring method	True RMS reading	
Display	3.5 digit LCD	
Accuracy		
Range	Resolution	Accuracy
30A	0.01A	±1.5% rdg ±8dgt (50/60Hz)
300A	0.1A	
3000A	1A	±2.0% rdg ±8dgt
Jaw opening capability	108㎜φ	
Overload indication	“OL” mark on LCD	
Maximum indication	3200	
Low battery indication	“B” mark on LCD readout	
Sampling	2 times/s	
Data hold indication	“D•H” mark on LCD readout	
Data output	DC 300mV (Full count)	
Withstanding voltage	AC5550V	
Limitation of circuit voltage	Less than AC 500V	
Operating temperature	0℃ to 40℃,<80% RH	
Storage temperature	-10℃ to 60℃,<70% RH	
Power supply	UM-4(1.5V)×2	
Power consumption	6mW	
Battery life	200hours (By alkaline batteries)	
Size	194(W)×341.5(H)×52(D)㎜	
Weight	Approx. 1850g	
Accessories	Carrying case ·····1 Instruction manual ·····1 Batteries(UM-4) ·····2	

3CT METHOD LEAKAGE CURRENT METER

AC CURRENT/LEAKAGE

Model MCL-4000F

φ 36 | AC 800A | DATA HOLD | FILTER SWITCH | SIGNAL OUTPUT

New Method-Can Measure Leakage Current
by clamping 3 or 4 CTs respectively to the conductors

GENERAL

Most suitable to measure the leakage current in the fields where one CT cannot be clamped to the wires en bloc and also, this model can measure each line current up to AC 800A.

SPECIFICATIONS

(Display Part)

Measuring Range	: AC 0～2000mA/0～800A
Accuracy	: ±1%rdg±5dgt
Measuring Method	: Dual integration mode
Sampling Rate	: 2 times/sec.
Filter Function	: Hi-Frequency Cut (LPF=130Hz)
DC mV Output	: 100mV F.S.
Power Supply	: UM-4 (1.5V)×2
Size & Weight	: 130×200×38㎜, 500g

(CT Part)

Diameter	: φ36㎜
Applicable Current	: less than AC 800A
Circuit Voltage	: less than 600V
Remanence	: less than 10mA at 100A
Size & Weight	: 100×130×25㎜, 420g
Cable Length	: 3m

Accesories

3 CTs, Carrying Case, Batteries and Instruction Manual

Option : CT for 3P/4W. (Model No. MCL-4000F-NCT)

Io/Ior DIGITAL CLAMP TESTER

Ior (RESISTIVE) LEKAGE CURRENT MEASUREMENT

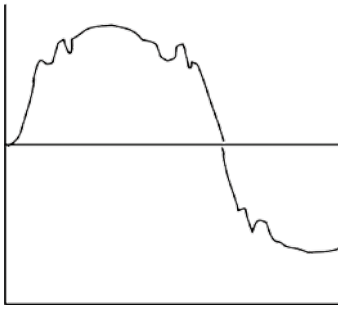
BACKGROUND

Nowadays, many harmonics and high-frequency current are contained to leakage current of grounding line and or other circuits due to spread of high-frequency electric apparatus with inverter, converter, etc. and the measured values by different instruments are not same even at the same measuring point.

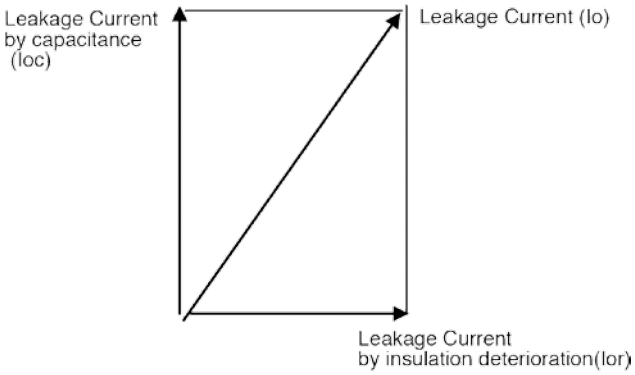
Generally, leakage current contains the resistive component (Ior) which flows to the ground by insulation deterioration and also, the capacitive component (Ioc) which flows by electrostatic capacity caused from above high-frequency and harmonics.

The actual insulation deterioration should be related with only Ior but ordinary leakage clamp testers can measure only Io (vector between Ior & Ioc as under drawings) and cannot judge what kind of leakage current is flowing

Drawing No.1
Current Wave Form
containing harmonics (Example)



Drawing No.2
Vector of Leakage Current Components

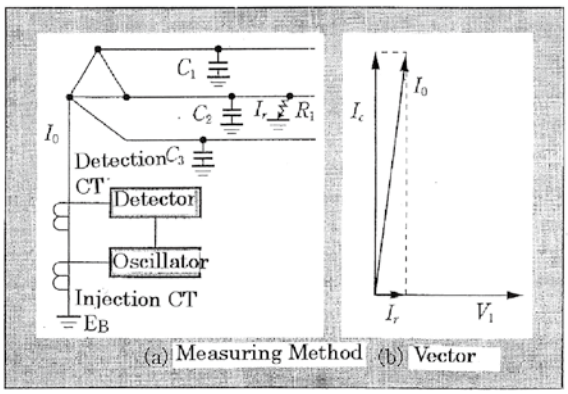


MEASURING METHODS FOR RESISTIVE LEKAGE CURRENT

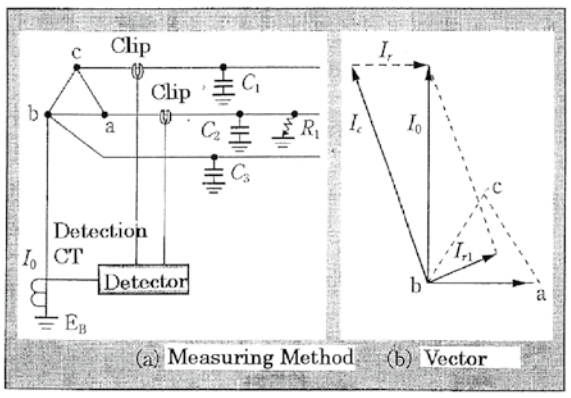
There are mainly two methods for measuring resistive component of leakage current as followings:

1. Igr Method - Inputting a certain fixed low range frequency to the circuit by injection CT.

2. Ior Method – Measuring synchronous current based on the circuit voltage inputted to clamp tester.



Drawing No. 3 Igr Method



Drawing No. 4 Ior Method

We are adopting Ior method to all our Io/Ior Digital Clamp Testers (except for model MCL-400IR), as Igr method is very difficult to have injection CT in the actual measuring fields.

Our new models MCL-500IRV, 340IRV & MCL-800IRV have non-contact voltage sensors which enable more safely measurement without touching voltage terminals.

Also, model MCL-400IR has very unique method, detecting harmonics (5th & 7th) and measuring resistive component by calculations without voltage input.

Non-Contact Io/Ior DIGITAL CLAMP TESTER

AC CURRENT/LEAKAGE

Model 340IRV

ϕ 40 | AC 60A | DATA HOLD | AUTO POWER OFF | Ior

Mini Type, easy to hand carry

Model MCL-500IRV

ϕ 40 | AC 500A | DATA HOLD | AUTO POWER OFF | Ior | AC V

Wide Range, measurable from mA to Line Current up to 500A

Model MCL-800IRV

ϕ 80 | AC 10A | DATA HOLD | AUTO POWER OFF | Ior | AC V | MΩ

Big Window CT, High Precision

FEATURES

Integrated Non-contact Voltage Input Type Clamp Leaker.
*Safety: Available voltage input from the coated conductors (not touching voltage terminal)
*Convenience: Built-in LCD display combined with clamp CT.
It is getting more & more difficult to check the insulation conditions by ordinary Io leakage current due to spread of inverter appliances, etc.
By detecting resistive leakage current (Ior), management of insulation conditions can be made more accurately on the live lines.

SPECIFICATIONS

Model	MCL-340IRV	MCL-500IRV	MCL-800IRV
AC Current	10mA/100mA/60A	40mA/400mA/4A/40A/500A	10mA/100mA/1000mA/10A
AC Voltage	----------	0 - 500V	0 - 500V
MΩ Display	----------	---------	Calculation by A & V
CT Inside Diameter	ϕ40mm	ϕ40mm	Φ80mm
Minimum Resolution	0.001mA	0.01mA	0.001mA
Sampling Rate	2 times/sec.	2 times/sec.	2 times/sec.
Filter Function	----------	When measuring I & Io	----------
Other Functions	Over Range Display, Data Hold, Low Battery Indication & Auto Power Off		
Dimension	44(W)x200(H)x24(D)mm	70(W)x223(H)x34(D)mm	71(W)x315(H)x34(D)mm
Weight	approx. 210g	approx. 440g	approx. 750g
Power Supply	AAA Size Alkaline Battery (LR03) x 3 pcs.		
Accessories	Battery(LR03) x 3, Non-contact Voltage Sensor x 1, Carrying Case x 1, Instruction Manual x 1, Direct Voltage Input Test Lead x 1 (MCL-500IRV & MCL-800IRV)		

ACCURACY

M-340IRV

	Range	Resolution	Accuracy	
I,Io	10mA	0.001mA	0~9.999mA	±1.0%rdg±10dgt
	100mA	0.01mA	0~99.99mA	
	60A	0.01A	0~49.99A	
			50A~59.99A	±3.0%rdg±10dgt
Non-contact Ior	10mA	0.001mA	0~9.999mA	±3.0%rdg±20dgt
	100mA	0.01mA	10~99.99mA	±2.5%rdg±20dgt

MCL-500IRV

	Range	Resolution	Accuracy	
I,Io	40mA	0.01mA	0.40mA~39.99mA	±1.0%rdg±10dgt
	400mA	0.1mA	40.0mA~399.9mA	
	4A	0.001A	0.4A~3.999A	
	40A	0.01A	4.0A~39.99A	
	500A	0.1A	40.0A~499.9A	±1.0%rdg±3.0%F.S
Direct contact Ior	40mA	0.01mA	0.40mA~39.99mA	±1.5%rdg±15dgt
	400mA	0.1mA	4.0mA~399.9mA	±1.2%rdg±15dgt
	4A	0.001A	0.04A~3.999A	
Non-contact Ior	40mA	0.01mA	0.40mA~3.99mA	±3.0%rdg±20dgt
			4.00mA~39.99mA	±1.5%rdg±15dgt
	400mA	0.1mA	4.0mA~39.9mA	±3.0%rdg±20dgt
			40.0mA~399.9mA	±1.5%rdg±15dgt
	4A	0.001A	0.040A~0.399A	±3.0%rdg±20dgt
			0.400A~3.999A	±1.5%rdg±15dgt
V	500V	0.1V	10.0V~499.9V	±1.0%rdg±8dgt

MCL-800IRV

	Range	Resolution	Accuracy	
I,Io	10mA	0.001mA	0.010mA~9.999mA	±1.0%rdg±10dgt
	100mA	0.01mA	10.00mA~99.99mA	
	1000mA	0.1mA	100.0mA~999.9mA	
	10A	0.001A	1.000A~9.999A	
Direct contact Ior	10mA	0.001mA	0.010mA~9.999mA	±1.5%rdg±20dgt
	100mA	0.01mA	10.00mA~99.99mA	±1.5%rdg±15dgt
	1000mA	0.1mA	100.0mA~999.9mA	
	10A	0.001A	1.000A~9.999A	
Non-contact Ior Single Phase	10mA	0.001mA	0.100mA~9.999mA	±2.0%rdg±20dgt
	100mA	0.01mA	10.00mA~99.99mA	±2.0%rdg±15dgt
	1000mA	0.1mA	100.0mA~999.9mA	
	10A	0.001A	1.000A~9.999A	
Non-contact Ior (△)	10mA	0.001mA	0.500mA~4.999mA	±3.0%rdg±40dgt
			5.000mA~9.999mA	±2.0%rdg±15dgt
	100mA	0.01mA	10.00mA~99.99mA	±2.0%rdg±15dgt
	1000mA	0.1mA	100.0mA~999.9mA	
	10A	0.001A	1.000A~9.999A	
V	500V	0.1V	10.00V~499.9V	±1.0%rdg±8dgt

Io/Ior MINI DIGITAL LEAKAGE CLAMP TESTER

Io Ior AC CURRENT/LEAKAGE,HARMONICS,VOLTAGE RESISTANCE

Model MCL-400IR

φ 40 | AC 300A | DATA HOLD | AUTO POWER OFF | Ior | AC V

FEATURES

- Can measure the resistive leakage current (Ior) of the grounding lines and other electric circuit without voltage input.

SPECIFICATIONS

1) CT Sensor

Inside Diameter of CT : 40㎜
Influence of External Magnetic Field : less than 5mA nearby 100A conductor.
Withstanding Voltage: AC2200V, 1 minute

2) Measuring Part

Measuring Function : load current, leakage current (Io), resistive leakage current (Ior),harmonics current & voltage (fundamental, 3rd, 5th, 7th, 11th, & 13th), AC voltage.
Measuring Method : CT clamp-on method
Measuring Range : 0-40mA, 400mA, 4A, 40A, 300A. 0～500V
Input Frequency : 45-65Hz
Detection Method : RMS detection through average rectification
A/D Conversion : double integration method
Display : 3.5 digit LCD, max. reading of 4000
Sampling Rate : 2 times/second, 1 time/6 seconds for Ior
Over Range Indication : "OL" mark on LCD readout
Low Battery Indication : Battery mark on LCD readout
Auto Power Off : automatically power off approx. 10 minutes after the final key operation
Data Hold Indication : "DH" mark on LCD readout
Power Supply : 1.5V ("AAA" size, um-4)x3 or AC adaptor (option)
Power Consumption : Approx. 8mA (approx.60 hours with continuous use).
Limitation of Circuit Voltage : Less than AC 500V
Operating Temperature: 0℃～40℃, <80%RH (non-condensing)
Storage Temperature : -10℃～60℃, <70%RH (non-condensing)
Size & Weight : 70(W)×223(H)×34(D)㎜
Approx. 440gs including batteries

Range	Resolution	Accuracy
AC 40mA	0.01mA	±1.0% rdg ± 8 dgt
AC 400mA	0.1mA	
AC 4A	0.001mA	
AC 40A	0.01A	
AC 300A	0.1A	±1.0% rdg ± 1%FS
AC 600V	0.1V	±1.0% rdg ± 8 dgt

Model MCL-550D

φ 55 | AC 1000A | DATA HOLD | AUTO POWER OFF | AC DC V | Ω | ●))) | →|

FEATURES

- 55mmφCT window and Multi Function
- AC Leakage/Line Current up to 1000A
- AC/DC Voltage, Resistance, Continuity Check & Diode Test

SPECIFICATIONS

Safety standard : IEC1010-1, CATⅢ 600V
Measuring function : AC current, AC/DC voltage and Resistance
Measuring method : Clamp CT
Jaw opening capability: 55mmφ
Measuring ranges : AC 2000mA/200A/1000A manual, AC/DC 2VΩ600V auto, Resistance 200Ω～20MΩ auto
Change of measuring range : By rotary switch
AC current detection : Dual integration mode
Display : Max.1999 count on LCD with annunciator
Over range indication : Blanking of all digits except MSD1
Data hold indication : "DH" mark on LCD
Sampling rate : 2 times/sec.
Low battery indication : "B" mark on LCD
Circuit voltage : ess than AC/DC 600V
Operating temperature: 0～40℃, < 80%RH (without condensation)
Storage temperature : -10～60℃, < 70%RH (without condensation)
Auto power off : Approx. 10 minutes after power on
Power supply : Battery "AAA" size (1.5V) x 2
Dimension/Weight : 85(W)×240(H)×34(D)mm, approx. 350g
Accessories : Carrying Case, Test Lead, Batteries, Instruction Manual

Range		Accuracy
~A (50/60Hz) Manual range	2000mA	± 1.2% rdg ± 10 dgt
	200A	± 1.2% rdg ± 10 dgt
	1000A	± 1.2% rdg ± 8 dgt
~ACV (50/60Hz) ----DCV Auto range	2V	± 0.7% rdg ± 5 dgt
	20V	± 1.2% rdg ± 5 dgt
	200V	± 1.2% rdg ± 5 dgt
	600V	± 1.2% rdg ± 5 dgt
Ω (OHM) Auto range	200Ω	± 1.2% rdg ± 5 dgt
	2KΩ	± 1.2% rdg ± 5 dgt
	20KΩ	± 1.2% rdg ± 5 dgt
	200KΩ	± 1.2% rdg ± 5 dgt
	2000K Ω	± 1.2% rdg ± 5 dgt
	20M Ω	± 3% rdg ± 10 dgt
Continuity check	2KΩ	Continuity beeper <Approx. 300 Ω
Diode Test	2V	± 10% rdg ± 3 dgt

DIGITAL HARMONICS TESTER

Model HWT-301 Harmonics measurements on current and voltage for the electric line

φ 40 | AC 300A | DATA HOLD | AUTO POWER OFF | RMS | AC V | Ω

FEATURES

- The best monitor for determining harmonic distortion levels in the field use.
- Measures harmonics voltage and harmonics current flow up to the 25th harmonic.
- Measures leakage current, load current, voltage with true rms reading.
- Small size, light weight, low cost.
- Easy to use with clamp-on operation.

SPECIFICATIONS

General Specification

Measuring method	: Dual integration mode with true rms reading
Measuring function	: Load current, leakage current, harmonics current, voltage, harmonics voltage, resistance
Safety standard	: IEC 61010-1, IEC 61010-2-032 CATⅡ 600V, CATⅢ 300V
E.M.C. standard	: EN 61326
Affection of magnetic fields	: Less than 3mA (100A nearby conductor)
Display	: 3¾digit LCD, max. reading of 4000
Input frequency	: 45Hz~65Hz
Sampling time	: 2 times/s
Over range indication	: "OL" mark on LCD readout
Low battery indication	: "⊟" mark on LCD readout
Data hold indication	: "DH" mark on LCD readout
Jaw opening capability	: 40mmφ
Withstanding voltage	: AC 3700V/1 minute max. (Between the core of CT and outer case)
Operating temperature	: 0℃±40℃, <80%RH (Non-condensing)
Storage temperature	: -10℃~60℃, <70%RH (Non-condensing)
Power supply	: 1.5V ("AAA" size, R03)×3
Power consumption	: Approx. 13mA
Auto power off	: The meter is set to power off mode at approx. 20 minutes after the power switch on.
Battery life	: Approx. 50 hours continuous (By manganese battery)
Size	: 70(W)×223(H)×34(D)mm
Weight	: Approx. 440g
Accessories	: Batteries ·····3 Carrying case ·····1 Instruction manual·····1

Measuring Ranges

All pass mode

AC Current (True rms)

Range	Resolution	Accuracy
400mA	0.1mA	±1.0% rdg ±8dgt
4A	1mA	
40A	10mA	
300A	100mA	±1.0% rdg ±1% of full scale

AC Voltage (True rms)

Range	Resolution	Accuracy	Input impedance	Max. input voltage
400mV	0.1mV	±1.0% rdg ±8dgt	>10MΩ	AC 250V rms
400V	100mV			AC 450V rms

Resistance

Range	Resolution	Accuracy	Max. test current	Open circuit voltage
4000Ω	1Ω	±1.0% rdg ±8dgt	70μA	1.5V

※Input protection : 400V rms

Harmonics Mode

Measuring method : Synchronous filter

Measurable harmonics : Fundamental frequency to 25th harmonics.

Minimum fundamental input : More than 5% of full scale in each range.

Harmonics	Accuracy (In case of more than 4% harmonics are included against fundamental input)
1~9th	(±1% rdg ±5dgt)±(Basic accuracy of ACA or ACV)-(Error by neighboring harmonics)
10~19th	(±2% rdg ±5dgt)±(Basic accuracy of ACA or ACV)-(Error by neighboring harmonics)
20~25th	(±5% rdg ±5dgt)±(Basic accuracy of ACA or ACV)-(Error by neighboring harmonics)

MINI DIGITAL CLAMP TESTER

AC CURRENT

Model 200

φ 23 | AC 200A | DATA HOLD | AUTO POWER OFF

FEATURES

- with “U” Type Direct Touch CT enables AC current measurement of Single & Three Phase Circuit just by touching CT to conductor.

SPECIFICATIONS

Measuring method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 1999
Over range indication	: Blanking of all digits except MSD1
Maximum indication	: 1999
Low battery indication	: ”B” mark on LCD
Data hold indication	: ”DH” mark on LCD
Sampling time	: 2 times/sec
Operating temperature	: 0℃ to +40℃, < 80% RH
Storage temperature	: -10℃ to +60℃, < 70% RH
Power supply	: SR-44 (1.55V)×2 or LR-44×2
Power consumption	: 2.5 mW
Battery life	: SR-44 (200 hours), LR-44 (100 hours)
Size	: 54(W)×170(H)×21(D)㎜
Weight	: Approx. 100g
Accessories	: Soft case ····· 1
	instruction manual ····· 1
	Batteries, LR-44 (1.55V) ·· 2

33㎜φCT

Range : 0～20/200A

Accuracy

Range	Resolution	Accuracy
20A	10mA	±1.2% rdg ± 5dgt (50/60Hz)
200A	100mA	

“U” Type CT

Range : 300A (Resolutoin 0.1A)

Accuracy

Single Phase IV Conductor	±5%
Parallel VVF Conductor	±5%
Three Phase VVR Conductor	Estimated Value

Max Measurement Conductor : 20㎜φ

Model 210

φ 23 | AC 200A | DATA HOLD

FEATURES

- Ultra compact size with 23㎜φCT.
- Most suitable for the use of the narrow & congested circuit.

SPECIFICATIONS

Measuring method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 1999
Range	: 0～20/200A
Jaw opening capability	: 23㎜φ
Over range indication	: Blanking of all digits except MSD1
Maximum indication	: 1999
Low battery indication	: ”B” mark on LCD
Data hold indication	: ”DH” mark on LCD
Sampling time	: 2 times/sec
Operating temperature	: 0℃ to +40℃ < 80% RH
Storage temperature	: -10℃ to +60℃ < 70% RH
Power supply	: SR-44 (1.55V)×2 or LR-44×2
Power consumption	: 2.5 mW
Battery life	: SR-44 (200 hours), LR-44 (100 hours)
Size	: 48(W)×146(H)×20(D)㎜
Weight	: Approx. 80g
Accessories	: Soft case ····· 1
	instruction manual ····· 1
	Batteries, LR-44 (1.55V) ·· 2

Accuracy

Range	Resolution	Accuracy
20A	10mA	±1.2% rdg ± 5dgt (50/60Hz)
200A	100mA	

MINI DIGITAL CLAMP TESTER

AC CURRENT

Model 220

ϕ 33 | AC 200A | DATA HOLD

FEATURES

- 33㎜ϕ CT window, and ultra compact size
- Data-hold function. Especially useful when working in dark or hard to get areas.
- Conform to IEC safety requirements.

SPECIFICATIONS

Safety standard	: IEC 61010-1 , IEC 61010-2-032 CATⅡ 600V , CATⅢ 300V
E.M.C. standard	: EN 61326
Measuring method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 1999
Jaw opening capability	: 33㎜ϕ
Over range indication	: Blanking of all digits except MSD1
Maximum indication	: 1999
Low battery indication	: "B" mark on LCD
Data hold indication	: "DH" mark on LCD
Sampling time	: 2 times/sec
Withstanding voltage	: AC 3700V 1 minute max. (Between the core of CT and outer case)
Operating temperature	: 0℃ to +40℃<80%RH
Storage temperature	: -10℃ to +60℃<70%RH
Power supply	: SR-44 (1.55V)×2 or LR-44×2
Power consumption	: 3mW
Battery life	: SR-44 (200 hours), LR-44 (100 hours)
Size	: 54(W)×167(H)×23(D)㎜
Weight	: Approx. 100g
Accessories	: Soft case·····1 : Instruction manual·····1 : Batteries,LR-44(1.55V)··2

Accuracy

Range	Resolution	Accuracy
20A	10mA	±1.2% rdg ±5dgt (50/60Hz)
200A	100mA	

Model 225

ϕ 40 | AC 600A | DATA HOLD

FEATURES

- 40㎜ϕ CT window, and ultra compact size.
- Data hold function. Especially useful when working in dark or hard to get areas.
- Conform to IEC safety requirements.

SPECIFICATIONS

Safety standard	: IEC 61010-1 , IEC 61010-2-032 CATⅡ 600V , CATⅢ 300V
E.M.C. standard	: EN 61326
Measuring method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 1999
Jaw opening capability	: 40㎜ϕ
Over range indication	: Blanking of all digits except MSD1
Maximum indication	: 1999
Low battery indication	: "B" mark on LCD readout
Data hold indication	: "DH" mark on LCD readout
Sampling time	: 2 times/sec
Withstanding voltage	: AC 3700V 1 minute max. (Between the core of CT and outer case)
Operating temperature	: 0℃ to 40℃, 80% RH max. (Non-condensing)
Storage temperature	: -10℃ to 60℃, 70% RH max. (Non-condensing)
Power supply	: 1.55V (SR-44 LR-44)×2
Power consumption	: 5mW
Battery life	: SR-44 (200 hours), LR-44 (100 hours)
Size	: 64 (W)×175(H)×23(D)㎜
Weight	: Approx. 115g
Accessories	: Soft case·····1 : Instruction manual·····1 : Batteries,LR-44(1.55V)··2

Accuracy

Range	Resolution	Accuracy
200A	100mA	±1.5% rdg ±5dgt
600A	1A	±1.0% rdg ±8dgt

MINI DIGITAL & ANALOG CLAMP TESTER

AC CURRENT AC/DC VOLTAGE RESISTANCE

Model 2020

ϕ 40 | AC 300A | DATA HOLD | AUTO POWER OFF | AC DC V | Ω

FEATURES

- 40㎜ϕ CT window and ultra compact size
- Low cost and multi-function clamp tester.
- Data-hold function and auto power off.
- Conform to IEC safety requirements.

SPECIFICATIONS

Safety standard	: CATⅡ 600V or CATⅢ 300V
Measuring method	: Dual integration mode
Display	: 3.5 digit LCD max. reading of 3200
Measuring range	: AC current 30A/300A (2 range auto) AC voltage 3V~500V (4 range auto) DC voltage 300mV~500V (5 range auto) Resistance 300Ω~3000Ω(2 range auto)
Jaw opening capability	: 40㎜ ϕ
Over range indication	: "OL" mark on LCD.
Auto power off	: Automatically power off mode approx.10 minutes after the power switch on.
Low battery indication	: "B" mark on LCD
Data hold indication	: "DH" mark on LCD
Sampling time	: 2 times/sec
Operating temperature	: 0℃ to ~ 40℃<80%RH (without condensing)
Storage temperature	: -10℃ to ~ 60℃<70%RH (without condensing)
Power supply	: 1.55V (SR-44 LR-44)×2
Power consumption	: 5mW
Battery life	: SR-44 (200 hours), LR-44 (100 hours)
Size	: 64(W)×193(H)×24(D)㎜
Weight	: Approx. 100g
Accessories	: Soft case·····1 : Instruction manual·····1 : Batteries,LR-44(1.55V)··2 : Test Lead·····1

Accuracy (AC: 50/60Hz)

Range	Min. Resolution	Accuracy
AC Current (~A)	0.01A	±2.0%rdg±8dgt
AC Voltage (~V)	0.001V	±2.3%rdg±6dgt
DC Voltage (…V)	0.1mV	±1.3%rdg±3dgt
Resistance (Ω)	0.1Ω	±2.0%rdg±8dgt

Model 3000

ϕ 40 | AC 600A | DATA HOLD | AC DC V | Ω

FEATURES

- High accuracy analog display with taut band meter.
- Meter hold function.
- AC/DC voltage and resistance measurements.

SPECIFICATIONS

Safety standard	: CAT.Ⅲ 600V
Withstanding voltage	: AC 5500V, 1 minute (between outer case and core of CT)
Operating temperature	: 0℃ to 40℃, <80%RH
Storage temperature	: -10℃ to 60℃, <70%RH
Power supply	: 1.5V ("AAA" size, R03)×2
Size	: 69(W)×210(H)×34(D)㎜
Weight	: Approx. 400g (Including batteries)
Accessories	: Carrying case·····1 : Instruction manual·····1 : Batteries·····2 : Test Lead·····1 set
Optional Accessories	MT-3000 Thermister sensor probe

Accuracy (AC: 50/60Hz)

Range	Multiplying Factor	Accuracy
AC Current 6A	x0.1	±3.0% of F.S.
AC Current 15A/60A	x1	±3.0% of F.S.
AC Current 150A/600A	x10	±3.0% of F.S.
AC Voltage 300V/600V	x1	±3.0% of F.S.
DC Voltage 60V	x0.1	±3.0% of F.S.
Resistance 1K/100KΩ	x1/x100	±3.0% of scale length
Temp. -50℃ to 200℃	x1	±3.0% of F.S.

DIGITAL CLAMP TESTER

AC CURRENT

Model 2010

φ 40 | AC 600A | DATA HOLD | AUTO POWER OFF | AC DC V | Ω | •)) | →|←

Model 2100

φ 55 | AC 2000A | DATA HOLD | AUTO POWER OFF | AC DC V | Ω | •)) | →|←

FEATURES

- Additional AC/DC voltage, resistance, diode test and continuity check.
- Data hold and auto power off function.
- Wide range of current measurements with tear drop style CT up to 2000A range.

SPECIFICATIONS

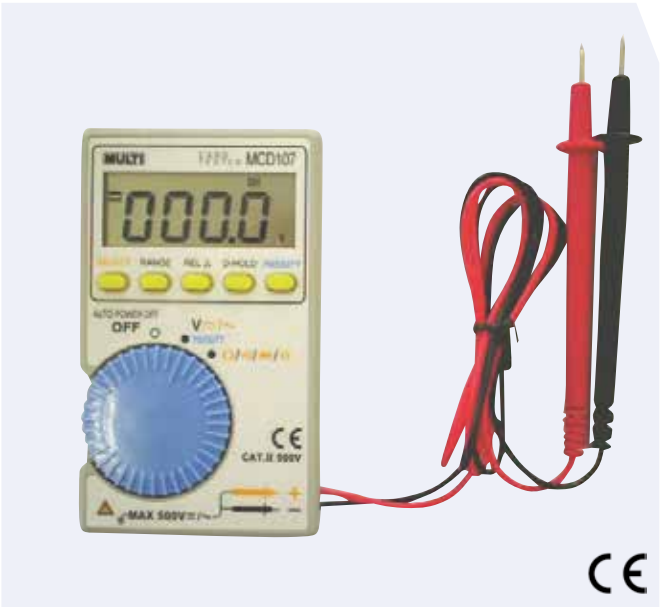
Safety standard : IEC 61010-1 , IEC 61010-2-032 CATⅢ 600V
E.M.C. standard : EN 61326
Measuring method : Dual integration mode
Display : 3½ digit LCD max. reading of 1999 and annunciators
Over range indication : Blanking of all digits except MSD1
Low battery indication : "B" mark on LCD readout
Sampling : 2 times/s
Data hold indication : "DH" mark on LCD readout
Auto power off : The meter is set to power off mode approx. 10 minutes after the power switch on.
Operating temperature : 0℃ to 40℃, <80%RH
Storage temperature : -10℃ to 60℃, <70%RH
Power supply : "AAA" size, (1.5V)×2
Power consumption and battery life : Approx. 3.5mW, 500 hours continuous.
Size/Weight(M-2010) : 70(W)×223(H)×34(D),Apprd425g.
Size/Weight(M-2100) : 85(W)×240(H)×34(D)㎜ Approx. 350g
Accessories : Carrying case ····· 1
Test lead ····· 1 set
Instruction manual ····· 1
Batteries ····· 2

Range		Accuracy	Max. input
~A (50/60Hz) Manual range	20A	± 1.5% rdg ± 10 dgt	AC 600A
	200A	± 1.5% rdg ± 10 dgt	
	600A	± 1.0% rdg ± 8 dgt	
~V (50/60Hz) ⎓ V Auto range	2V	± 0.7% rdg ± 5 dgt	AC/DC 600V rms
	20V	± 1.2% rdg ± 5 dgt	
	200V	± 1.2% rdg ± 5 dgt	
	600V	± 1.2% rdg ± 5 dgt	
Ω (OHM) Auto range	200Ω	± 1.2% rdg ± 5 dgt	Input protection 250V rms
	2KΩ	± 1.2% rdg ± 5 dgt	
	20KΩ	± 1.2% rdg ± 5 dgt	
	200KΩ	± 1.2% rdg ± 5 dgt	
	2000KΩ	± 1.2% rdg ± 5 dgt	
	20MΩ	± 3% rdg ± 10 dgt	
•)) Continuity check	2KΩ	Continuity beeper <Approx. 300Ω	250V rms
→|← Diode Test	2V	± 10% rdg ± 3 dgt	250V rms

Range		Accuracy	Max. input
~A (50/60Hz) Manual range	20A	± 1.2% rdg ± 10 dgt	AC 2000A (30 seconds)
	200A	± 1.2% rdg ± 10 dgt	
	2000A	± 1.2% rdg ± 8 dgt	
~V (50/60Hz) ⎓ V Auto range	2V	± 0.7% rdg ± 5 dgt	AC/DC 600V rms
	20V	± 1.2% rdg ± 5 dgt	
	200V	± 1.2% rdg ± 5 dgt	
	600V	± 1.2% rdg ± 5 dgt	
Ω (OHM) Auto range	200Ω	± 1.2% rdg ± 5 dgt	Input protection 250V rms (30 seconds)
	2KΩ	± 1.2% rdg ± 5 dgt	
	20KΩ	± 1.2% rdg ± 5 dgt	
	200KΩ	± 1.2% rdg ± 5 dgt	
	2000KΩ	± 1.2% rdg ± 5 dgt	
	20MΩ	± 3% rdg ± 10 dgt	
•)) Continuity check	2KΩ	Continuity beeper <Approx. 300 Ω	250V rms
→|← Diode Test	2V	± 10% rdg ± 3 dgt	250V rms

POCKET TYPE DIGITAL MULTIMETER

Model MCD-107



FEATURES

- Ultra compact size and weight
- Easy operation with rotary switch
- 4000count full scale with autoranging
- Auto Power Off Function.

SPECIFICATIONS

Display	: LCD, max.reading of 4000
Polarity	: Automatic (-)negative indication
Over range indication	: "OL" mark on LCD readout
Low battery indication	: "B" mark is displayed when the battery voltage drops below operating voltage
Sampling	: 3 times/sec.
Operating temperature	: 0~40℃, <80%RH (non-condensing)
Storage temperature	: -10~50℃, <70%RH (non-condensing)
Power Supply	: Lithium battery CR2032(3V)×1
Power consumption	: Approx.6.0mW(typical at DVC)
Size & Weight	: 98(H)×59(W)×9.5(D)㎜
Accessories	: Book type Cover case ····· 1 Instruction Manual····· 1 Battery ····· 1

MEASURING RANGES & ACCURACY

Function	Range	Accuracy	Input Resistance	Remark
DC Voltage	400.0mV	±(0.7%rdg+3dgt)	more than 100MΩ	
	4.000V	±(1.3%rdg+3dgt)	approx.11MΩ	
	40.00V		Approx.10MΩ	
	400.0V			
	500V			
AC Voltage	4.000V	±(2.3%rdg+10dgt)	approx.11MΩ	
	40.00V		approx.10MΩ	
	400.0V	±(2.3%rdg+5dgt)		
	500V			
Resistance	400.0Ω	±(2.0%rdg+5dgt)	Opening Voltage : Approx.0.4V Current Voltage is changing up to resistance value to be measured	
	4.000KΩ			
	40.00KΩ			
	400.0KΩ			
	4.000MΩ	±(5.0%rdg+5dgt)		
	40.00MΩ	±(10%rdg+5dgt)		
Capacitance	40.00nF	±(5.0%rdg+10dgt)	Accuracy : after cancelled the display value by relative function	
	400.0nF			
	4.000μF			
	40.00μF	±(10%rdg+15dgt)		
	100.0μF			
Frequency	5,000Hz	±(0.7%rdg+5dgt)	at AC sine wave Sensitivity of input voltage 5.000Hz~5.000KHz : more than 10Vrms 50.00KHz : more than 40Vrms	
	50.00Hz			
	500.0Hz			
	5.000KHz			
	50.00KHz			
Duty	0.1~99%	————	Input Sensitivity & Frequency Characteristic (Rectangular Wave Input Duty 50%) 2.5V 0 to peak input≧1KHz 6V 0 to peak input≧10KHz 40V 0 to peak input≧70KHz	
Continuity Check		Beeping 10~60Ω·Opening Voltage : approx. 0.4V		
Diode Test		Opening Voltage : approx.1.5V		

POCKET TYPE DIGITAL MULTIMETER

Model MCD-007

ULTRA COMPACT SIZE & LIGHT WEIGHT

Model MCD-008

UNIQUE FUNCTION – CORD REEL TEST LEAD TYPE

FEATURES

- Easy operation with rotary switch.
- AC/DC voltage, resistance, continuity check and diode test with full autoranging operation.
- 3200 count full scale with bargraph display.
- Low power consumption with auto power off function.

SPECIFICATIONS

Display : 3½ digit LCD, max. reading of 3200
Polarity : Automatic, (−) negative polarity indication.
Over range indication : "OL" mark on LCD readout
Low battery indication : " ▭ "mark is displayed when the battery voltage drops below operating voltage
Sampling : 2 times/sec.
Auto power off : The meter is set to power off mode approx. 10minutes after the power switch on.
Operating temperature : 0℃ to 40℃,<70% RH (Non-condensing)
Storage temperature : 20℃ to 60℃,<80%RH (Non-condensing)

Power supply : LR-44 (1.55V)×2
Power consumption : 5.0mW
Size : MCD-007 110(H)×60(W)×9.5(D)㎜
MCD-008 114(H)×72(W)×22.5(D)㎜
Weight : Approx. 86g (MCD-007)
Approx. 100g (MCD-008)
(Including batteries and case)
Accessories : Hard cover case·····1
Instruction manual·····1
Batteries·····2

Measuring ranges

DC Voltage

Range	Resolution	Accuracy	Input resistance	Max. input
320mV	100μV	±1.3% rdg ±3dgt	>1000MΩ	500V DC or AC rms
3.2V	1mV	±0.7% rdg ±3dgt	Approx. 11MΩ	
32V	10mV	±1.3% rdg ±3dgt	Approx. 10MΩ	
320V	100mV			
500V	1V			

AC Voltage (50/60Hz)

Range	Resolution	Accuracy	Input resistance	Max. input
3.2V	1mV	±2.3% rdg ±6dgt	Approx. 11MΩ	500V DC or AC rms
32V	10mV		Approx. 10MΩ	
320V	100mV			
500V	1V			

Resistance

Range	Resolution	Accuracy	Test current	Input protection
320Ω	100mΩ	±2.0% rdg ±5dgt	< 0.7mA	500V DC or AC rms
3.2KΩ	1Ω	±2.0% rdg ±3dgt	< 0.13mA	
32KΩ	10Ω		< 13μA	
320KΩ	100Ω		< 1.3μA	
3.2MΩ	1KΩ	±6.0% rdg ±4dgt	< 0.13μA	
32MΩ	10KΩ	±10% rdg ±10dgt		

Diode Test

Range	Resolution	Accuracy	Test current	Input protection
3.2V	1mV	±10% rdg ±3dgt	Approx. 0.7mA (Vf=0.6V)	500V DC or AC rms

Continuity Check

Range	Resolution	Accuracy	Test current	Input protection
320Ω	100mΩ	< Approx.20Ω	< 0.7mA	500V DC or AC rms

POCKET TYPE DIGITAL MULTIMETER

TRUE RMS READING

Model MCD-009

* Book Case Type
* Size : 60(W)×110(H)×9.5(D)㎜
* Weight : Approx. 86g

Model MCD-010

* Cord Reel Type
* Size : 72(W)×114(H)×22.5(D)㎜
* Weight : Approx. 110g

FEATURES

- Ultra compact size and light weight.
- Easy operation with rotary switch.
- AC/DC voltage, resistance, continuity check and diode test with full autoranging operation.
- 3200 count full scale with bargraph display.
- Low power consumption with auto power off function.

SPECIFICATIONS

Display : 3½ digit LCD, max. reading of 3200
Polarity : Automatic,(-)negative polarity indication.

Over range indication : "OL" mark on LCD readout
Low battery indication : "▭" mark is displayed when the battery voltage drops below operating voltage
Sampling : 2 times/sec.
Auto power off : The meter is set to power off mode approx. 10 minutes after the power switch on.
Operating temperature : 0℃ to 40℃,<70% RH(Non-condensing)
Storage temperature : 20℃ to 60℃,<80%RH(Non-condensing)
Power supply : LR-44 (1.55V)×2
Power consumption : 5.0mW
Accessories : Instruction manual·····1
Batteries·····2

DC Voltage

Range	Resolution	Accuracy	Input resistance	Max. input
320mV	100μV	±1.3% rdg ±3 dgt	>1000MΩ	500V DC or AC rms
3.2V	1mV	±0.7% rdg ±3 dgt	Approx. 11MΩ	
32V	10mV	±1.3% rdg ±3 dgt	Approx. 10MΩ	
320V	100mV			
500V	1V			

AC Voltage (50/60Hz)

Range	Resolution	Accuracy	Input resistance	Max. input
3.2V	1mV	±1.3% rdg ±5 dgt	Approx. 11MΩ	500V DC or AC rms
32V	10mV	±2.0% rdg ±6 dgt	Approx. 10MΩ	
320V	100mV			
500V	1V			

Resistance

Range	Resolution	Accuracy	Test current	Input protection
320Ω	100mΩ	±2.0% rdg ±5 dgt	< 0.7mA	500V DC or AC rms
3.2KΩ	1Ω	±2.0% rdg ±3 dgt	< 0.13mA	
32KΩ	10Ω		< 13μA	
320KΩ	100Ω		< 1.3μA	
3.2MΩ	1KΩ	±6.0% rdg ±4 dgt	< 0.13μA	
32MΩ	10KΩ	±10% rdg ±10 dgt		

Diode Test

Range	Resolution	Accuracy	Test current	Input protection
3.2V	1mV	±10% rdg ±3 dgt	Approx. 0.7mA (Vf=0.6V)	500V DC or AC rms

Continuity Check

Range	Resolution	Accuracy	Test current	Input protection
320Ω	100mΩ	< Approx.20Ω	< 0.7mA	500V DC or AC rms

VOLTAGE DETECTOR

AC and AC/DC Low Voltage

Model LV-1

FEATURES

- New Function to avoid Electric Shock.
- Using Conductive Rubber for Detector Tip free from short circuit.
- With Slip Stopper for the safety.

SPECIFICATIONS

Model : LV-1 (for AC low voltage only)
Voltage range : On the cover of wire AC50~500V (50/60Hz common use)
On the Bare terminal AC0~300V (50/60Hz common use)
Isolation resistance : Over 10M Ω by DC500V Insulation Tester (between detecting tip and clip)
Isolation withstanding : One minute by AC1500V Insulation Tester (between detecting tip and clip)
Minimum responsible voltage to ground : Sensitivity adjustable. (initial adjustment for standard / AC40V with detecting tip in contact with insulated wire 1V 2㎜)
Value for judgement of isolation defect : More than 10uA, floating to the human body ("L" lamp will turn on a light)
Display of indication Visual : intermittent flashing red light for the both of voltage detect & isolation defect.
Audio : intermittent beeper sound
Battery Alkaline button cell : LR-44×2 Pcs.
Operating temperature : 0℃~40℃
Size & weight : 20(W)×129(H)×19.5(D)㎜ approx. 30gs
Accessories : Batteries(LR-44) 2 Pcs.
Aligator clip for the eath 1 Pce.
Instruction manual 1 Pce.

Model V-550

FEATURES

- LCD display of voltage with voltage detective function (beeper sound).
- Can measure voltage from the cover of conductor (estimated value).
- Accurate & safety measurement on the bare terminal, etc. free from short circuit.

SPECIFICATIONS

Max. measuring voltage : AC500V
Auto power off : 5 minutes after switch on
Date hold : "DH" mark on LCD readout
Low battery indication : "B" mark on LCD
Power supply : 1.55V (LR-44)×2
Power Consumption : Continuous approx.60hours
Size : 130(L)×30(W)×14(D)㎜, approx.37g
Accessories : Battery ····· 2
Soft case ····· 1
Instruction Manual .. 1
Display of volatage detection : 3½ digit on LCD and beeper sound over 15V.
Measuring circuit voltage : less than AC600V (50/60Hz)
Accuracy

Range H	Range L
Bare terminal, Outlet bare conductor, etc.	on the insulated vinyl, rubber cover of conductor
Accuracy : ± 3% rdg	estimated value(according to materials, condition of wires, etc

Model VD-320

FEATURES

- Can measure AC/DC voltage of the bare terminal easily by one-hand operation and can judge the polarity of DC voltage.
- Can measure voltage even from the cover of conductor by touching the tip for 30 second. (Estimated value).
- Using conductive rubber tip, free from short circuit.
- Can measure DC voltage from 1.5V to 400V as well as AC voltage up to 500V.
- No effect on the measurement due to insulation ground condition, etc.

SPECIFICATIONS

Measurement circuit voltage : less than 600V
Data hold : "DH" mark on LCD readout
Low battery indication : "B"mark on LCD readout
Power supply : 1.55V(LR-44)×2
Power consumption : Continuous approx. 60 hours
Size : 153(L)×34(W)×24(D)㎜, approx.60g
Accessories : Battery ····· 2
Soft case ····· 1
Instruction manual ·· 1
Accuracy

Range	DC Voltage	AC Voltage
Range	400V/200V manual	500V (50/60Hz)
Polarity	"+" or "-" indication	Earth side/no indication Hot side/voltage value
Accuracy	± 5% rdg	± 5% rdg

ANALOG INSULATION RESISTANCE TESTER

Single Scale Indicator for 3 Range Insulation Measurements

Model MIS-1A
50V/10MΩ, 125V/20MΩ
250V/50MΩ

Model MIS-2A
25V/ 20MΩ, 250V/ 50MΩ
500V/100MΩ

Model MIS-3A
125V/ 20MΩ, 250V/ 50MΩ
1000V/2000MΩ

Model MIS-4A
250V/ 50MΩ, 500V/ 100MΩ
1000V/2000MΩ

FEATURES

- The single and fluorescent scale indicator for 3 ranges insulation measurements enabled easy observation. Especially useful when working in dark place.
- Hand free and continuous measurements with custom made switch.
- Safe design with built in automatic discharging function for any capacitors present in the circuit.
- The voltage in the circuit can be pre-checked without any switch operation for safe insulation measurements.
- Compact,light weight and heavy duty rugged case.

SPECIFICATIONS

Function	: Insulation resistance,AC voltage, battery check
Meter movement	: 100μA,870Ω,taut band meter.
Safety standard	: IEC 61010-1 CATⅡ, 600V
E.M.C. standard	: EN 61326
Constructional standard	: IEC 61557-2
Insulation resistance	: DC 500V-50MΩ or more (MIS-1A, MIS-2A) DC 1000V-50MΩ or more (MIS-3A, MIS-4A)
Withstanding voltage	: AC 3700V,1 minute (Between input terminal and outer case)
Overload protection	: 120% of the highest nominal output voltage (10sec.)
Battery check	: DC 6.3V～9.5V
Low battery limit	: DC6.3V
Temperature characteristics (0~40℃)	: ±5%rdg of specified accuracy
Operating temperature	: 0℃ to 40℃,80% RH max. (Non-condensing)
Storage temperature	: -10℃ to 60℃ 80% RH max. (Non-condensing)
Power supply	: 1.5V (“AA” size,R6)×6
Size	: 170(W)×105(D)×54(H)㎜
Weight	: Approx.330g(Excluding batteries)
Accessories	: Line test lead ····· 1 Earth test lead ····· 1 Batteries ····· 6 Test lead case ····· 1 Belt ····· 1 Instruction manual ····· 1
Optional accessory	: Remote switch test lead

Measuring Ranges and Technical Data
Insulation resistance measurement

Model	MIS-1A	MIS-2A	MIS-3A	MIS-4A
Rated voltage & effective measuring range	50V-10MΩ 125V-20MΩ 250V-50MΩ	125V- 20MΩ 250V- 50MΩ 500V-100MΩ	125V-20MΩ 250V-50MΩ 1000V-2000MΩ	250V-50MΩ 500V-100MΩ 1000V-2000MΩ
Center scale	0.2MΩ/0.5MΩ/1MΩ	0.5MΩ/1MΩ/50MΩ	0.5MΩ/1MΩ/2MΩ	1MΩ/2MΩ/50MΩ
Minimum measurable resistance at rated voltage	0.05 MΩ 0.125MΩ 0.25 MΩ	0.125MΩ 0.25MΩ 0.5 MΩ	0.125MΩ 0.25MΩ 1MΩ	0.25MΩ 0.5MΩ 1MΩ
Rated current	1mA+20%-0%			
Maximum no-load voltage	Rated voltage+30%-0%			
Short circuit current	<2mA			

Accuracy

Rated voltage	DC 50V	DC 125V	DC 250V	DC 500V	DC 1000V
First effective range	0.01MΩ～5MΩ ±5%rdg	0.02MΩ～10MΩ ±5%rdg	0.05MΩ～20MΩ ±5%rdg	0.1MΩ～50MΩ ±5%rdg	2MΩ～1000MΩ ±5%rdg
Second effective range	0.005MΩ～0.01MΩ 5MΩ～10MΩ ±10%rdg	0.01MΩ～0.02MΩ 10MΩ～20MΩ ±10%rdg	0.02MΩ～0.05MΩ 20MΩ～50MΩ ±10%rdg	0.05MΩ～0.1MΩ 50MΩ～100MΩ ±10%rdg	1MΩ～2MΩ 1000MΩ～2000MΩ ±10%rdg
	10MΩ～50MΩ ±30%rdg	20MΩ～100MΩ ±30%rdg	50MΩ～100MΩ ±30%rdg		

AC voltage measurement (50/60Hz)

Range	Accuracy	Input impedance	Maximum input voltage
AC 600V	±2.5% of full scale	Approx.1.5MΩ	AC 600V rms

DIGITAL INSULATION RESISTANCE TESTER

For 3 Range Insulation Measurements

Model MIS-2D

25V/20MΩ,250V/50MΩ
500V/100MΩ

Model MIS-3D

25V/ 20MΩ, 250V/ 50MΩ
1000V/2000MΩ

Model MIS-4D

125V/ 20MΩ, 250V/ 50MΩ
1000V/2000MΩ

SPECIFICATIONS

Function	: Insulation resistance, AC voltage
Display	: 3½ digit LCD with bargraph display, max. reading of 3200 count and annunciators
Response time	: Less than 5 sec. (Auto ranging)
Data hold indication	: "DH" mark on LCD readout
Infinity indication	: "OL(∞)" mark on LCD readout (Over 3200 count)
Safety standard	: IEC 61010-1, CATⅡ, 600V
E.M.C. standard	: EN 61326
Constructional standard	: IEC 61557-2
Insulation resistance	: DC 500V-50MΩ or more (MIS-2D) DC 1000V-50MΩ or more (MIS-3D, MIS-4D)
Withstanding voltage	: AC 3700V, 1 minute (Between input terminal and outer case)
Overload protection	: 120% of the highest nominal output voltage (10sec.)
Low battery indication	: " B " mark on LCD readout
Temperature characteristics (0~40℃)	: ±5%rdg of specified accuracy
Operating temperature	: 0℃ to 40℃, 80% RH max. (Non-condensing)
Storage temperature	: -10℃ to 60℃, 80% RH max. (Non-condensing)
Power supply	: 1.5V("AA" size, LR6)×6
Size	: 170 (W)×105(D)×54(H)㎜
Weight	: Approx. 365g (Excluding batteries)
Accessories	: Line test lead ·····1 Earth test lead ·····1 Batteries ·····6 Test lead case ·····1 Belt ·····1 Instruction manual ·····1
Optional accessory	: Remote switch test lead

FEATURES

- The big digital and bargraph LCD display with back light enabled easy observation. Especially useful when working in dark place.
- Hand free and continuous measurements with custom made switch.
- Safe design with built in automatic discharging function for any capacitors present in the circuit.
- The voltage in the circuit or capacitor can be checked by warning lamp for safe insulation measurements.
- Data hold and auto power off function.
- Compact, light weight and heavy duty rugged case.

Measuring Ranges and Technical Data
Insulation resistance measurement

Model	MIS-2D	MIS-3D	MIS-4D
Rated voltage & effective measuring range	125V- 20MΩ 250V- 50MΩ 500V-100MΩ	125V-20MΩ 250V-50MΩ 1000V-2000MΩ	125V-20MΩ 250V-50MΩ 1000V-2000MΩ
Minimum measurable resistance at rated voltage	0.125MΩ 0.25MΩ 0.5MΩ	0.25MΩ 0.5MΩ 1MΩ	0.125MΩ 0.25MΩ 1MΩ
Rated current	1mA+20%-0%		
Maximum no-load voltage	Rated voltage+30%-0%		
Short circuit current	<2mA		

Accuracy

Rated voltage	DC 125V	DC 125V	DC 250V	DC 500V
	0~20MΩ~0L(∞)	0~50MΩ~0L(∞)	0~100MΩ~0L(∞)	0~2000MΩ~0L(∞)
First effective range	0.02MΩ~10MΩ <±5%rdg	0.05MΩ~20MΩ <±5%rdg	0.1MΩ~50MΩ <±5%rdg	2MΩ~1000MΩ ±5%rdg
Second effective range	0.01MΩ~0.02MΩ 10MΩ~100MΩ <±10%rdg	0.02MΩ~0.05MΩ 20MΩ~100MΩ <±10%rdg	0.05MΩ~0.1MΩ 50MΩ~100MΩ <±10%rdg	1MΩ~2MΩ 1000MΩ~2000MΩ <±10%rdg
Other range	100MΩ~0L(∞) Not specified			2000MΩ~0L(∞) Not specifind

AC voltage measurement (50/60Hz)

Range	Accuracy	Input impedance	Maximum input voltage
AC 600V	±2.5% of full scale	Approx.2.0MΩ	AC 600V rms

FIELD MEASURING INSTRUMENTS FOR PV SYSTEMS

INSULATION RESISTANCE TESTERS

MIS-PV SERIES PATENT PENDED

Three Models Line-up according to the applications

MIS-PV1

PV OK | 2 RANGE

- Can measure accurately during PV generating
- Safety – no need to short-circuit P & N phase
- Measurable from AC circuit to PV panels
- Switchover 2 ranges – 500/1000V

MIS-PV2

PV OK | 4 RANGE | AC VOLT

- Can measure accurately during PV generating
- Safety – no need to short-circuit P & N phase
- Measurable from low voltage circuit to PV panels
- Can be used in ordinary electric circuit
- Switchover 4 ranges - 125/250/500/1000V

MIS-PVS

PV OK | 2 RANGE | DC VOLT | DETERIO RATION

- With function to judge deterioration point (only for solar panel measurement)
- Can measure accurately during PV generation
- Safety – no need to short-circuit P & N phase
- Measurable from AC circuit to PV panels
- Measurable generated voltage (DC0～999V)
- Switchover 2 ranges – 500/1000V

DIFFERENCE FROM ORDINARY INSULATION RESISTANCE TESTERS

Generally, PV systems are generating powers always during day time and the measurement of insulation resistance should be done under live line conditions.

In case of ordinary resistance testers, the generated voltage will have an influence on measured values and in addition, there is a possibility that the tester might be damaged caused by superimposed voltage.

In order to solve this problem, there is a measuring method by short-circuit of P & N phase but it is necessary to prepare the short-circuit breaker, etc. and there is possible danger that electric arcs happen by mis-operation.

MIS-PV series have been developed by taking the above matters into consideration and can measure insulation resistance accurately & safely even during PV generation without short-circuit by its unique designs.

By using MIS-PV series, safer and more efficient works for insulation resistance measurement of PV generating panels can be realized.

SPECIFICATIONS

RATED VOLTAGE EFFECTIVE	MIS-PV1/MIS-PVS(500/1000V) MIS-PV2(125/250/500/1000v)			
	125V	250V	500V	1000V
MAX. DISPLAY	20MΩ	50MΩ	100MΩ	2000MΩ
CENTER	0.5MΩ	1MΩ	2MΩ	50MΩ
FIRST EFFECTIV	0.02MΩ～10MΩ	0.05MΩ～20MΩ	0.1MΩ～50MΩ	2MΩ～1000MΩ
TOLERANCE	Less than ±5%			
SECOND EFFECT.	0.01MΩ～less 0.02MΩ Over 10MΩ～20MΩ	0.02MΩ～less 0.05MΩ Over 20MΩ～50MΩ	0.05MΩ～less 0.1MΩ Over 50MΩ～100MΩ	1MΩ～less 2MΩ Over 1000MΩ～2000MΩ
TOLERANCE	Less than ±10%			
DETERIORATION (ONLY MIS-PVS)	Deterioration point will be displayed on LCD in case of insulation resistance less than 1MΩ. ※Only during measurement of PV panels, indicate P or N phase and or between modules.			

AC VOLTAGE(ONLY MIS-PV2)

RANGE	AC0～599V (Min. Resolution 0.1V)
TOLERANCE	±1.5%rdg±10dgt

DC VOLTAGE(ONLY MIS-PVS)

RANGE	DC0～999V (Min. Resolution 0.1V)
TOLERANCE	±1.5%rdg±10dgt

GENERAL

DISPLAY RANGE	3.200MΩ/32.00MΩ/320.0MΩ/3200MΩ (4 Range Auto)
OTHER FUNCTIONS	OVER RANGE DISPLAY, DATA HOLD, AUTO POWER OFF, BACKLIGHT, LOW BATTERY DISPLAY, AUTO DISCHARGE
STANDARD	JIS C 1302 Equivalent
OPERATING TEMP.	0～40℃, less than 80%RH (without condensing)
POWER SUPPLY	1.5V (AA size, LR6) alkali battery×6 pcs.
DIMENSION/WEIGHT	170(W)×105(D)×52(H)㎜, approx. 350g (without batteries)
ACCESSORIES	MIS-PV1 : Line Cord×1, Earth Cord×1, Case for Cords MIS-PV2 : Line Cord×1, Earth Cord×1, Hard Case for Instrument×1 MIS-PVS : Line Cord×2, Earth Cord×1, Hard Case for Instrument×1 Common : Insulation Cap×1, Belt×1, LR6 battery×6, Instruction Manual×1

Model MIS-PVS TECHNICAL GUIDE

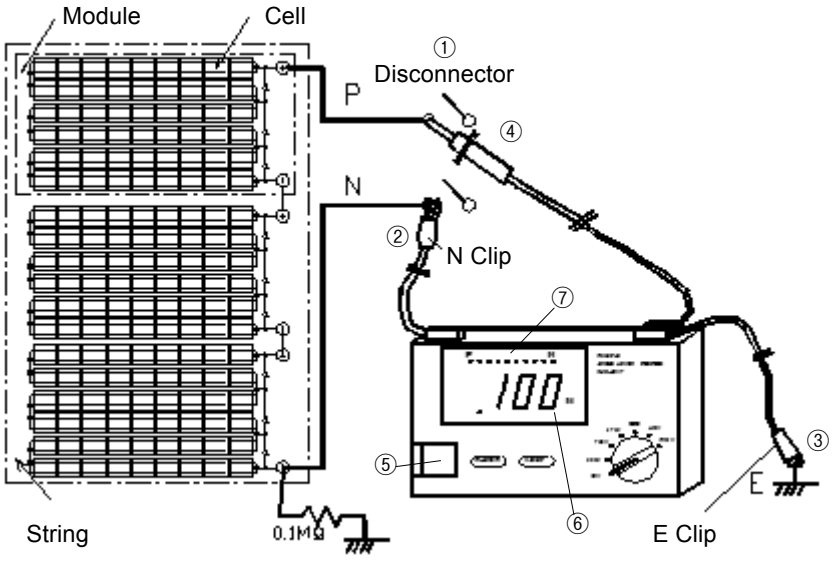
GENERAL

We developed the insulation resistance tester which can measure insulation resistance at solar panels easily under generating condition. (Patent Pending).
The ordinary insulation resistance testers cannot measure resistance correctly during generation but model MIS-PVS can make measurement easily regardless of generating or no power and also can display the insulation failure point. (at P phase side, N phase side or between modules).

(1) Indicate the insulation failure point of PV systems
(2) Can measure the insulation resistance at solar panel side under generating conditions by one operation.
(3) Can measure the insulation resistance of ordinary electrical equipment.

MEASUREMENT

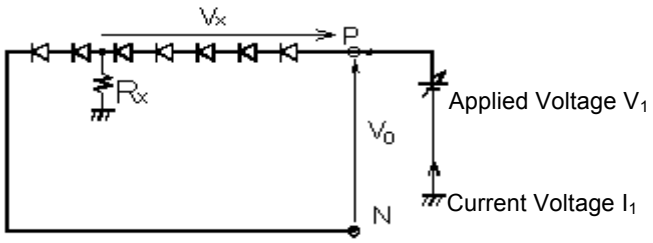
① Make the disconnector off.
② Apply N clip of the tester to N phase side.
③ Connect E clip to grounding earth side.
④ Apply the probe to P phase side of solar panel.
⑤ Set the measuring switch of MIS-PVS on.
⑥ The insulation resistance value is displayed on LCD.
⑦ In case of the measured value less than 1MΩ, P1～P12 on LCD display will be lightening. When P3 is lightening, there is an insulation failure at the place between 3/10 and 4/10 of whole modules. P1 will be lightening in case of the insulation failure at P phase side and P11 will be lightening in case of failure at N phase side.



Drawing 1. How to display the insulation failure point

THEORY of Indication for insulation failure point

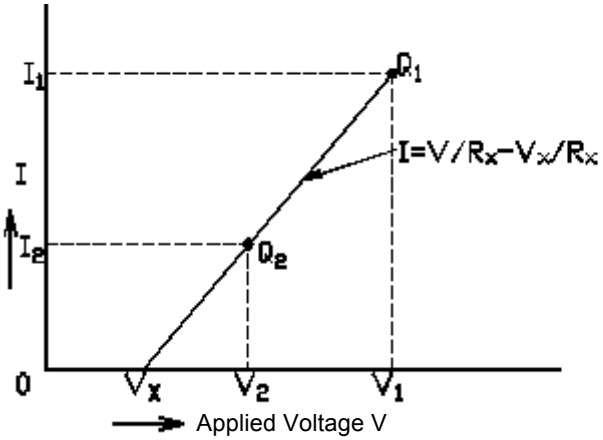
As shown on the drawing 2, considering that an insulation failure (Rx) happens between solar panel modules and provided that the generated voltage of PV system is Vo and the voltage from insulation failure point to P phase terminal is Vx. Also, provided that applied voltage is V1 and current is I1.



Drawing 2. Circuit Diagram in case of applying voltage to solar cell

When measuring the insulation resistance two times by changing voltage, provided that the fist applied voltage is V1, current I1 and the second applied voltage is V2, current I2, the drawing 3 is showing the relation between these applied voltages and currents.

The intersection point Vx with horizontal axis (current I=0) on the drawing 3 is showing the generated voltage of solar panel from P phase to the insulation failure point. The insulation failure point can be specified by the ratio of the generated voltage of solar panel Vo to the generated voltage to failure point Vx.



Drawing 3. Relation between applied voltage, current value and insulation failure point

FIELD MEASURING INSTRUMENTS FOR PV SYSTEM

MULTI CIRCUIT DC CURRENT MONITOR (16 CHANNELS)

Model MCM-1600PV

Measuring + display of DC current values generated by PV systems and DC load current of related apparatus in multi circuit successively for a long term as well as memorizing the average current values between the intervals, of which data can be transmitted to PC in Excel File.

The circuits to be measured are max. 16 lines and in PV systems, can measure DC current per each string unit at the same time.

Using clamp type current sensors which enable safe and easy operation.

MEASURE·MEMORIZE·DISPLAY THE DC CURRENT OF MAX.16 CIRCUITS AT THE SAME TIME.
EASY FOR DATA MANAGEMENT (STORAGE BY CSV FORMULA).

GENERAL

1. MEASURING FUNCTION

By Connecting Optional CT Sensors, the instrument can Measure and memorize DC current of 16 circuit at th Same time and the memorized data can be seen even During measurement.

2. LOGGING MEASURING FUNCTION

This instrument displays and memorizes the average current between the selected intervals.
Interval : 1 / 5 / 10 / 15 / 30 / 60 minutes
Contents of Memory : Measuring Time / Measuring Circuit / The average current value
Capacity of Memory : Approx. 20,000 data (72 days with 5 minutes interval)

3. OTHER FUNCTION

Over Range Indication : “OL” mark on LCD
Low Battery Indication : “B” mark on LCD
Logging Mode Indication : “R” mark on LCD
Auto Power Off : Approx. 10 minutes after last key operation. (this function will not be active in case of using AC adopter, timer set on and logging mode)

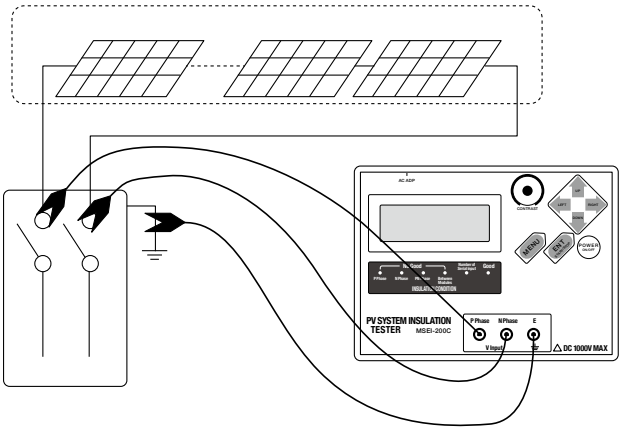
SPECIFICATIONS

Number of Measuring Circuit	: 16 circuits (channels)
Detection Method	: Clamp-on CT method
Measuring Range	: DC0～99.9A
Minimum Resolution	: 0.1A
Measuring Accuracy	: ±3%rdg±5dgt
Sampling	: Approx. 20mS
Measuring Temperature	: 0～50℃, less than 80%RH w/o condensing
Storage Temperature	: -10～60℃, less than 80%RH w/o condensing
Measuring Circuit Voltage	: less than DC600V (insulated conductor)
Insulation Resistance	: more than 100MΩ by DC500V insulation tester(between input terminal and housing case) more than 50MΩ by DC500V insulation tester (between power supply source and housing case)
Withstanding Voltage	: AC2200V (50 / 60Hz) one minute between power supply source and housing case
Power Supply	: AC100V～240V with adapter Internal Ni-hydride Battery
Battery Life	: Approx. 4 days at continuous use by full charge
Dimensions & Weight	: 236(W)×170(H)×56(D)㎜, approx. 840gs
Standard Accessories	: Carrying Case, AC Adapter, USB Cable, Instruction Manual
Optional Accessories	: CT-30PV Clamp CT with i.d. 30㎜ & 2.8m cable, CT Carrying Case (for max. 8 CTs)

FIELD MEASURING INSTRUMENTS FOR PV SYSTEMS

INSULATION RESISTANCE TESTER FOR DC CURRENT CIRCUIT

Model MSEI-200C



Wiring Connection Image

Comply with Max.1000V PV Generation Systems

Increased the applicable circuit voltage up to 1000V from 600V of previous model.

Can measure accurate insulation resistance even during generation

This instrument displays and memorizes the average leakage curUtilizing the generated voltage on solar battery panel for insulation resistance measurement (Patent). No loading to modules and circuits due to no voltage application.

No need to remove surge absorber, etc.

Can measure insulation resistance without removing surge absorber, etc.
Can make operation works efficiently and prevent forgetting relocations.

With function to discriminate insulation deteriorated part

Can distinguish deteriorated part by inputting module numbers, in case of measured values less than 1M Ω and can find deteriorated part immediately.

Measuring Function	Generated Voltage, Insulation Resistance (between P phase/N phase/PN phase/Module)
Measuring Ranges	Voltage : DC0.01~999.9V Resistance : 0.01~19.99MΩ
Accuracy	Voltage : ±1%rdg±10dgt Resistance : 0.01~10MΩ ±5%rdg : 10.01~19.99MΩ ±10%rdg
Judgement Method	When insulation resistance becomes less than 1MΩ, Red LED lamp will lighten and in case of no problem for resistance value, Green LED lamp will lighten.
Measuring Interval Time	Selecting 30/180/300/600/900sec
Module Numbers	Selecting 2~19
Auto Power-off	Approx. 40 minutes after the final key operation
Circuit Voltage	DC1000V PV Generation Circuit
Operation Temp.	-10℃~+60℃ <85%RH w/o condensation
Power Supply	AA alkaline battery LR-6 x 4 or AC adaptor (option)
Dimension/Weight	W190×H140×D42mm approx. 600g
Accessories	Voltage input cable ×1set Carrying case ×1 AA alkaline battery ×4 Instruction manual ×1

FIELD MEASURING INSTRUMENTS FOR PV SYSTEMS

DISCONNECTION DETECTOR FOR DC CURRENT CIRCUT

Model NSEI-100D

DETECTOR CHECKER

GENERAL

This device can detect the disconnected & broken point of DC current lines between PV panels and power conditioners in PV systems, without cutting power off and without climbing the roof where PV modules are located.
Furthermore, this model can find out the disconnecting point by applying the attached detector to the specific PV module.

SPECIFICATIONS

1. CHECKER

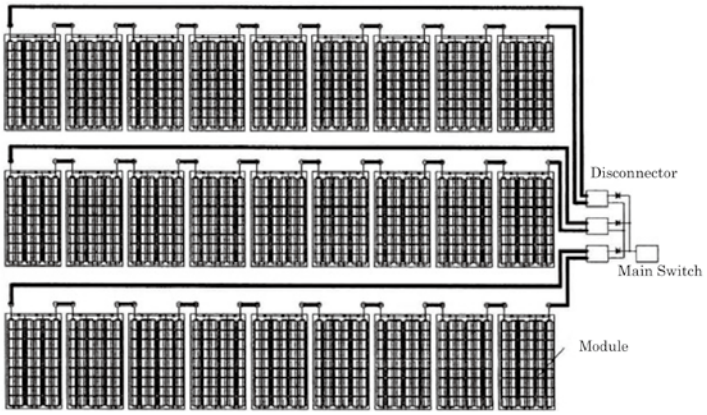
Applicable Voltage : DC12~600V±10%
Applying Frequency : 5KHz

2. DETECTOR

Detective of Magnetic Flux by Signal Current
Detection Sensitivity : 4 steps by manual
Continuity : LED lightening and intermittent beep by buzzer

MEASURING METHOD

1. Switch off the disconnector
2. Connect lead wires of checker to the terminals at PV module side of disconnector
3. Switch on the disconnection checker
4. In case of finding the disconnection, change the instrument to Detector (NSEI-100DR)
5. Apply the Detector on PV modules and find out the disconnection point.
   At the disconnection point, LED and buzzer will stop.



FIELD MEASURING INSTRUMENTS FOR PV SYSTEMS

DC LEAKAGE CURRENT MONITOR

Model MDLA-100

GENERAL

This DC Leakage Current Monitor constantly observes leakage current of DC circuit like as PV generation system, etc. and lights up the warning lamp with signal output, when the leakage current exceeds the setting value.

COMPOSITION

1) DC Leakage Current Monitor (MDLA-100)····· 1 (with power supply cord & magnet)
2) DC Current Sensor (DCZCT-20)····· 1 (with input/output cable)
3) Instruction Manual····· 1

SPECIFICATIONS

1) SPEC. OF LEAKAGE CURRENT DETECTION

Numbers of Monitoring Circuit : 1 Channel
Setting Current Values : 10/30/50/100/200mA
Measurement : DC Leakage Current
Detection Accuracy : within ±10%± 1mA to each range
Detection Period : less than 2 sec. at the time of 120% of setting value
Recovery Value : 80%± 5% of setting value
Additional Time for Signal Output : 2-3 sec.

2) SPEC. OF CT

Inside Diameter : φ20㎜
Structure : Non-Split Core Type ZCT

3) SPEC.OF WARNING DISPLAY & SIGNAL OUTPUT

Warning Lamp (Red LED) lights and is kept lightening when leakage current exceeds the setting value for the period
Numbers of Output Circuit : 1 circuit
Output Method : Relay Contact (AC125V, 0.5A/DC24V, 1A), Resistance Loading

4) GENERAL SPECIFICATION

Power Supply Voltage : AC100V±10%, 50/60Hz
Operating Temperature : 0～50℃, less than 85%RH (w/o condensation)
Storage Temperature : -20～60℃, less than 85%RH (w/o condensation)
Withstanding Voltage : AC1000V, 1 minute between power input and case AC1000V, 1 minute between signal output and case
Insulation Resistance : more than 100MΩ by DC500V insulation tester between power input and case more than 100MΩ by DC500V insulation tester between signal output and case
Dimension & Weight : 85.5(H)×110(W)×5(D)㎜, Approx. 300gs.

5) OTHER SPECIFICATION

Test Function : By pushing test switch, warning lamp lights and output signal becomes ON.
Reset Fuction : By pushing reset switch, warning lamp goes out and can reset it.
In case of operating when reset, warning lamp lights again.

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