



ragno 16



Precise Multimeter

FLUKE

New Fluke 287

True-rms Electronics Logging Multimeter with TrendCapture

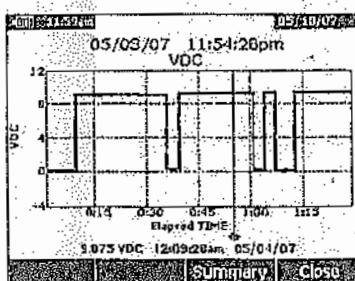
Technical Data

The advanced, logging digital multimeter with high accuracy and TrendCapture electronics professionals can depend on.

The Fluke 287 True-rms Electronics Logging Multimeter with TrendCapture quickly documents design performance and graphically displays what happened. Its unique logging and graphing capabilities mean you no longer need to download logged readings to a PC to detect a trend. The Fluke 287 packs more accuracy and convenience into a handheld multimeter than ever before.

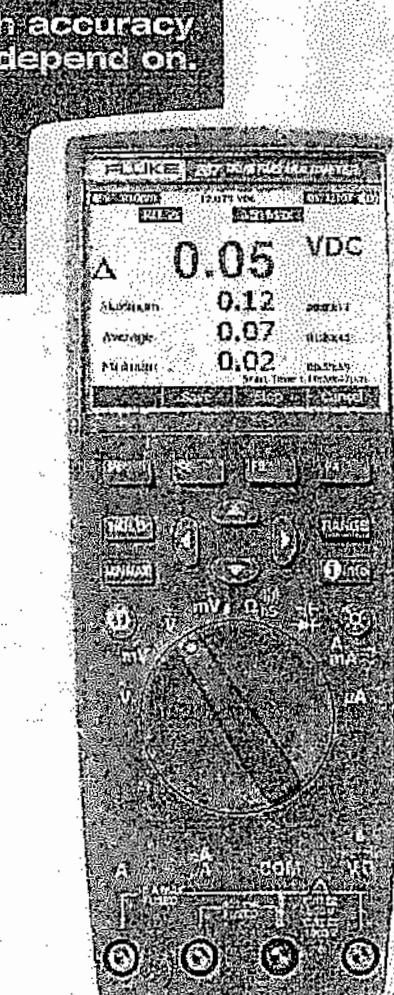
Equipped with new functionality

- New – Large 50,000 count, 1/4 VGA display with white backlight. Multiple sets of measurement information can be simultaneously displayed at the same time.



TrendCapture displays vDC logged data.

- New – Logging function with TrendCapture. Useful for characterizing the performance of a design or for unattended monitoring while in the field. Users can review logged readings without needing a PC.
- New – button. On board help screens for measurement functions.
- New – Saved measurements allow you to name and recall measurements made in the field.
- New – Multi-lingual interface
- Multiple logging sessions possible without download
- 0.025 % basic dc accuracy
- 100 kHz ac bandwidth
- Real time clock for automatic time stamping of saved readings
- True-rms ac voltage and current for accurate measurements on complex signals or non-linear loads. AC bandwidth specified to 100 kHz.
- Measure up to 10 A (20 A for 30 seconds)
- 50 mF capacitance range
- Temperature function
- Relative mode to remove test lead resistance from low ohms or capacitance measurements
- Peak capture to record transients as fast as 250 µs
- Premium test leads and alligator clips included
- Optional FlukeView forms enables you to document, store and analyze individual readings or a series of measurements, then convert them into professional-looking documents
- Optional magnetic hanger allows you to hang the meter for easy viewing while freeing your hands to focus on the job
- Limited lifetime warranty





FLUKE

Specifications

Function	Range and Resolution	Basic Accuracy
DC volts	50.000 mV, 500.00 mV, 5.0000 V, 50.000 V,	0.025 %
AC volts	500.00 V, 1000.0 V	0.4 % (true-rms)
DC current	500.00 µA, 5000.0 µA, 50.000 mA, 400.00 mA,	0.15 %
AC current	5.0000 A, 10.000 A	0.7 % (true-rms)
Temperature (excluding probe)	-200.0 °C to 1090.0 °C (-328.0 °F to 1994.0 °F)	1.0 %
Resistance	500.00 Ω, 5.0000 kΩ, 50.000 kΩ, 500.00 MΩ, 50.00 MΩ, 500.0 MΩ	0.05 %
Capacitance	1.000 nF, 10.00 nF, 100.0 nF, 1.000 µF, 10.00 µF, 100.0 µF, 1000 µF, 10.00 mF, 100 mF	1.0 %
Frequency	99.999 Hz, 999.99 Hz, 9.9999 kHz, 99.999 kHz, 999.99 kHz	0.005 %

Additional Functions/Features	Fluke 287
Multiple on screen displays	Yes
True-rms ac bandwidth	100 kHz
dBV/dBm	Yes
DC mV resolution	1 µV
Megohm range	up to 500 M
Conductance	50.00 nS
Continuity beeper	Yes
Battery/fuse access	Battery/fuse
Elapse time clock	Yes
Time of day clock	Yes
Min-max-avg	Yes
Peak	280 µS
Duty cycle	0.01 % to 99.99 %
Pulse width	0.025 ms, 0.25 ms, 2.5 ms, 1250.0 ms
Hold	Yes
Isolated optical interface	Yes
Auto/touch hold	Yes
Reading memory	Yes
Log to PC	Yes
Interval/event logging	Yes
Logging memory	up to 10,000 readings

General specifications

Maximum voltage between any terminal and earth ground:
1000 V

Battery type: 6 AA alkaline batteries, NEDA 15A IEC LR6

Battery life: 50 hours minimum, 180 hours in logging mode

Temperature:
Operating: -20 °C to 55 °C
Storage: -40 °C to 60 °C

Relative humidity: 0 to 90 % (0 to 37 °C), 0 to 65 % (37 °C to 45 °C), 0 to 45 % (45 °C to 55 °C)

Electromagnetic compatibility:
EMC EN61326-1

Vibration: Random vibration per MIL-PRF-26802 Class 2

Shock: 1 meter drop per IEC/EN 61010-1 2nd Edition

Size (HxWxD): 22.2 cm x 10.2 cm x 6 cm (8.75 in x 4.03 in x 2.38 in)

Weight: 870.9 g (28 oz)

Ordering information

287 True-rms Electronics Logging Multimeter with TrendCapture

Optional accessories

FVF-SC2 FlukeView® Forms Software with Cable

80BK Integrated DMM Temperature Probe

TLK287 Electronic Test Lead Set

TPAK Magnetic Hanging Kit

C280 Soft Case

Fluke. Keeping your world up and running.®

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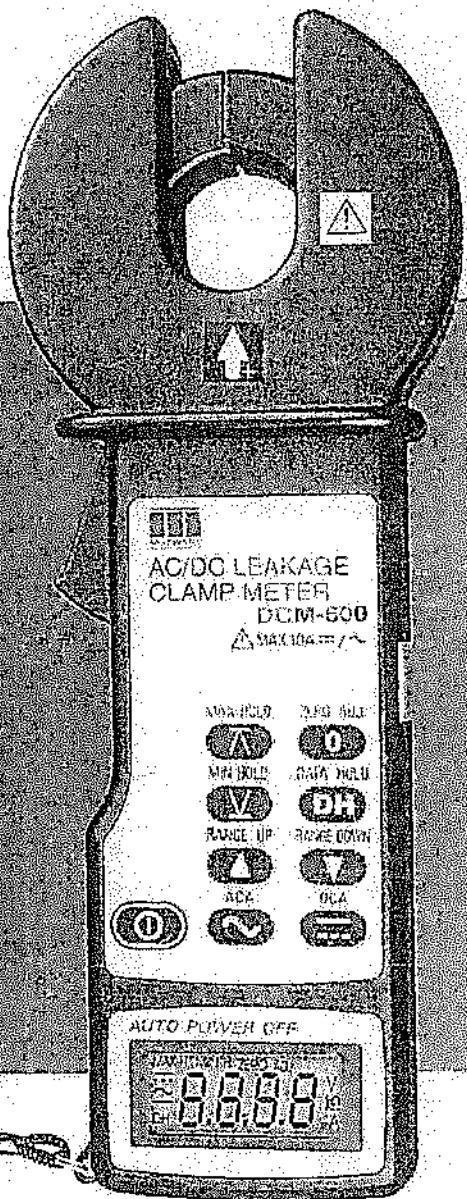
Web access: <http://www.fluke.com>

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Specifications subject to change without notice.
Printed in U.S.A. 5/2007 3032814 D-EN-N Rev A

Leakage Clamp meter



EMPOWERING
MEASUREMENT



AC/DC Leakage Clamp Meter **DCM 600**

**Highly Accurate AC/DC Leakage Current
Clamp-on Tester AC/DC 0~200mA/2000mA/10A**

FEATURES

- Wide Application for process control and automotive service.
- The world's 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 maximum value and minimum value.
- For measurements of 4~20 mA current loop signal of transmission control.

**SP2000A: DMS**

- **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** : 3½ digit LCD, max. reading of 1999.
- **Range** : AC/DC 200mA, 2000mA, 10A.
- **Jaw Opening Capability** : 20 mm ø.
- **Sampling** : 1.6 times/s.
- **Over Range Indication** : "OL" mark on LCD.
- **Data Hold Indication** : "DH" mark on LCD.
- **Low Battery Indication** : "±" mark on LCD.
- **Resolution** : 0.1mA / 1mA / 0.01 A.
- **Accuracy** : AC/DC Current : ± (3% of reading + 5digit).
(23°C ± 5°C, 80% RH or less)
- **Limitation of Circuit Voltage** : Less than AC/DC 300 V.
- **Withstanding Voltage** : AC 2300V/1 minute max. between the core of CT & outer case.
- **Operating Temperature** : 0°C ~ 50°C, < 80% RH (Non - Condensing).
- **Storage Temperature** : -20°C ~ 60°C, < 75% RH (Non - Condensing).
- **Power Supply** : 1.5V("AA" size, UM-3) X2.
- **Battery Life** : 120 hours or more (Alkaline).
- **Auto Power Off** : The meter is set to power off mode approx. 10 minutes after the power switch on.
- **Size** : 76 (W) x 194 (H) x 30 (D) mm.
- **Weight** : Approx. 340 g.
- **Accessories** : a) Carrying Case....1 b) Instruction Manual....1 c) Batteries2

SAFETY STANDARD

- Compliant with IEC 1010-2-032, IEC 1010-1(1995) CATII 300V.

APPLICATIONS

- The typical application of DCM 600 is in Railways, Substations & Industries where the Leakage Current of Batteries, Chargers is to be measured.
- It is useful in Telecom Industries.
- It also measures Leakage Current in Variable Frequency Drives
- The meter is very useful for measurements of current loop signal of transmission control.
- General AC Load / Process Loop monitoring, Ground fault Current Measurement, Industrial Trouble Shooting Checks etc.

DBS/FC/OC/MQ/Tech/ver1.0

1. The Instrument is accompanied with Test & calibration sheet. 2. Test Facilities can be provided at the factory with the available test set-ups only. 3. The Company's policy is continuous improvement of its products. we therefore reserve the Right of any deviation from illustration or specifications without notice. 4. Stated accuracies are valid from 1/10th of range to FS. 5. Accuracy Specified for temperature range of 25°C ± 5°C & 55%RH ± 10%

The Motwane Manufacturing Company Private Limited

[REGD. OFF. & FACTORY]

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ndb**Advanced and
Innovative Solutions**

DRM-10A™

High precision digital micro-ohmmeter

The DRM-10A™ is a lightweight and portable micro-ohmmeter designed to measure very low resistances from $0.01 \mu\Omega$ to 200Ω . It is the most accurate in its category.

ADVANTAGES

- ➊ Much lighter and handier than other equipment in its category
- ➋ Shock resistant, it is suitable for all types of applications: work site or laboratory
- ➌ The LCD display is equipped with a backlight to allow work in any conditions
- ➍ Weak current injection for applications that require small measurement contacts
- ➎ Many accessories are available for your application such as exothermic welding (Cadweld®), measurements on very small surfaces, etc...

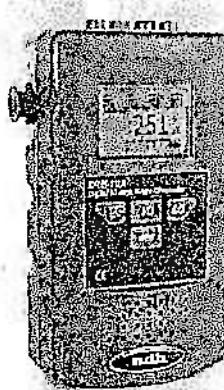
The DRM-10A™ uses a four-pin resistance measurement system which consists of injecting a current with two cables connected at each end of the joint to be tested. Then, the cables are installed which allow reading the voltage on each side of the part to be tested in order to measure the resistance. This eliminates any uncertainty linked to resistance of the contacts. The instrument is equipped with a microprocessor which eliminates gops and parasite voltages. Thanks to its unique filtering system, the DRM-10A™ can be used in spite of the presence of intense magnetic fields.

APPLICATIONS

- ➊ Quality control of smelting parts
- ➋ Control of mechanical joints and high voltage welded joints
- ➌ Control of exothermic joints (Cadweld®)
- ➍ Control of electrodes for aluminum plants
- ➎ Inspection of contacts, circuit breakers and power fuses

OPERATION

The DRM-10A™ is suitable for both laboratory and field applications. Resistance measurements are calculated automatically. This equipment has become the number one choice for industries, products engineers, and manufacturers. Recognized as the most accurate and easy to use on the market, the DRM-10A™ is shock resistant and suitable for many applications.



DRM-10A™

10 amp high precision micro ohmmeter



TECHNICAL SPECIFICATIONS

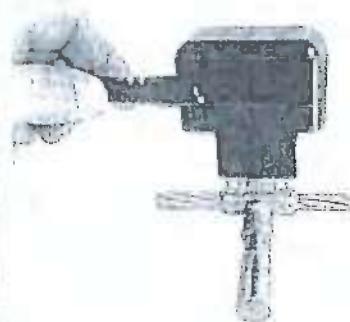
Measuring range	0.01 $\mu\Omega$ to 200 Ω
Display	LCD display 128 x 64
Current	10A, 250mA, 5mA
Resolution	0.01 $\mu\Omega$
Power supply	Six AA NiMH batteries
Autonomy	> 12 000 measurements at 10A > 10 000 measurements for the other currents
Operation temperature	-20°C to 50°C (-4°F to 122°F)
Charging temperature	0°C to 50°C (32°F to 122°F)
Storage temperature	-40°C to 50°C (-40°F to 122°F)
Humidity	0 to 95% non-condensing
Weight	0.86 kg (1.9 lbs)
Dimensions	203 x 114 x 51mm (8 x 4.5 x 2 inches)

HIGHLIGHTS

- Uses the four point measuring method
- Automatic current adjustment from 5mA to 10A
- Automatic stop mechanism of the instrument after 2 min. in idle mode
- Automatic stop mechanism of the backlighting system after 30 seconds
- The LCD (Liquid Crystal Display) displays the results in letters that are easy to read
- A set of standard connecting cables with alligator clips comes with the instrument

INCLUDED:

- DRM-10A™ instrument
- Set of standard cables and clips
- Battery charger
- Rechargeable batteries
- User Manual
- Calibration certificate



DRM-4012™
Optional Exothermic welding test probe (Codweld®)



DRM-4017-35™
Optional Kelvin clamp kit



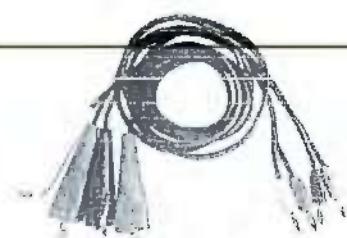
DRM-4013™
Optional reference shunt



DRM-4015™
Optional Double Hands probe kit



DRM-4017-19™
Optional Kelvin clamp kit



DRM-403™
Set of standard cables and clips (included)



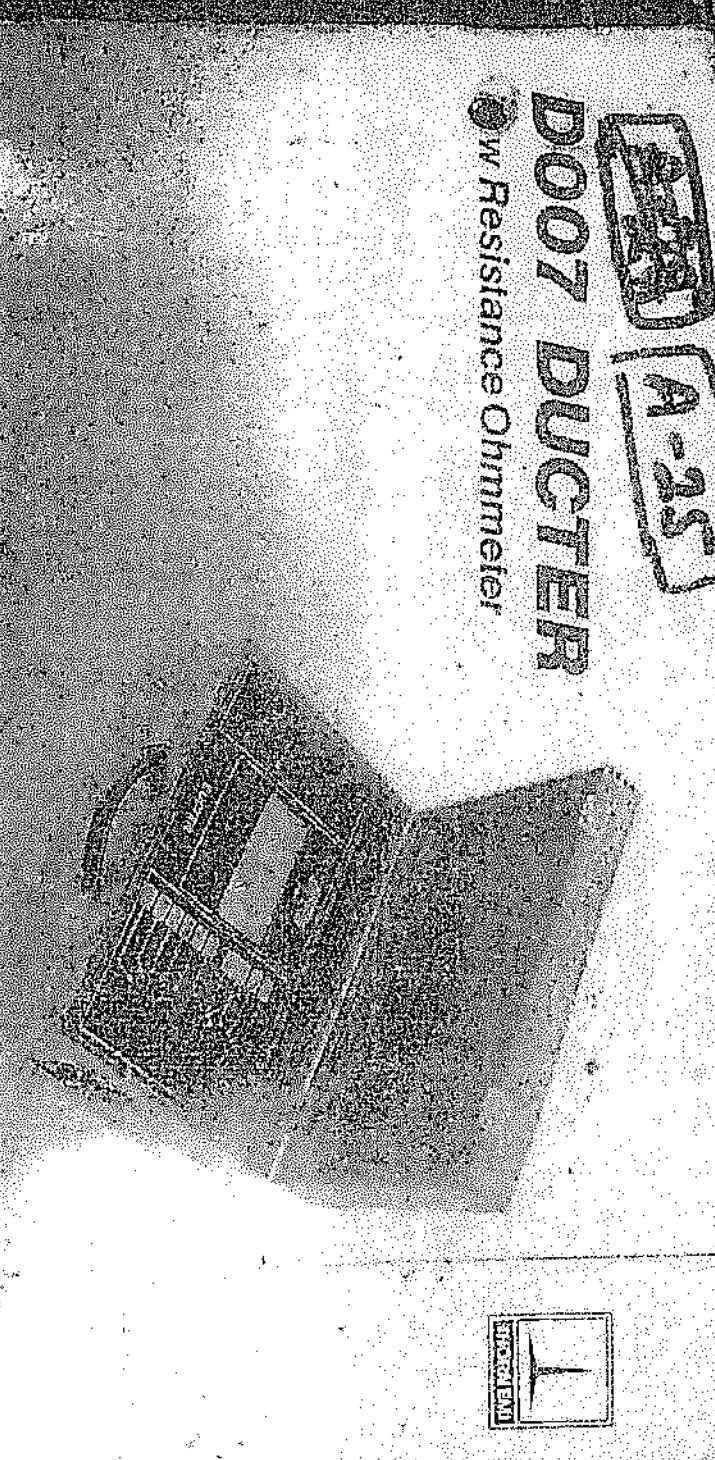
Kaleno 28

Ramagundam Fertilizers and Chemicals Limited Mail - Ducter details & spec



Micro Ohm meter

Operating Instructions



Specification

Range

Resistance range	Lowest reading	Approx. test current
0-100 $\mu\Omega$	1 $\mu\Omega$	10A
0-1m Ω	10 $\mu\Omega$	10A
0-10m Ω	100 $\mu\Omega$	1A
0-100m Ω	1m Ω	1A
0-1 Ω	10m Ω	1A
0-10 Ω	100m Ω	0.1A

Movement

Evershed Cross-coils with amplifier assisted detecting coil.

Accuracy

1% of full scale deflection on all ranges.

Instrument Overload Protection

By diodes on amplifier input.

Fuse

Protection a.c. supply (1A)

Batteries

NiCd cells supplied internally with 20 ampere-hour total capacity.

Battery Charger

Built into instrument case. Operates from a.c. power supply 110V/240V, 50/60Hz

Dimensions

280 x 192mm
11 7/8 in x 7 1/2 in

Weight

11.1 kg (24.5 lb)

Accessories

SUPPLIED WITH INSTRUMENT

Power supply lead.
Test leads with Duplex handles.
Operating instructions.

AVAILABLE AT SUPPLY CO.:

0-0 test leads with single handles.
Part No. 6130-516.

20' 0 test leads with uniglas handlespikes (2 used).
Part No. 6230-246.

30' 0 test leads with duplex handlespikes (2 used).
Part No. 6330-247.

Four terminal lead set with clip connectors.
Part No. 6110-220.

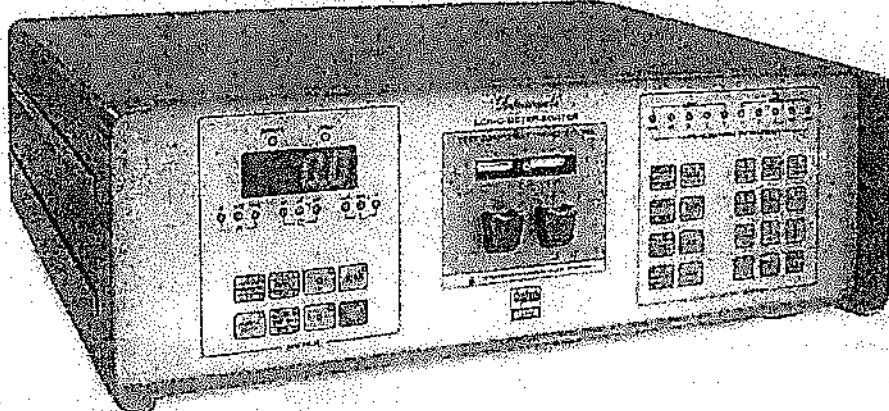


LCRQ Meter

Aplab

MODEL 4912 / 4912PG / 4912PR

Autocompute LCR-Q Meter Sorter



Features

- ★ Microprocessor based Fully Automatic L, C, R, Q and D measurement
- ★ Autoranging with Direct Digital Readout
- ★ 4 Terminal Measurement Technique
- ★ No Tuning or Balancing
- ★ Series or Parallel Equivalent Measurement
- ★ Absolute Value and Nominal Value with Percentage Tolerance
- ★ Single / Multiple Parameters Check During Component Sorting
- ★ Self Test Facility
- ★ Feather Touch Keys with Audio Feedback
- ★ Special Mechanism for Fast and Easy Insertion and Removal of Test Component
- ★ Low Cost and Portable
- ★ Component Sorting on Absolute or Nominal Value Basis with a Percentage Tolerance
- ★ **Aplab Model 4912PG/4912PR is Remote Programmable Auto Compute LCR-Q Meter Sorter, Which can be Programmed through GPIB, RS232 or SPIB Interface**

Description

APLAB Model 4912 is a microprocessor based LCR-Q Meter Sorter that meets today's requirements of measurement, selection and sorting of components in the laboratory, on the production line and in the quality assurance area. Model 4912 features fully autoranging and automatic operation over a wide range of measurements. Model 4912 measures inductance, capacitance, resistance and quality factor to a basic accuracy of $\pm 0.25\%$ of the reading for values upto 2000H, 2000 μ F, 2M ohm and 04 respectively and upto 0.25 for dissipation factor. Measurements can be made at a frequency of 100Hz or 1KHz as required and either the series equivalent or parallel equivalent component values can be displayed. Range selection is fully automatic and the LCR-Sorter automatically discriminates between inductors and capacitors. The operating system of the LCR-Sorter provides assistance to the user in selecting the measurement mode and frequency to give best accuracy. If a wrong selection is done, then the corresponding LED flashes prompting the user to change to the proper setting. Loss of basic accuracy due to poor quality of component and operation beyond the operating range of the instrument is also indicated by flashing the range LED.

Model 4912 incorporates 4 terminal measuring technique which reduces errors due to electro-magnetic coupling of leads as well as reducing residual inductance and stray capacitance.

It provides 13 relay drive outputs at the back panel on 25 pin 'D' type connector. Out of these 3 are provided for Pass/Fail indication & the remaining for bin indication.

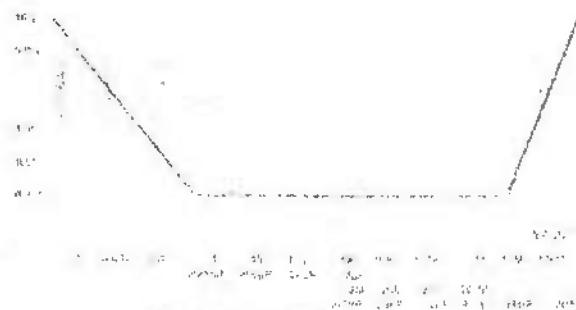
In sort test mode user can sort out components within 1, 2, 5 and 10 percent from the nominal value entered. High and low percent tolerance limits are entered for sorting components on go/no-go basis. Percentage deviation and PASS/FAIL indication is indicated on the 4 digit display in multiplex manner. Setting of nominal value is also possible by measurement of standard component. In absolute mode, upper and lower limit can be entered directly.

In multiple test mode multiple parameters of capacitor & inductor are compared and PASS/FAIL indication is given accordingly. Self test is also incorporated to check the internal circuitry of the instrument.

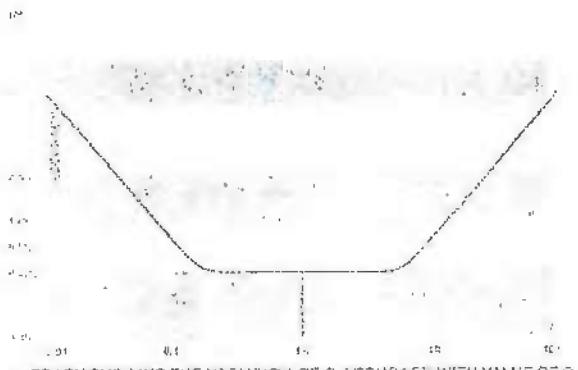


specifications

Variable Measured	: L, C, R, Q & D.	Ultimate Resolution	
Measurement Modes	: Series or parallel equivalent.	Inductance	: 0.1µH.
Sort Modes	: Absolute value or nominal value with % tolerance.	Capacitance	: 0.1pF.
Measurement Freq.	: User selectable 100Hz or 1KHz.	Resistance	: 0.001 ohm.
Accuracy of Measurement Frequency	: ±0.25% of nominal.	Quality Factor	: 0.01.
Maximum Voltage Across	: 0.285V rms (0.8V p-p) approx.	Conditions for Basic Accuracy Measurement Freq.	
Measuring Update Rate	: 2 per second.	100Hz	1KHz
Maximum Time for Valid Reading after User Connecting Component	: 1 second.	Range of Inductance (Q>10)	1H - 2000H 200µH - 1H (series mode) (series mode)
Display	: 4 digit 7 segment 12.5mm high, bright LED with automatic decimal point.	Range of Capacitance (Q>10)	1µF - 2000µF 200pF - 1µF (series mode) (parallel mode)
Connecting to Component Under Test	: 4 terminal integral test jig.	Range of Resistance (Q<0.1)	1ohm - 2Mohm (upto 10K series mode & >10K parallel mode).
Measurement Ranges		Range of Quality	0.25 to 4.
Inductance	: 0.1µH to 9999H.	Limits Setting Precision	: 4 digits for value, 2 digits for % tolerance.
Capacitance	: 0.3pF to 9999µF.	Input Protection	: The input is protected against connection of capacitor of upto 10mF charged to not more than 50V.
Resistance	: 0.001 ohm to 100M ohm.	Operating Temp.	: 0° to 40°C.
Basic Accuracy Valid for L, C & R Measurements	: ±0.25% of reading ±1 digit.	Power Supply	: 230V AC ±10%, 50Hz.
		Dimensions	: 430 (W) x 150 (H) x 330 (D) mm approx.
		Weight	: 4.5 Kg. approx.
		Standard Accessories	: 4 terminal remote test adapter, Mains cord & Operation manual.
		Options	: 4912PR with RS232 Interface 4912PG with GPIB Interface.



GRAPH SHOWING VARIATION OF ACCURACY WITH SCALING FOR 100Hz AND 1KHz Q>10 FOR L, C & R



WE PURSUE A POLICY OF CONTINUOUS DEVELOPMENT AND PRODUCT IMPROVEMENT, THUS THE SPECIFICATIONS IN THIS DOCUMENT AND THE LOCATION OF CONTROLS ON THE FRONT PANEL MAY BE CHANGED WITHOUT NOTICE.

Test & Measurement Instruments

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Decade Resistance Box

High stability Decade Megohm Box is Available in two Models:

Type 8400 Economy Model: Voltage range 500 Volts to 1000 Volts DC.

Type 8400-HV (High Voltage): Voltage Range 1000 Volts to 5000 Volts DC.

Model 8400: (Economy Model)

Model 8400 HV: (High Voltage 5 KV)

Specification

Type	: Portable
Function	: Resistance Calibration Standard
Resistance Range	: 0.1 Megohm to 10 Giga Ohm (In five decade dials)
Accuracy	: +/- 2% until 1 Giga ohm : +/- 5% from 1 Giga Ohm to 10 GigaOhm range
Power rating on 70 C	: 1.5 W
Rated Max. Voltage	: 1000 Volts DC
Stability	: 0.5%

Specification

Type	: Portable, 5 KV Model
Function	: Resistance Calibration Standard
Resistance Range	: 0.1 Megohm to 1000 Giga Ohm (In seven decade dials)
Accuracy	: +/- 2% until 1 Giga ohm : +/- 5% from 1 Giga Ohm to 1000 GigaOhm range
Power rating on 70 C	: 1.5 W
Rated Max. Voltage	: 5000 Volts, DC (If all the dials are in use)
Stability	: 0.5%

Capability

Decade	Resistance per step	Total Resistance on decade dial	Impressed Voltage (DC)
First	0.1 Meg.	1.0 Meg.	1000 Volts
Second	1.0 Meg.	10.0 Meg.	1000 Volts
Third	10.0 Meg.	100.0 Meg.	1000 Volts
Fourth	100.0 Meg.	1000.0 Meg.	1000 Volts
Fifth	1.0 Giga	10.0 Giga	1000 Volts

Total Available Resistance : 11.111 Giga Ohm

Capability

Decade	Resistance per step	Total Resistance on decade dial	Impressed Voltage (DC)
First	0.1 Meg.	1.0 Meg.	1000 Volts
Second	1.0 Meg.	10.0 Meg.	1000 Volts
Third	10.0 Meg.	100.0 Meg.	5000 Volts
Fourth	100.0 Meg.	1000.0 Meg.	5000 Volts
Fifth	1.0 Giga	10.0 Giga	5000 Volts
Sixth	10.0 Giga	100.0 Giga	5000 Volts
Seventh	100.0 Giga	1000.0 Giga	5000 Volts

Total Available Resistance : 1111.111 Giga Ohm

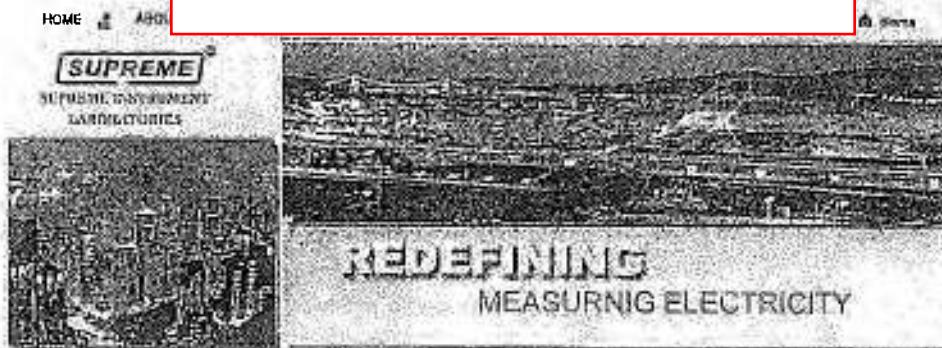
We, At Vaiseshika, offer our customers customized Decade Megohm Boxes with minimum four dial configuration as per customers' range of resistance Value.

We also undertake to manufacture hybrid Resistance Boxes with low & high value Decade Dials from 0.001 Ohm to 1 TOhm.

Vaiseshika is proud of achieving remarkable success in designing & manufacturing High stability Decade Megohm Boxes upto 1000 GigaOhm rated to work on 5000 Volts DC.

Vaiseshika is the only Company in India to manufacture such Megohm Boxes.

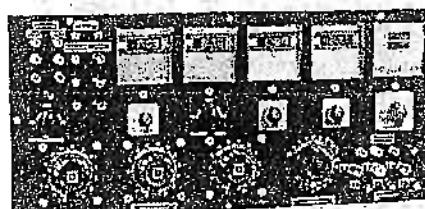
3 phase Energy Meter Phantom load Test Set

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[HOME](#) > [PRODUCTS](#) > [THREE PHASE PHANTOM LOAD TEST SET](#)

THREE PHASE PHANTOM LOAD TEST BENCH

Supreme make Phantom Load Test Set is a portable testing accessory designed for field service. It simulates various load conditions usually prevailing in power supply system. The unit offers a practical solution by providing artificial load unaltered by the variation in the power supply mains and adjustable to the complete motor testing requirements.



INPUT	: 110V or 440V, selectable, AC 3 phase 50 Hz,
RATED TEST VOLTAGE	: 110 V 3 phase & 440 V 3 phase -selectable,
CREEP TEST VOLTAGE	: 121V 3 Phase & 440 V 3 phase -selectable,
TEST CURRENT	: 0-1-5A or 0-1-5 10 Amps or 0-5-10 Amps or 0-5-10-20 Amps. Each range is selectable and continuously variable.
	Please select any one of the ranges as per your requirements,
CURRENT REGULATION	: 0-125% of the range selected.
STARTING CURRENT	: 0.5%, 0.75%, 1% and 1.5% of the range selected.
POWER FACTOR REGULATION	: Adjustable to any value between Zero to Unity lagging and leading with coarse and fine controls. A network transformer associated with selector switch and digital Power Factor Meter will be incorporated,
OUTPUT	: 0-1-5 Amps, 15 VA or 20 VA or 30VA per phase. 0-1-5-10 Amps, 15 VA or 20 VA or 30VA per phase. 0-5-10Amps, 15 VA or 20 VA or 30VA per phase. 0-5-10-20Amps, 15 VA or 20 VA or 30VA per phase. While ordering please specify the Current range and burden requirements.
INSTRUMENTS	: 3 Nos. 96 mm Analog — Ammeters, class 1% 1 No. 96 mm Analog — Voltmeter, class 1% 1 No. 96 mm — 3 phase four wire Power Factor Meter digital class 2 OR 3 Nos. 96 x 48 mm digital Ammeters class 0.5% 1 No. 96 x 48 or 96 x 96mm digital Voltmeter class 0.5% 1 No. 96 mm digital Power Factor Meter 3 phase four wire system, class 2 Please specify the type of instruments you prefer.

The unit is housed in powder coated sheet steel cabinet with detachable cover. All connections, switches, indicating lamps, control devices indicating Instruments etc. will be mounted on the top bakelite panel duly engraved for easy connection and operation. The unit will be supplied with operating instructions, circuit diagram and our works test report. The equipment is guaranteed for 12 months from the date of delivery against any manufacturing defects in normal use. The overall weight of the kit will be approximately 65 Kgs.

To have portability, we can supply the same in two parts also

(1) Current circuit and (2) Voltage and power factor circuit. Necessary inter connecting links will be supplied to connect voltage and current circuits. This system is very ideal considering your practical problems of carrying the single unit from place to place.

NOTE : While sending enquiries / order, please specify

- (1) Current Range
- (2) VA Burden
- (3) Type of instruments
- (4) Single unit or in two units as mentioned above.

SINGLE PHASE PHANTOM LOAD TEST SET



!! SUPREME INSTRUMENTS LABORATORIES !!

EP -



INPUT	:	440V, 3 Phase 4 WIRE AC 50 Hz.
OUTPUT TEST VOLTAGE	:	230 Volts, Single Phase AC 50 Hz.
OUTPUT CREEP TEST VOLTAGE	:	250 Volts, Single Phase
TEST CURRENT	:	0 - 5A & 0 - 10A (selectable)
STARTING CURRENT	:	0.5%, 0.75% & 1% of the range selected.
POWER FACTOR	:	Lead-Unity-Lag (selectable & continuously variable)
CAPACITY	:	25VA.
INSTRUMENT	:	Digital Ammeter, Voltmeter & Power Factor Meter class 1.

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1 phase Energy Meter Test Set

CL - 58

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SUPREME
SUPREME INSTRUMENT
LABORATORIES

REFINING
MEASURING ELECTRICITY

HOME > PRODUCTS > SINGLE PHASE METER TEST BENCH

SINGLE PHASE METER TEST BENCH

Single phase meter test bench suitable for calibration & testing of AC Ammeters, AC Volt Meters, AC Single phase Energy Meters, Power Factor Meters & Watt Meters. Other Technical Specifications are as under:

INPUT	: 400/440V., A.C. 3 Phase 50 Hz.
OUTPUT TEST VOLTAGE	: 0-250 Volts, single phase A.C. 50Hz.
TEST VOLTAGE REGULATION	: ±0.120% of the selected range.
CREEP TEST VOLTAGE	: 75%, 80%, 100%, 110% & 120% of selected voltage.
CURRENT RANGE	: 1-2.5-5-10-25 & 50A
CURRENT REGULATION	: ±0 to 120% of range selected.
STARTING CURRENT	: 0.5%, 0.75%, 1% & 1.5% of the range selected.
PHASE SHIFT	: Built-In Phase Shifting Transformer static type, phase angle variation 90 degree Lag Unity 90 degree lead & in between values continuously variable.
OUTPUT CAPACITY	: 1200 VA. This Bench will be capable to test 50 Nos. Single Phase Energy Meters at a time.

Class of accuracy for C.T. 0.2 & Potentiost Transformer 0.5

INSTRUMENTS:

Digital Ammeter	: 1 No.
Digital Voltmeter	: 1 No.
Single phase digital Power Factor Meters	: 1 No.
Digital Frequency Meter	: 1 No;

The complete system will be assembled in powder coated M.S. horizontal cabinet duly wired and tested. The ferrules matching circuit diagram will be supplied with the Bench.

More than 325 Nos. Meter Test Benches are already in use with the Maharashtra State Electricity Board to their O & M, and Testing Divisions throughout Maharashtra.

M.S.V.T. (MULTI SECONDARY VOLTAGE TRANSFORMER)

Ratio: 240V/240V having 88/44/22/11 secondary windings rated for 5VA/10VA/20VA or 40VA or any other VA ratings as per customers requirements. There is no measurable variation in error from one winding to any other winding. Also there is no measurable variation error when the burden is transferred to each of the other secondary windings. There is only one input and a number of independent output with same output voltage and burden. It is an ideal transformer for Energy Meter Test Benches where a number of meters are calibrated and tested at a time. The class of accuracy can be + 1% or + 0.5% or + 0.3% insulation between primary and secondary winding will be 5 KV. Between each secondary winding proper insulation will be given to withstand 3 KV. If there is no proper insulation, the primary and secondary windings will get heated and the transformer will be burntout. While heating up, the output will be disturbed and will be out of accuracy.



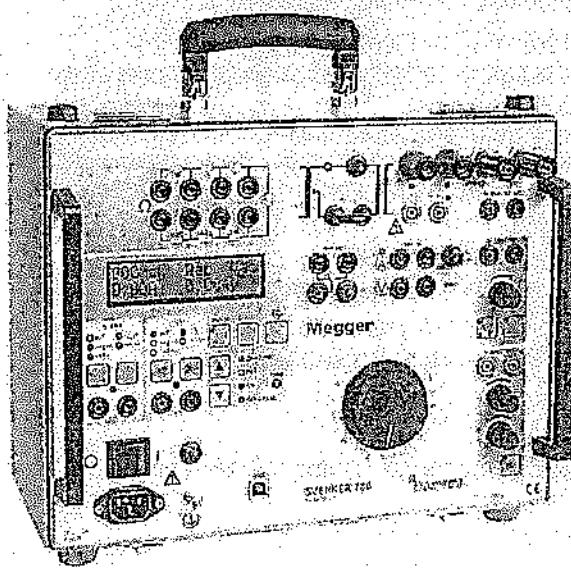
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Megger.**SVERKER 750/780**
Relay Test Sets

SVERKER 750/780

Relay Test Sets



Description

The SVERKER 750/780 Relay Test Set is the engineer's toolbox. The control panel features a logical layout; still SVERKER 650 users will find it comfortably familiar and will be able to start work right away.

The SVERKER 750/780 features many functions that make relay testing more efficient. For example, its powerful measurement section can display (in addition to time, voltage and current) Z, R, X, S, P, Q, phase angle and $\cos \varphi$. The voltmeter can also be used as a 2nd ammeter (when testing differential relays for example). All values are presented on a single easy-to-read display.

You can also test directional protective equipment efficiently by means of the built-in variable voltage source. In SVERKER 780 this has a continuous phase shift function and adjustable frequency as well. Automatic reclosing devices can also be tested – just as easily.

Designed to comply with EU standards and other personal and operational safety standards, SVERKER 750/780 is also equipped with a serial port for communication with personal computers and the PC software SVERKER Win. Since the compact SVERKER weighs only 18 kg (39 lbs), it's easy to move from site to site.

Two or more SVERKER units can also be synchronized, which allows the user to operate a basic 3-phase test set.

- The engineer's toolbox for all single phase relay testing
- Stand-alone functionality
- Rugged and reliable for field use

Application

Relay Testing

SVERKER 750/780 is intended primarily for secondary testing of protective relay equipment. Virtually all types of single-phase protection can be tested. You can also test three-phase protection that can be tested one phase at a time, and also a number of protective relay systems that require phase shifting. Moreover, automatic reclosing devices can be tested.

SVERKER 780 can test voltage relays with a frequency range from 15 Hz up to 550 Hz.

Examples of what SVERKER can test

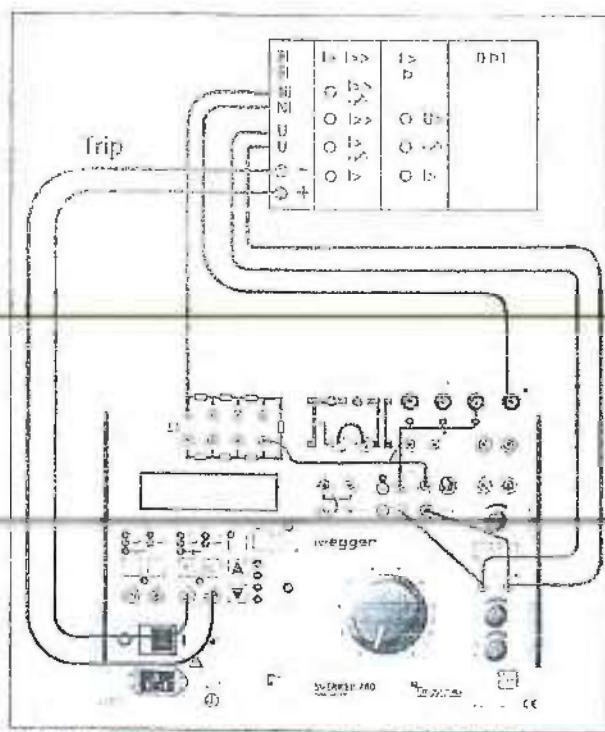
	ANSI® No.
Overspeed relays	50
Inverse time overcurrent relays	51
Undercurrent relays	37
Ground fault relays	50N, 51N
Directional overcurrent relays	67
Directional ground fault relays	67N
Overspeed relays	59
Undervoltage relays	27
Directional power relays	32
Power factor relays	55
Differential protection (differential circuits)	87
Distance protection equipment (phase by phase)	21
Negative sequence overcurrent relays	46
Motor overload protection	51/66
Automatic reclosing devices	79
Tripping relays	94
Voltage regulating relays	
Underimpedance relays	21
Thermal relays	49
Time-delay relays	
Frequency relays (SVERKER 780)	81



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Other fields of application

- Plotting excitation curves
- Current and voltage transformer ratio tests
- Burden measurement for protective relay test equipment
- Impedance measurement
- Efficiency tests
- Polarity (direction) tests
- Injection
 - Maintained
 - Injection continues without any time limitation.
 - Momentary
 - Injection continues only as long as the button is kept depressed.
 - Max. time
 - Injection stops automatically when the preset maximum time is reached.
- Filtering
 - When filtering is selected, five successive readings are averaged. The following can be filtered: Current, Voltage and Extra items that are measured.
- Off delay
 - The turning off of generation can be delayed after tripping throughout a specified time interval that is expressed in mains frequency cycles.



Testing the pick-up and drop-out using SVERKER 780

SVERKER 750/780

Relay Test Sets

Application example

IMPORTANT!

Read the User's manual before using the instrument.

Testing the pick-up and drop-out using SVERKER 780

1. Connect as shown in the diagram.
2. Select stop conditions, dry or wet contact.
3. Select HOLD to freeze the current reading.
4. Press button SEL A until you get a red light at the built-in ammeter.
Note: Maximum allowed current through the separate ammeter used in this connection example is 6 A. The other measurement points do not have this limitation.
5. Press the MODE button.
6. Use the key ∇ to select Ω , φ , W, VA...
7. Press CHG (Change)
8. Select φ ($^{\circ}$, Iref) or ($^{\circ}$, Uref) by using the key ∇ .
9. Press SEL (Select)
10. Press ESC
11. Set the voltage amplitude with the upper small knob.
12. Make sure the main knob is set to 0.
13. Turn on the SVERKER output by activating ON using the start switch ∇ .
14. Set the phase-angle. Use the lower knob for fine adjustment, and the middle knob for step of 90° .
Note: A small current flowing in the circuit is required to measure the phase angle.

Testing the operation time

15. Increase the current to 1.5 times the pick-up value.
16. Invoke the ON+TIME state by means of the start switch. The outputs will now remain turned on until the protective relay equipment operates.
17. Read the time from the display. Check also the high current setting using the same procedure.



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Features and benefits

1. Set of resistors
Fine regulation of current and voltage thanks to the built-in set of resistors.
2. Start and stop conditions
The timer's start and stop inputs respond to changes, voltage or contact closing/openings. The timer's start input is also used when testing auto-reclosing relays, to synchronize two or more SVERKER units and to start generation with an external signal.
3. Display
Presents time, current, voltage and other entities. Also used to make settings, after you enter the setting mode by pressing button marked MODE.
4. Freeze function (HOLD)
This makes it possible to measure voltages and current as short as a quarter of a mains-voltage period by immobilizing the reading on the display. Voltage and current readings are frozen when the timer stops. If the timer does not stop, the reading present when the current was interrupted is frozen on the display.

5. Make/break contact
Changes state automatically when a test is started. Can be used (for example) to synchronize two or more SVERKER units, other external equipment or to switch the voltage applied to the protective relay equipment back and forth between non-faulty and faulty.
6. Ammeter and voltmeter
Current and voltage are measured by the built-in ammeter and voltmeter. Resistance, impedance, phase angle, power and power factor can also be measured. Readings appear on the display. These instruments can also be used to take measurements in external circuits. The voltmeter can also be used as a 2nd ammeter (when testing differential relays for example, using CSU20A). Current and voltage can be displayed either as amperes and volts or as percentages of a given current or voltage (the present settings of the protective relay equipment for example).
7. Current source
Provides 0-250 A AC, 0-250 V AC or 0-300 V DC, depending on the output that is being used. Settings

are made using the main knob. The readings of current, voltage and other entities appear on the display. The start switch is used to turn the current source on and off. When time is being measured, this is done in synchronization with the timer.

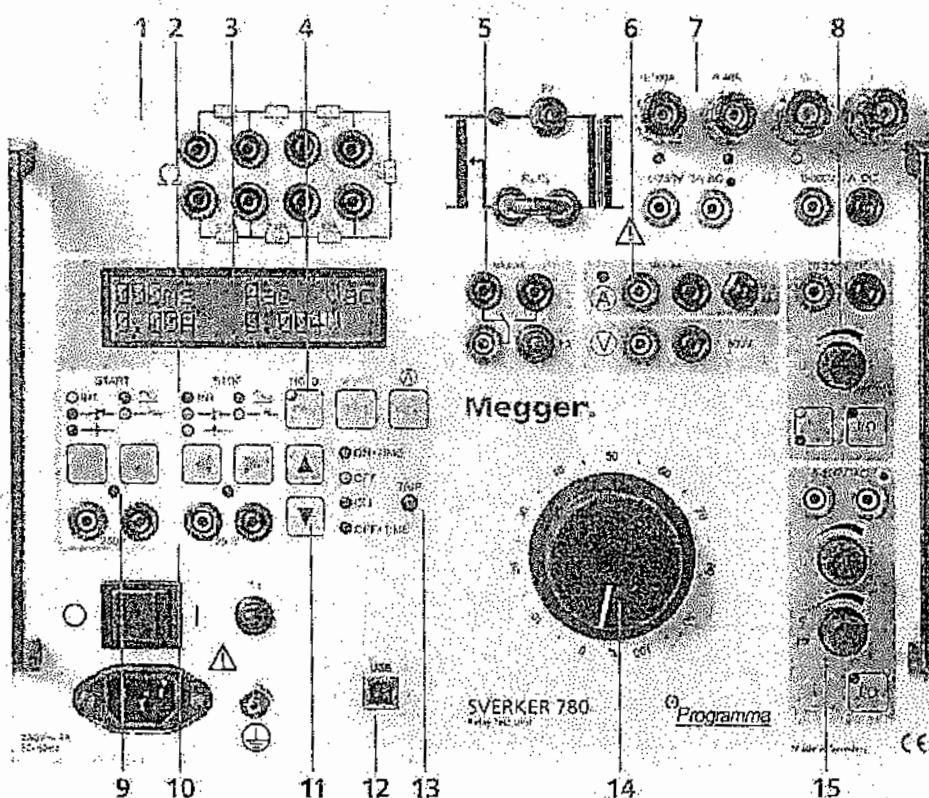
8. Auxiliary voltage source
Provides 20-220 V DC in two ranges. Equipped with overload protection and separated from the other outputs. Used frequently to supply the object being tested.
9. Status indicator
The timer's start and stop inputs are each equipped with indicator lamps which, when lighted, indicate a closed circuit (useful for detecting contact closings/openings) or the presence of voltage. These indicator lamps make it possible (for example) to check circuits before starting a measurement cycle.
10. Timer inputs
The timer has separate start and stop inputs, and it can be used to measure both external cycles and sequences initiated by SVERKER. The measured time appears on the display. Each input can be set to respond to the

SVERKER 750/780

Relay Test Sets

presence or absence of voltage (AC or DC) at a contact.

11. Start switch
Controls the turning on and off of the current source and timer. Can be set to one of four states: ON+TIME. Starts generation and timing simultaneously. Used to test over... relays (...means current, voltage or some other entity). Generation continues a) until the protective relay equipment operates and stops the timer or b) until the maximum time expires or the start switch is released if time-limited generation has been selected.
12. OFF. Turns off the current source, whereupon generation is interrupted.
13. ON. Turns on the current source in the generating state.
14. OFF+TIME. Interrupts generation and starts the timer simultaneously. Used when testing under... relays (...means current, voltage or some other entity). The timer is stopped when the protective relay equipment operates. When automatic reclosing is to be tested, SVERKER can be set so that new generation will start when the timer's start input is activated by the closing command.
15. Computer communication interface USB
SVERKER is equipped with a serial port for communication with personal computers and the PC software SVERKER Win.
16. Tripping indicator
Lights when a stop condition is fulfilled to indicate operation of the protective relay equipment. If the test being conducted incorporates timing, this indicator starts to blink when relay operation occurs.
17. Main knob
Used to set current output from the current source.
18. AC voltage source
Since the AC voltage source is separated from other outputs, it is set independently of the current source. The AC voltage source is intended primarily for the relay protection equipment's voltage input.





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SVERKER Win

PC software for SVERKER 750/780

The SVERKER Win software makes fieldwork easier while providing neater reports. The SVERKER Win software enables you to control the SVERKER from a PC. The SVERKER is connected to the PC's serial port. Test results can be reported either directly with table and graph, or from an external program, e.g. Microsoft® EXCEL.

SVERKER Win enables customised reports in an easy way. Very useful are the reference graphs, together with the current/voltage graph presentation for each test point during the test. The graph can of course be printed out on the test report if you like.

A usable feature is the ready-made current curves available for many relay types.

During relay testing, each measured value is stored in a log list. In this list you can add comments to each test point. When the entire test is finished, you can save everything as a data file. Later, you can print out the test results. You save time by not having to write your report in the field. All report writing can be done conveniently back at the office.

The SVERKER Win software provides easy access to connection instructions, test instructions and the like, which you prepare in advance. These instructions, which can contain both text and graphics, can be prepared using standard word processing packages.

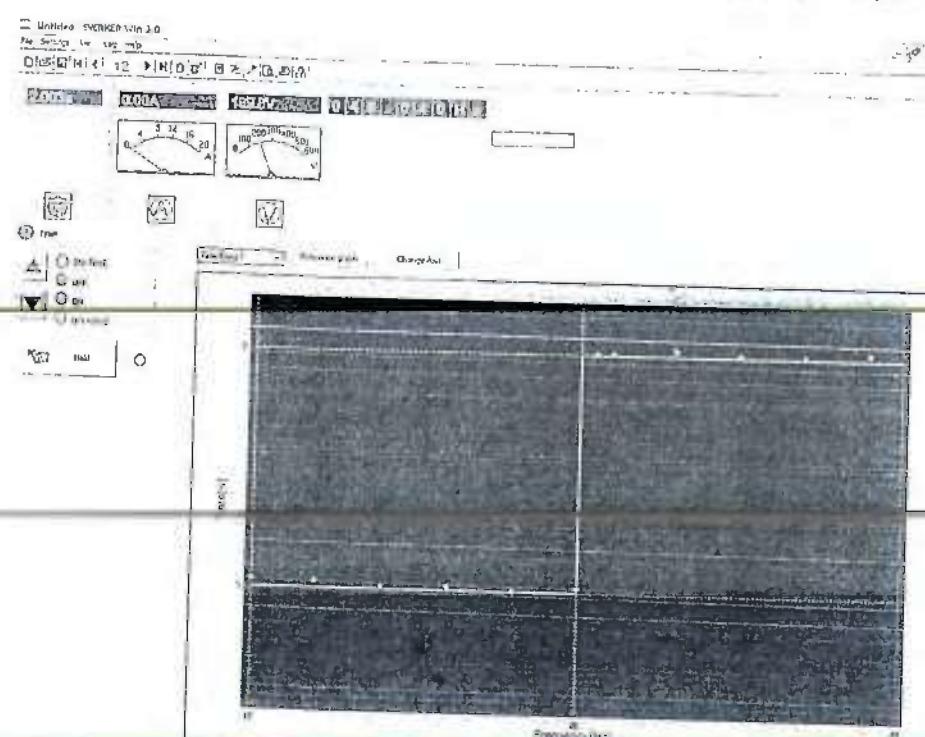
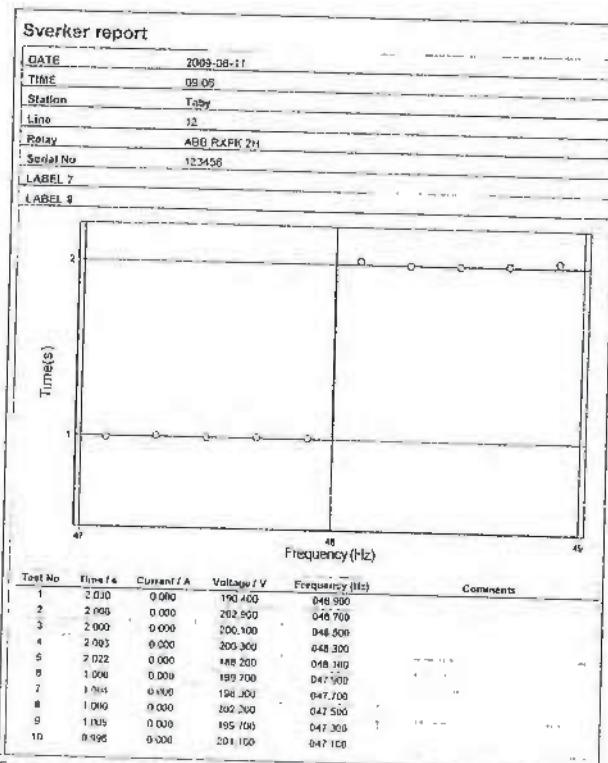
The settings you make on SVERKER are also saved in a file, so that the next time you want to test the same or similar protective relay equipment, all you have to do in order to set-up the SVERKER, is to open the file.

SVERKER 750/780

Relay Test Sets

Specifications SVERKER Win

The SVERKER Win software comprises a 32-bit program written to run under Windows® 95/98/2000/NT/XP. The amount of space needed to save reports and settings will depend on how many protective systems that are to be tested. Roughly estimated, you will thus need a total of about 20-100 MB of free space on the hard disk. Languages in SVERKER Win are: Czech, English, French, German, Spanish and Swedish.





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Specifications SVERKER 750/780

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment

Application field	The instrument is intended for use in high-voltage substations and industrial environments.
Temperature	
Operating	0°C to +50°C (32°F to +122°F)
Storage & transport	-40°C to +70°C (-40°F to +158°F)
Humidity	5% - 95% RH, non-condensing
CE-marking	
LVD	Low Voltage Directive 2006/95/EC
EMC	EMC Directive 2004/108/EC
General	
Mains voltage	115/230 V AC, 50/60 Hz
Power consumption (max)	1380 W
Protection	Thermal cut-outs, automatic overload protection
Dimensions	
Instrument	350 x 270 x 220 mm (13.8" x 10.6" x 8.7")
Transport case	610 x 350 x 275 mm (24.0" x 13.8" x 10.8")
Weight	
SVERKER 750	17.3 kg (38.1 lbs) 26.3 kg (58 lbs) with accessories and transport case
SVERKER 780	18.1 kg (39.9 lbs) 27.1 kg (59.7 lbs) with accessories and transport case
Test lead set, with 4 mm stackable safety plugs	2 x 0.25 m (0.8 ft), 2.5 mm ² 2 x 0.5 m (1.6 ft), 2.5 mm ² 8 x 2.0 m (6.6 ft), 2.5 mm ²
Test leads with spade tongue connectors	2 x 3.0 m (9.8 ft), 10 mm ²
Display	LCD
Available languages	Bulgarian, Czech, English, French, German, Russian, Spanish, Swedish, Turkish

Measurement section

Timer

Time can be displayed in seconds or in mains-frequency cycles.

Range	Resolution	Inaccuracy
0.00-9.999 s	1 ms	±(1 ms + 0.01%)*
10.00-99.99 s	10 ms	±(10 ms + 0.01 %)*
100.0-999.9 s	100 ms	±(100 ms + 0.01 %)*

* For the OFF+TIME start condition in INT mode, 1 ms shall be added to the above measurement error.

Range	Resolution	Inaccuracy
0.0-999.9 cycles	0.1 cycles	±(0.1 cycles + 0.01%)
1000-49999 cycles at 50 Hz 1000-59999 cycles at 60 Hz	1 cycle	±(1 cycle + 0.01 %)

SVERKER 750/780

Relay Test Sets

Ammeter

Measurement method AC, true RMS
DC, mean value

Ranges

Internal 0.00 - 250.0 A

External 0.000 - 6.000 A

Inaccuracy

Internal range " ±(1% + 20 mA)

0-10 A AC ±(1% + 40 mA)

0-100 A AC ±(1% + 200 mA)

External range " ±(1% + 20 mA)

0-0.6 A AC ±(1% + 20 mA)

0-6 A AC ±(1% + 20 mA)

0-0.6 A DC ±(0.5% + 2 mA)

0-6 A DC ±(0.5% + 20 mA)

Resolution

Internal range 10 mA (range <100 A)

100 mA (range >100 A)

External range 1 mA

Voltmeter

Measurement method AC, true RMS
DC, mean value

Range 0.00 - 600.0 V

Inaccuracy " AC, ±(1% + 200 mV) Max. value

DC, ±(0.5% + 200 mV) Max. value

Values are range depending

Extra measurements

Power factor and phase angle measurements

	Range	Resolution	Inaccuracy
Power factor cos ϕ	-0.99 (cap) to +0.99 (ind)	0.01	±0.04
Phase angle ϕ (°)	000 - 359°	1°	±2°

Impedance and power measurements

AC Z (Ω and °), Z (Ω), R and X (Ω and °), P (W), S (VA), Q (VAR)

DC R (Ω), P (W)

Range Up to 999 kX (X=unit)

Make/Break contact

Max. current 1 A

Max. voltage 250 V AC or 120 V DC

Reclosing test

Items measured Tripping and reclosing times

Display After test is finished a list of all times appears in display

Breaker state feedback The Make/Break contact can be used to feed back the breaker state

Max. number of reclosings 49

Max. testing time 999 s

Sets of resistors and a capacitor

Resistors 0.5 Ω to 2.5 kΩ

Capacitor 2) 10 pF, max voltage 450 V AC

1) Measurement intervals longer than 100 ms

2) SVERKER 750



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SVERKER 750/780
Relay Test Sets

Outputs

Current outputs - AC

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)	Load/unload times On (max)/Off (min)
0 - 10 A	90 V	75 V	10 A	2/15 minutes
0 - 40 A	25 V	20 V	40 A	1/15 minutes
0 - 100 A	10 V	8 V	100 A	1/15 minutes
0 - 100 A	10 V	-	250 A*	1 sec/5 minutes
			200 A**	

* Mains voltage 230 V AC

** Mains voltage 115 V AC

Voltage outputs - AC/DC

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)	Load/unload times On (max)/Off (min)
0 - 250 V AC	290 V AC	250 V AC	3 A	10 min/45 min
0 - 300 V DC	320 V DC	250 V DC	2 A	10 min/45 min

Separate AC voltage source SVERKER 750

Range	No-load voltage (min)	Full-load voltage (min)	Full-load current (max)
0 - 60 V AC	70 V	60 V	0.25 A
60 - 120 V AC	130 V	120 V	0.25 A

Both ranges are divided into voltage steps of 10 V that are steplessly variable.

Separate AC voltage source SVERKER 780

Range	No-load voltage (min)	Full-load voltage (min)	Full-load power (max)
5 - 220 V AC minimum step 0.1 V	240 V AC	220 V AC at 33 W 200 V AC at 46 W	33 W continuously 46 W 1 minute
Phase angle	Resolution	Inaccuracy	

D - 359° 1° ±2°

Frequency Resolution Inaccuracy

15 - 550 Hz 1 mHz ±0.1%

Auxiliary DC output

Range	Voltage	Max. current
20 - 130 V DC	20 V DC	300 mA
	130 V DC	375 mA
130 - 220 DC	130 V DC	325 mA
	220 V DC	400 mA

Optional accessories

Power source CSU20A

CSU20A is a small light-weight current and voltage source primarily intended to work together with the SVERKER 750/780 Relay Testing Unit when testing differential relays. Using the CSU20A together with SVERKER 750/780 gives the user two independent current sources, and the timer/measurement section in SVERKER 750/780 is used both for measuring the two outputs as well as measuring the trip time of the relay.

Besides testing differential relays the unit can be used as a multi-purpose AC/DC source. The CSU20A features one AC current/voltage output, one fully rectified DC output and one half-wave rectified DC output for harmonic restraint testing.

Other features are a current measurement shunt, selectable current/voltage ranges and an AC mains input/output. Connecting the SVERKER 750/780 mains to the mains output of the CSU20A gives an in phase synchronization of the two units.

Specifications CSU20A

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Operating temperature -20°C to +50°C (-4°F to +122°F)

Mains voltage 115/230 V AC, 50/60 Hz

Thermal protection Built-in

Dimensions 280 x 178 x 246 mm
(11" x 7" x 9.7")

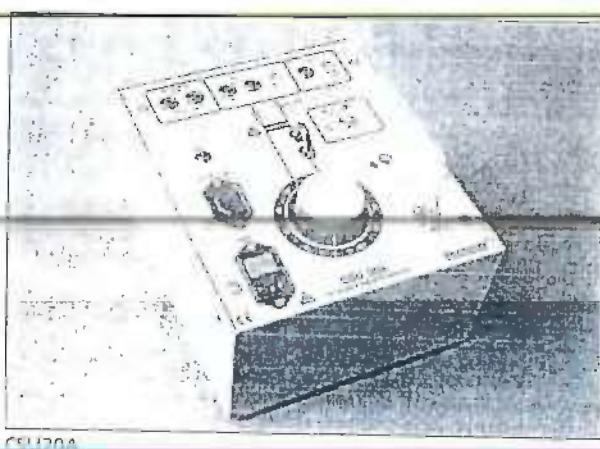
Weight 5.9 kg (13 lbs) excl. transport case
Current shunt 0.1 A / 1 V, ± 2%

Output, AC

20 A setting	Output voltage (min)	Load time
Idle/non-load	26 V	Continuous
5 A	25 V	Continuous
10 A	22 V	Continuous
20 A	18 V	2 min

10 A setting	Output voltage (min)	Load time
Idle/non-load	52 V	Continuous
3 A	50 V	Continuous
5 A	47 V	Continuous
10 A	41 V	10 min

Output, DC	As above, less the voltage drop over the rectifying diodes
------------	--



CSU20A

Megger.

SVERKER 750/780

Relay Test Sets

Phase selector switch PSS750

The Phase Selector Switch PSS750 is specifically designed to work with SVERKER 750/780 when testing three-phase relays. It is connected between SVERKER 750/780 and the relay inputs and allows the user to easily select which phase to test.

The PSS750 handles both the current and voltage sources and single-phase or phase-phase testing can be selected. Together with the output-input switching the unit also contains a variable resistor that can be used together with the built-in capacitor in SVERKER 750/780. This feature gives the user the possibility to create a variable phase shift at a decreased amplitude of the test voltage.

The design is passive which makes it very general. You may for example use any of the inputs for current or voltage as long as you do not exceed the specification. It is also possible to connect the measuring inputs of the SVERKER 750/780 to the PSS750 and use the switch for selecting measurement signals.

The PSS750 simplifies phase switching, selecting type of fault, phase reversing and gives a possibility to create a variable phase shift.

Specifications PSS750

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

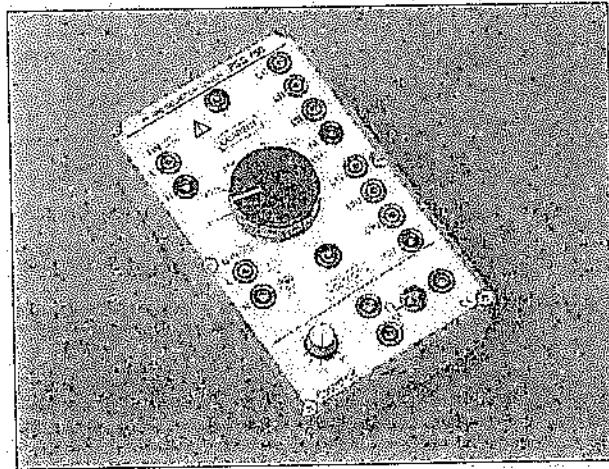
Max input voltage	250 V AC / 3 A
Max input current	6 A / 250 V AC
Max resistor loading	200 V AC / 200 mA (0.5 A during 5 seconds)
Dimensions	200 x 120 x 85 mm (7.9" x 4.7" x 3.3")
Weight	1.3 kg (2.9 lbs)

Application example with PSS750

IMPORTANT!

Read the User's manual before using the instrument

1. Connect the current and voltage outputs of SVERKER 750/780 to the PSS750 inputs.
2. Connect the current and voltage inputs of the relay to the PSS750 outputs.
3. Select which phase to test and type of test (phase-to-ground or phase-phase) with the selector switch.
4. Proceed with the test for each phase and fault type.
5. To create a phase shift, connect the 10 µF capacitor in SVERKER 750/780 in series between the voltage output and the PSS750 input, and connect the variable resistor in parallel with the PSS750 input.
6. Set the SVERKER 750/780 for phase (and impedance) measurement. Connect the voltage measurement input to the PSS750 input.
7. Start the test with the resistor in maximum position. Gradually decreasing the resistor gives increasing phase shift in the voltage signal. The test voltage/impedance will decrease at the same time so an adjustment of the test current might be necessary to get the correct impedance. Please observe that the phase shift depends on the input resistance and may vary between different relays. Some relays may also have a low voltage limit where the relay will not operate. For additional 180 degrees phase shift use the phase reversal switch.



PSS750



Megger.

SVERKER 750/780
Relay Test Sets



Test lead set GA-00030



Impact resistant and waterproof (IP65) HD-case with wheels and retractable handle.

Optional (not included)	
Item	Art. No.
SVERKER 750	
Incl. Test lead set GA-00030 and Transport case	
GD-00182	
Language: English, French, German, Spanish, Swedish	
115 V Mains voltage	CD-11190
230 V Mains voltage	CD-12390
SVERKER 750	
Incl. Test lead set GA-00030 and IP65 HD-case	
Language: English, French, German, Spanish, Swedish	
115 V Mains voltage	CD-13190
230 V Mains voltage	CD-13390
SVERKER 750	
Incl. Test lead set GA-00030 and Transport case	
GD-00182	
Language: Czech, English, German, Swedish, Turkish	
230 V Mains voltage	CD-12392
SVERKER 750	
Incl. Test lead set GA-00030 and Transport case	
GD-00182	
Language: English, French, German, Russian, Swedish	
230 V Mains voltage	CD-12394
SVERKER 750	
Incl. Test lead set GA-00030 and Transport case	
GD-00182	
Language: Bulgarian, English, French, German, Swedish	
230 V Mains voltage	CD-12396
Optional	
SVERKER Win PC Software	
Please specify the SVERKER serial number when ordering.	
SVERKER Win contains software, a copy-protection key and cables (RS232 and USB) for connecting the PC to SVERKER.	
Note that the software key can be installed on a single SVERKER. The software itself, however, can be installed on up to 5 limited numbers of PCs.	CD-8102X
SVERKER Win Upgrade	CD-8101X

Optional accessories	
CSU20A	
Incl. Cables and Transport case	
115 V Mains voltage	BF-41190
230 V Mains voltage	BF-42390
PSS750	CD-90020
Cable organizer	
Velcro straps, 10 pcs.	AA-00100

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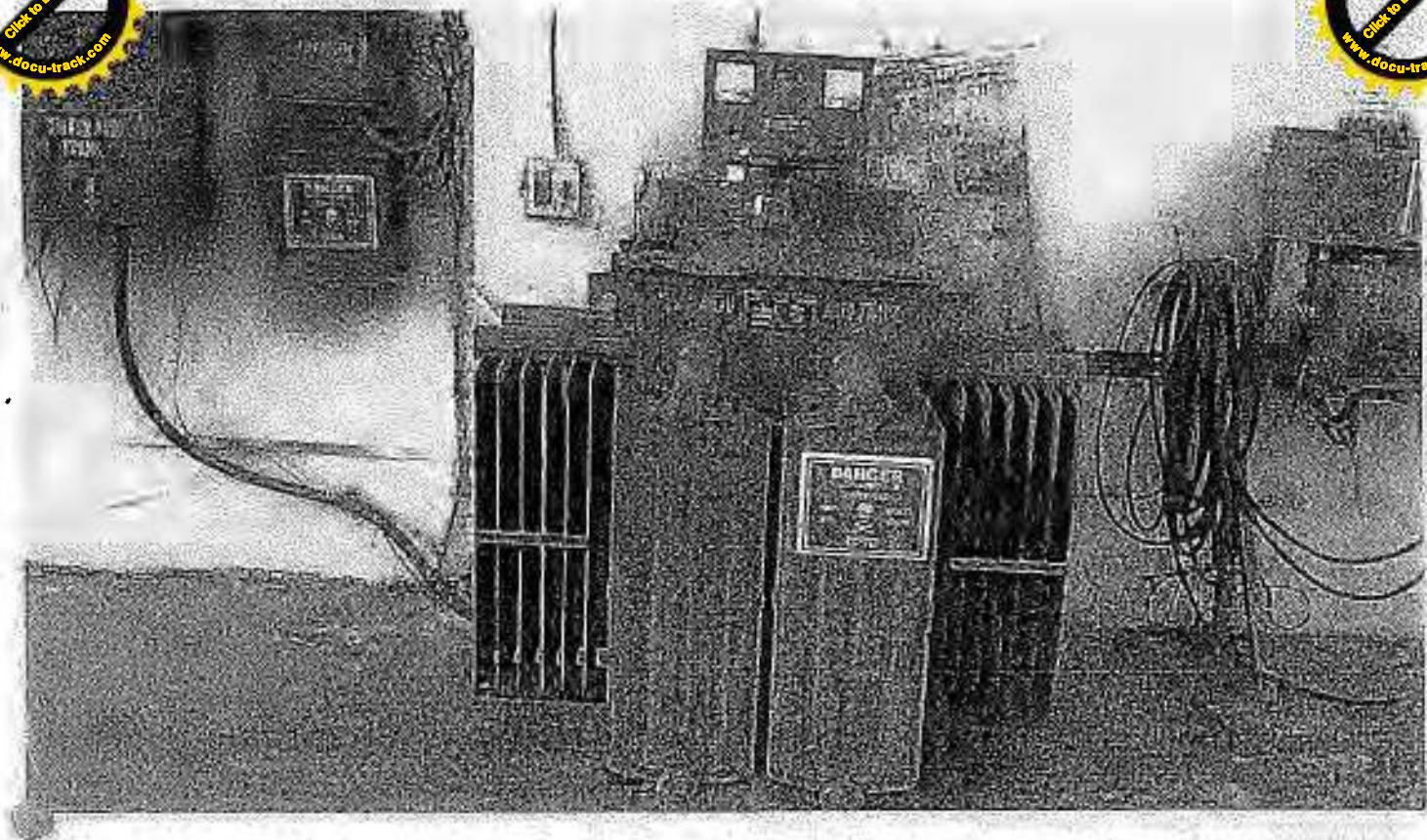
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CP 68

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Oil Filtration Machine



TECHNICAL SPECIFICATION HUHVR-5KL-2D (5000 LPH)

1. COMPLETE UNIT		
1.1	Name of the Manufacturer	M/s. Sapthagiri Industries
1.2	Mounting	Trolley Mounted
1.3	Dimensions of hoses	1 ¼ " Dai (32 N.B)
1.4	Characteristics of oil	Before filtration After filtration
1.5	Break Down Voltage (BDV)	20 KV >80 KV
1.6	Moisture contents	50 PPM 3 PPM
1.7	Gas content	10% by volume 0.1% by volume
1.8	Filter rating	Many particles 1 Micron
2. STRAINER		
2.1	Make	Sapthagiri Industries
2.2	Rating	1mm
2.3	Flow	5000 LPH
3. OIL INLET PUMP		
3.1.	Make and quantity	TUSHACO
3.2.	Type	Positive Displacement
3.3.	Capacity	5000 LPH /Rep
3.4.	Motor make and type	BBijlee / NGEF
3.5.	Rating	1.5/2 Hp.
3.6.	Type of starter	DOL Starter
4. HEATERS		
4.1.	Type of heaters	Tubular, Refectory former type
4.2.	Full load heater rating in kW	75 KW
4.3.	No. of groups in which heaters are divided	3 Banks
4.4.	Rating of each heater and total Nos.	4.16 KW. Total Numbers - 18 Nos.
4.5.	Selector Switch provided	Yes
4.6.	Max. temperature of oil	55-60° C
4.7.	Range of thermo controller	0-60° C
5. PRE FILTRATION SYSTEM		
5.1.	Rated output of filters	5000 LPH
5.2.	Type of filtering medium	S.S.Wire Mesh oil filter
5.3.	Rating	20 Micron
5.4.	Make	Sapthagiri Industries
5.5.	Quantity	2 No's
6. FINE FILTRATION		
6.1.	Rated output of filters	5000 LPH
6.2.	Type of filtering medium	Non hygroscopic cartridge
6.3.	Rating	1 micron
6.4.	Make	Cuno
6.5.	Quantity	5 No's x 20" /10x10"
7. DEGASSING COLUMN TWO STAGE		
7.1.	Make & material	Sapthagiri Industries
7.2.	Number of stage	Two stage
7.3.	Means adopted to increase the surface area in the tank.	Aluminum Rasching ring with slotted tubes
7.4.	Maximum vacuum pressure which the chamber is subjected during the process	Less than 0.5 Torr.
7.5.	Suitable level indicator provided to the tank.	Sight glass with illumination lamp
8. VACUUM PUMP FOR FIRST STAGE		
8.1.	Make & Type	Indovac
8.2.	Pumping speed	1000 LPM
8.3.	Ultimate pressure	0.5 m.bar
8.4.	Motor make and Type	Supply by pump mfrs
8.5.	Motor rating	2 H.P. 415 Volt, 3 phase 50 Hz AC.



TECHNICAL SPECIFICATION HUHVR-5KL-2D (5000 LPH)



Quantity	1 No
ROOTS PUMP FOR SECOND STAGE	
9.1.	Make & Type
9.2.	Pumping speed
9.3.	Ultimate vacuum
9.4.	Motor make and type
9.5.	Motor rating
10.	DISCHARGE PUMP
10.1	Make and quantity
10.2	Type
10.3	Capacity
10.4	MOTOR
10.5	Rating
INSTRUMENTS	
11.	DIGITAL TEMPERATURE CONTROLLER
11.1	Make & Quantity
12.	TEMPERATURE GAGE
12.1	Make & Quantity
12.2	Type
12.3	Range
12.4	Location
13.	CONTROL PANELS
13.1	Electrical supply
13.2	Contactor make
13.3	Overload Relay
13.4	Indicating lamps
13.5	Mimic Diagram
13.6	MCB
13.7	Push Buttons & Selector Switch
14.	OIL HOSES
14.1	Make
14.2.	Material of Hoses
14.3.	Size & Length

NOTE:

THE FOLLOWING PRVISION WILL BE PROVIDED:

- 1) MOISTURE TRAP BEFORE VACUUM PUMP
- 2) 0-760 DIAL VACUUM GAUGES 2 NOS.
- 3) DIGITAL TEMPERATURE CONTROLLER AND SAFETY THERMOSTAT
- 4) OPTICAL OIL LEVEL CONTROLLER
- 5) HOT OIL CIRCULATION SYSTEM & TRANSFORMER DRAINING SYSTEM



SAPTHAGIRI INDUSTRIES



TRANSFORMER OIL FILTRATION PLANT – HUHVR-5KL-2D, 5000 LPH LPH CAPACITY

The plant shall be suitable for treating transformer & switchgear oil by first heating it and then passing it through specially designed filter and then subjecting it to high vacuum treatment which dehydrates and degasifies the oil to the following specifications after completion of the process.

The plant shall not require any special tools for operation and maintenance.

PARAMETERS	UN PROCESSED OIL	AFTER FILTERATION
Break down voltage(across 2.5 mm gap)	20 KV	>80 KV
Moisture content	50 PPM	3 PPM
Suspended particles	Visible to naked eye	1 Micron
Gas content	10% by volume	0.1% by volume

The oil filtration plant shall be designed for high vacuum and low temperature of oil for achieving required results. The oil filtration plant shall be fully mobile, the plant shall be weather proofed and shall be suitable for outdoor use. The casing shall be provided with doors of CRCA sheets, hinged on fabricated framework, angles and channels to have access to the operational controls and inspection windows etc. the equipment shall be enclosed and protected against climatic conditions. The screw jacks for relieving pressure on wheels at stationary conditions shall be provided. All components shall have adequate strength and rigidity to withstand normal conditions of handling transport and usage and shall be free from edges or corners to avoid injury to operating personnel in normal conditions of use. The design of the plant shall be such that if required the part/s can easily be replaced. Proper guarding arrangement shall be provided on all such parts which due to their position and nature of operation are liable to cause accidents.

The filter machine consist of the following

- a) Preliminary magnetic strainer
- b) Inlet feed gear pump
- c) Thermostatically controlled electric heaters
- d) Pre & Fine Filter vessel with filter cartridges
- e) Degassing chamber
- f) Vacuum pumping system-for filtration
- g) Oil level monitor to control oil level in degassing chamber
- h) Out let centrifugal glandless pump
- i) Set of valves for inlet, outlet & internal circulation, on return ,by pass ,sampling valves
- j) Vacuum, Temperature ,compoundgauge.etc
- k) Control panel consisting of control of various motors, heaters, etc

01. INLET PUMP

A positive displacement gear type pump with a capacity of 5000 LPH shall be provided. The pump shall be thoroughly tested for vacuum and shall be suitable continuous trouble free operation. The pump shall be provided with automatic protection against over-Pressure build-up.

Interlocking arrangement shall be provided in between the oil inlet pump and the heater so that heater cannot be energized unless inlet pump is on. Interlocking arrangement shall be provided in the filter plant between the inlet pump and high level float switch (located into degassing column) to avoid excessive rise of oil in the degassing column. Flow control valve for adjustment of flow rate through filter, a flow control valve shall be provided across the gear pump.

The suction head of the inlet feed pump at atmospheric condition at inlet shall be 4 to 5 mtrs.

02. HEATERS

Heaters shall be provided in protection tubes to avoid localized overheating, hotspot and breaking oil. Heaters shall be capable of heating oil from 30°C to 60°C. Temperature during degassing and dehydration for good results should not exceed 60°C. Heaters shall be thermostatically controlled. Total heater power shall be 75 KW. Heaters shall be divided into three groups.

Heater elements shall be of Nichrome/ Kanthal wire filament, inserted in refractory formers which are located in protection tubes. Construction of the heat exchanger shall be such that the replacement of heaters shall be easy and shall not require any special tools.

Heaters shall be interlocked with gear pump and shall not be in ON position, unless the Inlet Pump is working. Heater Tank shall be adequately thermally insulated to minimize loss of heat.

Heater Pipe surface density shall not be more than 2.0 Watt/cm².

Each group of Heaters shall be controlled by thermostat. A safety thermostat shall be provided to take care of any accidental rise of temperature of oil and shall put off the Heaters in such eventuality. This thermostat shall be set at slightly higher



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temperature than that of controlling Thermostats. There will be preset safety thermostat before digital temperature controller. One suitable Pressure Relief Valve shall be provided on the Heater Chamber to prevent any pressure rise above the acceptable limit.

03. FILTRATION SYSTEM

Filtration System shall consist of the following:

A. MAGNETIC STRAINER

The plant will be provided with a suitable magnetic strainer at the inlet of the gear pump with Necessary wire mesh perforated core to arrest all coarse particles. Provision is made to clean the strainer element without dismantling the complete strainer from the pipeline.

B. PRE FILTER

S.S. wire mesh cartridge filter of 20 Micron rating shall be provided. This cartridge element shall have large holding capacity. If choke, the filter can be washed and reused. (Filter housing designed for easy replacement of the choked cartridges) without dismantling the pipeline.

C. FINE FILTER

Non-hygroscopic throw away type Cartridge Filters of one Micron rating shall be provided. These Cartridge Elements shall have large dust holding capacity.

The replacement of Cartridge Elements is very easy and can be done without any special tools. The Housing / Vessel are suitable for high vacuum and pressure applications. Compound (Pressure / Vacuum) Gauge shall be provided on Filter Vessel for inlet pressure indication in order to ascertain condition of Cartridge Elements. Aeration shall be provided on the Filter Vessel to aerate the Vessel during draining. The Cartridge type Filter shall facilitate to achieve desired value of particle size in micron.

04. DEGASSING AND DEHYDRATION CHAMBER - TWO STAGE

The Degassing Chamber shall function as degasser and dehumidifier & shall be capable of removing dissolved gases and moisture from the oil. It shall be of M.S. and shall have welded construction. The Chamber shall be able to withstand the vacuum to which it shall be subjected. Efficiently spread Rasching Rings shall be placed in the Degassing Columns. The surface area offered by the Rasching Rings shall be sufficient to form a thin film of oil and shall facilitate removal of dissolved gases and moisture at the rated flow rate of oil. A Slight Glass with Illuminating Lamp shall be provided for observation of oil flow.

Two no's of Float Switch on the Degassing Chamber shall be provided for preventing excess rise of oil / foam level. It shall be electrically interlocked with Inlet Pump. Another Float Switch to control the low level of the oil / foam in Degassing Chamber shall be provided and it shall be electrically interlocked with the Discharge Pump. Two stages shall be separated by a Siphon Seal.

05. VACUUM PUMPING SYSTEM (FOR DEGASSING COLUMN / TRANSFORMER EVACUATION)

A high efficiency rotary Vacuum Pump shall be provided for evacuation of Degassing Chamber. The Pump shall be of reputed make. A Manufacturer's specifications for the same are as given below for reference.

Kindly Note that provision shall be provided for evacuation of transformer, i.e. only one operation can be performed at a time i.e. either filtration of transformer oil or evacuation of transformer

FIRST STAGE - ROTARY OIL SEALED PUMP (1 NO)

Nominal Pumping Speed	1000Ltrs/Min (63 M ³ /Hr)
Ultimate Vacuum with G.B. Closed	5 x 10 ⁻³ Torr
Ultimate Vacuum with G.B. Open	5 x 10 ⁻¹ Torr

SECOND STAGE - MECHANICAL TWIN LOBES BOOSTER PUMP (1 NO)

Nominal Pumping Speed	4200 ltr/Min (250 M ³ /Hr)
Ultimate Vacuum	10 ⁻⁴ Torr

The Vacuum Pumping System shall have a Bourdon Gauge (2 no's) (Range: 0 to 760 Torr), Airing Valve & Butterfly Valves

06. DISCHARGE PUMP



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The oil after purification, dehydration and degasification in the degassing chamber held under vacuum, will be drawn out by a discharge pump, which is of a **centrifugal pump glandless type**. The above centrifugal pump is a glandless pump without any rotary seal. This glandless feature is to ensure total isolation of the conditioned oil from atmosphere, which in turn is necessary or maintaining the quality of the filtered oil.

07. VALVES

All valves in oil lines are ball valves with Teflon seating and with stainless steel balls. These Valves are leak proof and are suitable for vacuum and pressure application. A bypass ball valve is also provided for internal circulation of oil within the plant itself.

Two numbers mechanical **non-return valves** are provided one before the degassing chamber and the other after the outlet pump so that in case of power failure or shutdown, flooding of degassing chamber or plant with the oil from the storage tank is prevented, thereby Preventing mixing of conditioned and unconditioned oil

Aeration valves are provided on the filter vessel and the degassing chamber. A ball valve is provided at the outlet of the outlet pump for drawing samples of conditioned oil.

08. OIL SAMPLING VALVE

This valve shall be provided to collect the sample of oil for testing during operation.

09. AIRING VALVE

One Airing Valve for airing the Degassing Chamber shall be provided.

10. GAUGES & INSTRUMENTS

A Dial type Thermometer shall be provided at Outlet & Inlet at the Heater Tank for indication of oil temperature.

PRESSURE GUAGE

One Compound Gauge on the housing pre filter chamber and One Compound Gauge shall be provided on the fine filter chamber to indicate the differential pressure.

INDEPENDENT DRIVES

Independent Drives for Oil Discharge Pump, Oil Inlet Pump & Vacuum Pumps shall be provided. Motors shall conform generally to IS: 325 (Testing) shall be of Class 'F' Insulation. Starters shall be of direct On-line type. Motors shall be of NGEF / ABB / REPUTED make.

11. CONTROL PANEL

All Electrical Control Gear, Mains Isolating Arrangement, Starters, Contactors, Pilot Lamp, Push Buttons, MCB, Relays, Indicating Lamps and Interlocking shall be housed in a Compact Control Panel and made of CRCA Sheets.

A Mimic diagram with Indicating Lamps shall be provided on the Control Panel with audio -visual annunciation.

All Wiring shall neatly rout and all wire termination shall be suitably identified with ferrules.

All MCB and Switchgear shall be of ABB make.

The Plant shall be suitable for operation on 415 V, 3 Ph, 4 Wire, 50 Hz, A.C Supply.

12. OIL HOSES - 2 NOS

Two No's Nit rile Rubber Hoses each 10 Mtrs long with flanged end connection on both sides shall be provided. One for Oil Inlet & One for Oil Outlet Oil Hoses shall be capable of handling the transformer oil at 100°C (Max) and vacuum.

13. PIPELINE & VALVES

The Valves in Oil Line & Vacuum Line shall be of Ball type. All Pipes shall be of ERW and all joints in Oil & Vacuum Line shall be flanged & shall have 'O' Ring Sealing. 'O' Rings shall be of Nitrile Rubber & shall be of round shape. The entire Plant along with all components mounted shall be tested for a total vacuum leak rate of less than 1 Torr Ltrs/sec.

We should confirm availability of testing facilities at their works for carrying out the following tests on the oil:

1. Break Down Voltage
2. Moisture Content
3. Plant flow rate confirmation



SAPTHAGIRI INDUSTRIES

15 OTHER DETAILS

A. INSTRUCTION MANUAL

Instruction Manual containing details of Plant Operation & Maintenance

B. WARRANTY

No warranty can be assumed for any damages incurred through the following causes. Improper or inadequate use, Faulty installation/start-up by the ordered or third parties, Natural wear and tear, improper storage, Failure to adopt conservation measures, Damages done to packing, Faulty or negligent handling, Excessive loading, Unsuitable operating media and Substitute materials, chemical, electro chemical or electrical factors.





Annexure – A

1. ‘RE’ Motorised Oil test set designed to deliver output voltage 0-100kV at 1kVA with Stirrer, suitable for working on 220/230 V single phase 50 Hz. AC supply.

The unit shall be housed in MS sheet housing finely finished, powder coated complete with the following :

- (i) ON/OFF switch
- (ii) Input Fuse
- (iii) LT ON Indicator.
- (iv) Push button to actuate HT.
- (v) HT ON Indicator.
- (vi) Push button to switch HT OFF
- (vii) Double pole double throw entire off switch to increase/decrease the output voltage.
- (viii) Voltmeter to indicate the output breakdown voltage.
- (ix) Zero start interlocking and clear cover interlocking.
- (x) Rate of rise of voltage shall be 2 kV/Sec.
- (xi) Test chamber will be in protected covers.
- (xii) Test cup will be made of non-absorbent, transparent plastic and will have brass electrodes nickel chromium plated as per fig. No. 2 of IS:6792.
- (xiii) Test gauge 2.5 mm.
- (xiv) 1 set of operating instructions and circuit diagram shall be provided.
- (xv) 4 Nos. carrying handle shall be provided.
- (xvi) Motorised stepless auto transformer for controlling the output voltage from zero to maximum
- (xvii) H.V transformer which shall be double wound epoxy moulded, air cooled type having separate coil for Primary & Secondary.

For Rectifiers & Electronics Pvt. Ltd.

Please turn over the leaf for Terms and Conditions

Oil Di-Electric Test Set



Description

'RE' Oil Test Set is suitable for testing dielectric strength of insulating oils e.g. transformer oil etc confirming to IS:335 for carrying out test as laid down in IS:6792.

The unit consists of High Voltage Transformer with epoxy encapsulated secondary coils. The High Voltage Transformer feeds H.T through electrodes to the oil under test in a removable oil test Cup with adjustable gap as per IS specifications. The H.T is varied steplessly by varying the primary voltage through a variac. All protective and safety devices viz MCB, push buttons, indicators, switch, contractor and electrical interlock etc. are in-built in the unit. The complete unit is housed in a powder coated sheet metal housing. Inspection window or transparent cover is provided to inspect the breakdown of oil.

Special Features

- ✓ Compact in Size
- ✓ Built-in safety arrangement for operator
- ✓ Easy to operate
- ✓ Efficient after sales service
- ✓ Guaranteed for one year against manufacturing defects



AC/DC HIGH VOLTAGE AND HIGH CURRENT TESTING EQUIPMENT AND ELECTRICAL MACHINES



Brief technical details

STEP UP TRANSFORMER	: A double wound Secondary Epoxy moulded air cooled/oil cooled transformer is used to boost the voltage to required voltage
VOLTAGE CONTROL	: A stepless variable auto transformer (VARIAC) is used for controlling the output voltage from zero to maximum
INPUT VOLTAGE	: 220/230 volts single phase
OUTPUT VOLTAGE CAPACITY	: 0-50 KV, 0-60 KV, 0-100 KV, and 0-120 KV
BURDEN	: 0.50 KVA to 1.2 KVA
RATE OF RISE OF VOLTAGE	: 2.0 KV/ Sec
METERING	: A voltmeter is provided on LT Side, calibrated to indicate the secondary output voltage
ELECTRODE	: Suitable size of electrodes with adjustable gap as per figure No. 2 of IS:6792
PROTECTION	: (a) The unit consists of fast acting DC relay provided on HT side to trip off the HT supply in case of flash (b) Zero start interlocking is provided (c) Clear cover with interlock
TEST CUP	: A test cup of suitable size made of transparent non absorbent thermoplastic
MODELS	: (1) Manual (MaOTS) (2) Motorised (MOTS) (3) Semi Automatic (SOTS) (4) Fully automatic with printer (AOTS)

Note: Our policy is one of continuous improvement and we reserve the right to change specifications and design at any time without notice

Our Product Range Includes

- AC High Voltage Test Set upto 800 KV, 2000 kVA capacity
- AC High Voltage Partial Discharge Free Test Set upto 800 KV
- AC High Voltage Divider & Coupling Capacitor upto 800 KV
- AC High Current Test Set/Power Source upto 25000 Amps, 500 kVA
- DC High Voltage Test Set upto 500 KV 1000 mA capacity
- DC High Current Test Set/Power Source 10000 with OCV @ 75V
- Primary Current Injection Test Set upto 25000 Amps
- Secondary Current Injection Test Set/Relay Tester
- Automatic/Semi-Automatic/Motorised Oil Test Set of 60/75/80/100 KV

Our Clients

Brief List of Selected Govt. Customers

- | | |
|-------|--|
| CPRI | - Central Power & Research Institute |
| NTH | - National Test House |
| ERTL | - Electronics Research & Testing laboratory |
| ETDC | - Electronic Testing & Development Center |
| PGCIL | - Power Grid Corporation of India Limited |
| IPR | - Institute Of Plasma Research |
| BHEL | - Bharat Heavy Electricals Limited |
| NTPC | - National Thermal Power Corporation |
| NPCIL | - Nuclear Power Corporation Of India Limited |
| NHPC | - National Hydro Power Corporation |
| RTC | - Regional Testing Center |
| BIS | - Bureau Of Indian Standards |

Rectifiers & Electronics

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DIMMERSTAT®

Continuously Variable Voltage Auto-Transformer

AE

ISO-9001

**DESCRIPTION**

'Dimmerstat' is registered trademark for continuously variable voltage auto - transformer. It is the most effective device for stepless, breakless & continuous control of AC voltage & therefore for various parameters, dependent on AC voltage.

The basic Dimmerstat is meant for operation from a nominal Input voltage of 240V AC & can give output voltage anywhere between 0 to 240V or 0 to 270V AC by simple transformer action. Three such Dimmerstat connected electrically in star and mechanically in tandem, become suitable for operation from a nominal input voltage of 415V 3Ph AC and can give output anywhere between 0 to 415V or 0 to 500V.

Resin moulded Dimmerstat is basically a variable Auto-Transformer which is partly or fully Moulded in Reinforced Polyester Resin. This has adjustable spindles which allows easy assembling of flush, table or Motorized Type in single or three phase models. These models are designed upto 120% continuous load.

FEATURES

- Simple, rugged construction.
- Coils made from high grade CRGO Silicon Steel & 99.9% pure copper.
- Output voltage variation is smooth, continuous, breakless & linearly proportional to angular rotation.
- High efficiency.
- Negligible waveform & power factor distortion.
- Excellent short time overload capacity.
- Remote operation possible by motorization.
- Wide range of current ratings.
- High quality carbon brush used for current collection.

ELECTRICAL SPECIFICATIONS

- | | | |
|---------------------|---|-----|
| ■ MODEL | : a) Flush Open Manual (Air Cooled) | — F |
| | b) Portable Enclosed Manual (Air Cooled) | — P |
| | c) In Tank Manual (Oil Cooled) | — T |
| | 'F', 'P', 'T' suffixed by 'M' means motor operated models. | |
| ■ OPERATING VOLTAGE | : For Single Phase — 240V AC, 50 - 60 Hz. 1φ. | |
| | For Three Phase — 415V AC, 50 - 60 Hz., 3φ - 4wire. | |
| ■ CURRENT RATINGS | : For Oil Cooled models, maximum current & continuous current are one & the same. | |
| | For Air Cooled models, the ratings are as shown below | |

Maximum Current	0.7	2	4	8	10	15	20	28
Continuous Current	0.6	1.8	3.8	6.5	9	11.5	16	22

- OPERATING TEMP. : 0° - 45°C.
- INSULATION RESISTANCE: Not less than 5M ohms at 500V DC.
- DIELECTRIC TEST : 2.5kV RMS for 1 minute.
- STORAGE TEMP. : -9°C to 70°C
- HUMIDITY : Upto 95% RH
- CONFORMS TO : I.S. 5142.

Notes: 1) As output voltage is continuously variable, Dimmerstats are rated in terms of current that can be drawn from the output.
 2) Oil should be Transformer Oil conforming to IS 335, IEC 296.



ISO-9001

DIMMERSTAT®

Continuously Variable Voltage Auto-Transformer

MECHANICAL CONSTRUCTION

Single phase Dimmerstats are available in 3 types.

- Portable type (P) with sheet steel enclosure for floor / table mounting.
- Flush type (F) with open type construction. Suitable for panel mounting.
- Tank type (T) immersed in oil in sheet steel tank with roller mounting.

Three phase Dimmerstat are usually ganged assemblies of 3 coils, available in all 3 types: P, F, T.

Higher rating Dimmerstat (above 200 Amps) use 2/3 or more coils in parallel with load balancing arrangements.

Motorised Dimmerstat uses 240V A C Step-Syn Motor having 60 rpm speed at 50Hz. With proper gearing higher torque at lower speed can be achieved. Standard gear ratios used provide sweep time of 8, 15, 30, 45, 60, 120secs.

APPLICATIONS

- Auditorium, Hotels, Conference Halls, Exhibitions, Laboratories etc.,
- AC Voltage Stabilizers, Rectifiers, Battery Chargers.
- Temperature control of Ovens, Furnaces.
- Testing of Instruments, Relays, Circuit Breakers etc.
- Welding, Electro-plating, Anodizing etc.
- Colleges & Universities.

Ordering information

(as per code specified below)

1 st block	Output current rating amps	0.7,2,4,8,10,15,20,28,40,50,60,75,100,125,150,200,300,400, 500,600,800,1000,1200,1500
2 nd block	Dimmerstat (D)	Continuously variable voltage auto transformer.
3 rd block	No. of coils	1,2,3,4,6,9,12,15.
4 th block	Type of construction	F,P,T F = Flush, back of panel, open. P = Portable, floor, table mounting, air cooled with enclosure. T = In tank, immersed in oil.
5 th block	Provided with motor drive (M)	"Step-syn" 230V 1Ph AC 50Hz. 60rpm motor having instantaneous start-stop-reverse characteristics.
6 th block	Approx. time in secs. for full rotation sweep time.	8,15,30,45,60,120 (As per standard gear ratios available)

e.g.

1	2	3	4	5	6
75	D	3	T	M	15

 75 A Dimmerstat with 3 coils (Three phase) in oil-cooled tank construction with motor drive having 15s sweep.

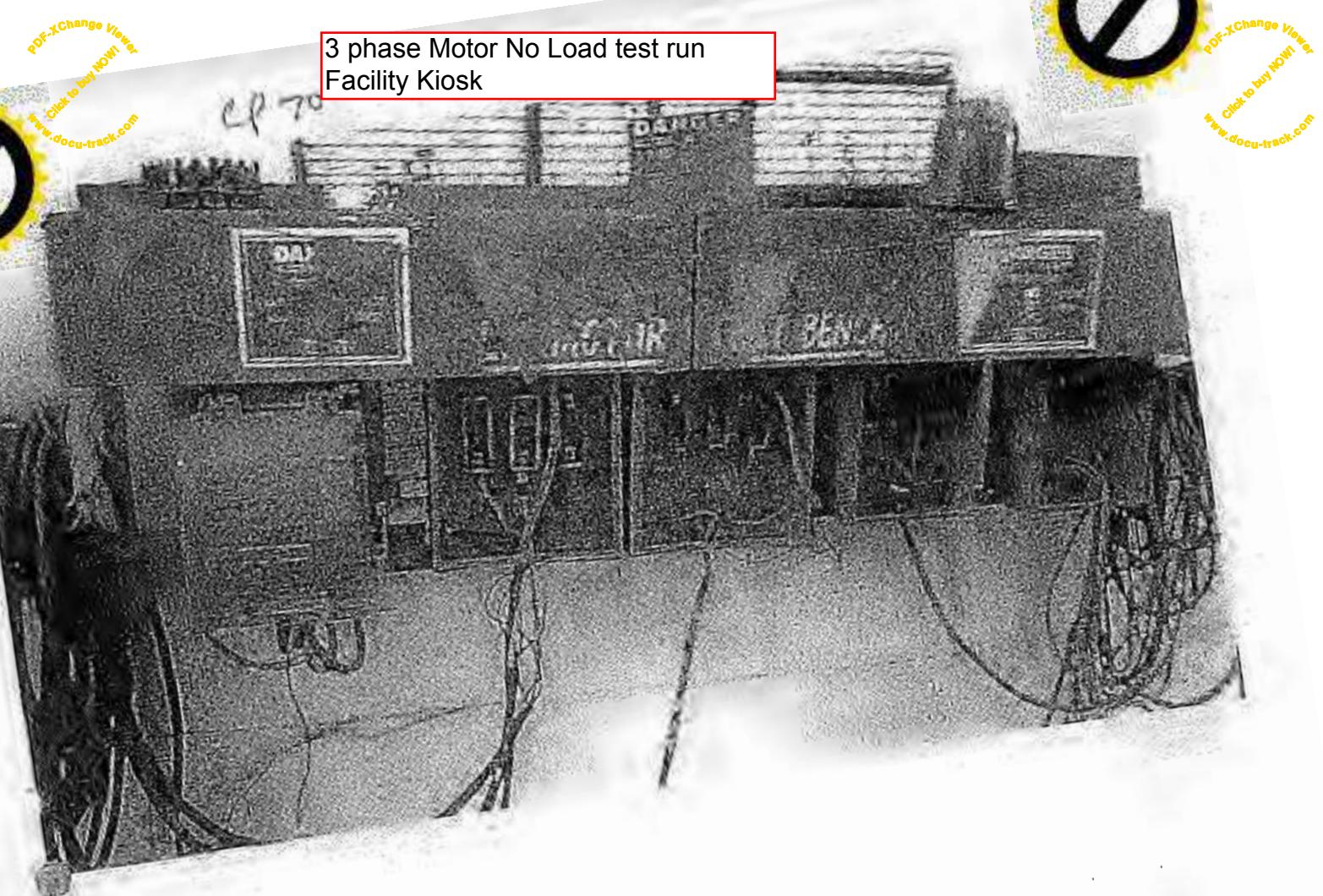
e.g.

1	2	3	4
8	D	I	P

 8A Dimmerstat with 1 coil (single phase). Portable type & suitable for manual operation (no motorisation)

Similarly, other Dimmerstats can be configured & ordered.

3 phase Motor No Load test run
Facility Kiosk



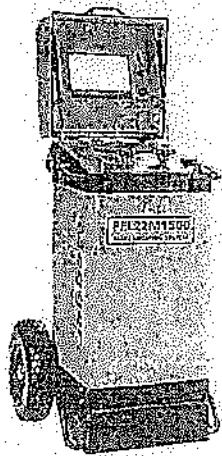
Cable fault locator

CP 71

Megger.

PFL22M1500
Portable Cable Fault Location and High Voltage Test System

PFL22M1500 Portable Cable Fault Location System



- Portable, rugged fault locating system
- HV insulation testing to 20 kV
- Burn up to 115 mA
- 8/16 kV, 1500 Joules surge output
- Arc reflection method
- Arc reflection plus
- Differential arc reflection
- Impulse current (current impulse)
- Integrated large screen color TDR
- Optional onboard inverter

DESCRIPTION

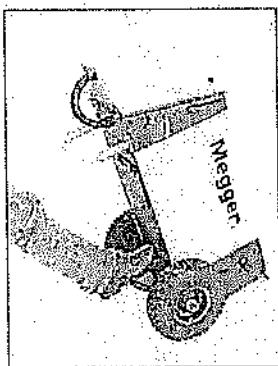
The PFL22M1500 Power Cable Fault locator is designed to provide quick, effective, accurate and safe fault location, thereby reducing system outages and minutes lost.

The instrument comes in a rugged yet portable enclosure. Its IP64 rating makes it suitable for use in even environmentally hostile conditions.

All systems offer the facility to undertake cable testing; cable and fault diagnosis, pre-location of cable faults, fault conditioning, and pinpoint fault location using acoustic methods.

FEATURES AND BENEFITS

- Innovative MTDR100 mounted in the lid features:
 - Single knob (jog-dial) control
 - Large easy-to-view color (XGA) display
 - Auto ranging
 - Cable library
- Multiple fault locating techniques
 - Pre-location
 - Pulse écho
 - Arc reflection
 - Arc reflection plus
 - Differential arc reflection
 - Impulse current
- Pinpoint
 - Surge/voltage impulse
 - High-voltage module
 - 2-range
 - Safety interlocks
 - HV on indicator



The handle and foot-step allows for easy and comfortable transport.

APPLICATIONS

HV Testing (proof/insulation testing)

Used to prove the integrity of and identify and confirm fault conditions in cable networks. The variable output voltage can also be used for sheath testing at 5 or 10 kV.

Fault Pre-location

After identifying the type of fault, pre-location of the fault position can be determined using the following methods:

- A TDR is used to pre-locate cable faults using pulse echo, arc reflection, impulse current (ICE). The MTDR100 features auto-ranging, auto distance to fault and operator assist functions that guide the operator through the fault locating process.
- In the Arc reflection mode, faults are stabilized by creating a temporary "bridge" to earth. During this condition, a standard pulse echo measurement is taken into what is basically seen as a short circuit fault.
- Arc reflection plus provides the operator the added advantage of being able to view and analyze up to 1024 traces (range dependent) taken during the period of the arc.
- During Differential arc reflection mode unwanted and confusing reflection are removed leaving a clean trace with only the fault position, point being displayed by a positive pulse. This method is especially suited in locating high-resistance faults in complex cable systems.
- Impulse current, or ICE, is a transient analysis method of pre-location utilizing the integrated linear coupler.

Fault Conditioning

Fault conditioning is used to stabilize unstable flashing or high resistance faults. The PFL22M1500 incorporates both proof/burn and arc reflection modes.



Megger

PFL22M1500
Portable Cable Fault Location and High Voltage Test System

ProofBurn

Following a breakdown of the cable under test, a high current is applied that stabilizes the fault condition. This allows easier and faster pre-location and pinpointing of the unstable faults.

Pinpoint fault location

Accurate pinpoint fault location is achieved using the electro-magnetic/acoustic method whereby the powerful 8/16 kV 1500 Joule surge generator (thumper) and a pinpointer (Megger digiPHONE+) is used.

SPECIFICATIONS

Testing

Output:	0 - 20 kV (negative with regard to earth)
	0 - 10 kV, 115 mA constant
	0 - 20 kV, 58 mA constant
Resolution:	5 mA

Low-voltage Pre-location

MTDR100

Range:	10 ranges; 100 m - 55 km (328 ft - 34 miles) 100 m - 220 km (328 ft - 137 miles) - transient methods
Pulse width	50, 100, 200, 500 ns, 1, 2.5, 10 μ s, and auto
Pulse Amplitude	25 V into 50 Ω
Sampling Rate	100 Mhz
Timebase Accuracy	200 ppm
Resolution ($V_p=55\%$)	0.82 m (2.8 ft)
Display	264 mm (10.4 in.), full XGA, 1024 X 768 color display
Cursors	Dual independent control
Gain:	60 dB range in 5 dB Steps
Input:	Impedance 50 Ω
Inputs:	1 x TDR/ARC, 1 x current impulse
Ports:	1 x printer/USB memory device
Software:	CAS1 (Cable analysis software)

High Voltage Pre-location

Arc Reflection:	0-8 and 0-16 kV, 1500 Joule
Arc Reflection Plus:	0-8 and 0-16 kV, 1500 Joule 1024 - 16 traces dependent on range
Differential Arc Reflection:	0-8 and 0-16 kV, 1500 Joule
Impulse Current:	0-8 and 0-16 kV, 1500 Joule

Fault Conditioning

Proofburn:	0 - 20 kV 58 mA
	0 - 10 kV 115 mA

Pinpoint Fault Location

Surge:	0 - 8 and 0 - 16 kV, @ 1500 Joule
Impulse Sequence:	Adjustable 5 - 30 seconds Single Shot

Cables

HV:	Detachable 15 m (50 ft) 1-phase flexible shielded cable with HV crock-clips
Input/Supply:	Input Cable
Earth:	15 m (50 ft) 8 mm ² flexible earth cable with vice grips

Safety

High visibility "status" bar
Emergency stop
Safety Interlock circuit
External beacon circuit

Supply

Universal AVSM 2-ranges: 108 - 132 V ac and 208 - 265 V ac 47 - 63 Hz
Inverter: 11.5 - 14 V dc (Optional)

Environmental

Operating Temperature:	-20 ° to +50 °C (-4 ° to 122 °F)
Storage Temperature:	-20 ° to +55 °C (-4 ° to 131 °F)
Elevation:	1600 m (De-rate voltages at higher altitudes)
Humidity:	5 to 95% RH non-condensing

IP Rating

IP64 (with top/back flaps closed)

Weight

131 kgs (290 lbs)

Dimensions

965 mm H x 536 mm W x 503 mm D (38 in. H x 21 in. W x 20 in. D)

Item	Cat. No.	Item	Cat. No.
20 kV dc, 8/16 kV @ 1500 Joule surge	PFL22M1500-EN	Cable bag	2001-813
As above but including 12 V inverter	PFL22M1500INV-EN	Instruction manual	AVTM/PFL22M
Optional Accessories		Software	PCAS-1
High-Voltage shielded output cable 15 m including MC terminations with HV Clamps	1001-123	Optional Accessories	
No. American input power supply cable 2.3 m (7.5 ft)	17032-4	HV Vice Grips	18944-2
International unterminated input power supply cable 2 m (6.5 ft)	17032-5	12 V Stand alone battery kit	1001-690
UK input power supply cable 2.5 m (8 ft)	17032-12	digiPHONE+ pinpointer	1003316-S
SHUKO input power supply cable 2.5 m (8 ft)	17032-13	Portable cable reel, set of 2, HV and ground cable	
Flexible ground cable, 15 m (50 ft)	19265-15	50 ft (15 m)	1005-412-50
Ham lock Quick Release Pin	90003-606	85 ft (25 m)	1005-412-85
		130 ft (40 m)	1005-412-130
NB: Refer to factory for full list of cable reel assemblies			

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Aargau SWITZERLAND, Chonburi
THAILAND, and Dubai UAE

ISO STATEMENT
Registered to ISO 9001:2008 Cert. no. 110066.01
PFL22M1500_DS_EN_V07A
www.megger.com
Megger is a registered trademark
Specifications subject to change
without notice

DIMMERSTAT®

Continuously Variable Voltage Auto-Transformer



ISO-9001

**DESCRIPTION**

'Dimmerstat' is registered trademark for continuously variable voltage auto - transformer. It is the most effective device for stepless, breakless & continuous control of AC voltage & therefore for various parameters, dependent on AC voltage.

The basic Dimmerstat is meant for operation from a nominal Input voltage of 240V AC & can give output voltage anywhere between 0 to 240V or 0 to 270V AC by simple transformer action. Three such Dimmerstat connected electrically in star and mechanically in tandem, become suitable for operation from a nominal input voltage of 415V 3Ph AC and can give output anywhere between 0 to 415V or 0 to 500V.

Resin moulded Dimmerstat is basically a variable Auto-Transformer which is partly or fully Moulded in Reinforced Polyester Resin. This has adjustable spindles which allows easy assembling of flush, table or Motorized Type in single or three phase models. These models are designed upto 120% continuous load.

FEATURES

- Simple, rugged construction.
- Coils made from high grade CRGO Silicon Steel & 99.9% pure copper.
- Output voltage variation is smooth, continuous, breakless & linearly proportional to angular rotation.
- High efficiency.
- Negligible waveform & power factor distortion.
- Excellent short time overload capacity.
- Remote operation possible by motorization.
- Wide range of current ratings.
- High quality carbon brush used for current collection.

ELECTRICAL SPECIFICATIONS

- | | | |
|----------------------------|---|-----|
| ■ MODEL | : a) Flush Open Manual (Air Cooled) | — F |
| | b) Portable Enclosed Manual (Air Cooled) | — P |
| | c) In Tank Manual (Oil Cooled) | — T |
| | 'F', 'P', 'T' suffixed by 'M' means motor operated models. | |
| ■ OPERATING VOLTAGE | : For Single Phase – 240V AC, 50 - 60 Hz. 1φ. | |
| | For Three Phase – 415V AC, 50 - 60 Hz., 3φ - 4wire. | |
| ■ CURRENT RATINGS | : For Oil Cooled models, maximum current & continuous current are one & the same. | |
| | For Air Cooled models, the ratings are as shown below | |

Maximum Current	0.7	2	4	8	10	15	20	28
Continuous Current	0.6	1.8	3.8	6.5	9	11.5	16	22

- OPERATING TEMP. : 0° - 45°C.
- INSULATION RESISTANCE: Not less than 5M ohms at 500V DC.
- DIELECTRIC TEST : 2.5kV RMS for 1 minute.
- STORAGE TEMP. : -9°C to 70°C
- HUMIDITY : Upto 95% RH
- CONFORMS TO : I.S. 5142.

Notes: 1) As output voltage is continuously variable, Dimmerstats are rated in terms of current that can be drawn from the output.
 2) Oil should be Transformer Oil conforming to IS 335, IEC 296.



ISO-9001

DIMMERSTAT®

Continuously Variable Voltage Auto-Transformer

MECHANICAL CONSTRUCTION

Single phase Dimmerstats are available in 3 types.

- Portable type (P) with sheet steel enclosure for floor / table mounting.
- Flush type (F) with open type construction. Suitable for panel mounting.
- Tank type (T) immersed in oil in sheet steel tank with roller mounting.

Three phase Dimmerstat are usually ganged assemblies of 3 coils, available in all 3 types: P, F, T.

Higher rating Dimmerstat (above 200 Amps) use 2/3 or more coils in parallel with load balancing arrangements.

Motorised Dimmerstat uses 240V A C Step-Syn Motor having 60 rpm speed at 50Hz. With proper gearing higher torque at lower speed can be achieved. Standard gear ratios used provide sweep time of 8, 15, 30, 45, 60, 120secs.

APPLICATIONS

- Auditorium, Hotels, Conference Halls, Exhibitions, Laboratories etc.,
- AC Voltage Stabilizers, Rectifiers, Battery Chargers.
- Temperature control of Ovens, Furnaces.
- Testing of Instruments, Relays, Circuit Breakers etc.
- Welding, Electro-plating, Anodizing etc.
- Colleges & Universities.

Ordering information

(as per code specified below)

1 st block	Output current rating amps	0.7,2,4,8,10,15,20,28,40,50,60,75,100,125,150,200,300,400, 500,600,800,1000,1200,1500
2 nd block	Dimmerstat (D)	Continuously variable voltage auto transformer.
3 rd block	No. of coils	1,2,3,4,6,9,12,15.
4 th block	Type of construction	F,P,T F = Flush, back of panel, open. P = Portable, floor, table mounting, air cooled with enclosure. T = In tank, immersed in oil.
5 th block	Provided with motor drive (M)	"Step-syn" 230V 1Ph AC 50Hz. 60rpm motor having instantaneous start-stop-reverse characteristics.
6 th block	Approx. time in secs. for full rotation sweep time.	8,15,30,45,60,120 (As per standard gear ratios available)

e.g.

1	2	3	4	5	6
75	D	3	T	M	15

 75 A Dimmerstat with 3 coils (Three phase) in oil-cooled tank construction with motor drive having 15s sweep.

e.g.

1	2	3	4
8	D	I	P

 8A Dimmerstat with 1 coil (single phase). Portable type & suitable for manual operation (no motorisation)

Similarly, other Dimmerstats can be configured & ordered.



Annexure – B

2. RE' Primary Current In ection test set having following technical details with Timer:

- Input voltage : 230V Single phase 50 Hz. AC supply.
Output voltage : 12/6
Output current : 0-100/200 Amps.
Capacity : 1KVA.
Cooling : Natural air cooled transformer and Natural oil cooled regulator.
Duty : Continuous duty.

'RE' Primary injection test set is specially designed for testing, loading and calibration CT's,

The unit will consist of the following :

- Step down transformer : A double wound transformer is used for supply high Current and low voltage for testing.
Auto Transformer : A stepless auto transformer is used for controlling output voltage and current from zero to maximum.
Amperemeter : 96 x 96 mm. Multirange Ampere meter to indicate the output current having range 100/200 Amp.
Line On Indicator : Neon lamps indicators are provided for input & output indication.
Main ON/OFF switch : Double pole ON/OFF is provided for input ON and OFF.
Output : Output is brought on copper bus-bars having off Load tap changing arrangement Bus Bar for series and parallel connection.

All the unit shall be housed in MS sheet body supported with angle iron frame.

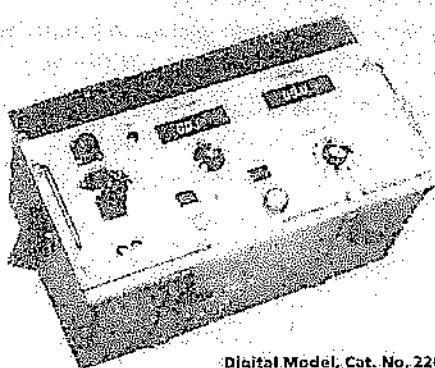
For Rectifiers & Electronics Pvt. Ltd.

70 KV DC Hipot Test Set

Megger

70-, 120- and 160-kV DC
High Voltage DC Dielectric Test Sets

70-, 120- and 160-kV DC High Voltage DC Dielectric Test Sets



Digital Model, Cat. No. 220070

DESCRIPTION

The High Voltage DC Dielectric Test Sets (70, 120 and 160 kV) provide the most dependable, portable dc high-voltage sources for checking the quality of electrical power cables, motors, switchgear, insulators, transformers and capacitors. Each portable set (heaviest is 73 lb, 32.8 kg) is comprised of two separate modules:

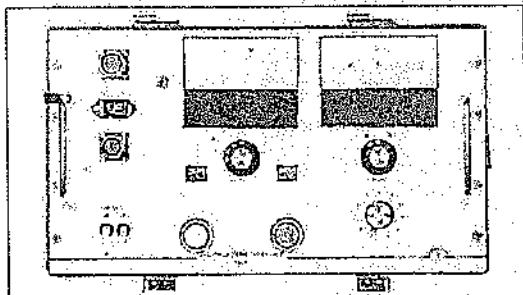
Control Module

This module allows the operator to switch-select the appropriate current output range, adjust the output level and monitor both the applied voltage and leakage current at a safe distance from the high voltage being delivered to the load under test. No voltage higher than input ac power is present in the control module.

High-Voltage Module

An air-insulated design receives its instructions from the control unit. It generates the dc high voltage that is delivered to the load under test.

Although a different control module is used with each of the three models, they are all the same size and weight. Each high-voltage module is a different size and weight to accommodate the rated output voltage.



Front panel of Analog Model, Cat. No. 220124

- Available in analog and digital models
- Lightest weight available in air-insulated high-voltage model
- Advanced performance with long-term reliability provided by filtered half-wave rectification
- Designed for maximum operator safety

APPLICATIONS

The dc dielectric test sets are used to make proof tests and insulation tests on electrical power cables, motors, switchgear, insulators, transformers and capacitors. Both types of tests are performed by applying controlled high voltages to the unit under test at or above insulation system operating level. Measuring the leakage current helps determine the unit under test's ability to withstand overvoltages such as lightning strikes and switching surges.

The three models described cover a range of output voltages that meet the most commonly specified ratings in 5-kV to 69-kV class cable. All are suitable for testing power cable, switchgear and rotating machinery in accordance with IEEE, IPCEA, NEMA and ANSI guidelines.

Proof Test

Proof testing is used for acceptance testing of newly installed cable and maintenance testing of aged and/or repaired cable. For the proof test, the unit under test will either withstand the test voltage or it will "break down," providing the user with a "go/no-go" answer.

Insulation Resistance Tests

To make appropriate tests on healthy insulation, the test instrument must have microampere sensitivity. Insulation resistance can be measured in at least three different ways.

The insulation resistance test is often referred to as a "spot check," and is performed by applying a predetermined voltage to the unit under test, holding it until the apparent leakage current becomes stable and recording the readings with adjustments for temperature. This test is especially applicable to low-capacitance units under test.



Megger

70-, 120- and 160-kV DC High Voltage DC Dielectric Test Sets

Time-varying tests such as the polarization index test (PI test) are independent of temperature effects and save time. To perform this test, a predetermined test voltage is applied to the unit under test and readings are taken at 1 minute and 10 minutes. The resulting ratio is analyzed to determine insulation quality. This type of test is especially appropriate for high-capacitance samples.

The step-voltage test is independent of temperature effects and saves time. To perform this test, the output voltage is increased in even steps at regular intervals over a fixed period of time. As long as the resistance of the unit under test increases with time, it has high-quality insulation. This type of test is only useful for high-capacitance samples.

FEATURES AND BENEFITS

Operates Like a Full-Wave Rectified Unit (Filtered Half-Wave Rectification)

- Provides the advanced performance equal to a full-wave rectified unit.
- Allows for a simple circuit scheme for long-term reliability.

Lightweight High-Voltage Module

- Air insulated, it is the lightest weight module available for its voltage and power ratings.
- Convenient portability allows a single operator to transport it into the field.

Complete Internal Guard Circuit/Guard Connection on High-Voltage Output Cable

- Intercepts stray surface leakage currents which could interfere with the measurement.
- Eliminates the need for an extra lead to hook up the guard connection.
- Ensures highly accurate measurements.

Choice of Digital or Analog Indications

- The preferred medium may be selected by the user.
- Intermediate Variable Test Voltage

User can set test voltage to intermediate values as required.

Fast Charging of High-Capacitance Samples

- Saves the operator test time.

Megger's Polarity to Ground

Applies a worst-case condition to assure reliability.

Storm Smart Recorder (Optionally Available)

Provides a permanent record of the leakage current for the unit under test.

Standard of Safety Features

- Bipolar ammeter that displays the magnitude of the discharge current from the unit under test (digital models only).
- Input-supply-line circuit breaker.
- Output current overload relay.

- Zero-start interlock for high-voltage output
- Pushbutton controls and indicating lights for high-voltage ON/OFF
- Full circuit-breaker protection against internal damage by overloads, surges or test sample breakdown
- Connection for external permissive and safety interlocks

Model Capabilities/Applications

Following are the acceptance and maintenance testing capabilities of each of the dc dielectric test sets.

70-kV DC Dielectric Test Set

- Acceptance testing on 15 kV class cable
- Maintenance testing on 28 kV class cable

120-kV DC Dielectric Test Set

- Acceptance testing on 35 kV class cable
- Maintenance testing on 46 kV class cable

160-kV DC Dielectric Test Set

- Acceptance testing on 46 kV class cable
- Maintenance testing on 115 kV class cable

SPECIFICATIONS

Input Power

Nominal 120 Vac, 50/60 Hz

For 220/240 Vac, 50/60-Hz operation, add -47 to Cat. No.

Please note that specifications for the -47 models differ as follows:

Output Current: 220/240 Vac

120 kV Models: 5 mA for 5 min; 2 mA continuous

160 kV Models: 5 mA for 5 min; 1.5 mA continuous

When using external 240/120 volt step down voltage transformers, the ratings may be used as given for 120 volt input.

Weight: Add approx. 2 lb (1 kg) for -47 control unit.

Ammeter (Digital Models)

Ranges:

0 to 19.9 μ A

0 to 199 μ A

0 to 1.99 mA

0 to 5 mA

Resolution: To 0.1 μ A on lowest range

Accuracy: $\pm 2\%$ of reading + 1 digit

Ammeter (Analog Models)

Ranges:

0 to 5 μ A

0 to 50 μ A

0 to 500 mA

0 to 5 mA

Resolution: To 0.1 μ A on lowest range

Accuracy: $\pm 2\%$ of full scale range

Voltmeter (Digital Models)

Resolution: To 100 V over entire range

Accuracy: $\pm (2\% \text{ of reading} + 100 \text{ V})$

Voltmeter (Analog Models)

Resolution — Dual Range:

35 kV/70 kV: 2.5% full scale

60 kV/120 kV: 1.6% full scale

80 kV/160 kV: 2.5% full scale

CP - 76

Megger

70-, 120- and 160-kV DC High Voltage DC Dielectric Test Sets

Ripple

Less than 2% on capacitive samples at continuous rated output

Temperature Range

Operating: -20 to +130° F (-30 to +55° C)

Storage: -40 to +150° F (-40 to +65° C)

Relative Humidity Range

Operating: 0 to 90% noncondensing

Storage: 0 to 95% noncondensing

Dimensions

Control Unit (all models)

20 H x 12 W x 12.5 D in.

(510 H x 305 W x 318 D mm)

High Voltage Unit

70 kV: 20 H x 12 W x 12 D in. (510 H x 305 W x 305 D mm)

120 kV: 29 H x 12 W x 12 D in. (740 H x 305 W x 305 D mm)

160 kV: 39 H x 12 W x 12 D in. (1000 H x 305 W x 305 D mm)

Weight

Control Unit (all models)

23 lb (10.5 kg)

High-Voltage Unit

70 kV: 44 lb (20 kg)

120 kV: 65 lb (30 kg)

160 kV: 73 lb (33 kg)

Cables (including carrying bag)

70 kV Models: 7 lb (3 kg)

120 and 160 kV Models: 9 lb (4 kg)

ADDITIONAL SPECIFICATIONS

Model	*Test Voltage	Max. Power System Voltage (phase-to-phase)	Output Current (120 Vac Input)	Display	CAT. NO.
70 kV	0 to 70 kVdc	15 kVac	5 mA for 30 min; 3.5 mA continuous	Digital Analog	220070 220072
120 kV	0 to 120 kVdc	35 kVac	5 mA for 20 min; 2.5 mA continuous	Digital Analog	220123 220124
160 kV	0 to 160 kVdc	69 kVac	5 mA for 20 min; 2 mA continuous	Digital Analog	220163 220164

*Negative polarity with respect to ground.

OPTIONS AND ACCESSORIES

External Voltage Stabilizer

Filters input power to the test set and guards against line voltage fluctuations that may cause inaccurate readings.

Strip Chart Recorder

Document and print test sample leakage current measurements at the test site. This portable analog chart recorder features two ranges (50 and 500 mA), with results printed on pressure-sensitive paper.

Dimensions

9 H x 7.5 W x 7.4 D in. (230 H x 190 W x 190 D mm)

Weight: 6 lb (2.7 kg)

Special Cable Lengths

For a nominal charge, a custom-length, shielded, high-voltage output cable up to 50 ft (15 m) can be supplied. Specify length when ordering.

Applications Guide

A practical guide, "Lowdown on HV DC Testing," gives the what, when, how and why of high-voltage dc testing and its applications.

High-Voltage Discharge and Grounding Stick

Applying a suitably rated high-voltage resistance discharge stick following a test is recommended. This is not only a good safety practice, but will hasten discharge of highly capacitive samples.



High-voltage Discharge and Grounding Stick, ratings 70/120/160 kV

High-Voltage Discharge and Grounding Stick Specifications					
Voltage	Cat. No.	Resistance	Max. Safe Discharge Capacitance*	Length	Weight
70 kV	222070-62	90 MΩ	10 µF	51 in. (1.295 m)	2.0 lb. (0.9 kg)
120 kV	222120-62	100 MΩ	2.75 µF	51 in. (1.295 m)	2.7 lb. (1.2 kg)
160 kV	222160-62	120 MΩ	2.25 µF	71 in. (1.803 m)	3.3 lb. (1.5 kg)

*25°C 15 minute cooling period required after discharge



Megger

CP-77



70-, 120- and 160-kV DC High Voltage DC Dielectric Test Sets

ORDERING INFORMATION			
Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
Dielectric Test Sets		Optional Accessories	
70 kVdc, digital	220070	External voltage stabilizer	220004
70 kVdc, analog	220072	Discharge sticks	
120 kVdc, digital	220123	70 kV HV	222070-62
120 kVdc, analog	220124	120 kV HV	222120-62
160 kVdc, digital	220163	160 kV HV	222160-62
160 kVdc, analog	220164	Special cable lengths, HV cable	add -56
For 220/240-Vac, 50/60-Hz operation, add -47 to Cat. No.		"Lowdown on HV DC Testing" manual	AVTM22P-1
Included Accessories			
Input supply cord, three-wire, 8 ft (2.4 m)	17032		
Ground cables, 15 ft (4.5 m) [2]	4702-5		
Interconnection cable, 15 ft (4.5 m)	18320		
Detachable HV output cable, for 70 kV test sets, 15 ft (4.5 m)	18328		
Detachable HV output cable, for 120 and 160 kV test sets, 15 ft (4.5 m)	29590		
Carrying bag for cables	18313		
Kilovolt/negohm test record graph paper (100-sheet pad)	220000		

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Registered to ISO 14001 Reg no. EMS 61597
70_120_160_DCTS_D5_en_V16
www.megger.com
Megger is a registered trademark



CP-78



Non-Contact High Voltage Detector

High Voltage Detectors

Also known as Live Line Detector, indicates presence of high voltage when the tester is brought near live circuits. It is a must for Electrical Engineers & technicians working in Switch-yards, Circuit Breakers and high voltage equipment. The Live line detectors are available in voltage ratings of 11/33, 66, 132, 220, 420 & 510KV Ratings. Brief specifications of our system are as follows –

OPERATING VOLTAGE RANGE

: 80Volts to 420KV (Adequate no. of insulated sticks to be connected to match the rated voltage)

INDICATION

: Visual LED & Audible Buzzer Indication to show the presence of voltage

TYPE

: Contact as well as Field Proximity Type

SELF-TEST FACILITY

: Inbuilt facility to check the health of the Detector

POWER SUPPLY

: 9V Battery

ACCESSORIES

: Special Waterproof carrying cases

OPERATING VOLTAGE RANGE

: 230Volts to 750KV (Adequate no. of insulated sticks to be connected to match the rated voltage)

INDICATION

: Visual LED & Audible Buzzer Indication to show the presence of voltage

TYPE

: Contact as well as Field Proximity Type

SELF-TEST FACILITY

: Continuous and Automatic Self Testing

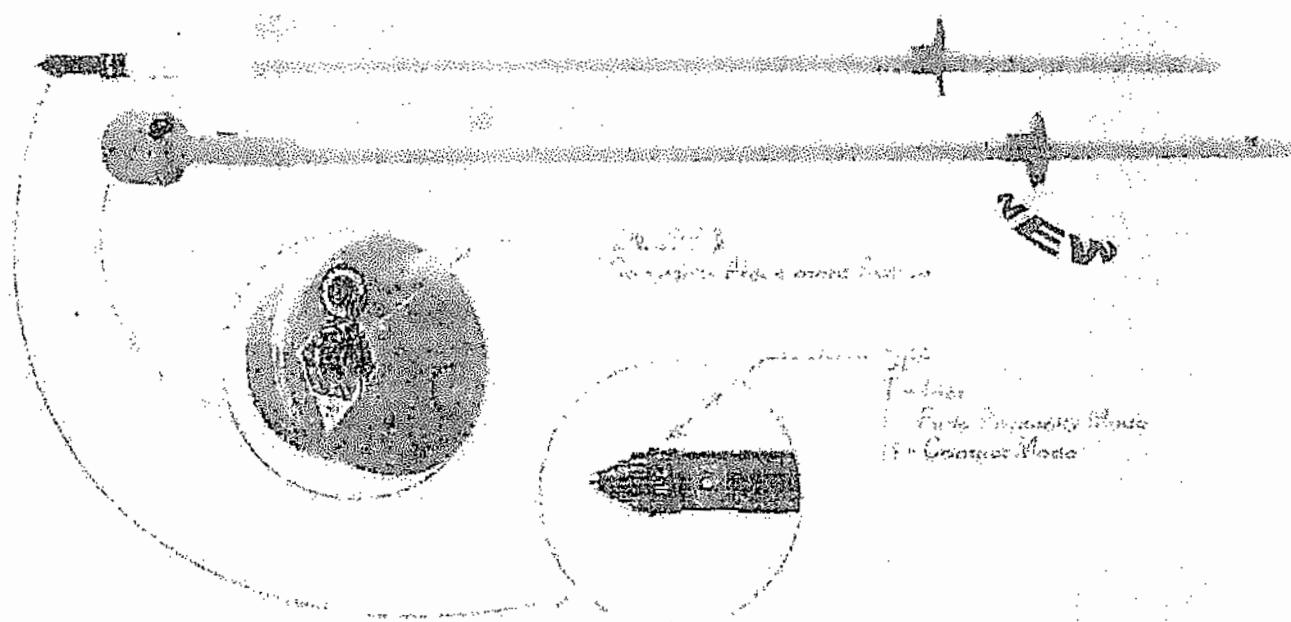
POWER SUPPLY

: 3x Size C battery (easily available and long lasting)
(The detector continuously diagnoses its health during operation)

ACCESSORIES

: Special Waterproof carrying cases
External Detector Proving unit

The Spout Tester is similar to TR-S8 Model except that it has a detachable probe. When the detachable probe is removed from the tester, it will not operate for safety precautions. The Spout Tester is suitable for both Indoor as well as out door applications. This Detector can operate in both contact as well as Field proximity modes.





EP-29



High Voltage Detectors

HV-40

HV-220

HV-132

HV-50



Visit us at : www.motwane.com



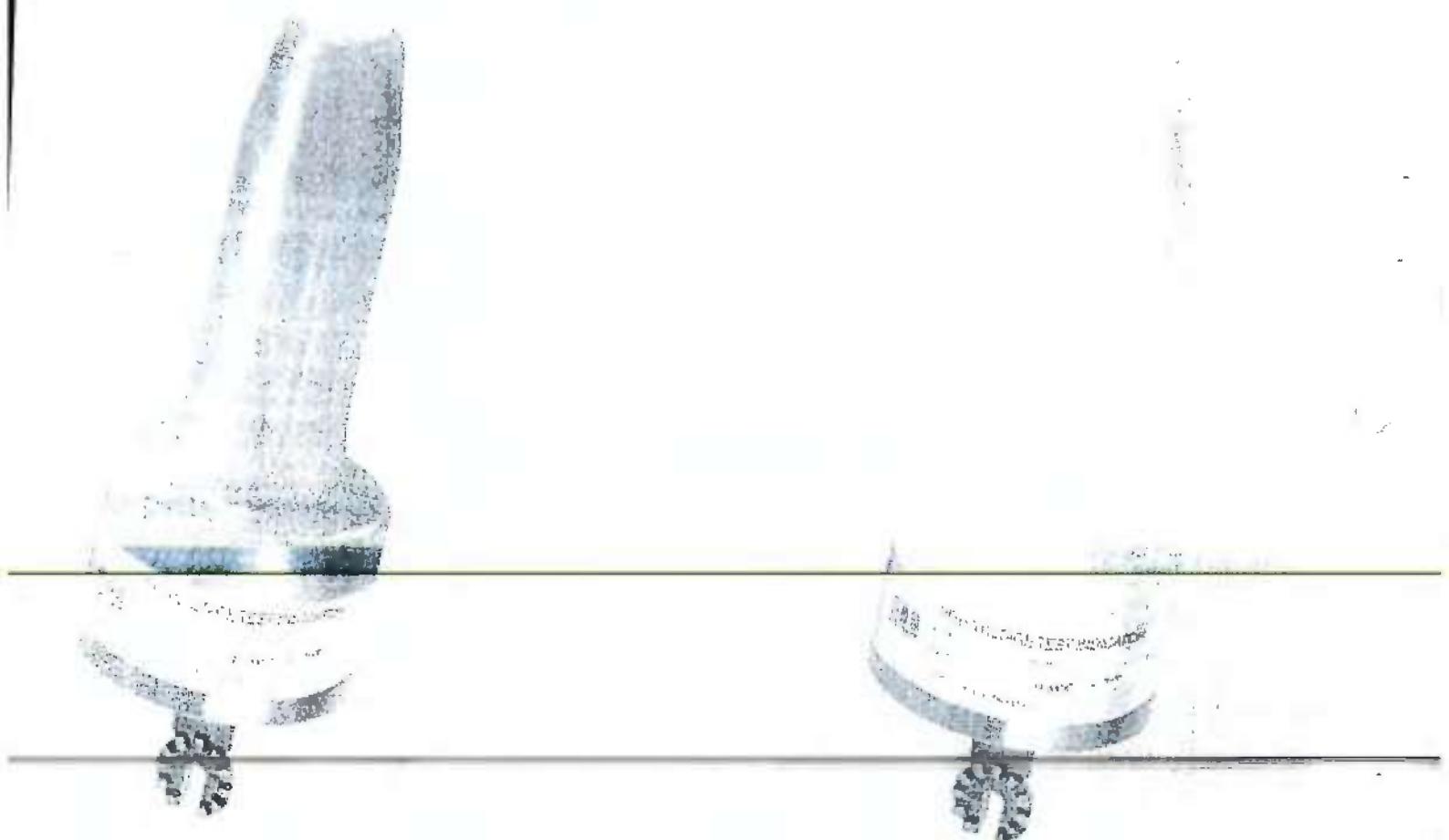
INTRODUCTION :

The High Voltage Detector is a SAFETY DEVICE used to verify that the overhead LIVE prior to earthing. It is suitable for 11 KV / 33 KV / 132 KV / 220 KV / 440 KV lines. It is powered by a single 9V battery. The HV Detector starts annunciation with flashing Red LED's and buzzer beeps indicating that the line is LIVE and not safe to earth and carry any operations.



FEATURES

- ④ Colour code models for different voltage levels.
- ④ Non contact type Probe.
- ④ Indicates the presence of HIGH VOLTAGE by audio annunciation as well as visual indication.
- ④ Bright high intensity RED LED'S provide clear visual indication even in unfavorable daylight conditions. A buzzer produces a loud beep which is audible even in noisy backgrounds.
- ④ Supplied as a complete Kit with HV Detector Probe, Telescopic Fibre Glass Reinforced plastic Insulation stick and ergonomically designed sturdy Carrying bag.
- ④ Self Test button to test battery and proper functioning of HV detector.
- ④ Selectable sensing level 1m/3m/5m for HV-D 132/HV-D 220/HV-D 440
- ④ Powered by a single 9V Battery type (6F22), Easily replaceable on field.
- ④ Type tested at CPRI.



HV-50 :

Safety Device Designed for 6.6 KV to 33 KV AC 50 Hz overhead lines in HV Switchgear

Installation instructions, Power + Installation
Instructions for using HV Safety Device HV-D 50
For 33 KV and 1 m to 5 m 11 KV

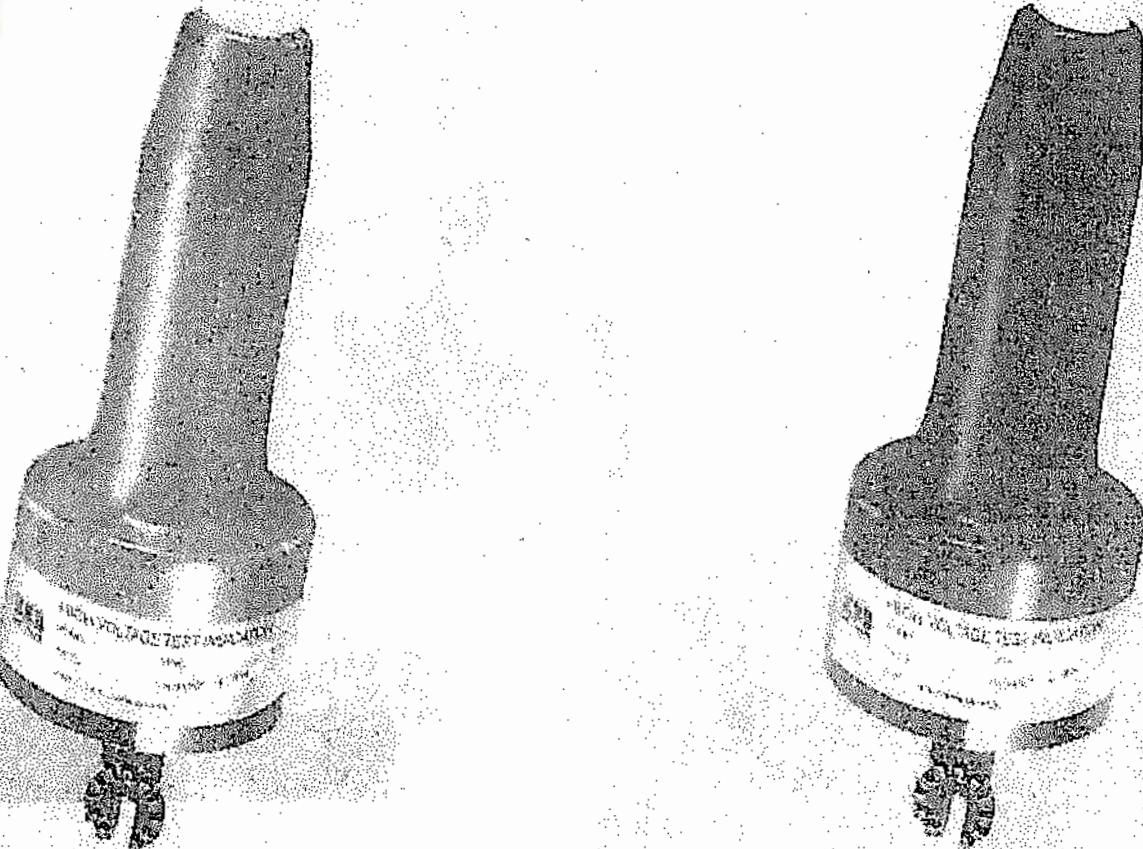
HV-132 :

Safety Device Designed for 11 KV to 132 KV

Installation instructions, Power + Installation
Instructions for using HV Safety Device HV-D 132
For 132 KV and 1 m to 5 m 11 KV



CP - 8)



HV-220 :

Safety Device Designed for 33 KV to 220 KV AC 50 Hz overhead lines in HV Switch yards, Transmissions lines, Power Plants and similar installations.

HV-440 :

Safety Device Designed for 66 KV to 440 KV AC 50 Hz overhead lines in EHV Switch yards, Transmissions lines, Power Plants and similar installations.

GENERAL SPECIFICATIONS :

• HIGH VOLTAGE INDICATION :

RED LEDs start flashing with an audible buzzer if taken into High Voltage induction area.

• TEST VOLTAGE RANGE :

Test Voltage range as per the models : HV-50 for 6.6 KV to 33 KV, HV-132 for 11 KV to 132 KV, HV-220 for 33 KV to 220 KV, HV-440 for 66 KV to 440 KV.

ELECTRICAL SPECIFICATIONS :

Insulation Resistance : Greater Than 100M Ohms by 1KV I.R. Tester.

Dielectric Strength : Equivalent or greater than as per model selected.

POWER SPECIFICATIONS :

Current Consumption : 30mA maximum

Battery Low : 7.2 V Nominal

Battery : 9V / Battery type 6F22 or equivalent

Visual Indication : High Bright LEDs flashing

Audible Indication : Buzzer beeps Loudly

ENVIRONMENTAL SPECIFICATIONS :

Recommended Operating

Temperature Range : 5°C to 50°C

Humidity : <85% RH non-condensing

Storage Temperature : 10°C to 60°C,

<85% RH non-condensing Range

• UNIVERSAL LINK :

Material : Glass Filled Nylon

Length : 95mm Approximate

• INSULATED STICK :

Material : Fibre Glass (Sturdy & Rugged)

Length : Telescopic Extendable length 3 mtrs. for 33 KV & 5 mtrs. for 132 KV & above

• PHYSICAL SPECIFICATIONS :

Length : 245mm Approx.

Diameter : 105mm Approx.

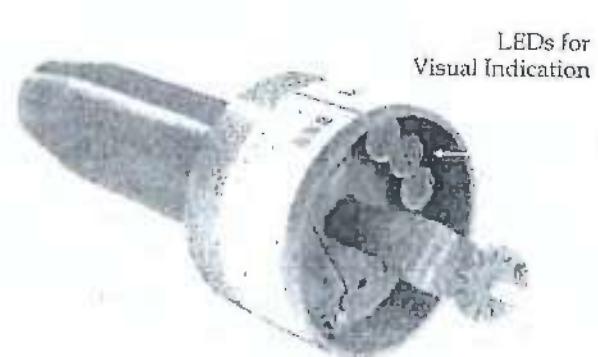
Weight : Approx. 2.5Kg including Telescopic Insulated Stick.



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Non Contact Type Probe.



Universal Link



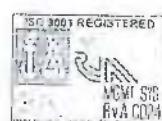
Sturdy & Rugged telescopic extendable fibre glass rod with carrying bag.

S/N CHV ~ Rev-02



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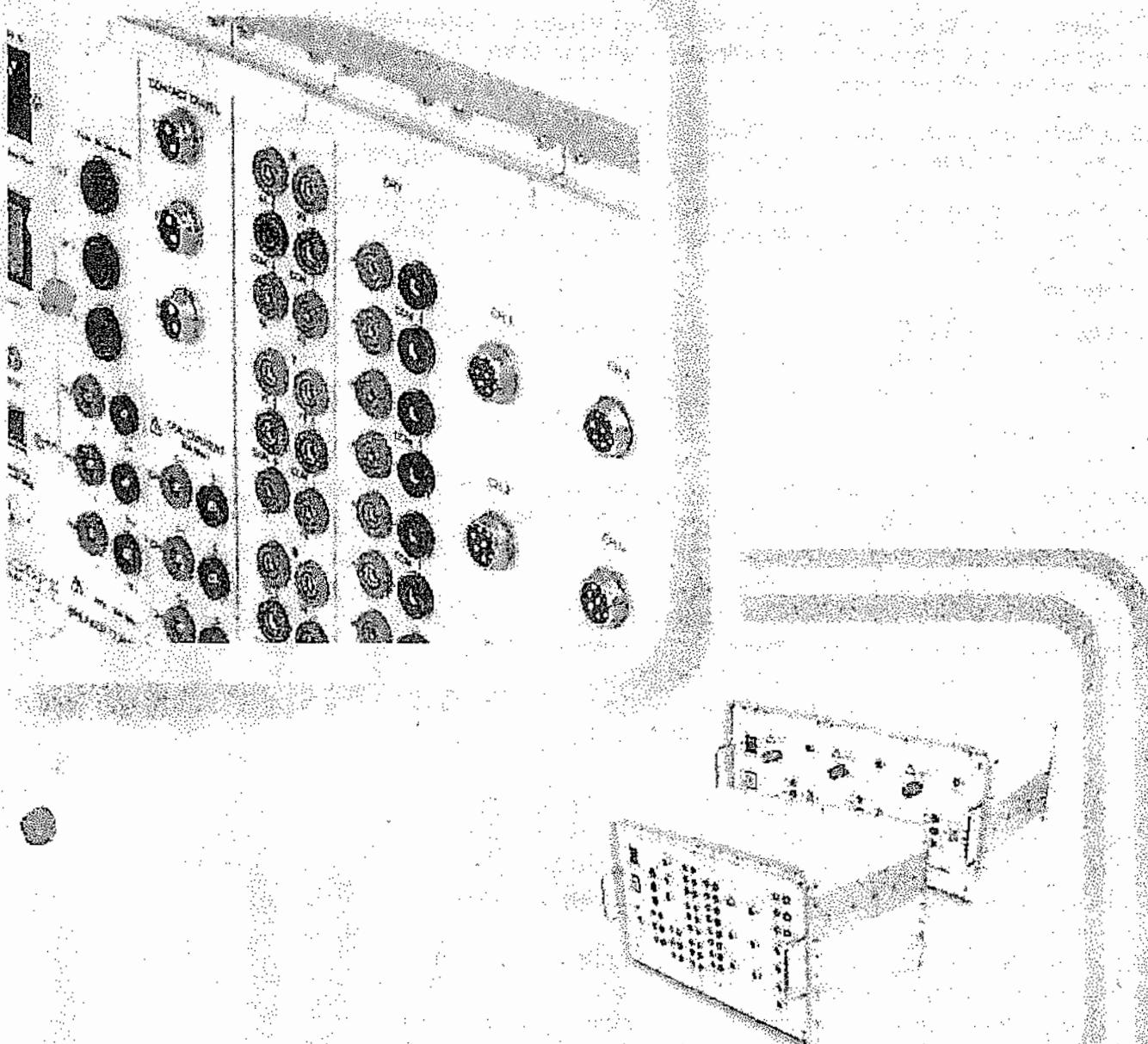


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www.motwane.com and click
 'Make an enquiry'.

Represented by

Circuit Breaker
Operation Analyser

HISAC Ultima
Circuit Breaker Dynamic Test Set



Ultimate solution for testing circuit breakers
of all types has arrived...



CP-84

HISAC Ultima



The Product

HISAC Ultima – new generation Circuit Breaker Dynamic Test Set from SCOPE the ultimate solution for testing Circuit Breakers of all types. HISAC Ultima is the most complete analyser for checking the dynamic performance of CBs in live EHV switchyards upto 765kV.

The portable analyzer is based on DIN standard modular and up-graddable 19" configuration having intelligent measuring modules controlled by an external laptop through an Ethernet link.

The Ultima can carry out Dynamic Contact Resistance Measurement on SIX breaks of THREE poles in one operation thereby significantly reducing stress on CB & testing downtime.

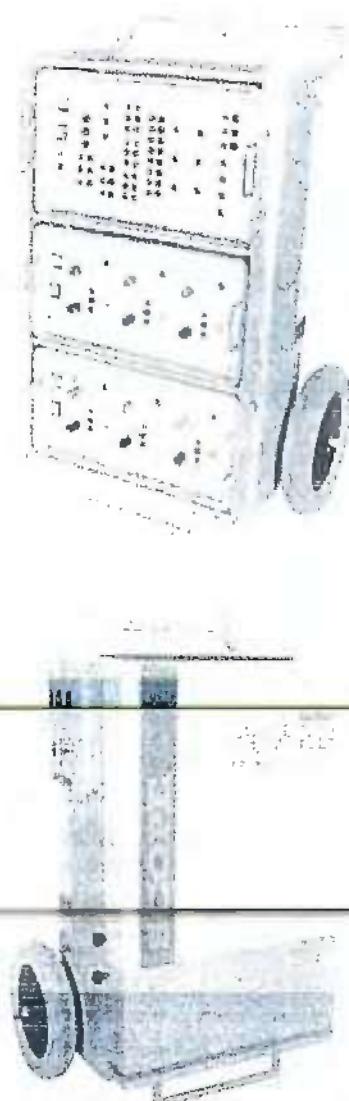
It offers flexibility to create pre-programmed Test Plans including all test settings for all types of circuit breakers available in a switchyard, that can simply be recalled at the time of actual testing. This saves you from doing all settings in switchyards.

The Analysis software offers a range of utilities which enables effective Condition Monitoring of CB by comparing present test data with previous signatures and predicting future performance.

HISAC Ultima actually gives you the power to design your own condition based maintenance strategy and obtain optimum breaker performance with minimum maintenance shutdowns

The Measurement

- TESTS all types of CBs - LV, HV, EHV & UHV for all critical performance parameters of all the poles / breaks in a single shot - saves downtime & number of operations during testing.
- MEASURES Main / PIR contact timings, bounce, non-simultaneity of contacts and auxiliary contact timings.
- ANALYSES contact travel characteristics for speed, insertion, contact gap, over-travel and rebound with suitable transducer and mounting fixture.
- RECORDS trip and close coil current characteristics.
- REGISTERS the signature of Dynamic Contact Resistance of main and arcing contacts, of all the 6 breaks simultaneously - helps assessing condition of the contacts without opening the interrupter.
- DISPLAYS settings, graphical and tabulated test results.
- PRINTS test report in graphical format with test header and calculation footer, on external printer.
- INCORPORATES a powerful and practical Windows™ based Test Manager software to control & operate instrument; view, analyse and handle graphical test data on a laptop at high resolution.
- SELECTS pre-programmed setup parameters and pass/fail limits through software.
- CONNECTS to CB with wear resistant test leads of sufficient length, having quick-fit connectors, suitable for EHV CBs.
- MOVES easily within switchyard as the set can be mounted on a specially designed Trolley having large wheels & mains supply distribution board.
- TRANSPORTS over long distance in rugged industrial aluminium cases.
- OFFERS additional options to measure PIR value and configurable analog channels that can be used for monitoring Station DC, Motor current or other static parameters for enhanced performance assessment of CB.



HISAC Ultima with 6 Channel

HISAC Ultim

Dynamic Contact Resistance Measurement ... DCRM signature

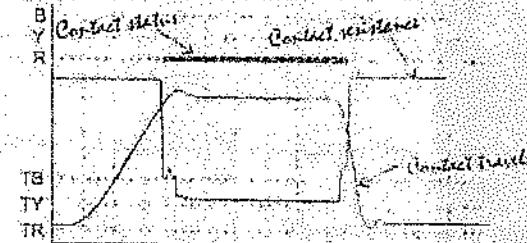
Advent of DCRM had given condition monitoring of CBs a new dimension. It enables user to see what was not visible before.... Condition of main & arcing contacts, without opening the interrupter for physical inspection!

Change in micro-ohm values during C-O operation, as first the arcing & then the main contacts of moving and fixed contacts engage and disengage is plotted against time and a graphical record is obtained. For this DCRM injects 100A DC through contact assembly, reads the voltage drop at high sampling speed during this short time span & relays it to Analyser, which calculates dynamic resistance by doing high speed V/I measurement.

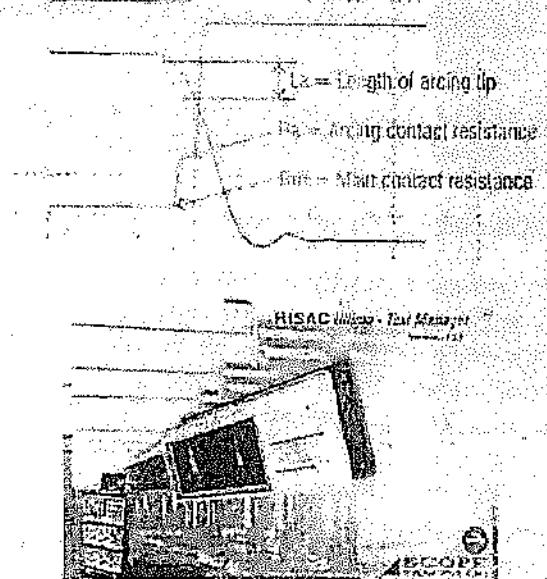
This dynamic micro-ohm signature of the circuit breaker can be used as a periodic inspection parameter for condition monitoring of contacts. Any abnormal jitters or deviation from the standard signature is helpful in identifying between good contact and worn out contact. Any change in the dynamic / frictional characteristics of the whole system, immediately reflects as a change in the dynamic resistance signature. When co-related with travel curve the DCRM curve helps in estimating the wipe of arcing contacts.

Specially engineered test lead set having special Ck clamps ensure correct implementation of classical four wire measurement method and excellent accuracy and repeatability of results.

TYPICAL DYNAMIC RESISTANCE CURVE OF EHV CB

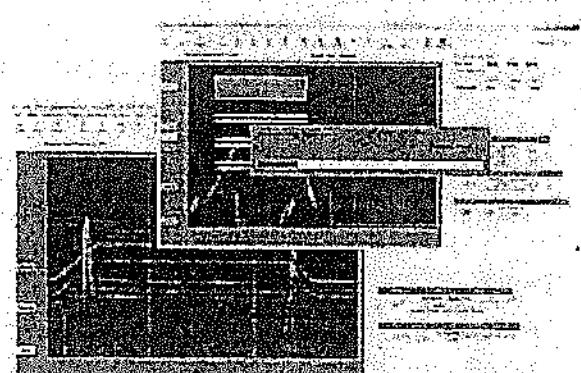
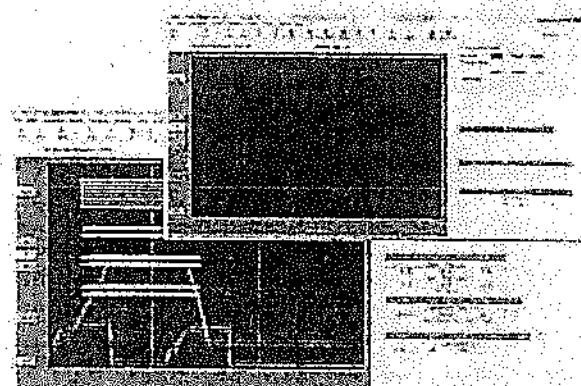


ZOOMED VIEW - ANALYSIS OF CURVE



HISAC Ultima Test Manager Software

- Controls the operation of HISAC Ultima through laptop
- Pre-programmable Test Plans facilitate creation of Test Setup library which is very easy to use & time saving during testing.
- User defined, structured storage of test data for easy future retrieval. Dynamic calculations on graphical information with cursor movement facilitating easy on-screen analysis.
- Comparison of test results with Manufacturer's test certificate using programmable limit checks.
- Assessment of present condition & prediction of future performance by multiple signature comparison and Trend Analysis.
- Comprehensive report generation including graphs and numerical results for all important parameters.
- Back up & restoration of test data
- Save graphs as bitmap images for incorporating in user reports
- Facility to export test report to pdf & excel format.
- This powerful test manager software really makes condition monitoring & condition based preventive maintenance feasible for the Power Utilities !



Software Screen shot

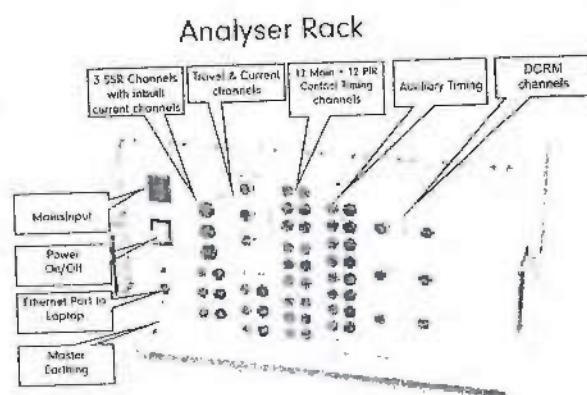


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SCOPE

Standard Configuration of HISAC Ultima Analyser rack consists of following modules

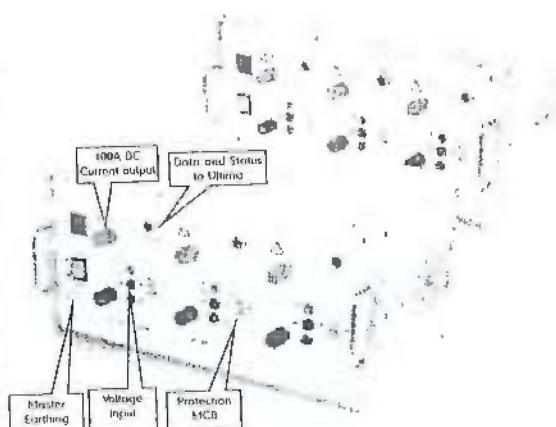
- Base CPU module with Ethernet connection for laptop
- Breaker Control module for Close, Trip1 & Trip2
- Travel & Current module for 3 Travel & 3 Coil Current channels.
- Contact Timing module for Main & PIR contacts –
12 Main + 12 PIR.
- Auxiliary Timing module for 4 dry & 4 wet auxiliary contacts.
- DCRM Link module as per DCRM modules selected
(1 for 3 DCRM modules, 2 for 6 DCRM modules).



Optional Accessories extend the capabilities of the basic instrument making it complete test equipment for testing circuit breakers.

DCRM Modules (Optional)

It captures dynamic variation in contact resistance of main & arcing contacts during breaker operation, as DCRM signature of 3 or 6 breaks simultaneously. Each DCRM rack houses 3 DCRM modules. Each module has in-built, independent, isolated, re-chargeable battery based 100 A DC source. Yet it is highly portable. One DCRM rack having 3 DCRM modules is sufficient for CBs having single break per pole whereas two DCRM racks (having 6 DCRM modules in total) will be needed for CBs having two breaks per pole. Each DCRM modules communicates with DCRM Link module in Analyser rack and passes on data O/S test current, dynamic resistance, battery status etc. It incorporates MCB protection to save battery from accidental short circuits.



3 Channel DCRM Racks

Additional Measurement Modules (Optional)

- Additional optional modules are available to measure PIR value and for monitoring Station DC (Coil voltage), Motor current or other static parameters through configurable Analog channels.
- The Standard configuration of Travel & Current module having 3 Travel & 3 Coil Current channels can be further expanded to have additional 3 Travel & 3 Coil Current channels.
- The Standard configuration of Auxiliary Timing module having 4 dry & 4 wet auxiliary contacts Timing channels can be further expanded to have additional 2 dry & 2 wet auxiliary contact channels.
- The combination of these optional modules should be confirmed with SCOPE before ordering.

Travel Transducers with Mounting Fixtures (Optional)

For evaluating travel characteristics of operating mechanisms SCOPE offers rotary and linear resistive travel transducers with universal / specially designed fixtures to suit variety of CBs available. More details are given on subsequent pages.

Trolley (Optional)

For easy movement within the substation, safe storage & transportation. Can accommodate one Analyser

one DCRM Link rack

Travel Transducer with Mounting Fixture (Optional)

In order to evaluate the travel mechanism / contact behavior of circuit breakers, it is necessary to mount the travel transducers at the appropriate point on the operating mechanism of CB. Depending on type of motion to be tapped either a rotary or a linear travel transducer having correct length as dictated by the stroke of circuit breaker is required. To hold this travel transducer rigidly on breaker mechanism suitable mounting fixture is required. This fixture is generally common (universal) for rotary transducers, however it may be custom built for different make / type & travel stroke of breaker mechanisms.

HISAC Ultima with such suitable travel transducer with mounting fixture can record travel graph & measure various travel related parameters like Total Travel, Default & Datum Velocities, Default Travel (Contact Gap / Contact Insertion), Over-travel & Rebound etc. For meaningful analysis of DCRM signature, it is recommended to have travel curve of circuit breaker along with DCRM curve.

SCOPE has rich experience in designing and providing solutions for travel measurement. It offers following options for facilitating this:

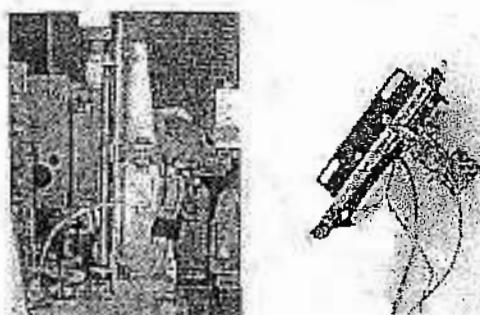
Standard Travel Transducer

SCOPE offers linear and rotary transducers manufactured by specialist manufacturers. These are rugged, reliable and suited for recording of circuit breaker travel characteristics. Detailed specifications of these transducers are available on request. Standard transducers are available from 25 to 600 mm linear stroke lengths and 360 degrees rotation, with a conductive plastic resistive element.



LTF Series Travel Transducer-cum-Fixtures

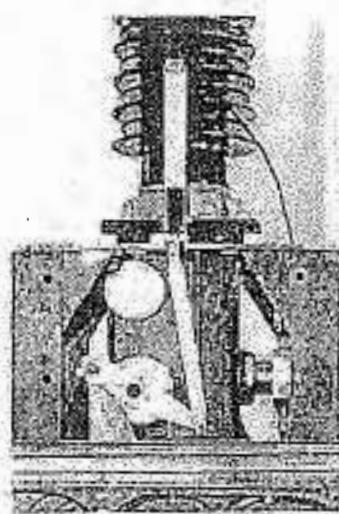
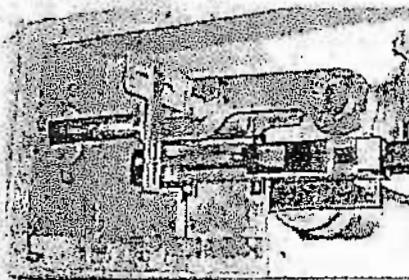
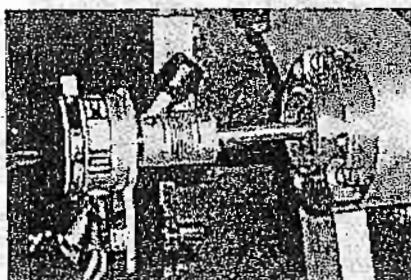
Sometimes, it is difficult to mount commercially available linear or rotary transducers on the mechanisms of some circuit breakers. This may be due to complicated geometry of the mechanism or due to conditions of special linkages or problems of vibration. SCOPE has studied the construction of some of these and designed and manufactured rugged and reliable transducer-cum-fixtures that make it possible to perform travel measurement on such circuit breakers.



LTH Series Mounting Fixtures for Standard Travel Transducers

SCOPE has designed and standardized fixtures for mounting standard transducers which are commercially available.

SCOPE has capability to design special fixtures for any new CB on request!



Actual pictures of Transducers mounted with their fixtures



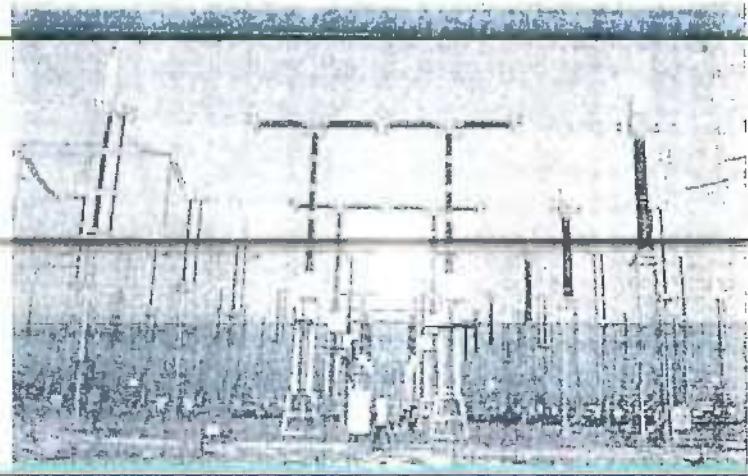
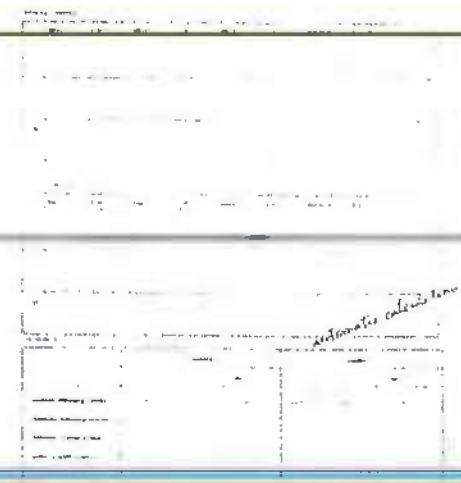
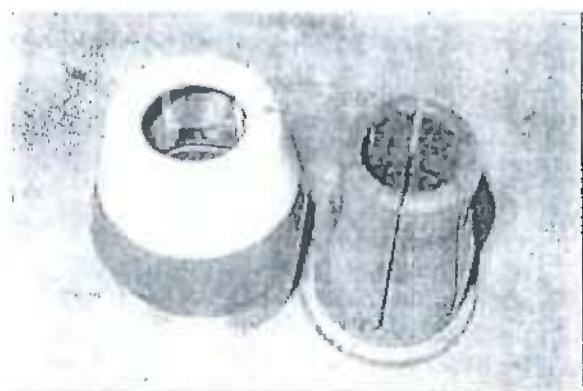
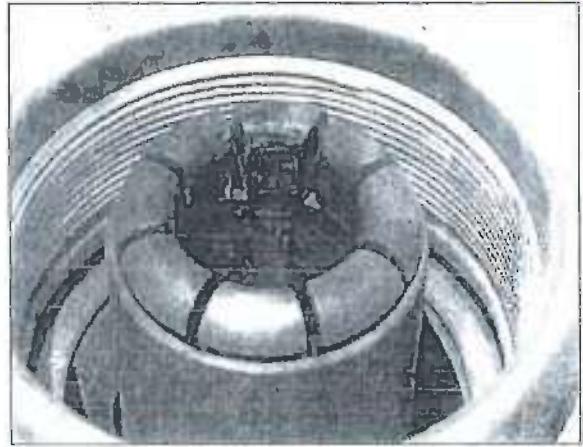
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Benefits

Analysis of test results provides inputs to assess and correct:

- settings for contact timings
- closing and opening speeds, over-travel, rebound and contact wipe
- auxiliary contact settings for obtaining specified C-O times
- trip / close release mechanism settings
- DCRM Signature gives information on:
 - Reflects useful information on contact conditions, especially arcing contacts
 - Gives prior indication of deterioration in operating mechanism linkages
 - Certain mechanical weaknesses, undetected by travel measurement, are reflected in DCRM measurement.



SPECIFICATIONS

CHANNELS	CONFIGURATION	RANGE	RESOLUTION	ACCURACY
Contact Timing	24: 4 Main + 4 PIR per pole, on 3 poles simultaneously	Measurement duration: 1 mS to 40 Sec at 1 kC, 0.05 mS to 2 Sec at 20 kC	1 mS at 1 kC 0.05 mS at 20 kC	Value \pm 0.05% \pm 1 digit
Auxiliary Contact Timing	8: 4 dry, 4 wet. Optionally expandable to 12 dry, 12 wet	24 to 250 V DC	1 mS at 1 kC 0.05 mS at 20 kC	Value \pm 0.05% \pm 1 digit
Coil Current	3: Trip / Close Coil current Optionally expandable to 6	1, 2, 5, 10, 25 A DC	0.1% of range at 1 A, 0.004% of range at 25 A	Value \pm 0.5% \pm 1 digit
Voltage (Travel)	3: Travel characteristics Optionally expandable to 6	0-5 V DC	1.2 mV	Value \pm 0.5% \pm 1 digit
Optional DCRM	3 or 6: Each for Resistance & Test Current as per configuration ordered	1000, 2000, 4000, 8000 μ Ω	0.1 % of selected range	Value \pm 2% \pm 1 digit
Optional Configurable Analog Inputs	4 or 6: Optional, for conditioned analog signal inputs	0-5V DC	1.2 mV	Value \pm 0.5% \pm 1 digit
Optional PIR Value	3: Optional, for Pre-Insertion Resistor value measurement	0-5 kΩ	1 Ω	Value \pm 5% \pm 1 digit

- Breaker Control : Three solid state contacts rated at 35A, 300V AC/DC for breaker operation (Close, Trip1 & Trip2)
- Trigger Options : Open, Close, C-O, O-C, O-C-O, delay between operations configurable. Command duration is also configurable
- Sampling Speed : 20kC, 10kC, 5kC, 1kC, selectable
- Plot Length : 2Sec at 20kC, 4Sec at 10kC, 8Sec at 5kC and 40Sec at 1kC
- Travel Channels : For linear / rotary resistive transducers. 0-5V DC excitation source in-built
- Test Report : Clear graphical result with test header and computation footer
- Control Through : IBM compatible external laptop
- Communication Port : Ethernet port for communication between laptop and instrument
- Test Leads : Suitable to test EHV Circuit breakers. Leads supplied are of suitable length, thickness, insulation quality & mechanical strength. They have colour coded terminators, quick-fit-type rugged clamps & identification labels
- Environment : 0 to 50°C, 95% RH (non-condensing). Electrical interference normally found in charged EHV switch yards upto 765 kV
- Power : 230V AC \pm 15%, 50Hz \pm 10%, 70VA (for Analyser), 55 VA (per DCRM rack)
- Dimensions : HISAC Ultima Analyser Rack: 500 x 270 x 300 mm, HISAC Ultima DCRM Rack: 500 x 270 x 250 mm (3 modules/enclosure)
- Weight : HISAC Ultima : 12 kg, DCRM : 18 kg (3 channels/enclosure); instrument
- Type Testing : As per IEC 60068 / IS 9000 for Supply Voltage Variation, Dry Heat, Damp Heat, Change of Temperature, Bump, Vibration, Mechanical Shock
- As per IEC 61326 for EMI/EMC & As per IEC 61010-1 for Safety



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HISAC Ultima



Ordering Information

Description	Quantity
Standard Accessories	
HISAC Ultima Analyser Rack with Standard Configuration	1 No.
Contact Cables for R1R2,R3R4, Y1Y2, Y3Y4 & B1B2,B3B4 of 15m	6 Nos.
Current Cables for CH1, CH2 and CH3 of 7m	3 Nos.
Travel Cables for TR, TY and TB of 7m	3 Nos.
Breaker Control Cable CLS, TRIP1, TRIP2 of 7m	4 Nos.
Auxiliary DRY Cable A1,A2,A3,A4 of 7m	4 Nos.
Auxiliary WET Cable A5,A6,A7,A8 of 7m	1 No. Each
AC Mains Cord of 3m, Master Earthing Cable of 7m & Ethernet Cable of 1.5m	10 Nos.
Spare Fuses	1 No.
Aluminium Carrying Case for Instrument	1 No.
Carrying Case for Test Lead Set	1 No.
HISAC Ultima Test Manager Software on CD	1 Set Each
Instruction Manual & Test & Calibration Report	

Optional Accessories

HISAC Ultima DCRM Rack - 3 Channel or 6 Channel as per configuration ordered is supplied with following Standard Accessories. The Accessories mentioned are for 3 Channel DCRM Rack. They will get doubled for 6 Channel DCRM (2 DCRM Racks)

Calibrated Test Cables for C+, C- & V+, V-, 15m with Ck clamp of 75mm opening	3 Sets
DCRM Link Cable of 1m	3 Nos.
AC Mains Cord of 3m & Master Earthing Cable of 7m	1 No. Each
Spare Fuses	10 Nos.
Aluminium Carrying Case for Instrument	1 No.
Carrying Case for Test Lead Set	1 No.
Test & Calibration Report	1 Set

For both Analyser & DCRM, Test Lead Set with 20 m & 35 m (specially designed for 765 kV CBs) lengths are optionally available.

- Travel Transducers & Fixtures for various types of CBs
 - Standard Linear Travel Transducer, Resistive, 25 to 600 mm travel
 - Standard Rotary Position Transducer, Resistive, 360° rotation
 - LTF Series Travel Transducers-cum-Fixtures
 - LTH/NLTH/NRTF Series Fixtures for Standard Linear or Rotary Transducer
- SCOPE has capability to design special fixtures for any new CB on request.
- Configurable Analog Inputs Module - 4 or 6 Channels for Station DC, Motor Current etc.
- Pre-Insertion Resistor (PIR) Value Measurement Module - 3 Channels
- Trolley - Suitable for carrying one HISAC Ultima Analyser Rack & two DCRM Racks having large wheels & distribution board
- Laptop for operating HISAC Ultima, with standard configuration available in market
- Printer with standard configuration available in market

Simple solutions for difficult measurements®

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Partial Discharge Test Set

4 42

Section II – Technical Specifications

Technical Specification for Series Resonant Transformer with Partial Discharge Measurement System

1.0 SCOPE

The scope of supply covers design, manufacture, testing, supply, installation and commissioning of Series Resonant Transformer with Partial Discharge Measurement System for RFCL

2.0 APPLICATION

Series Resonant Transformer (SRT) with Partial Discharge (PD) Measurement System shall be used for Power frequency voltage withstand & flashover tests (dry), measurement of Partial Discharge and Radio Interference Voltage (RIV) tests on current transformers, Voltage transformers, Capacitive voltage transformers, Bushings, Cables, Transformers, Circuit breakers, Disconnectors and other high voltage equipments of voltage rating upto 400kV class as per relevant IS, IEC, IEEE etc. standards.

3.0 Detailed Specification : The Series Resonant Test system shall be designed to provide rated test power at specified voltages and partial discharge levels for high voltage testing of capacitive test objects. The Series Resonant Test system with Partial Discharge Measurement system shall comprise of all the necessary test, measurement, control, protection system along with associated accessories to demonstrate its capability to meet the general specification. The high voltage Series Resonant Test and its measurement system shall meet the requirement of IEC 60060-1 & IEC 60060-2 and Partial Discharge measurement system shall meet the requirements of IEC60270 standard for PD measurements and NEMA 107/ANSI C63.2-1996/CISPR 18-2 standards for RIV tests. The offer shall be for the comprehensive system including erection and commissioning of the whole system including training of CPRI personnel. The general requirements and specifications of various components of the system are given below in the tabular format which shall be filled and submitted by the bidders along with the offer.

Note: The Offers should be submitted only in this format otherwise the offer will be liable for rejection. A detailed technical catalogue/literature/pamphlet and any other technical details shall be sent in hard copy in a sealed cover super scribbling enquiry number and due date so as to reach the following address within the due date and time. This is very much essential to evaluate your offer. The item to be delivered:

TO RFCL

Name of the Vendor :-

Offer No and date:-

Sl.No	Parameter	RFCL REQUIREMENTS	To be Completed by the Bidder
		TECHNICAL SPECIFICATIONS	Guaranteed Technical Particulars (GTP) Deviation/Remarks specify if any
3.1		Environment and Operating conditions: Complete system shall work satisfactorily under following environment and operating conditions: a) Installation : Indoor b) Ambient temperature : 5 °C to 40 °C, Average: 30°C c) Altitude : <1000 m above MSL d) Relative humidity: 10 to 90% (non-condensing) e) Power Supply : 415V±10%, 3-Phase, 4-Wire, 50 Hz	
3.2		Series Resonant Test System : General Specification Mode of Operation: Series resonant Total Output Voltage : 0-800 kVrms Max. Load current: 3A Maximum Test Power: 2400 kVA Duty Cycle: 30 min ON / 30 min OFF Maximum PD level: ≤ 2pC @ 400kV, and ≤ 5pC @ 800kV	



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		Name of the Vendor :		
		Offer No and date:		
Sl.No	Parameter	To be Completed by the Bidder		
		Guaranteed Technical Particulars (GTP)	Deviation/Remarks specify if any	
	RFCL REQUIREMENTS TECHNICAL SPECIFICATIONS			
	<p>The High voltage series resonant system shall be supplied with all the necessary components for generation & measurement of test voltage, control & protection of the test system, display & storage of data, routine tests on the components, performance tests on the total tests and measuring system etc in compliance with the IEC standard 60060-1 and 60060-2. The whole test system shall comply with IEC 60060-1 and IEC60060-2.</p> <p>The series resonant test system include the following main components :</p> <ul style="list-style-type: none"> i). Double Shielded Isolation Transformer ii). Regulating Transformer iii). Exciter Transformer iv). High Voltage Reactor v). Capacitive Voltage Divider vi). Low Voltage Filter vii). Measuring Instrument, System and control panel viii). Measurement Instrument(TBV system) ix). Software x). Accessories and spares 			
3.2.1	<p>Double Shielded Isolation Transformer (DSIT): Double shielded isolation transformer shall be designed to provide isolation of the test system from the mains and reduce the coupling of high frequency noise between the mains and test power source. The base frame of double shielded isolation transformer shall be fitted with high quality castor wheels with locking mechanism for easy movement on smooth platform.</p>			
3.2.2	<p>Regulating Transformer (RT): The regulating transformer shall be provided with "zero start" interlock so that the regulating transformer always starts at zero voltage. It shall be over current and short circuit protected. The base frame of regulating transformer shall be fitted with high quality castor wheels with locking mechanism for easy movement on smooth platform. Type: Indoor Input : 415V, 50Hz, 2-Ph Output : 0 - 415V, 50Hz Rated KVA: 60 KVA or higher Cooling class : ONAN/MN</p>			
3.2.3	<p>Exciter Transformer (ET): The exciter transformer shall be designed to set up the mains voltage and provide real power losses present in the high voltage series resonant circuit. It shall also provide isolation between the mains connected primary and the high voltage circuit in the secondary. Multiple taps shall be provided to maximize the operating load range of the system. The taps must be selectable through motorized system. The transformer shall be protected with suitable arresters. The exciter shall be fitted with suitable voltage and current measurements for tuning the circuitry. Input : 415V, 50Hz, 2 Ph Output : 0-415V, 50Hz Rated Power: 60 KVA or higher Cooling class : ONAN/MN Tap configuration: To be specified with output voltage and output current.</p>			
3.2.4	<p>High Voltage Reactor (HVR): The high voltage reactor shall be oil insulated and modular in construction for cascading. The high voltage reactor modules shall be designed to withstand electro magnetic forces and transient voltage stresses due to external breakdowns. The air gaps shall be variable so as to allow continuous adjustment of the inductance of the reactor. The gap variation shall be motorized with high precision mechanism to allow variable drive speed for the full range of inductance adjustment for precise tuning. Safety systems to protect the gap drive mechanism from damages shall be provided. The high voltage modules shall be equipped with high voltage electrodes for corona free operation at the specified voltages. The base frame of high voltage reactor modules shall be fitted with high quality castor wheels with locking mechanism for easy movement on smooth platform.</p>			
	<p>Rated voltage : 60KV RMS Operating frequency : 50Hz Rated Maximum Power : ≥2400 KVA</p>			

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Name of the Vendor:				
Offer No and date:				
Sl.No.	Parameter	RFCL REQUIREMENTS	To be Completed by the Bidder	
		TECHNICAL SPECIFICATIONS	Guaranteed Technical Particulars (GTP)	
3.2.5		<p>Capacitive Voltage Divider with blocking impedance</p> <p>Capacitive Voltage Divider (CVD)</p> <p>The capacitive divider shall be Oil insulated and hermetically sealed capacitor in FRP housing mounted on mobile platform and suitable corona free HV electrodes. HV divider shall be fitted with suitable rugged design wheels for smooth movement of the divider. The high voltage electrode provided shall be dimensioned for suitably connecting the blocking impedance alongwith coupling capacitor and shall be PD free.</p> <p>Type : Capacitor</p> <p>Rated Voltage : 800 kV</p> <p>Rated Capacitance: 1000pF or Higher</p> <p>Accuracy: $\pm 1\%$</p> <p>P.D. Level: $\leq 2\text{pC}$ at 800 kVRms.</p>		
3.2.6		<p>Blocking Impedance:</p> <p>Blocking impedance shall also be PD free and shall be provided with an internal spark gap to protect the HV source in case of failure of the test object against high energy steep front voltages.</p>		
3.2.7		<p>Low Voltage Filter (LVF):</p> <p>Input filter shall be designed to attenuate electrical noise in the PD measurement band which may be introduced by the mains into the HV test circuit. The filters shall behave as passive networks consisting of inductors and shunt capacitors. The filter configuration must be such that it provides low pass characteristic to minimize pass band loss and maximize high frequency attenuation.</p>		
3.2.7.1		<p>Measuring Instrument (MI):</p> <p>The Low Voltage output from secondary arm of CVD may be transmitted to the measuring instrument module. In case of the voltage measuring instrument forms as an integral part and embedded into the computer based system, the overall measuring system shall meet the requirements of IEC 60060-1 & 2. The Measuring Instrument, if provided separately, shall meet the following requirements.</p> <p>Input Voltage: Compatible with divider output voltage</p> <p>Protection: Surge protection to be provided</p> <p>Display/Setting: In built along with control panel or can be independent</p> <p>Aux. AC voltage: $230\text{V} \pm 10\%$, 50Hz</p> <p>Operating System and Control Panel:</p> <p>The operating system and control panel for the series resonant test system shall have all the necessary controls, indicators and measuring systems required by the operator to easily and safely perform the tests. The computer assisted operation of series resonant type AC high voltage test system shall be provided with ease of control and built in safety interlocks for the test system. The system should have a high electromagnetic compatibility. The display shall be wide and presentable for ease of monitor and settings. The control desk shall have high quality wheels with locking mechanism for ease of movement.</p> <p>The following features shall be provided</p> <ul style="list-style-type: none"> - ON/OFF Switch of the primary circuit breaker - High voltage on/off switch - Automatic zero start-up after switch off of the high voltage - Switch for tuning of the high voltage reactor - Emergency OFF - Any other control for functioning of the test system to meet the requirement of reference standards. 		



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		Name of the Vendor	
		Offer No and date:	
Sl.No	Parameter	To be Completed by the Bidder	
		Guaranteed Technical Particulars (GTP)	Deviation/Remarks specify if any
3.2.7.2	<p>RFCL REQUIREMENTS</p> <p>TECHNICAL SPECIFICATIONS</p> <p>Safety and protective function :</p> <ul style="list-style-type: none"> - After flashover or breakdown in the test circuit, the input circuit breaker shall be immediately opened. - After every shut-down of the test system the regulating transformer shall be reset to the initial position. - A lockable emergency switch shall be built into a separate case so that the switch can be placed as needed. <p>External Safety Devices :</p> <p>Provisions shall be made on the control desk to connect the following external devices</p> <ul style="list-style-type: none"> • Safety loop to connect external emergency switches • Safety loop to control the safety fences • Warning lamps to signal operating conditions. <p>GREEN : Ready for operation, Main switch ON RED : Operating primary and secondary ON</p>		
3.2.7.3	<p>Metering/Display</p> <p>All the meters used for voltage or current shall be digital and shall have ±1% class or better accuracy. The meters shall be easily accessible and calibrated.</p> <p>Aux. AC supply voltage .240Vac ±10%, 50Hz. Acc. Class : ±1% class or better</p> <p>1. Output Current Ammeter (AC) 2. Digital Exciter Voltage 3. Input current meter 4. Input voltages 5. Timer 6. Any other meter/display for functioning of the test system (Resistance point, frequency, etc)</p> <p>In case of computer based control and display system, the parameters can be provided as virtual display on the operator panel with high impact visual effect.</p>		
3.2.7.4	<p>Partial Discharge Measuring system</p> <p>Partial Discharge Measuring and Analyzing system is intended to measure, record, analyze and interpret partial discharges from high voltage equipment. It shall meet the following requirements;</p> <ol style="list-style-type: none"> a. Measurement of apparent charge b. PD quality tests on high voltage equipment c. PD diagnosis and d. Radio Interference Voltage (RIV) measurements <p>The equipment system shall include the following components</p> <ul style="list-style-type: none"> - Digital Partial Discharge Detector with Analyzing Software - Coupling capacitor with blocking impedance - Coupling Device (Quadrupole) for partial discharge measurement - Partial Discharge Calibrator - Measuring impedance and Additional module for RIV measurement (match with coupling capacitor) 		



CP 96

Name of the Vendor:				
Offer No and date:				
Sl.No	Parameter	To be Completed by the Bidder		
RFCL REQUIREMENTS		Guaranteed Technical Particulars (GTP)	Deviation/Remarks specify if any	
TECHNICAL SPECIFICATIONS				
3.2.7.4.1	Digital Partial Discharge Measuring System: General Requirements: The Digital PD measurement and Analyzing shall have the following basic technical features, and shall comply with IEC 60270 (latest version), ANSI C63.2-1996, (latest version) and other standards for high voltage test and measurement technology including IEC61 T-24-380 standard for cable. The PD measuring system shall be complete in all respect with dedicated software for acquisition and analysis of the data measuring and any other essential and necessary accessories. The equipment shall have computer aided measuring, recording, storing, monitoring and analysis of PD pulses and suitable for fundamental PD studies in research and quality assurance testing. Operating condition: Operating temp.: 5 °C to 40 °C Relative humidity : 20% to 90% Input voltage : 230Vac ±10% Frequency : 50Hz ±1.5 Hz EMC : Compliance as per relevant international standards Safety : Shock and vibration proof as per relevant international standards Hardware (PD measurements): Minimum requirement for measurement of parameters with digital PD Instrument : As per Cl. 4.4 of IEC 60270/2000 Maximum detectable apparent charge: 1000 pC or higher (with auto ranging feature)			
Sl.No	Parameter	RFCL REQUIREMENTS	TECHNICAL SPECIFICATIONS	
		Input impedance : 50 Ohms Minimum detectable apparent charge : < 1pC (@ 50 Ohms Input Impedance) Resolution : 0.1 pC Input : From quadrupole as per Clause 4.3.2 of IEC 60270 (compatible with coupling capacitor 1nF or higher) Pulse Train response: Compliance to Cl. 4.3.3 of IEC 60270/2000. PD system bandwidth : 30kHz ~ 400kHz for Wide Band (as per Clause 4.3.4) Wide band with active Integrator (as per Clause 4.3.5) / 50-kHz ~ 1MHz (as per Clause 4.3.65) for Narrow band Pulse resolution time: 10µs or better Derived quantities measurement: Pulse repetition rate (n), Pulse repetition frequency (N), Average Discharge current (I) etc. as per CL 4.5 of IEC 60270		
3.2.7.5	Coupling device - Quadrupole for partial discharge measurement : The Coupling device used for PD measurement shall be a passive device which converts high input current to convenient output voltage signal and transmitted to measuring instrument by a suitable coaxial cable. The device shall have proper terminations for ease of connections. The device shall fulfill the following requirement of IEC and ANSI standards for PD measurements: Operating Temperature: 5 to 40°C Relative humidity : 20% to 90% Bandwidth : ≥10 MHz Protection : Built In Overvoltage protection Input Isolation : >500V Voltage measurement : With additional Low voltage capacitor and coupling capacitor (Voltage measurement shall comply to IEC 60060-2)			
3.2.7.6	Partial Discharge Calibrator: The PD calibrator shall meet the technical requirements as per Clauses 6.2 and 6.3 of IEC 60270/2000 for calibration of a measuring system in the complete test circuit and performance tests on measuring systems respectively. The calibrator shall have the following minimum features: Partial Discharge range : 5,20,50,200 & 500pC (in convenient steps) Discharge tolerance: ±5% ±1 pC Rise time: < 60nsec Pulse resolution time: 10 µs approx. Polarity : Positive/ Negative for Full range and Bipolar (up to 500pC atleast) Power : Mains Powered/ Rechargeable Battery with battery charger Cable : Suitable length cable with connectors. Calibration magnitude : Provision of external terminals for measurement of capacitance and pulse			



CP 97

		Name of the Vendor :	
		Offer No and date:	
Sl.No	Parameter	To be Completed by the Bidder	
	RFCL REQUIREMENTS		
	TECHNICAL SPECIFICATIONS		
3.2.8.1	Hardware (RIV Measurements)		
	The PD measuring system shall have the capability (with or without additional hardware and processing software) to measure RIV level according to NEMA standard 107, ANSI C63.2-1996, ANSI C63.4-1981, CISPR 18-2 standards. The RIV measuring system shall meet the following technical requirements: Frequency Range: 800kHz – 1.2 MHz Input Impedance : 50 Ω Bandwidth : 9 KHz		
3.2.8.2	Coupling Device (RIV): Suitable matching impedance box(s) (compliance to reference standards) with built in over voltage protection (for RIV measurement at 500kHz and 1000kHz @ 300Ω considering Coupling capacitor of 1nF) along with 50Ω coaxial cable of 50m length.		
3.2.9	Software and other features; <ul style="list-style-type: none"> - Display of PD and test voltage - Display RIV level - Laptop with Windows operating system - Software for computer aided measuring, recording, storing, monitoring and analysis of PD pulses - Additional analyzing tools for diagnosis of high voltage insulation like PD pattern recognition, statistical evaluations may be provided. 		
3.2.10	Accessories and Spares		
	The following accessories and spares shall be provided as standard package and included in the scope of supply:		
4	<p>Tests and Calibration:</p> <p>1. The supplier shall conduct appropriate tests (routine and functional) on individual components of the series resonant test and partial discharge measuring system to ensure compliance with the specifications and relevant applicable standards. Detailed test reports shall be supplied for review during the inspection at supplier's works before dispatch and shall form as a part of overall documentation package. Some of the tests as applicable shall be performed on the major components are listed below:</p> <ul style="list-style-type: none"> • DSIT: a) Turns ratio measurement for all windings b) Excitation current and no load loss c) Short circuit impedance measurement d) Applied potential test between windings and shield at the appropriate specified test levels • RT: a) Excitation current and no load loss b) Short circuit impedance measurement c) Minimum and Maximum output voltage with rated voltage applied on no load • LVF: a) Signal attenuation in frequency band specified • Power cubicle and controls a) Functional tests of all overload protection devices b) Operational tests of all devices c) Functionality of all control circuits, overloads and safety interlocks d) Calibration of all measuring displays according to IEC requirements • ET: a) Voltage ratio measurement for each output tap b) Excitation current and no load loss c) Short circuit impedance measurement for each output tap d) DC winding resistance d) <p>2. The supplier shall carry out all type, routine test, performance tests, performance checks and additional capabilities as sought in the specifications on capacitor voltage divider, Coupling capacitor and the measuring instrument in accordance with IEC 60060-2 (latest version) measurement of voltages including the PD measurement of the capacitor units. The performance of the overall high voltage measuring system shall comply with this standards and supplier should furnish the documents for the traceability of calibration with IEC 17025 accreditation laboratory.</p> <p>3. The supplier shall carry out all type, routine test, performance tests, performance checks and additional capabilities as sought in the specifications for PD measuring system and the calibrator as per IEC 60270/2000, Clause 7. The performance of the overall PD and RIV measuring system along with calibrator shall comply with this standard and supplier should furnish the documents for the traceability of calibration with IEC 17025 accreditation laboratory.</p> <p>4. Calibration certificates for all other measuring instrument shall be submitted for approval.</p>		



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		Name of the Vendor:	
		Offer No and date:	
Sl.No	Parameter	RFCL REQUIREMENTS	
TECHNICAL SPECIFICATIONS			
5	Pre Dispatch Inspection	<p>The supplier shall submit the routine, type, special and calibration test reports of the individual components as well as overall system as detailed in Sl. No. 14 above for review during Pre Dispatch Inspection (PDI) to be carried out at the works of the supplier or at any specified location as agreed. Further, PDI will be carried out subject to the satisfactory compliance of all the test and calibration reports in accordance with the relevant standards. The supplier shall conduct the following tests in the presence of CPRI representatives at the manufacturers' works as a part of PDI:</p> <ul style="list-style-type: none"> • Functional tests of all overload protection devices. • Operational tests of all devices • Functionality of all control circuits, overloads and safety interlocks • Overvoltage tests at 110% of rated output for 5 minutes with voltage divider and coupling capacitor with blocking impedance connected • Three repeated flashover tests at rated voltage through an external gap directly to ground with base load connected. • PD measurements at rated output voltage performed after overvoltage and flashover tests • PD measurement at 100% rated voltage followed by measurement at rated output voltage for the duty cycle assigned with voltage divider and coupling capacitor connected. <p>The Delivery Instructions are subject to the compliance of all the test and calibration reports in accordance with the relevant standards and satisfactory completion of PDI.</p>	
6	Qualifying Conditions :	<ol style="list-style-type: none"> 1. The vendor, who or their principals have at least 10 year experience in manufacturing of such type of system. 2. The vendor should have supplied and commissioned at least one set of AC HV series resonance test system having rating at least 400kV/ 1200kVA or higher in the past five years and such system shall be presently working satisfactorily for more than three years. The vendor shall submit the document giving details Viz., Name of the customer/ company where similar system is installed, complete postal address of the customer, Year of commissioning & commissioning report, Name of the contact person with designation, Phone No. & email address and performance certificate. 	
7	Installation, Commissioning, and Training :	<ul style="list-style-type: none"> - The Installation and commissioning of all components of the Series Resonant Test and PD measuring system along with trial testing at rated test voltage with basic loads shall be carried out by the supplier. The supplier shall provide operation, maintenance and troubleshooting training to CPRI representatives for three main days. 	
8	Documents and Drawings :	<p>The scope of supply shall also include three sets of all relevant technical specifications and drawings detailing the constructional features, operating instructions and maintenance schedule etc. of all components of the test and measuring system. All the documents and communication shall be in ENGLISH.</p>	
9	Guarantees :	<p>The Series Resonant Test and PD measuring system shall be guaranteed to perform in accordance with the specifications of CPRI and against defective material, design and workmanship. The guarantee period shall be 18 (Eighteen) months from the date of receipt of all the equipment / materials at CPRI, Bhopal or 12 months from the date of commissioning whichever is earlier.</p>	
10	Delivery Period :	<p>All the instruments / equipment for the Series Resonant Test and PD measuring system shall be supplied to STDs, CPRI, Bhopal, Madhya Pradesh, India. The delivery period should be 8 to 10 months from the date of clear purchase order.</p>	
11	Payment Terms :	<p>The supplier shall quote the payment terms, mode of dispatch, freight and insurance etc.</p>	
12	Validity of Offer :	<p>The offer shall be valid for six months in order to obtain the necessary clearances for the purchase / import of the equipment.</p>	



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		Name of the Vendor :				
		Offer No and date:				
Sl.No	Parameter	To be Completed by the Bidder				
	RFCL REQUIREMENTS		Guaranteed Technical Particulars (GTP)	Deviation/Remarks specify if any		
	TECHNICAL SPECIFICATIONS					
	Remark : All the items shall be quoted separately with the model No. of the specific item.					
	The system supplied shall cover the test and the equipments covered in the scope of supply.					
13	<p>Note:</p> <ul style="list-style-type: none"> a) Offers quoted in the above format will only be considered. b) Each page of the offer shall contain signature and seal of the bidder. c) Firms meeting the qualifying conditions only are eligible to quote. d) The quotation shall include detailed diagrams of each component, necessary circuit diagrams of the test system, floor area layout, necessary electrical clearance, etc. e) Necessary Catalogues / Brochures to be enclosed. Reference to the Catalogues / Brochures in the offer shall clearly mention the Item Number, Clause, Table, Page Number, Figures etc., and appropriately highlighted in the Catalogues / Brochures. f) The bidder shall specify the area of laboratory building with clear dimensional drawing to house the test source (High voltage system complete) along with test samples inside laboratory building with safety clearances. The bidder is also required to submit the details of earthing/shielding network and type of earthing / shielding etc. to CPRI for the execution by CPRI. g) The bidder shall give the details of power supply requirement for installation and commissioning at rated test power. h) All civil works for the construction of laboratory building, electrical fittings, water supply along with handling facilities etc. will be done by CPRI with a separate agency / supplier. 					
<p>PN: 1. A detailed technical catalogue/pharmlet and other details shall be sent in hard copy in a sealed cover super scribbling tender enquiry number and due date so</p> <p>2. Letter of authorization issued by the principal shall be sent by the Indian agents who have offered on behalf of their principals.</p>						
RFCL RAMAGUNDAM						



70 KV AC Hipot test set

Rectifiers & Electronics Pvt. Ltd.

Ph. : +91-11-4368-0100 • Fax : +91-11-4142-5853
www.re-india.com • info@re-india.com • CIN : U29308DL2013PTC252965



Annexure – D

4. RE' AC High voltage test set capable of giving output voltage 0-70 kV at 50mA capacity. The unit shall be in two parts:

- a) Control panel cum Regulating Transformer.
- b) H.V. Transformer.

Technical details :

Input	:	240 V Single Phase 50 Hz AC Supply
Output	:	0-70 kV AC continuously variable.
Capacity	:	50 mA.
Timer	:	0-15 minutes Digital timer.
Control	:	<ol style="list-style-type: none">i) Push Buttons for switching ON/OFF Main Contactor.ii) Motorised Regulating Transformer to Control the output.iii) Selector switch to select leakage current at 25/50 mA.
Metering	:	Voltmeter : One Digital type voltmeter connected on primary side to indicate the output voltage. Scale: 0-70 kV AC.
Ammeter:	:	One Digital type ammeter Connected on earth side to indicate the leakage current on sample under test.
Scale	:	0-50 mA AC.
Protections	:	<ol style="list-style-type: none">i) The unit will have zero start interlocking to avoid the transients on HV transformer.ii) cage door interlocking shall also be provided.iii) A fast acting DC relay will isolate the circuit when the current exceeds pre-set level.

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- iv) MCB
- v) Current Limiting Resistor
- vi) '0' Interlock
- vii) Fuses
- viii) High Speed DC Tripping Relay
- ix) External Trip Contact (Test Area Interlock)

- Termination : The HT output on suitable HT insulator and other point at earth potential will be brought out on suitable insulator.
- Control panel : Shall be naturally air cooled type having main switch, fuses, indicating lamps for mains, HT 'ON, AC ON', KV & mA meters of 96 sq.mm digital, control Transformer, digital timer 0-15 minutes, housed in a sheet metal body. It will also incorporate Motorised Regulating auto transformer oil cooled type.
- HV Transformer : The HV transformer will be made of silicon steel Lamination, wound with electrolytic grade copper and insulated with extra High quality insulating paper, oil cooled type (oil charged extra.)

For Rectifiers & Electronics Pvt. Ltd.

Please turn over the leaf for Terms and Conditions

10/3, DLF Industrial Area, Moti Nagar, New Delhi – 110015

AC High Voltage Test Set



HIGH CAPACITY



CASCADED

Description

'RE' High Voltage High capacity testers are specially designed for testing cables and Electrical Equipment as per National and International Standards.

'RE' High Voltage Testers have been designed and developed in house. During manufacturing each unit is tested at multiple stages, thus ensuring consistency and best quality. These instruments are cooled, oil cooled or air oil cooled combined as per requirement and have been manufactured upto 800 kV and upto 2000 kVA.

Special Features

- Supplied up to 600 kV and upto 2000 kVA
- Light In weight
- Casted Wheel for easy movement
- Multiple safety locks for the operator
- Build in safety for operator
- Efficient after sales service
- Guaranteed for one year against manufacturing defects only



AC/DC HIGH VOLTAGE AND HIGH CURRENT TESTING EQUIPMENT AND ELECTRICAL MACHINES



Brief technical details

TRANSFORMER	: A double wound step up transformer is the most important part of the equipment. The transformer is wound with high quality enameled copper wire & Polyester film/Paper is provided between the layers. CRGO step core is used for light weight & efficient transformer.
INPUT VOLTAGE	: 230 or 400 volts single/two phase 50Hz AC supply
OUTPUT VOLTAGE RANGES	: Upto 800 kV
CAPACITY	: Upto 2000 kVA
DUTY CYCLE	: 15 minutes ON / 15 Minutes OFF or as specified
CONTROL	: (a) The unit can be manual/motorised control for voltage variation & push button controlled for HT actuation (b) The unit can be microprocessor based complete with on board memory, printout facility, programmable features, etc (c) The unit can be PLC based complete with computer, HMI, memory, printer, etc for operation
METERING	: The metering can be provided via primary measurement, tertiary winding measurement, or via capacitive voltage divider for direct HT measurement
TERMINATION	: One end at earth potential & other at HV insulator with Tan delta Test Capabilities
PROTECTION	: (a) Switch fuse unit is provided for higher Capacity (b) A fast acting DC relay actuates to isolate High voltage in case of fault or when current exceeds the preset value (c) The unit has zero start interlocking arrangement to ensure that HV will not actuate unless variac is at zero position (d) Test cage door interlock where ever required
ADDITIONAL	: (a) The HT Meter can be on primary or secondary side (b) The control panel in all the models is naturally air cooled type (c) Control transformer and main transformer oil or air cooled as per the design & capacity of the unit

Note: Our policy is one of continuous improvement and we reserve the right to change specifications and design at any time without notice

Rectifiers & Electronics

AN ISO 9001:2000 COMPANY

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II. INTRODUCTION FEATURE

The symptoms of poor power quality include intermittent lock-ups and resets, corrupted data, premature equipment failure, over-heating of components for no apparent cause, etc. The ultimate cost is in downtime, decreased productivity and frustrated personnel.

Use power analyzer to power quality trouble shooting can help you keep your power system up and running, troubleshoot problems quickly, improve power efficient, manage energy costs, zero in on harmonics, optimize power system performance, improve power quality and analyze system data to design optimal upgrades.

- 10 display Easy-to-view LCD screen, and is capable of showing many power quality parameters at the same time.
- 4 current probe including for measuring a neutral line current.
- Measures single-phase 2-wire, single-phase 3-wire, three-phase 3-wire and three-phase 4-wire systems.
- All True-RMS sensing , V, A, KW, KVAR, KVA, PF, θ, Hz, KWh, KVARh and KVAh measurements.
- Phase sequence indicator function.
- Backlight display function.
- Manual Data Memory and Read (99 sets).
- Data logging (504K byte memory, 12,000 sets per block, total 20,000 sets).
- RS-232 optical interface with three phase voltage / current waveform display and harmonic analysis.
- Easy-to-use key operation.
- Light weight and portable design.

III. SPECIFICATIONS

3-1 Environment Conditions:

- ① Altitude up to 2000 meters
- ② Indoor use only
- ③ Relatively humidity 80% max.
- ④ Operation ambient 0~40°C



3-2 Safety Specifications

Category Rating : 1000V Measurement Category III, Pollution Degree 2.

CE : IEC 61010-1 2nd Edition

CAT III : Measurement category in which measurements performed in the building installation.

Safety Characteristics :

Current Clamps, Model TES AC3600, to be used only with the Three-Phase Power Analyzer, Model TES-3600.

This manual contains information and warning that must be followed by the user to ensure safe operation and to keep the meter and its accessories in a safe condition.

Use of this meter and its accessories in a manner not specified by the manufacturer may impair the protection provided by the equipment.

Equipment operation, the responsible body shall be made aware that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the probe assembly may be impaired.

3-3 General Specification

- Maximum voltage between voltage input terminals and earth ground : 1000 Vrms
- Maximum rated working voltage for current input : 0.35 Vrms
- Maximum current for current probe : 1000 Arms
- Numerical 10 display : 10 display 4 digit LCD maximum reading 9999.
- Battery life : approx. 50 hours.
- Auto power off : approx. 30 minutes.
- Low battery indication : The **[BT]** is displayed when the battery voltage drops below the operating voltage.
- Backlight display time : Auto off approx. 30 seconds.
- Sampling rate : Approx. 1 time per 2 seconds (Digital display).
- Waveform and harmonic analyzer : 64 samples per period.
- Current probe jaw opening diameter : Cables ϕ 40mm.
- Operating temperature : 0°C to 40°C
- **Operating humidity** : Maximum relative humidity of 80% for temperatures up to 31°C decrease linearly to 50% relative humidity at 40°C (non-condensed).
- Temperature coefficient : $0.1 \times (\text{specified accuracy})/\text{°C}$ (<18 or >28°C)

- Storage temperature and humidity : -10°C to 60°C
R.H. < 70% non-condensed.
- Dimensions : Meter → 235(L)×117(W)×54(H)mm.
Current probe → 193(L)×88(W)×40(H)mm.
- Weight : Meter including battery → approx. 730g
Current probe → approx. 333g

- Accessories :

1. TES 3600 AC CURRENT ADAPTOR x 4pcs

Category Rating : CAT III 600V per IEC61010-1, Pollution Degree 2.

CE : IEC 61010-1 2nd Edition and IEC61010-2-032

Input : AC 1000A maximum.

Output : 0.35mV/A

2. Voltage test lead x 4pcs

Model no : TL 202I

Manufacturer : Hong Kai Co., Ltd.

Category Rating : CAT III, 1000V, AC 10A Max.

3. Alligator clip x 4pcs

Model no : FC-A23

Manufacturer : Fu Chyi Enterprise CO., Ltd.

Category Rating : CAT III, 1000V, AC 10A Max.

4. AC Adaptor (IN-OUT Isolated type, Input 120V AC 60Hz

Model : MW35-1200300

Input : 120V AC 60Hz 6.1W



Output : 12V DC 300mA

Manufacturer : MAW WOEI Enterprise CO., Ltd.

AC Adaptor (IN-OUT Isolated type, Input 230V AC 50Hz

Model : MWD48-1200300GS

Input : 230V AC 50Hz



Output : 12V DC 300mA

Manufacturer : MAW WOEI Enterprise CO., Ltd.

5. Battery 1.5V "AA" × 8

6. Instruction manual × 1

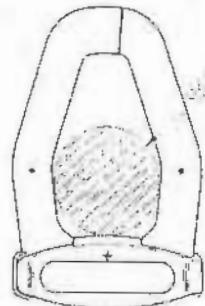
7. PC software CD-R × 1

8. Carrying case × 1

9. Optical RS232 interface × 1



3-4 Electrical Specification



Accuracy : $\pm(\% \text{ of reading} + \text{number of digits})$ at 18°C to 28°C (64°F to 82°F) with relative humidity to 80%.

The current error is specified within the largest circle which can be drawn inside the jaw.

AC Voltage Trms measurement (V) :

Range	Resolution	Accuracy	Input impedance	Overload protection	Nominal power system frequency
999.9V	0.1V	$\pm(0.3\%\text{rdg}\pm10\text{dgts})$ (>50V)	$2M\Omega$	1000VRMS	Only 50Hz or 60Hz

- Display item : RMS voltage value for each channel.

AC Current Trms Measurement (A) :

Range	Resolution	Accuracy (including current probe)	Current probe output	Overload protection	Nominal power system frequency
999.9A	0.1A	$\pm(0.5\%\text{rdg}\pm15\text{dgts})$ (>3A)	0.35mV/A	1000ARMS	Only 50Hz or 60Hz

- Display item : RMS current value for each channel.

Active Power measurement P (KW) :

Range	Resolution	Accuracy
999.9KW	0.1KW	$\pm1.0\%\text{rdg}\pm20\text{dgts}$

- Display items : Active power of each channel and its sum of multiple channels.
- Polarity display : For influx (consumption) No symbol, For outflow (regenerative) “ - ”.

Apparent Power measurement S (KVA) :

Range	Resolution	Accuracy
999.9KVA	0.1KVA	$\pm1.0\%\text{rdg}\pm20\text{dgts}$

- Measurement method : Calculate from RMS voltage U and RMS current I.
- Display item : Apparent power of each channel and its sum of multiple channels.
- Polarity display : No polarity.

Reactive Power measurement Q (KVAR) :

Range	Resolution	Accuracy
999.9KVAR	0.1KVAR	$\pm1.0\%\text{rdg}\pm20\text{dgts}$

- Measurement method : Calculate from apparent power S and active power P,
$$Q = \sqrt{S^2 - P^2}$$
.

- Display item : Reactive power of each channel and its sum of multiple channels.

- Polarity display : For phase lag (LAG : current is slower than voltage) : No symbol.
- For lead phase (LEAD : current is faster than voltage) : “-”

Power Factor measurement ($\cos \phi$) :

Range	Resolution	Calculated Accuracy
0 ~ +1	0.001	±3dgt

- Measurement method : Calculate from apparent power S and active power P,

$$\text{PF} = \cos \phi = |P| / S$$

- Display item : Power factor of each channel and its sum of multiple channels.

Phase angle measurement (ϕ) :

Range	Resolution	Calculated Accuracy
+90° ~ 0° ~ -90°	0.1°	±3dgt

- Measurement method : Calculate from power factor $\cos \phi$, $\phi = \cos^{-1} \text{PF}$.
- Display item : Phase angle of each channel and its sum of multiple channels.
- Polarity display : For phase lag (LAG : current is slower than voltage) : No symbol.

For phase lead (LEAD : current is faster than voltage) : “-”.

Frequency measurement (Hz) :

Range	Resolution	Accuracy	Measurement source
60Hz	0.1Hz	±0.1%rdg+2dgt	Voltage U1 > 50V

- Measurable input range : > 50V

Three Phase Sequence Detection :

Input voltage range	Normal phase indication	Reverse phase indication	Measurement source
3P > 50V	123	123	U1, U2 and U3

Active Power Energy measurement (KWh) :

Range	Resolution	Active power accuracy	Timer interval	Timer Accuracy
3.999KWh	0.001KWh			
39.99KWh	0.01KWh			
399.9KWh	0.1KWh			
3.999MWh	0.001MWh	±1.0%rdg+20dgt	1 sec	±50ppm (25°C, 77°F)
39.99MWh	0.01MWh			
119.3MWh	0.1MWh			

- Measurement display : Display all active power consumption energy (sum of absolute values).

Apparent Power Energy measurement (KVAh) :



Range	Resolution	Apparent power accuracy	Timer interval	Timer Accuracy
3.999KVAh	0.001KVAh	$\pm 1.0\% \text{rdg} \pm 20 \text{dgt}$	1 sec	$\pm 50 \text{ppm (25°C, 77°F)}$
39.99KVAh	0.01KVAh			
399.9KVAh	0.1KVAh			
3.999MVAh	0.001MVAh			
39.99MVAh	0.01MVAh			
119.3MVAh	0.1MVAh			

- Measurement display : Display all apparent power energy (sum of absolute values).

Reactive Power Energy measurement (Kvarh) :

Range	Resolution	Reactive power accuracy	Timer interval	Timer Accuracy
3.999Kvarh	0.001Kvarh	$\pm 1.0\% \text{rdg} \pm 20 \text{dgt}$	1 sec	$\pm 50 \text{ppm (25°C, 77°F)}$
39.99Kvarh	0.01Kvarh			
399.9Kvarh	0.1Kvarh			
3.999Mvarh	0.001Mvarh			
39.99Mvarh	0.01Mvarh			
119.3Mvarh	0.1Mvarh			

- Measurement display : Display all reactive power consumption (sum of absolute values).

Harmonic measurement (use only PC on line analyzer)

Order	Accuracy	Harmonic Source	No. of samples per period
1 ~ 31	$\pm 3\% \text{THD}$	U1, U2, U3 > 80V I1, I2, I3 > 50A	64

Waveform (use only PC on line displayed)

Select phase A, B or C.

Select Voltage and current waveform output.



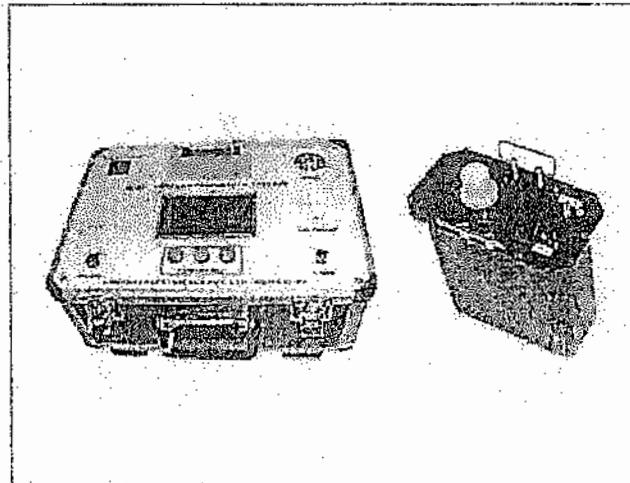
very low frequency Hi-pot set

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VLF AC Hipot Testers

Very Low Frequency HIPOTS

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VLF AC Hipot Testers

Model

It is well known that DC testing of aged extruded cable such as XLPE and EPR is potentially damaging to the cable, leading to failure of the cable under service conditions.

In addition, DC "proof" or hipot testing has been found to be ineffective in detecting even serious defects in cable. Any hipot test, and due to the negative side effects of DC, VLF waveform testing is now recommended by almost all standards such as IEEE, CENELEC, VDE, SABS etc. Acceptance or maintenance hipot/proof testing using VLF high voltage is able to efficiently detect serious cable insulation defects, before they result in an in-service failure, without affecting the cable which still have remaining service life.

Feature

Machine Technical Specification

Power Supply	220 ± 5% Volts AC, 50 Hz, single phase
Test Voltage	30kV / 50kV / 80kV
Frequency	0.1Hz, 0.05Hz, 0.02Hz
Voltage Accuracy	Fluctuation < 0.5%
Current Accuracy	±3%.
Load Accuracy	<3%.
Temperature Accuracy	<5%
Control Functions	<ul style="list-style-type: none">1) Frequency : 0.1Hz, 0.05Hz, 0.02Hz2) Timing: 0-99 minutes3) Test Voltage: Zero to rated voltage4) Trip Current: Zero to rated current
Protection Functions	<ul style="list-style-type: none">1) Self-check, if condition is abnormal, the unit shuts down & displays 'Load connected'2) Mains fuse.3) Over voltage protection4) Over current protection5) Protective HV resistor connection
Control Unit	In two units: Controller and Power supply
Environment	Temperature Indoor and outdoor : -10 to +40°C
Dimensions	Dim(cm)
Weight	Wt(Kg)



VL-32	30kV/20mA	0.1Hz<=1.1μF 0.05Hz<=2.2μF 0.02Hz<=5.5μF	28x37x22	
VL-53	50kV/30mA	0.1Hz<=1.1μF 0.05Hz<=2.2μF 0.02Hz<=5.5μF	28x37x22	6
VL-85	80kV/50mA	0.1Hz<=1.1μF 0.05Hz<=2.2μF 0.02Hz<=5.5μF	28x37x22	7

Video

VLF



Udeyraj Electrical Pvt. Ltd. | +91 98200 44333 | info@udeyraj.com | www.udeyraj.com



2014/05/25

TP 500 V

N/A 1 min

2014/05/25

AC/DC 500V
1 min

N/A

2014/05/25

TP 500 V

N/A

F N G Y

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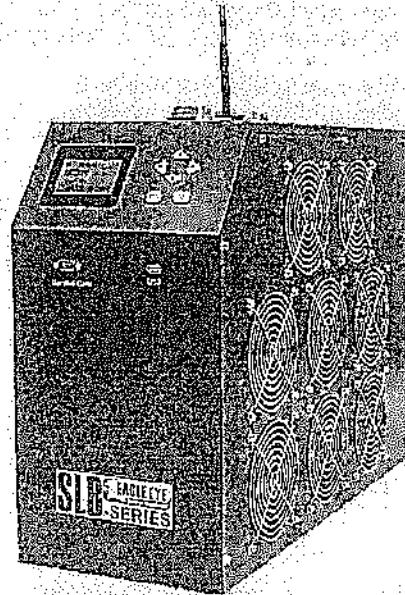
Battery Charge Discharge Set



To Order Call Toll Free:
1-877-805-3377

SLB-Series DC Load Banks (10-576V, 0-1200A)

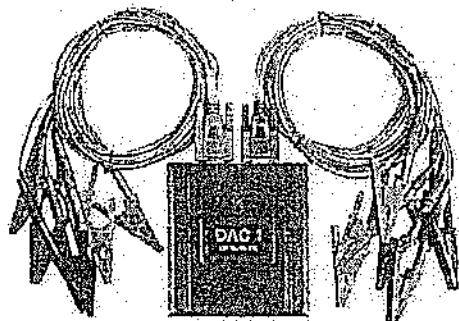
SLB-SERIES
SMART DC Load Banks



SLB-Series DC Load Bank

Data Acquisition Case (DAC):

Eagle Eye's SLB-Series Load Banks come with an optional DAC package allowing the voltage of EACH CELL to be wirelessly monitored and recorded during discharge. The DAC package allows the user to evaluate the health of each cell and replace only the cells that require replacement - saving time and money by significantly reducing labor hours and replacement costs.



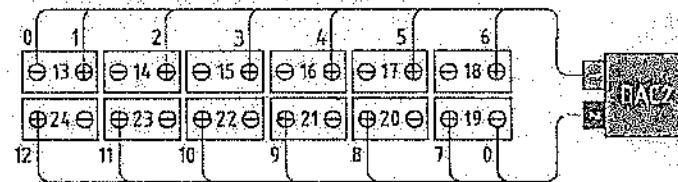
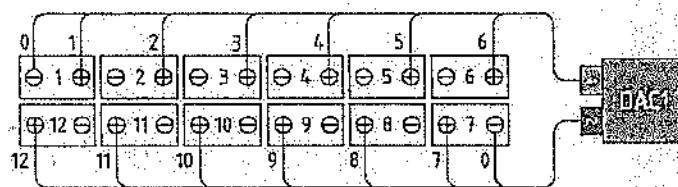
Data Acquisition Case (DAC)

Product Overview

Eagle Eye's SLB-Series DC load banks are designed for user ease of use, portability, and versatility in mind. Discharge testing batteries is the only verifiable method the capacity of your batteries and the SLB delivers a programmable, constant current load for your testing needs. Whether you are load testing for capacity, performance, acceptance, NERC compliance, or other, the SLB provides an economical complete package solution. Increase employee and battery system safety with PER CELL monitoring and standard built-in auto-shutdown features. To suit a variety of industries and diverse applications, Eagle Eye offers over 75 standard models to fit your exact needs at the best price.

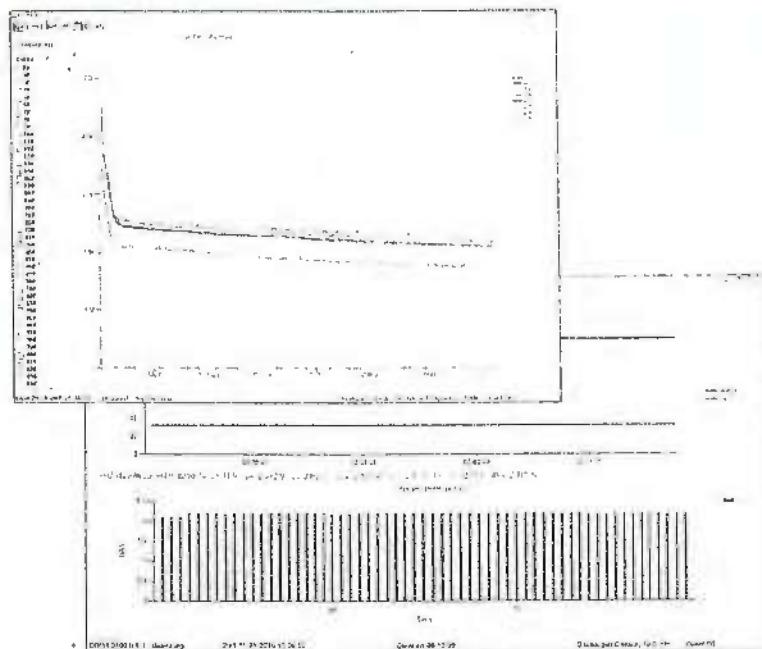
Product Features

- Safely monitor live tests remotely with wireless communication to the SLB load bank
- DataView software includes live monitoring, data recording, and report exporting to Microsoft Excel
- Discharge auto-shutdown for time duration, total string voltage, capacity, and individual cell voltage
- Parallel with another SLB-Series unit for increased discharge current capacity
- Assistant discharge feature allows for compatibility with existing non-SLB load banks
- Increase current and add individual cell monitoring to your existing equipment with SLB-Series
- Built-in circuit breakers for emergency shutdown and overload protection
- Optional: Real-time display of voltage for each cell/unit with DAC package for 1.2V, 2V, 6V, 12V cells
- Optional: Custom DAC packages available for monitoring of uncommon cell voltages and configurations



DAC Connection to 48V Battery (2V) Cells

Typical connection of DAC's to the battery cells include a test lead connected to each cell from the DAC. Each DAC can connect up to 12 cells. DAC's are expandable to any size battery system and are compatible with VRLA, VLA, NiCad, and other battery types.



Real-Time Data Logging of Cell Voltage

Technical Specifications

Cell Voltage:	Standard DAC: 1.2V, 2V, 6V, 12V / Optional 3.6V, 4V, and other custom DAC configurations available upon request
Discharge Current Range:	Single Load: 12 – 600A / Parallel Load: Up to 1200A
Discharge Voltage Range:	Range: 10 – 576V (Max) / Voltage Steps: 12V, 24V, 36V, 48V, 80V, 125V, 240V, 380V, 480V
Accuracy:	Discharge Current: 1% / Voltage: 0.5% – 0.8%
Resolution:	Discharge Current: 0.1 A or 0.5% / Voltage: 0.001 V
Sampling Interval:	5 seconds – 1 minute
Data Transfer:	USB, Wireless (466 MHz)
Display:	Backlit LCD
Operating Environment:	0 – 40 °C (32 – 104 °F)
Power Requirements:	110/220 VAC 50/60 Hz / DC (from connected batteries)
Dimensions:	Small: 400 x 177 x 288 mm (15.7 x 7 x 11.3 in) Medium: 520 x 202 x 355 mm (20.5 x 8 x 14 in) Large: 555 x 225 x 435 mm (22.5 x 8.9 x 17.2 in) X-Large: 603 x 400 x 740 mm (23.7 x 15.7 x 29 in) XX-Large: 762 x 406 x 737 mm (30 x 16 x 29 in)
Weight:	Small: 11 kg (24 lbs) Medium: 16 kg (36 lbs) Large: 21 kg (47 lbs) X-Large: 42 kg (93 lbs) XX-Large: 55 kg (122 lbs)

(1)The standard DAC package includes quantity of DAC's & cabling for 2V/6V/12V batteries, testing of 1.2V NiCad batteries require additional DAC & cabling. Please make sure to note testing of NiCad to your sales rep.

**Discharge DataView Software**

The included DataView software allows the user to monitor the discharge test in real-time or import and view tested data from the load bank with the provided USB drive. View and print a detailed histogram of each cell's voltage from any point during the discharge test at user defined intervals of 15, 30, or 60 minutes.

Recorded data exports directly to Microsoft Excel. Users are able to customize the report with company name and location as well as input battery information including battery make, cell type, rated capacity, and more. The complete test criteria, weakest cells, string information, and individual cell information are included in the report. Graphs for string, and cells are also available to view in the software.

SLB-SERIES

SMART DC Load Banks

Kit Includes

- SLB-Series Load Bank
- DataView Management Software
- Carrying Case (for small & medium size models)
- Set of 3m/10ft Load Cables
- 3m/10ft Voltage Test Leads
- PC communication interface
- Ground Cable
- AC Power Cord
- USB Drive with Software/ User Manual
- (2) Antenna
- **Optional:** Standard DAC Package
- **Optional:** CT Clamp for Assisted or External Load Testing
- **Optional:** Parallel Load Cable

Ordering Information

No.	Model #	Description
1	SLB-Series*	SMART Constant Current DC Load Bank with Monitoring (12-480V, 100-600A) *See next page for listing of model numbers *Add "DAC" after model number for wireless monitoring per cell



To Order Call Toll Free:
1-877-805-3377

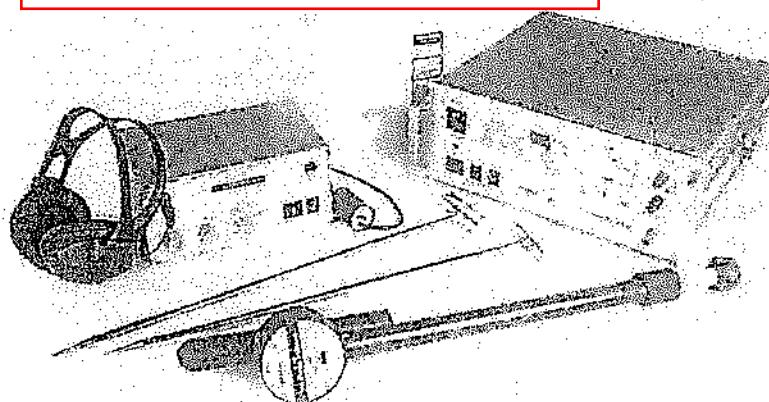
SLB-Series Standard Models

*Custom models available upon request

No.	Model	Maximum Discharge Current At:									
		12VDC	24VDC	28VDC	36VDC	48VDC	80VDC	125VDC	240VDC	380VDC	480VDC
1.	SLB-12/24-400	400	400	—	—	—	—	—	—	—	—
2.	SLB-24-300	—	300	—	—	—	—	—	—	—	—
3.	SLB-24-400	200	400	—	—	—	—	—	—	—	—
4.	SLB-24-500	250	500	—	—	—	—	—	—	—	—
5.	SLB-24/36-100	50	100	77.7	100	—	—	—	—	—	—
6.	SLB-24/36-300	150	300	233.3	300	—	—	—	—	—	—
7.	SLB-24/36/48-300	150	300	233.3	300	300	—	—	—	—	—
8.	SLB-24/36/48/80-200	—	200	—	200	200	200	—	—	—	—
9.	SLB-24/48-200	—	200	—	—	200	—	—	—	—	—
10.	SLB-24/48-300	150	300	175	225	300	—	—	—	—	—
11.	SLB-24/48-300/600	150	300	350	450	600	—	—	—	—	—
12.	SLB-24/48-600	300	600	350	450	600	—	—	—	—	—
13.	SLB-28-100	40	80	100	—	—	—	—	—	—	—
14.	SLB-28-150	60	120	150	—	—	—	—	—	—	—
15.	SLB-28-300	120	240	300	—	—	—	—	—	—	—
16.	SLB-28-500	200	400	500	—	—	—	—	—	—	—
17.	SLB-48-150	—	—	—	—	150	—	—	—	—	—
18.	SLB-48-300	75	150	175	225	300	—	—	—	—	—
19.	SLB-48-400	—	—	—	—	400	—	—	—	—	—
20.	SLB-48-500	125	250	290	375	500	—	—	—	—	—
21.	SLB-48/125-100	25	50	58	75	100	64	100	—	—	—
22.	SLB-48/125-200	50	100	116	150	200	128	200	—	—	—
23.	SLB-48/125-300	75	150	174	225	300	192	300	—	—	—
24.	SLB-48/240-100	25	50	58	75	100	33	52	100	—	—
25.	SLB-10-288v-200A	50	100	116	150	200	50	75	150	—	—
26.	SLB-80-100	15	30	35	45	60	100	—	—	—	—
27.	SLB-80-200	30	60	70	90	120	200	—	—	—	—
28.	SLB-125-100	—	—	—	—	—	—	100	—	—	—
29.	SLB-125-200	19	38	44	57	76	128	200	—	—	—
30.	SLB-125-300	29	57	67	86	115	192	300	—	—	—
31.	SLB-125-400	38	76	89	115	153	256	400	—	—	—
32.	SLB-125-500	—	96	112	144	192	320	500	—	—	—
33.	SLB-125/240-100	9.6	19	22	29	38	64	100	100	—	—
34.	SLB-125/240-150	14	30	33.4	43	60	96	150	150	—	—
35.	SLB-240-150	8	15	17.5	23	30	50	78	150	—	—
36.	SLB-240-200	10	20	23	30	40	66	104	200	—	—
37.	SLB-380-50	—	—	—	—	—	—	—	—	50	—
38.	SLB-380-100	—	—	—	—	—	—	—	—	100	—
39.	SLB-480-100	2.5	5	5.8	7.5	10	16.6	26	50	79	100

RT 50 Cable Route Tracer

Cable Route Tracer



Description

Cable Route Tracer CRT50 is an essential item in the kit for fault location of underground power and telecom cable network.

It is a powerful audio frequency system with maximum 50 watts output power that can be effectively used for various unique functions such as route tracing of any metallic cable, depth measurement, live loaded cable tracing.

The system is capable to trace route of underground cable maximum 15km in communication cable and more than 15 km

in power cable, and find out the depth up to 5 meter, by triangulation method.

This method is found to give more accurate results in presence of other metallic utilities in close proximity.

The system is accurately identifying the wanted cable from the bunch of cables in communication network.

The system can be used to trace route of loaded live cable with the help of receiver unit and search coil in passive mode.

Application

It is used for route tracing of any underground metallic cable in communication, power transmission, distribution and signal cable networks or cable fault location service provider. It is also use to identification of wanted cable from bunch of cables in communication network.

Features

- Route tracing of buried underground any metallic cables up to 15km max length.
- LCD Bar-graph on Audio frequency receiver unit for precise indication of cable route tracing.
- Route tracing of underground loaded live cables with passive frequency and inductive coupling.
- Peak and null reception methods for route tracing of cables.
- Pin-Pointing of contact nature faults.
- Depth measurement of buried cables up to 5 m with triangulation method.
- Inductive coupling in a particular cable using transmitter tong (Optional)
- Identification of cable from bunch of cables in communication cable network.
- Rugged construction and easy to carry on site.



Working Principle

The Audio Frequency Generator injects an Audio frequency signal into the cable which generates an electromagnetic field around it.

This field is concentric to the cable & is present over length. The presence of this field is detected by selective and sensitive receiver with a search coil.

Function

The audio frequency signal is passing through the cable conductor an electromagnetic field of sending frequency is developed around on the conductor. When the search coil axis is passing in the developed field, it will sense the field and given to the receiver unit.

The receiver amplifies that signal and indicates in terms of maximum bar-graph and sound in headphone on the cable. When the search coil is going away from the field the signal indication and sound will reduce.

Standard Accessories

- Transmitter Coil TC 8
- Cable Identification Probe CIP 3
- Headphone
- Earth Spikes

- Output connecting cables
- 5 pin connecting cable
- Mains cord

Standard Warranty

One Year

Other models available

Cable Route Tracer CRT 8 (Up to 8 Watt max)
 Cable Route Tracer CRT 10 (Up to 10 Watt max)
 Cable Route Tracer CRT 200 (Up to 200 Watt max)
 Cable Route Tracer CRT 500 (Up to 500 Watt max)

Specifications

Audio Frequency Generator AFG 50

Output Power	5, 10, 25 and 50 Watts selectable
Output Frequency	480Hz, 1450Hz & 9820Hz selectable
Impedance Matching	From 0.5 to 1000 Ohms selectable
Indication	Analog meter indication to indicate of transmitted power ON Indication
Power Supply	230V AC \pm 10 %, 50 Hz Single phase,
Operating Time	Mains supply no time limit
Storage Temp.	-5 Deg C ~ 60 Deg C
Working Temp.	0 Deg C ~ 55 Deg C
Dimensions	343 (L) x 132 (H) x 305 (D) mm
Weight	9.5 kg Approx

Audio Frequency Receiver APR 4

Receiving Frequency	Passive - 50 Hz Active 480Hz, 1450Hz, 9820Hz selectable
Gain	More than 90 db
Indication	LCD Bar-graph display with scale illumination for signal strength & Battery status indication
Power Supply	8 x 1.5 V AA size alkaline batteries
Operating Time	8 to 10 hrs without scale illumination
Storage Temp.	-5 deg C ~ 60 deg C
Working Temp.	0 deg C ~ 55 deg C
Dimensions	240 (L) x 110 (H) x 155 (D) mm
Weight	1.35 kg Approx

Universal Search Coil SC 4

Receiving Freq.	50 / 480 Hz, 1450 Hz, 9820 Hz selectable
Axis of Coil	Can be swivelled 45 / 90 Deg
Extension of Coil Telescope and Adjustable	
Dimensions	470 (H) x 80 (W) x 207 (D) mm
Weight	0.85 kg Approx

Telemetrics Equipments Pvt. Ltd.

Pune

www.telemetrics.in

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 Maharashtra, INDIA.

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 9011083682

CIN
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Mumbai	5, 7 & 8 Electronic Sedan II, MIDC, Bhosari, Pune - 411026 Maharashtra, INDIA.	+91-20-27122836 / 27123176 9011083682
Chennai	100, 1st Floor, 10th Main, 100ft Road, T. Nagar, Chennai - 600017	+91-44-42666666
Kolkata	100, 1st Floor, 10th Main, 100ft Road, T. Nagar, Chennai - 600017	+91-44-42666666



CERTIFICATE OF CALIBRATION

We hereby certify that this product has been calibrated and found to be in accordance with the applicable SPECIFICATIONS and MECO STANDARDS.

Accuracies of the standard equipment used in this calibration are traceable to the National Standards.

MECO METERS PVT. LTD.

Plot No. EL-60, MIDC Electronic Zone,
TTC Industrial Area, Mahape,
Navi Mumbai - 400710 (INDIA)
Tel : 0091-22-27673311-16, 27673300 (Board)
Fax : 0091-22-27673310, 27673330
E-mail : sales@mecoinst.com
Web : www.mecoinst.com

SR. NO.

CHECKED BY

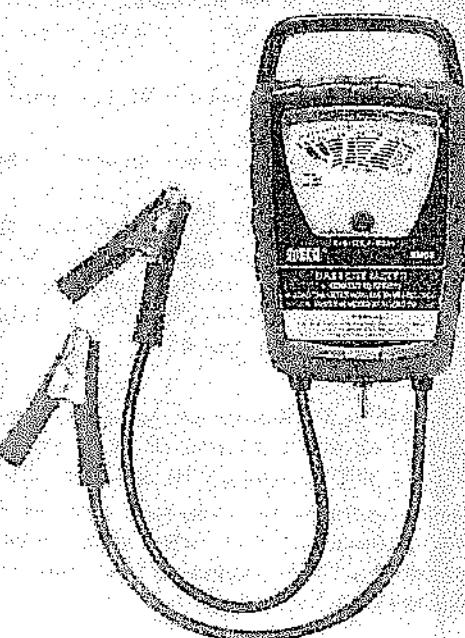
DATE

MODEL NO.

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Battery Meter Model : BM63



Instruction Manual

1. AN INTRODUCTION

BM63 is a Lead acid storage battery meter. It is used to check the capacity condition of various car storage Battery, electric-driven bike storage battery and other Lead acid storage Battery.

The "OK", "WEAK", "BAD" are directly indicated on the meter dial, in order to check the quality of storage battery visually and quickly.

The meter is designed special one scale (10-20Ah) for electric-driven bike storage battery.

2. SPECIFICATION

- Storage battery type : Lead acid storage battery
- Rating capacity : 2-500Ah
- Discharge current in measurement :
 - About 10A / 2V storage battery
 - 30A / 6V storage battery
 - 60A / 12V storage battery
- Colour indication for capacity :
 - RED : fully discharged, must be recharge at once.
 - YELLOW : insufficient, recharge as possible.
 - GREEN : enough, normal operating
- Storage battery rating voltage : 2V, 6V, 12V
- Electric-driven bike Battery rating capacity : 10Ah to 20Ah
- Measuring Time : < 3sec



TESTING PROCESS

Before testing, first time must be check the meter pointer whether at "0" position on the meter dial scale. If not, adjusting "0" position.

By the "ZERO" adjuster that is on below the meter dial.

3.1 Measuring method :

First clip-on the "-" terminal of storage battery by the black clip of the meter, and then red test plug is touching the "+" terminal of battery.

In this time, the pointer of meter is deviated towards the right.

After observe the scale, remove the test lead from testing point at once.

When use the BM63, first time, observe the open voltage of storage battery, and then push the "TEST" switch to test battery capacity. The maximum measuring time do not over measuring time that showed in specification. If not, the meter will be damaged.

NOTE :

1. When testing, the discharging current is large (example: 12V Storage battery is consumed power up to 700W), so, must be shorten the Testing time as possible.
2. Do not use the meter as discharger for long time. If not, The plastic case will be melted easily under high temperature. (in that situation, our factory is not ensure the repair with free of charge.)

4

3.2 Distinguish method :

When use the meter for first time, at first you may check the new full charged storage battery that its specification has been known. The various dial scale indicate various capacity.

If battery capacity is 12V/60Ah, should observe 55-85Ah dial scale line, in this time, the pointer should indicate around 12V.

In normal condition, the pointer should indicate to the green area for full charged storage battery

NOTE :

For same specification storage battery of various makers, the indicated position of pointer is difference. After use the storage battery, for some time (about 300 time charge/discharge), full recharge this battery and then testing again. This time, the position of pointer has dropped Compare with new battery (deviated toward the left). The fact has proved that the capacity of storage battery is drop by degrees.

- The Green area means full battery electricity capacity. Use the battery normally.
- The Yellow area means battery electricity capacity is not enough, battery need recharged as possible.
- The Red area means that the battery is used up, battery must be recharged at once.

According to the various capacity of battery and manufacture technology of battery.

There are several scale lines of battery capacity in this meter, so, user can select scale line on the basis of rated capacity of battery.

5

When the pointer at red area, if user do not recharge the storage battery timely in short time (about 3-5 days), the storage battery is maybe scrapped.

New special scale for electric-driven car storage is designed on the dial.

The Specification of the large quantity of electric driven bike battery is 10A-20Ah.

3.3 Check the quality of storage battery at quick :

When measuring, If the pointer of meter indicates to red area rapidly, the battery should be recharged at once. Then test full recharge the battery again. If pointer still falls to red area rapidly, even fall to the other battery area.

For example: if test 12V storage battery, pointers fall to 6V area. It means ineffective the storage battery that has been damaged. If pointer fall to yellow area rapidly, it means that the battery can be used as lower grade battery.

For the storage battery group, should test battery unit separately. Because the battery meter input voltage do not over 12V. The storage battery group for electric-driven bike consists of 3-5 pics 12V battery normally.

When measuring battery, every battery unit should be identical, if some battery unit is not identical, this battery unit must be changed or repaired.

4. NOTE OF USE

1. The meter is designed only for Lead acid storage battery, if you want measure other storage battery (Lithium ion storage battery or nickel (Ni)-hydrogen (H) storage battery), you can use "DC V" scale on dial of the meter.

This scale is for testing storage battery voltage (not for battery capacity). You can read data directly. The higher voltage means that the battery is good.

2. The meter maximum test voltage is 12V; So, do not directly testing battery group that voltage is over 12V. For example : 24V storage battery for track or 36V/48V storage battery for electric-driven bike. In this condition, only test battery unit respectively.
3. The measuring time must fit the specification.
4. The meter do not used to test common battery.
5. When you test the battery of electric-driven bike, you should use the Special scale line.
6. When you use the meter first time, high temperature will cause smoke. It is normal.

Sound Level Meter Class1 NL-52
Sound Level Meter Class2 NL-42

Sound level Meter



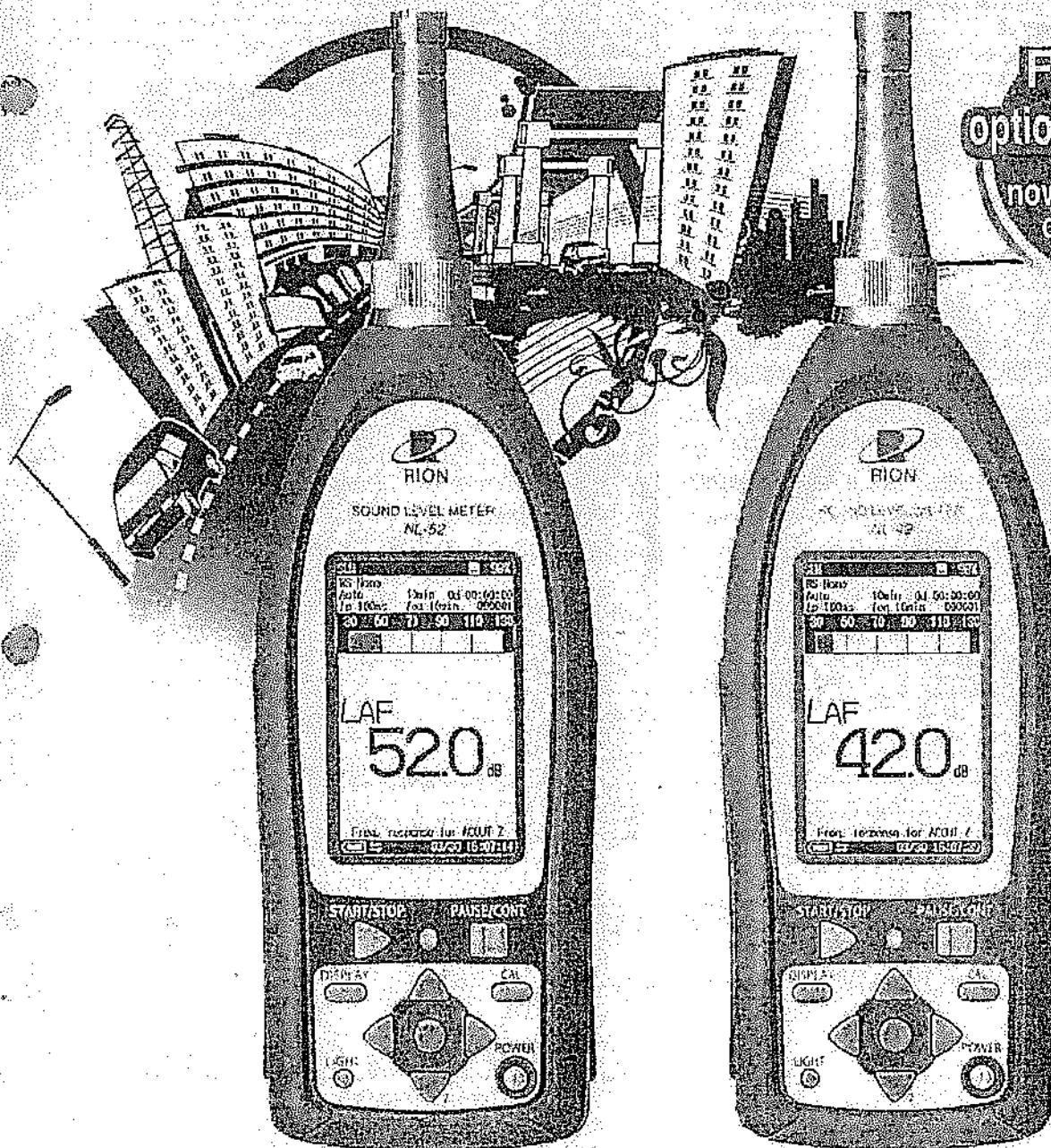
CE

RION

Measure Sounds Reliably

Sound Level Meter
Class1
NL-52

Sound Level Meter
Class2
NL-42



Free trials
optional programs
now available on
our website



Specifications

	NL-52	NL-42
Applicable standards	IEC 61672-1: 2013 Class 1 ANSI S1.4-2014 Class 1 JIS C 1509-1: 2005 Class 1 CE Marking (EMC Directive 2004/108/EC, 2014/30/EU), Low Voltage Directive 2006/95/EC, 2014/35/EU, WEEE Directive, Chinese RoHS (export model for China only)	IEC 61672-1: 2013 Class 2 ANSI S1.4-2014 Class 2 JIS C 1509-1: 2005 Class 2
Measurement functions	Simultaneous measurement of the following items, with selected time weighting and frequency weighting	
Processing (main ch)	Instantaneous sound pressure level: L_p Equivalent continuous sound pressure level: L_{eq} Sound exposure level: L_e Maximum sound pressure level: L_{max} Minimum sound pressure level: L_{min} Percentile sound levels: $L_{x(0\text{ to }99.9\%)}\text{, 0.1-increment steps, max. 5 values}$	
Processing (sub ch)	Instantaneous sound pressure level: L_p	
Additional processing	In addition to main processing items, one of the following can be selected for simultaneous processing C-weighted equivalent continuous sound level: L_{Ceq} C-weighted peak sound level: L_{Cpeak} Z-weighted peak sound level: L_{Zpeak} 1-time-weighted equivalent continuous sound level: L_{A1eq}^{*2} Maximum 1-time-weighted equivalent continuous sound level: L_{Amax}^{*2} The power average of the maximum level of each 5 second interval: L_{Amax} The frequency weighting for the additional processing synchronizes with the frequency weighting of the sub channel, so when the sub channel has A-weighting, L_{Amax} can be selected. When C-weighting (Z-weighting) is selected, the additional processing L_{Ceq} and L_{Cpeak} (L_{Zpeak}) are selectable.	
Microphone	Type: UC-59 Sensitivity (level): -27 dB	UC-52 -33 dB
Measurement range	A-weighting: 25 dB to 138 dB C-weighting: 33 dB to 138 dB Z-weighting: 38 dB to 138 dB C-weighting peak sound level: 55 dB to 141 dB Z-weighting peak sound level: 60 dB to 141 dB	
Inherent noise	A-weighting: 17 dB or less C-weighting: 25 dB or less Z-weighting: 30 dB or less	19 dB or less 27 dB or less 32 dB or less
Frequency range	10 Hz to 20 kHz	20 Hz to 8 kHz
Frequency weighting	A, C, and Z	
Time weighting	F (Fast) and S (Slow)	
Level range	Single range (Linearity range: 113 dB) Bar graph display range: Max. 110 dB (20 to 130 dB) Quantity of bar graph display: Set the upper/ lower limit in 10 dB increments	
REL/S detection circuit	Digital processing method	
Sampling cycle	20.8 µs (L_p , L_{eq} , L_e , L_{max} , L_{min}) sampling frequency: 48 kHz 100 ms (L_{Ceq})	
Calibration	Electrical calibration performed according to IEC and JIS standards, using internally generated signals; acoustic calibration performed with the NC-74	
Correction functions	Windscreen correction: Compliant with IEC 61672-1 and JIS C 1509-1 standards when the windscreen is installed Diffuse sound field correction: Correction of frequency characteristics in order to comply with standards (ANSI S1.4) in diffuse sound field	
Delay time	The meter can be set to start measuring a specified time (OFF, 1, 3, 5 or 10 s) after the start button has been pressed or when a user-set trigger is exceeded	
Pause/stop function	When the PAUSE key is pressed to pause measurement, the preceding user-selectable (0, 1, 3 or 5 s) data are excluded from processing	
Display	Backlit semi-transparent color TFT LCD display (IGZO/LGD) (400 x 240 dots) w/LCD with touch panel (Capacitive Touch Panel) Numerical display update frequency: 1 s (bar graph update frequency: 100 ms)	
Storage	Manual Number of data: internal memory: max. 1000 sets SD Card: depends on the capacity of the SD Card*1 Auto Interval: internal memory: max. 1000 sets (depends on the capacity of the internal memory) stored continuously and automatically at preset intervals	
Sampling cycle	100 ms, 200 ms, 1 s, L_{eq}	
Recording cycle	10 s, 1, 5, 10, 15, 30 min, 1, 8, 24 h, and user-selected time (up to 24 hours)	
Storage time	Max. 1000 h in Auto L_p storage mode, max. 100 000 addressed in Auto L_p storage mode (depends on the capacity of the SD card)*1	



JCSE

RION Co., Ltd. is recognized by the JAS which uses ISO/IEC 17025 (JIS Q 17025) as an accreditation standard and based its accreditation scheme on ISO/IEC 17011. JCSE is operated by the accreditation body (JA Japan) which is a signatory to the Asia Quality Laboratory Accreditation Cooperation (AQAC) as well as the International Laboratory Accreditation Cooperation (ILAC). The Quality & Environment Management System Center of RION Co., Ltd. is an international laboratory accredited JAS operating with the accreditation number JCSE 0197.

* Windows is a trademark of Microsoft Corporation. * Specifications subject to change without notice.

Distributed by:

CP 144

Data recall	Allows viewing of stored data
Setup memory	Up to five setup configurations can be saved in internal memory, for later recall Start up via file settings previously stored on SD card possible
Waveform recording*3	
File format	Uncompressed waveform WAVE file
Sampling frequency	Select 48 kHz, 24 kHz or 12 kHz
Data length	Select 24 bit or 16 bit
Outputs	Output AC signals using a frequency weighting characteristic selected by processing
DC output	Output DC signals using a frequency weighting characteristic selected by processing
Output voltage	2.5 V, 25 mV / dB at bar graph display full scale
AC output	Output AC signals using a frequency weighting characteristic selected by processing or by A, C, Z-weighting.
Output voltage	1 V (rms values) at bar graph display full scale
Comparator output*2	Turns on when the open-collector output exceeds the set value (max. applied voltage 24 V, max. current 60 mA, allowable dissipation 300 mW)
USB	Allows USB to be connected to a computer and recognized as a removable disk Allows USB to be controlled via communication commands
RS-232C communication	Allows for RS-232C communication via use of a dedicated cable
Data continuous output*2	
Type of data	L_p Processed value
Output interval	100 ms
Print out	Printing of measurement results on dedicated printer DPU-414
Power requirements	Four 1.5V AA batteries (alkaline or rechargeable batteries) or external power supply
Battery life (23 °C)	Alkaline battery LR6 (AA): 20 h Ni-MH secondary battery: 25 h At the maximum * Depends on the setting
AC adapter	NC-98C (NC-94 for previous models cannot be used)
External power voltage	5 to 7 V (rated voltage: 6 V)
Current consumption	Approximately 90 mA (normal operation, rated voltage)
Ambient conditions	-10 to +50 °C 10 to 90 % RH (non-condensing)
Humidity	
Dustproof / water-resistant performance*4	IP code: IP54 (except for microphone) See precautions regarding waterproofing
Dimensions, weight	Approx. 250 (H) x 76 (W) x 30 mm(D), approx. 400 g (with batteries)
Supplied accessories	Storage case x 1, Windscreen WS-10 x 1, Windscreen Hill prevention rubber x 1, Hand strap x 1, LR6 (AA) alkaline batteries x 4, SD card 512 MB x 1 (NX-42E K pre-installed model only)

Options

Product name	Product number
Extended function program (Inst. on 512 MB SD card)	NX-42EX
Waveform recording program*2 (Inst. on 2 GB SD card)	NX-42WR
Octave, 1/3 octave real time analysis program*2 (Inst. on 512 MB SD card)	NX-42RT
Reverberation time measurement program*2 (Inst. on 512 MB SD card)	NX-42RTV
FFT analysis program*2 (Inst. on 512 MB SD card)	NX-42FT
Data management software for environmental measurement	AS-60
Data management software for environmental measurement (includes the octave and 1/3 octave data management software)	AS-60RT
Data management software for environmental measurement (includes the vibration level data management software)	AS-60VM
Waveform analysis software	AS-70
SD Card 512 MB	MC-51501
SD Card 2 GB	MC-20SD2
AC adapter (100 V to 240 V)	NC-98C
Battery pack	BP-21A
Microphone extension cables	EC-04 (from 2 m)
BNC-Pin output cords	CC-24
Comparator output cable	CC-42C
Printer	DPU-414
Printhead	CC-42P
RS-232C serial I/O cable	CC-42IV
USB cable	Ceramic USD cable can be used
Sound calibrator	NC-74
All weather windscreen	WS-19
Windscreen mounting adapt.	WS-15006
Rain protection windscreen	WS-16
Sound level meter tripod	ST-80
Microphone windscreen adapt.	ST-81

* 1 One Rion fully guaranteed product. * 2 NX-42K required (add approx. 300 g). * 3 SD-42W required (add approx. 300 g).

* 4 Protection against harmful dust and water splashing from any direction

Precautions regarding waterproofing

Before use, verify that the rubber bottom cover and the battery compartment lid are firmly closed.

To maintain the water and dust proof rating, internal packing replacement is required every three years (at cost).



RION CO., LTD.
<http://rion-sv.com/>
3-20-41, Hinashimotomachi, Kokubunji, Tokyo 185-8533, Japan

Non-Contact Tachometer

Page no. 24

testo 470

Be sure. **testo**



rpm measuring instrument

testo 470 – For non-contact and mechanical measurement

Easy one-hand operation

Measurement of rpm, speeds and lengths

Storage of mean, max. and min. values as well as the last measurement value

Measurement distance up to 600 mm (optical measurement)

Battery check „Low Batt“

Robust design thanks to SoftCase (protective case)



The rpm measuring instrument testo 470, which can be operated with one hand, offers an optimum combination of optical and mechanical rpm measurement. By simply attaching an adapter for a probe tip or a speed disc, the optical measurement becomes a mechanical one. This allows speeds and lengths to be measured additionally. For optical measurements, simply attach a reflective marker

(optional) to the measurement object, point the visible measurement spot at the reflective marker, and measure. The distance to the measurement object is up to 600 mm. The testo 470 stores mean, min. and max. values as well as the last measurement value. The SoftCase included in delivery protects the instrument from impact and ensures especially long working life.



testo 470

Page no 25

Be sure.



Technical data / Accessories

testo 470

testo 470 rpm measuring instrument with SoftCase in transport case incl. probe tip, 0.1 m and 6" wheel, reflectors and batteries

Part no. 0563 0470



General technical data

Operating temperature	0 to +50 °C
Storage temperature	-20 to +70 °C
Battery type	2 AA batteries
Battery life	40 h
Display	5-figure LCD display, 1-line
Dimensions	175 x 60 x 28 mm
Weight	190 g
Warranty	2 years

Sensor types

Optically with mod. light beam	
Measuring range	+1 to +99999 rpm
Accuracy ±1 digit	±0.02% of m.v.
Resolution	0.01 rpm (+1 to +99.99 rpm) 0.1 rpm (+100 to +999.9 rpm) 1 rpm (+1000 to +99999 rpm)
Mechanical	
Measuring range	+0.1 to +19999 rpm
Accuracy ±1 digit	±0.2% of m.v.

	0.1 m	6"	12"
m/min	0.10-1999	0.10-1524	0.40-609,6
ft/min	0.40-6550	0.40-5000	0.40-2000
in/min	4.00-78700	4.00-60000	4.00-24000
m/sec	0.10-33.30	0.10-25.40	0.10-10.16
ft/sec	0.10-109	0.10-83.33	0.10-33.33
m	0.00-99999	0.00-99999	0.00-99999
ft	0.00-99999	0.00-99999	0.00-99999
in	0.00-99999	0.00-99999	0.00-99999

Units rpm, m/min, ft/min, in/min, m, ft, in

The mechanical tolerance for measurements with a wheel is 0.2 %, the measurement accuracy is dependent on handling, e.g. application pressure, angle etc.

Accessories for measuring instrument

	Part no.
Reflectors, self-adhesive (1 pack = 5 off, each 150 mm long)	0554 0493
Measuring wheel 12"	0554 4755
Measuring wheel 6"	0554 4754
Measuring wheel 0.1 m	0554 4751
Measurement tip	0554 4752
Hollow cone	0554 4766
ISO calibration certificate/rpm optical and mechanical rpm measuring instruments; cal. points 500, 1000, 3000 rpm	0520 0012
ISO calibration certificate/rpm optical rpm measuring instruments; calibration points 10, 100, 1000, 10000, 99500 rpm	0520 0022
ISO calibration certificate/rpm Calibration points freely selectable from 10 to 99500 rpm	0520 0114
DAkkS calibration certificate/rpm Optical rpm probes, 3 points in instrument measurement range (1 to 99999 rpm)	0520 0422

Subject to change without notice.

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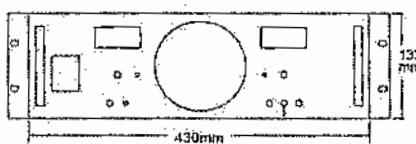
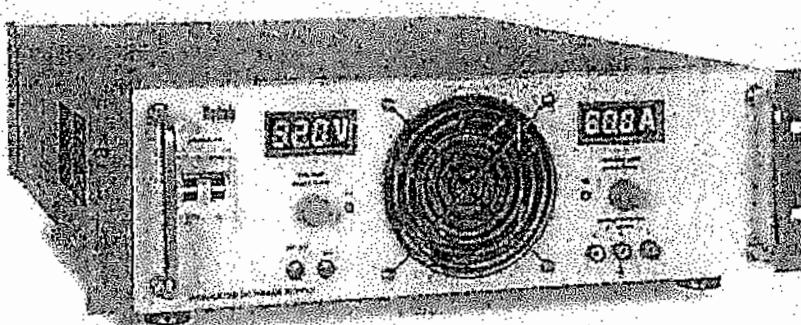


Regulated DC Power Supply

no 32



2kW DC PS



FRONT VIEW



SIDE VIEW



REAR VIEW

Note: Input & output cable will not be provided along with Power Supply.

	0 to 16V 0 to 100A	0 to 32V 0 to 60A	0 to 64V 0 to 30A	0 to 80V 0 to 25A	0 to 128V 0 to 15A
Input Voltage	230V AC, ±10%, 50Hz, 1phase.				
Output Voltage					
Output Current					
Line Regulation CV *			±0.01% ±5mV		
Load Regulation CV I			±0.01% ±5mV		
Line Regulation CC *			±0.1% ±10mA		
Load Regulation CC II			±0.1% ±10mA		
Output Ripple CV (max)			1mV rms		
Output Ripple CC (max)			100mA rms		
Remote Sensing			Provided		
Operating Temp.			0 to 50°C		
Protection			OL/SC (constant current type)		
Indications (LED)			CV & CC		
3 Digit DPM			V & I		
Meter Accuracy			±3 counts		
Input On/Off			M.C.B.		
Multi Turn Pot			V Set & I Set		
Dimensions approx. **			19 Inches × 133 mm × 650 mm		
W × H × D	36.0		43.0		
Weight approx. (Kg)					

Terminals: Input and output at rear side

* For 10% variation in input voltage with constant rated load. ** All dimensions are behind the panel and excluding legs.
I Load change from no load to full load. II Change in output voltage from zero volt (short circuit) to max. output voltage.
WE PURSUE A POLICY OF CONTINUOUS DEVELOPMENT AND PRODUCT IMPROVEMENT, THUS THE SPECIFICATIONS IN THIS DOCUMENTS AND THE LOCATION OF CONTROLS ON THE FRONT PANL MAY BE CHANGE D WITHOUT NOTICE.

Revised April 2012



POWER CONTROLS & CONVERSION DIVISION

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Crimping Tools Alongwith all
Crimping Die set
accessories

jainson

The Interface Partner

COMPRESSION TOOLS



VIRAT - 6



Capacity : 0.5mm² to 6mm²
Weight : 350 grm.

JOP - 427



Capacity : 1.5mm² to 10mm²
Weight : 512 grm.

SAMRAT - 16



Capacity : 0.5mm² to 16mm²
Weight : 672 grm.

JOP-16-14/22-16/26-22

INSULATED TERMINAL CRIMPING TOOL



Capacity : 2.5,1.5,0.75mm²
Weight : 510 grm.

JOP - 12 - 10 A/B/C



A.Capacity : 4-6mm²Wire with normal ins thickness
B.Capacity : 4-6mm²Wire with heavy ins thickness
C.Capacity : 2.5mm²Wire with heavy ins thickness
Weight : 900 grm.

TRISHUL (3 IN 1)

INSULATED TERMINAL CRIMPING TOOL



Capacity : 1.5,2.5,4-6mm²
Weight : 525 grm.

LUV-KUSH - 6

OPEN BARREL TAB TERMINAL CRIMPING TOOL



Capacity : 0.5-1.0,1.1-2.5,4-6mm²
Weight : 525 grm.

CHETAK - 6

END SEALING FERRULES CRIMPING TOOL



Capacity : 0.5mm² to 6mm²
Weight : 525 grm.

CHETAK - 16

END SEALING FERRULES CRIMPING TOOL



Capacity : 10mm² to 16mm²
Weight : 525 grm.

CHAKRA - 6

END SEALING FERRULES CRIMPING TOOL (DIELESS)



Capacity : 0.5mm² to 6mm²
Weight : 375grm.

AGNEE -95

(DIELESS)



Capacity : 10mm² to 95mm²
Weight : 3.900Kg.

VIKRANT - 50

(DIELESS)



Capacity : 6mm² to 50mm²
Weight : 1.600Kg.



ARJUN - 50



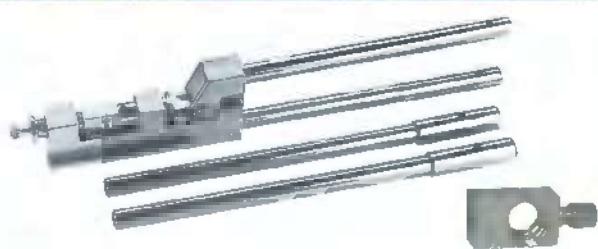
Capacity : 16,25,35,50mm²
Weight : 2.500Kg.

GRD - 95 (RING TYPE)



Capacity : 10mm² to 95mm²
Dies: R-1 to R-10.(9 Sets) **Weight :** 5.450Kg.

GRD - 185 (RING TYPE)



Capacity : 10mm² to 185mm²
Dies: R-1 to R-13.(12 Sets) **Weight :** 7.350Kg.

VISHAAL - 185 (RING TYPE)

*Provided dual gripper system in jaws & dies for perfect crimping"



Capacity : 10mm² to 185mm²
Dies: R-1 to R-13.(12 Sets) **Weight :** 7.350Kg.

SURYA - 400



Capacity: 25mm² to 400mm²
Dies: H-25 to H- 400.(11 Sets) **Weight :** 5.200Kg.

TRISHAKTI



Capacity : 1.5mm² to 10mm²
 (NON INSULATED TERMINALS)



Capacity : 1.5,2,5,4-6mm²
 (PRE INSULATED TERMINALS)



Capacity : 1.5mm² to 10mm²
 (END SEALING FERRULES)

Weight : 750grm.

GRD - 95 (HEXAGONAL TYPE)



Capacity : 10mm² to 95mm²
Dies: H-10 to H-95.(7 Sets) **Weight :** 5.450Kg.

GRD - 185 (HEXAGONAL TYPE)



Capacity : 10mm² to 185mm²
Dies: H-10 to H-185.(10 Sets) **Weight :** 7.350Kg.

VISHAAL - 185 (HEXAGONAL TYPE)

VISHAAL - 185 (HEXAGONAL TYPE)



Capacity : 10mm² to 185mm²
Dies: H-10 to H-185.(10 Sets) **Weight :** 4.700Kg.

SANGRAM - 400

(GEAR POWERED)



Copper Tubular: 25 mm² to 300 mm² Aluminium Tubular: 25 mm² to 400 mm²

Capacity: 25mm² to 400mm²
Dies: H-25 to H-400.(11 Sets) **Weight :** 4.800Kg.





AAKASH - 400 / 500

HYDRAULIC COMPRESSION TOOL -DIELESS



AAKASH-500
Capacity: 6mm² to 500mm²
Weight : 5.800Kg.

SAGAR - 400

FOOT OPERATED HYDRAULIC
COMPRESSION TOOL



Capacity: 25mm² to 400mm²
Dies: H-25 to H-400.(11 Sets) **Weight :** 16.500Kg.

HPCT - 20 - A (RING TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : Up to 300mm²
Dies: R-11 to R-16.(6 Sets) **Weight :** 16.500Kg.

HPCT - 20 - B (RING TYPE)

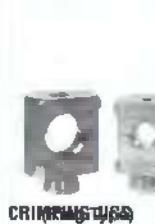
HYDRAULIC COMPRESSION TOOL



Capacity : Up to 400mm²
Dies: R-11 to R-18.(8 Sets) **Weight :** 17.100Kg.

HPCT - 150 - A (RING TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : Up to 400mm²
Dies: R-11 to R-18.(8 Sets) **Weight :** 20.500Kg.

HPCT - 150 - A (HEXAGONAL TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : 50 to 400mm²
Dies: H-50 to H-400.(9 Sets) **Weight :** 20.500Kg.

EKLAVYA - 120

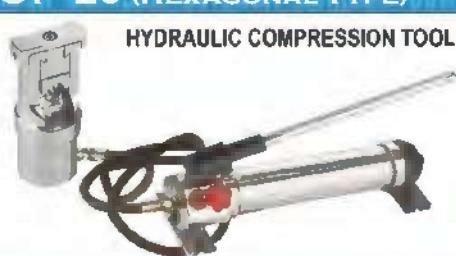
(GEAR POWERED- DIELESS)



Capacity: 10mm² to 120mm²
Weight : 2.300Kg.

HPCT - 20 (HEXAGONAL TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : 50 to 400mm²
Dies: H-50 to H-400.(9 Sets) **Weight :** 16.500Kg.

HPCT - 20 - B (RING TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : Up to 400mm²
Dies: R-11 to R-18.(8 Sets) **Weight :** 17.100Kg.

HPCT - 150 - B (RING TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : Up to 1000mm²
Dies:R-11 to R-23,R-27,R-29.(15 Sets) **Weight :**25.500Kg.

HPCT - 150 - B (HEXAGONAL TYPE)

HYDRAULIC COMPRESSION TOOL



Capacity : 50 to 1000mm²
Dies: H-50 to H-1000.(13 Sets) **Weight :** 25.500Kg.



ASHOKA - 400

HYDRAULIC COMPRESSION TOOL



Capacity: 25mm² to 400mm²
Dies: H-25 to H-400.(11 Sets)
Weight : 7.500Kg.

SHAKTI - 400

HYDRAULIC COMPRESSION TOOL



Capacity: 25mm² to 400mm²
Dies: H-25 to H-400.(11 Sets)
Weight : 7.500Kg.

PRITHVI - 1000

HYDRAULIC COMPRESSION TO



Capacity : 50mm² to 1000mm²
Dies: H-50 to H-1000.(13 Sets)
Weight : 22.500Kg.

BHOOMI - 400

HYDRAULIC COMPRESSION TOOL



Capacity : 25mm² to 400mm²
Dies: H-25 to H-400.(11 Sets)
Weight : 14.500Kg.

VARUN - 400

HYDRAULIC COMPRESSION TOOL



Capacity : 25mm² to 400mm²
Dies: H-25 to H-400.(11 Sets)
Weight : 14.500Kg.

PUMP FOR

HPCT- 20/150



SAGAR-400



JACK FOR



HPCT- 20



HPCT- 150



SAGAR- 400



BHOOMI- 400



VARUN- 400



PRITHVI- 1000

BHOOMI-400,VARUN-400,PRITHVI-1000



GRD-95/185



R-1, R-2, R-3
R-4, R-5, R-6
R-7, R-9, R-10
R-11
R-12, R-13



H-10, H-16, H-25,
H-35, H-50, H-70,
H-95, H-120, H-150,
H-185.

VISHAAL - 185



R-1, R-2, R-3
R-4, R-5, R-6
R-7, R-9, R-10
R-11,R-12,R-13



H-10, H-16, H-25,
H-35, H-50, H-70,
H-95, H-120, H-150
H-185.

SANGRAM - 400



(Hexagonal Type)
H-25, H-35, H-50,
H-70, H-95, H-120,
H-150, H-185, H-240,
H-300, H-400.

SURYA - 400



(Hexagonal Type)
H-26, H-36, H-50,
H-70, H-95, H-120,
H-150, H-185, H-240,
H-300, H-400.

SAGAR - 400



(Hexagonal Type)
H-25,H-35,H-50,
H-70, H-95, H-120,
H-150,H-185,
H-240,H-300,H-400.

HPCT - 20



R-11, R-12,
R-13, R-14,
R-15,
R-16, R-17,
R-18,



H-50, H-70, H-95,
H-120, H-150,H-185,
H-240,H-300.
H-400,

HPCT - 150



R-4, R-5,R-6,R-7,
R-9,R-10,R-11,R-12,
R-13,R-14,R-15,
R-16,R-17,R-18.



H-50, H-70, H-95,
H-120, H-150,H-185,
H-240,H-300,H-400.
H-500,H-630,H-800,
H-1000.

PRITHVI - 1000



(Hexagonal Type)
H-50, H-70, H-95,
H-120, H-150,H-185,
H-240,H-300,H-400.
H-500,H-630,H-800,
H-1000.

ACC - 50



ANTI CORROSIVE COMPOUND
FOR ELECTRICAL JOINTS.

BOOMI-400,VARUN-400, ASHOKA-400,SHAKTI-400.

H-26,H-50, H-70, H-95,
H-120, H-150,H-185,H-240,
H-300,H-400.



(Hexagonal Type)

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PRODUCTS

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AC Analogue Clamp Meters

MODEL 2608A



- DC voltage range is also available especially for checking emergency battery operated power supply.
- Tear drop shaped transformer jaws for ease of use.

CE



AC A	6/15/60/150/300A ±3% of FS
AC V	150/300/600V ±3% of FS
DC V	60V ±3% of FS
Ω	1/10kΩ (25/250Ω mid-scale) ±2% of scale length
Temperature	Note: The MODEL2608A includes a temperature measurement scale, but it is not available for new customers due to the discontinue of the Temperature Probe 7060.
Conductor size	Ø33mm max.



frequency response

50Hz/60Hz

Applicable standards

IEC 61010-1 CAT III 300V Pollution Degree 2
IEC 61010-2-031
IEC 61010-2-032

Power source

R6 (AA) (1.5V) × 1

Dimensions

193(L) × 78(W) × 39(D)mm

Weight

275g approx.

Included Accessories

7066A (Test leads)
8923 (Fuse [0.5A/600V]) × 2
9097 (Carrying case)
R6 (AA) × 1
Instruction Manual

Accessories/Optional Accessories /Related Products



MODEL 7066A

[Product Catalogue](#)

[Instruction Manual](#)

[Selection Guide](#)

Product Catalogue

[MODEL2608A Product Catalogue \(324 KB\)](#)

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primary current injection test kit

Primary Current Injection Testing Kits

Primary Current Injection Kits are used to test and commission Circuit Breakers, Bus Bars, CTs, Relays, MCCs, PCCs etc. These are also used for high current injection and simultaneously measuring voltage drops and hot spots in bus-bar joints, circuit breaker contacts etc.

RATINGS	:	500, 1000, 1500, 2000, 3000, 4000, 5000 & 10000A
CONNECTIONS	:	Series-Parallel to select various current ranges.
KVA RATINGS	:	5KVA to 100KVA (Combination of various Currents & KVA Ratings available in continuous & intermittent Duty Cycles)
CONSTRUCTION	:	In single/two units i.e. control cum protection unit & loading unit, stationary & mobile trolley mounted models available
PROTECTIONS	:	6 types of inbuilt protections are provided for the safety of operator and equipment under test.

The High Current Loading Units are also available with series parallel links arrangement to configure the coils in series-parallel configurations to meet the field test requirement.

AUTOMATED CONTROLS

The Controls are automated microprocessor controls the operation of the equipment front Back lit LCD Display integrates all the meters and also displays the status of tests. The test programming is done via menu driven user interface.

HIGH CURRENT CABLES

Special flexible high current low resistance cables from 25mm² to 400mm² are available for primary injection testing.



VCB testing kit

Vacuum Circuit Breaker Bottle Test Sets

To test VCB Bottles we have developed a specialized Vacuum Bottle test Set. This is a portable microprocessor based equipment with built 60KVDC source and controllers to test bottles at high voltage. The vacuum bottles can be tested just by drawing out the breakers (without even removing the bottle) in less than 5 minutes time.

TESTING CAPACITY	
INPUT	: 240V, 50Hz, 1 Phase AC
OUTPUT	: 0-60KV DC @ 2.5mA
METERING	: Digital KV & mA Meters Class 1.5
OUTPUT	: The output is available through a highly flexible HV Cable which can be directly connected to the vacuum bottle under test.

The leakage current passing through the vacuum bottle is monitored by a microprocessor which in turn indicates the condition of vacuum bottles. The threshold settings can be programmed (in the internal microprocessor) to suit different breaker types also.

Leakage current monitor & controllers are provided to test the health of bottles. The values of output voltage and leakage currents are displayed on Digital LED meters.

The specifications of this set are same as that of Model VT-60 above except for voltage rating

OUTPUT : 0-35KV DC @ 2.0mA

Available in extra compact design weighing <15Kgs approx.





HVA34

VLF High Voltage Test Set

tan delta test set



at 0.1 Hz
at 24 kV_{rms}



19.5 kg



VLF 0.1 Hz
34 kV_{peak}



The compact design and unmatched high voltage output power to weight ratio of the HVA test sets are second to none in the market, and make the b2 electronic high-voltage generators the lightest in all classes at all voltage levels.

Dry system: the HVA34 test set is a dry type test system, have no oil filled components. This means less maintenance, compact and lightweight design and no limitation of operating time.

Safety: The instrument has two independent earthing devices (electronic and mechanical discharging) and a 12 kV feedback protection system to protect both operator and instrument.

Connectivity: on site, no external PC is needed. All results can be downloaded later by USB for further investigation and easy report creation on the PC software.

Solid HV connectors: robust HV-connectors allow the use of different HV test lead lengths, the quick exchange for a replacement cable, or the simpler upgrade path for connection of diagnostics systems.

Unlimited operating time: Operating time of the HVA high voltage generators are not thermally limited and can be operated continuously.



Features

- Output voltage 24 kV_{rms}, 34 kV_{peak}
- Pure sinusoidal output voltage (load-independent)
- Output current 15 mA max.
- Highest test capacity of 12 μF
- Real time oscilloscope display of output voltage
- Breakdown voltage and load detection
- RMS digital metering of voltage and current
- PC software "b2 Control Center" with various reporting functions included
- Cable testing according:
CENELEC HD 620/621, IEEE 400.2-2004,
IEC60502-2:2014
- Programmable test sequences
- Upgradable with Partial Discharge and Tan Delta diagnostics system (optional)
- 12 kV transient protection (50 Hz)
- Dual Discharge Device (DDD®), integrated electronic and mechanical discharge devices
- Easily exchangeable HV cable
- Vacuum Bottle Test
- Sheath Fault Locating (in combination with Earth Fault Locator) (not included)

www.b2hv.com | info@b2hv.at



HVA34

www.b2hv.com | info@b2hv.com



dry system



upgradeable to
PD and TD
diagnostics systems



unlimited
operating time

HVA34		
Article number		SH5006
Input voltage		110-240 V, 50/60 Hz, 400 VA
Output voltage	VLF sine wave	0-34 kV peak, 24 kV rms
	DC	± 0-34 kV
	VLF square wave	0-34 kV
	accuracy	± 1%
resolution		0.1 kV
Output current		0-15 mA
Resistance range		0.1 MΩ-5 GΩ
Output frequency		0.01-0.1 Hz in steps of 0.01 Hz default: 0.1 Hz (auto frequency)
Output load		0.5 μF @ 0.1 Hz @ 24 kV rms 1.0 μF @ 0.04 Hz @ 24 kV rms 2.5 μF @ 0.01 Hz @ 24 kV rms 12.0 μF maximum Capacitance ¹
Sheath test	max. test voltage	10 kV
	trip current	0.1-5.0 mA
Sheath fault location ²	max. test voltage	10 kV
	Pulse/Period	1:3 / 4 s, 1:5 / 4 s, 1:5 / 6 s, 1:9 / 6 s
Output Modes		AC (VLF) Symmetrical and load independent across full range, DC (plus or negative polarity), Burn-/Fault Condition or Fault Trip Mode, Jacket/Sheath Testing
Safety		12 kV/50 Hz Feedback Protection integrated electronic and mechanical discharge devices - DDD®: Dual Discharge Device (internal)
Memory		50 Test Record Stored, USB almost unlimited
Metering		Voltage and Current (True rms and/or peak), Capacitance, Resistance, Time, Flashover Voltage
Duty cycle		Continuous! No thermal limitation for operating time.
HV-Cable		4 m with clamp
Software		"b2 Control Center" (included)
Interfaces		RS232 (Computer), USB (flash drive)
Dimensions L x W x H		430 x 250 x 360 mm
Weight		19.5 kg
Environment		temperature: storage:-25°C to +70°C, operating: -10°C to +50°C humidity: 5-85% non condensing

¹ at lower frequency and voltage ^{1/2} in combination with locating device (not in scope of supply)

Riedstrasse 1 | 6833 Klaus | AUSTRIA | T +43 (0)5523 57373 | info@b2hv.com
DHV1285 Rev04 - ENGLISH - Subject to alterations. Errors excepted. Illustrations are not binding.



Options

- External Tan Delta diagnostics system
- Partial Discharge system

Scope of delivery

- HVA34 testing device
- PC Software - b2 ControlCenter
- HV cable 4 m
- Power and earthing cable
- USB flash drive
- Operating manual





Megger
Power on

TRAX

Transformer and substation test system

The TRAX transformer and substation test system is designed to be a complete solution in transformer testing. TRAX is a multi-functional test system that replaces numerous individual testing instruments for testing of transformers and other system components addressing the need for a single test system capable of performing multiple tests. Testing with TRAX is a time saving and cost effective alternative to using separate instruments.

TRAX provides up to 800 A and 2200 V test signals (2000 A and 12 kV with accessories) with a frequency range adjustable from 5 to 500 Hz (1 - 500 Hz for insulation testing). These variable levels of voltage and current can be generated and measured with



TRAX Apps for various measurements/applications

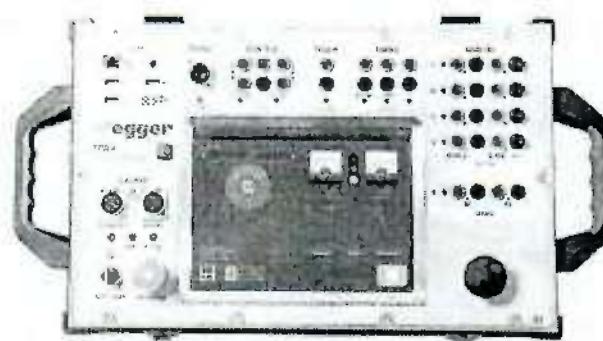
- Power transformers
- Load tap-changers
- Reactors
- Instrument transformers
- Bushings
- Circuit-breakers
- Protection relays
- Grounding systems

high precision, allowing TRAX to be used for testing of turns ratio, excitation current, winding and contact resistance, impedance, tan delta/power factor and various primary tests for LV, MV and HV electrical apparatus.

The user interface allows full manual control where the user defines a specific test setup. Alternatively, a variety of individual instruments/apps are available to perform different tests like winding resistance, turns ratio, impedance measurements, relay testing, circuit breaker analysis and more. The tests measurements can be organized and reported as separate tests or as a combined full set of test results for the same asset. TRAX can be used with an integrated touch screen or external computer device with a Chrome web browser.



9 Transformer test equipment



10 Transformer test equipment

TRAX

Transformer and substation test system

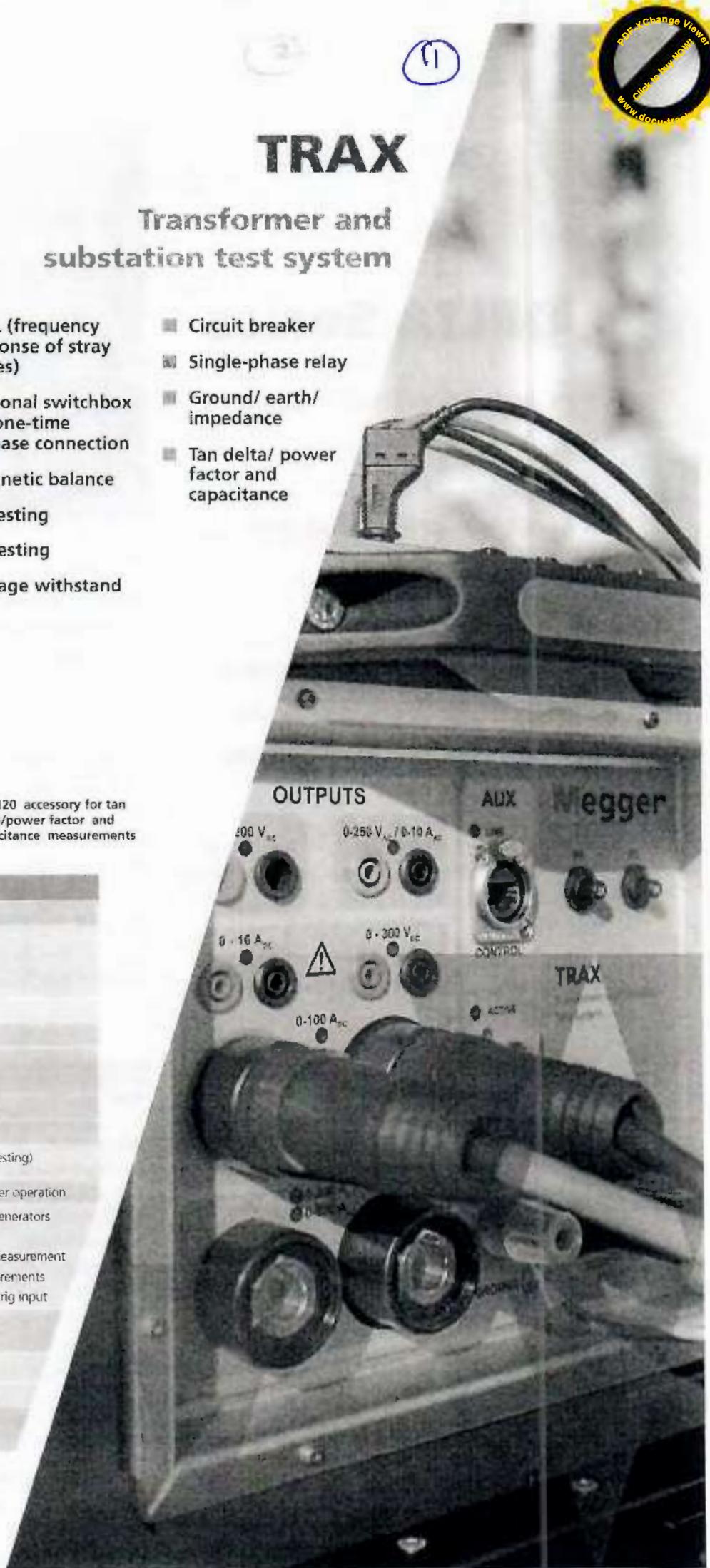
- Winding resistance
- Demagnetization
- Load tap-changer (OLTC) continuity and dynamic resistance
- Turns ratio
- Excitation current
- Short-circuit impedance (Leakage Reactance)
- FRSL (frequency response of stray losses)
- Optional switchbox for one-time 3-phase connection
- Magnetic balance
- CT testing
- VT testing
- Voltage withstand
- Circuit breaker
- Single-phase relay
- Ground/earth/impedance
- Tan delta/ power factor and capacitance



TDX120 accessory for tan delta/power factor and capacitance measurements

TRAX SPECIFICATIONS

Input Power	100-240 V $\pm 10\%$, 50/60 Hz
Output Voltage	0 to 250 V AC 0 to 2200 V AC 0 to 12 kV AC (with TDX option) 0 to 300 V DC
Output Current	0 to 10 A AC 0 to 200 A AC (TRAX 220) 0 to 800 A AC (TRAX 280) 0 to 2000 A AC (with TCX option) 0 to 100 A DC
Frequency Range	5-500 Hz (1-500 Hz for insulation testing)
Output contacts	2, for tap-changer and circuit breaker operation
Measurement channels	Internal measurements on output generators and output contacts 4 x multi-purpose voltage/current measurement 2 x DC voltage for resistance measurements 1 x transducer input 3 x timing 1 x trig input
3-phase one-time connection	With TSX option
Tan delta and capacitance measurements	With TDX option
Weight	26 kg (TRAX 220) 29 kg (TRAX280)



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PRODUCTS MEASURING INSTRUMENTS > INSULATION TESTER > WI

 Name : WI 2504HM (2500 VOLT - 5000 MOHMS, ANALOGUE DISPLAY, WOODEN BODY, HAND + MOTOR DRIVEN, 2 IN 1 INSULATION TESTER)

WI 2504HM (2500 VOLT - 5000 MOHMS, ANALOGUE DISPLAY, WOODEN BODY, HAND + MOTOR DRIVEN, 2 IN 1 INSULATION TESTER)

Model : WI 2504Range : 2500 Volts - 5000 Mohms

Hand drive Insulation Tester is used for measuring insulation resistances of various electrical machineries, Control Panels, Switching Equipment, Insulators Cables, Wirings and various other devices ranging from Small Electrical Units to Large size Transformers. The instrument conforms to Is: 2992:1980.

AVAILABILITY: OUT OF STOCK

PRICE : INR

QTY : 0

DELIVERY WITHIN :

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Email :

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Name :

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Description WI 2504HM (2500 VOLT - 5000 MOHMS, ANALOGUE DISPLAY, WOODEN BODY, HAND + MOTOR DRIVEN, 2 IN 1 INSULATION TESTER)
Model : WI 2504Range : 2500 Volts - 5000 Mohms
Hand drive Insulation Tester is used for measuring insulation resistances of various electrical machineries, Control Panels, Switching Equipment, Insulators Cables, Wirings and various other devices ranging from Small Electrical Units to Large size Transformers. The instrument conforms to Is: 2992:1980.

Catalogue Types & Ranges : Testers are available from 50 Volts onwards to 5000 Volts, Tester can also be supplied with a metal flap over the glass window for protection of glass, Fold back handle can provided on request, Dual range also available on request.

Reviews ()

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Rheostat



13

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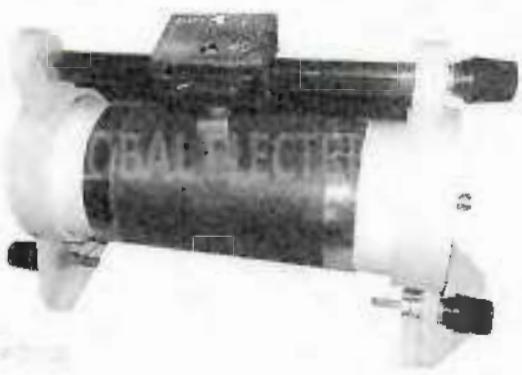
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LABORATORY RHEOSTATS

Prominent & Leading Manufacturer from Ambala, we offer Rheostat, Rheostat Multiple Tube, Rheostat (VE-223), Single Tube Rheostat, Rheostat Perforated Cover and Perforated Cover Rheostat (VE-209).

Last View
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Get Best Price

Rheostat

Approx Price: Rs 600 /Piece Get Best Price

Minimum Order Quantity: 5 Piece

To meet the varied requirements of our prestigious clients, we are engaged in offering a wide gamut Laboratory Rheostat. The provided array is manufactured by our professionals utilizing only premium grade raw material and modern technology in accordance with predefined industry quality standards. Apart from this, our offered rheostat is largely appreciated by our clients for its durability. Furthermore, clients can avail the entire range from us at industry leading prices.

Features:

- Easy installation
- Resistance against corrosion
- Precisely designed

Product Details:

Products



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contact sliders in the guide squire rod. Bright chrome plated Phosphor bronze strip which makes immediate contact with the guide rod. A back-lit knob is fitted with square piece for sliding up and down.

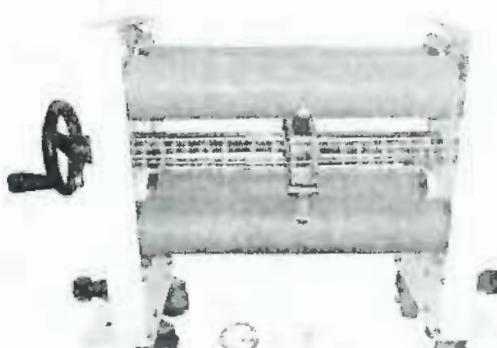
- Guide Rod: Rheostat Solid driven brass rod bright chrome plated square
- Contact Material: Rheostat contains Multiple brushes of Phosphor bronze strip rolled strip give springy action to the contacts

Note: Rheostat are available in 4 tubes ganged rheostat with screw & knob 10 KW and above, Double tube rheostat, 3 phase loading rheostat, Rotary type rheostat with knob.

Additional Information:

- Item Code: GE-224
- Pay Mode Terms: L/C (Letter of Credit), T/T (Bank Transfer), Other
- Port of Dispatch: Ambala Cantt
- Production Capacity: 200 units/week
- Delivery Time: As per buyer's requirement

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For Price

Rheostat

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- Customized designing available on request.

- Higher wattage resistors for special applications can be made.

Rheostat :

- Open/Covered/GRADED

L.M.S- Lead Screw Motion

Range: 0.5 Ohms – 12000 Ohms

Power: 0.1 Amp – 200 Amp

VIDUIT Brand Wirewound Sliding Rheostat are spaced wound with best quality Cu/Ni or Ni/Cr Alloy. Resistance Wire having very low temp. Co-efficient and wire is protected with high temp. Resistance Compound. The winding is done on vitreous enamelled drawn steel tube, fitted with aluminium die casted stands/fabricated steel stands. Phosphor Bronze or Self Lubricating Copper Graphite Contacts are fitted on Brass slider. Slides on Solid drawn brass rods.

Types of windings:

- Straight winding
- Graded winding
- Non-Inductive winding

Standard Tolerance 10% but closer tolerance can also be supplied on request:

Special features:

- Former – vitreous enamelled steel tube or vitreous ceramic.
- Slider – pressure die casted metal slider.
- End bracket – pressure die casted metal stand or steel fabricated stands.
- Wire – cupro-nickel alloy / nickel-chromium alloy having a negligible temperature co-efficient.
- Manganin wire wound rheostats on request.
- Slider knob made of bakelite having good finger grip.

Additional Information:

- Item Code: GE-258
- Pay Mode Terms: L/C (Letter of Credit), T/T (Bank Transfer), Other
- Port of Dispatch: Ambala
- Production Capacity: 1 week

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Rheostat Multiple Tube

Only single manufacturer in India of producing Rheostat of all type Rheostat with 4/Tube in Metal Legs (Manually Operated)

Important Note:

- Power Rheostats are made with a variety of resistance & current carrying capacity so as to satisfy every need. They are wound with heavily oxidized eureka resistance wire upon a porcelain tube dia 44 mm approx. The tube is carrying upon Bakelite rider and the heavy duty sliding contact is of the phosphor bronze...

Specification:

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Quantity Select Unit

Select a value

Approximate Order Value (Rs)

Select a value

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3 Phase Primary injection set for 3000 Amp

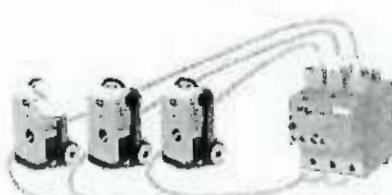
THREE PHASE PRIMARY INJECTION

► TriRaptor



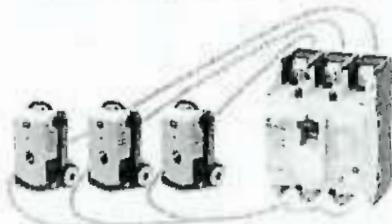
SMC
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TriRapport: Applications



Motor protection relay

Motor protection relays feature numerous diagnostic options and user-selectable settings. To test the relay's power supply, it can be easily tested with single-phase current. The TriRapport provides a stable and accurate output of up to 9.5A with 10% between phases, and can measure operating time by monitoring the relay's impulse output or directly the contact flow.



Circuit breaker testing

Single- and three-phase protection functions in four-, medium- and high-voltage circuit breakers can be easily tested with the TriRapport thanks to its wide current range (0.3 A/kV output power), and the selectable current classes. The time is automatically measured on or when a secondary protective device (e.g. a relay) has to be activated for testing.

Check measured secondary values

Check measured secondary values

• Check I₂, I₃, I₄ and I₅

Verify operation and accuracy

Check measured and output ground

Check measured and output ground

• Check I₂, I₃, I₄ and I₅

Check for adequate tripping

Check measured and output ground

Check measured and output ground

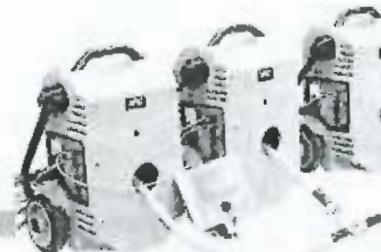
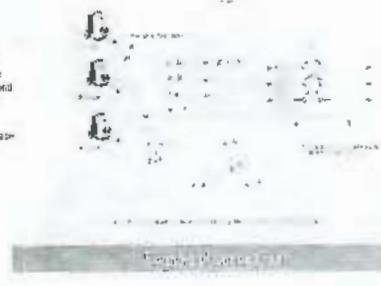
• Check I₂, I₃, I₄ and I₅

Check for adequate tripping

Substation commissioning

Commission the TriRapport's three-phase output to both ends of a busbar and hot impedance. A pre-defined test menu will help you achieve the ultimate insulation for measurements and possible connection mistakes - quickly and safely using harnessless voltage. Typical commissioning targets:

- Circuit breaker
- CT ratios and polarity
- Secondary equivalent connection
- Protection relay settings
- Overrating
- Grounding
- Instruments
- Phase consistency
- Shunting jumpers left in place
- Protection relay settings



TEST REPORTS





TriRaptor: Specifications

RAPTOR MS (3 units per system)

(values @240 Vac, 50 Hz, 1 turn sec. 960 mm², measured 25 cm on each side)

HIGH CURRENT OUTPUT

Output Current	Output Voltage
No Load V (0%max)	0 - 1.20 Vac - Continuous
3.8 KAac (25%max)	0 - 0.81 Vac - Continuous
7.5 KAac (50%max)	0 - 0.42 Vac - 3 min
9.5 KAac (Imax)	0 - 0.22 Vac - 3 s
No Load Resolution	25 uVac
Output Frequency	Same as supply's (50/60 Hz)
Ranges	0-1 KAac/N; 0-15 KAac/N (n: number of secondary turns)
Resolution	1 Aac, 10 Aac
Accuracy	$\pm 0.2\%$ of the value $\pm 0.2\%$ of the range
Phase angle	$\pm 0.25^\circ$

LOW CURRENT OUTPUT (not simultaneous with high current output)

Output Current	0 - 35 Aac (0 - 9 Aac continuous)
Voltage Output	0 - 200 Vac
Output Frequency	Same as supply's (50/60 Hz)
Isolated output	Yes
Protection	Fuse

AMMETER/LOW LEVEL VOLTMETER

Ammeter Ranges	0 - 0.2 / 0 - 2 / 0 - 20 Aac
Ammeter Resolution	0.1 mAac, 1 mAac, 10 mAac
Ammeter Impedance	<10 m Ω
Voltmeter Ranges	0 - 30 mVac, 0 - 0.3 Vac, 0 - 3 Vac
Voltmeter Resolution	0.01 mVac, 0.1 mVac, 1 mVac
Voltmeter Impedance	>3000 k Ω
Frequency range	20 - 400 Hz
Accuracy	$\pm 0.1\%$ of the value $\pm 0.1\%$ of the range
Phase angle	$\pm 0.25^\circ$
Isolated Input	Yes

VOLTmeter

Ranges	0 - 0.2 / 0 - 2 / 0 - 20 / 0 - 300 Vac
Resolution	0.1 mVac, 1 mVac, 10 mVac, 0.1 Vac
Impedance	>120 k Ω
Frequency range	20 - 400 Hz
Accuracy	$\pm 0.1\%$ of the value $\pm 0.1\%$ of the range
Phase angle	$\pm 0.25^\circ$
Isolated Input	Yes

BINARY INPUT

Type	Dry contact / Voltage
Voltage mode Levels	1.5 V, 15 V ; Max. Voltage 250 Vac.
Time resolution	1 ms
Isolated input	Yes

COMMUNICATIONS

2 x RS-485 Raptor Bus connectors from previous R-MS or 3xHH to next R-MS

GENERAL

Supply	230 V $\pm 10\%$, 50/60 Hz, single phase (all the 3 units must be plugged into the same phase and must be connected in parallel or wye)
Weight	35 Kg / 77 lb
Dimensions	550 x 440 x 230 mm / 21 ½" x 17 ¾" x 9"
Working temperature	0-50° C
Storage temperature	-25 to + 70 °C
Protections	MCB, overload, temperature, supply, communications, polarity
Ser. hole diameter	85 mm
Transport	Wheels, folding handle, fixed handle

RAPTOR 3xHH

Mini-PC powered by Windows CE

CONTROL

Display	7" high definition color TFT
Interface	Resistive touch panel + Rotary Encoder (turn & push)
LEDs	Alarm, Connectivity, Power

COMMUNICATIONS

RS-485	Raptor BUS Communication with Raptor-MS
USB	Connection to PC
RJ-45	Ethernet for software updates

GENERAL

Power Supply	Self-powered from Raptor-MS, or with external 5V AC/DC power adapter with a real consumption of about 1A
Weight	1 Kg / 2 lb
Dimensions	224 x 164 x 40 mm / 8" x 6" x 1 ½"
Case	High quality injection-molded ABS. Entire backface covered with magnet + rubber for fixation
Transport	Soft nylon bag,
Connection cable	5 m / 16 ½ ft (3 no.)
Compliance	The instrument is intended for use in high-voltage substations and industrial environments. All EuroSMC products comply to CE-marking directives and IEC and international standards, and are designed and manufactured in accordance with ISO-9001 quality standard.

Please note: Due to the continuous research and development by EuroSMC, specifications in this catalog may be changed without previous notice.

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Tel.: +852 91516 899
asia@eurosmc.com



TEST-330B

Three phase secondary current injection test set

The Test 330B three phase secondary current injection test set is the first choice for applications requiring very high accuracy more than 0.1%. This unit is not only an excellent test set for protection devices of all kinds but also a universal calibrator. It can as a ac or dc current source and voltage.



Overview

1. 3 phase current output
2. 5 phase voltage output
3. 8 binary input, 4 binary output
4. Accuracy more than 0.1%

Features

1. Embedded host machine equipped with Complex Programmable Logic Device (CPLD)
2. Eight-path synchronous D/A output in a single machine
3. High-accuracy linear power amplifier
4. Host machine integrated single cabinet structure with big LCD screen and complete interface has obtained appearance patent
5. Intelligent self-protection function
6. Plentiful Binary and powerful software function
7. Easily complete the ABB, Siemens, AREVA, Schneider, GE, SEL, VAMP, Toshiba, NR, Sifang and other foreign manufacturers of protective device test
8. Synchronous output of five-phase voltage and three-phase current, Max AC current output is 90A, Max AC voltage output is 260V

Test item

- | | | |
|------------------------------|------------------------------|----------------------------|
| 1. U/I test | 7. Harmonic test | 13. Synchronization test |
| 2. DC test | 8. Differential protection | 14. Special test |
| 3. Impedance characteristics | 9. Distance protection | 15. Oscillation test |
| 4. Power direction test | 10. Zero sequence protection | 16. Metering instrument |
| 5. I-T test | 11. Setting group test | 17. Hardware checkout |
| 6. Differential relay | 12. State sequence | 18. Low Voltage protection |
| | | 19. Fault Waveform |



TEST-3303

RELAY TESTER

Parameters

Electrical parameters

Power voltage	AC220V±10% or AC110V±10%, 50/60Hz±10%
Time measurement	0.1ms-999999.999s
AC current output	
Phase current output (effective value)	3 x 0-30A
Maximum power output	260VA/phase
Maximum parallel current output (effective value)	0-90A
Long-term allowable working value of phase current (effective value)	>10A
Allowable working time of maximum current	>11s
Accuracy class	<±0.1%
AC voltage output	
Phase voltage output (effective value)	5 x 0-130V
Line voltage output (effective value)	0-260V
Maximum power output	70VA/phase
Accuracy class	<±0.1%
DC current output	
Output range	-10 to 10A or 3 x 0 to ±10A
Maximum power output	200VA
Accuracy class	<±0.1%
DC voltage output	
Output range	0-300V or 5 x 0 to ±130V
Maximum output power	130VA
Accuracy class	<±0.1%
Binary input	
Idle contact	1-20mA, 24V (DC)
Electric potential contact	250V/0.5A (DC)
Binary output	
Idle contact	250V/0.5A (DC)
Rated output	
Frequency error	<±0.01Hz
Phase error	<±0.1°
Waveform distortion	<±0.3% (fundamental wave)
Time error	<40μs
Output frequency	0-1050Hz
Superposed harmonic wave	0-21times



GFUVE

TEST-330B RELAY TESTER

Mechanical parameters

Dimensions (LxWxH) (mm)	360x195x375
Weight (kg)	16.6

Environmental conditions

Use range	0°C to 45°C
Storage range	-25°C to 70°C



TEST-330B THREE PHASE SECONDARY CURRENT INJECTION TEST SET



The Test-330B three phase secondary current injection test set is the first choice for applications requiring very high accuracy more than 0.1%. This unit is not only an excellent test set for protection devices of all kinds but also a universal calibrator. It can as a ac or dc current source and voltage.

Its unique accuracy and reliability make the Test-330B ideal for protection and measurement equipment manufacturers for research and development, production and electric power company type testing.

[Find out more](#)

Quick Links: [Download Catalogue](#)

FEATURES

- Embedded host machine equipped with Complex Programmable Logic Device (CPLD)
- Eight-path synchronous D/A output in a single machine
- High-accuracy linear power amplifier
- Host machine integrated single cabinet structure with big LCD screen and complete interface has obtained appearance patent
- Intelligent self-protection function
- Plentiful Binary and powerful software function
- Easily complete the ABB, Siemens, AREVA, Schneider, GE, SEL, VAMP, Toshiba, NR, Sifang and other foreign manufacturers of protective device test
- Synchronous output of five-phase voltage and three-phase current, Max AC current output is 90A, Max AC voltage output is 200V

OVERVIEW

- 3 phase current output
- 5 phase voltage output
- 8 binary input, 4 binary output
- Accuracy more than 0.1%

TEST ITEM

- U/I test
- DC test
- Impedance characteristics
- Power direction test
- I-T test
- Differential relay
- Harmonic test
- Differential protection
- Distance protection
- Zero sequence protection
- Setting group test
- State sequence
- Synchronization test
- Special test
- Oscillation test
- Metering instrument
- Hardware checkout
- Low Voltage protection
- Fault Waveform Reproduction

PARAMETERS

TEST-330B	
Power voltage	AC220V±10% or AC110V±10%, 50/60Hz±10%
Time measurement	0.1ms-999999.999s
AC current output	
Phase current output (effective value)	3 x 0-30A
Maximum power output	260VA/phases
Maximum parallel current output	(1-90A)



effective value)	
Long-term allowable working value of phase current (effective value)	>10A
Allowable working time of maximum current	>11s
Accuracy class	<±0.1%
AC voltage output	
Phase voltage output (effective value)	5 x 0-130V
Line voltage output (effective value)	0-260V
Maximum power output	70VA/phase
Accuracy class	<±0.1%
DC current output	
Output range	-10 to 10A or 3 x 0 to ±10A
Maximum power output	200VA
Accuracy class	<±0.1%
DC voltage output	
Output range	0-300V or 5 x 0 to ±130V
Maximum output power	130VA
Accuracy class	<±0.1%
Binary input	
Idle contact	1-20mA, 24V (DC)
Electric potential contact	250V/0.5A (DC)
Binary output	
Idle contact	250V/0.5A (DC)
Rated output	
Frequency error	<±0.01Hz
Phase error	<±0.1%
Waveform distortion	<±0.3% (fundamental wave)
Time error	<40µs
Output frequency	0-1050Hz
Superposed harmonic wave	0-211times

Dimensions (L×W×H) (mm)	
Weight (kg)	16.8

Environmental conditions	
Use range	0°C to 45°C
Storage range	-25°C to 70°C

DOWNLOAD CATALOGUE

[Test-330B-Three Phase Secondary current injection Test Set](#) (427KB)

RELATED PRODUCTS



Single phase microcomputer protection relay test set
Test-750



Six Phase Universal protection device relay test kit
Test-671



Electrical 3000A Primary Current Injection Test Equipment
Test-915

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铧正电气
Huazheng Electric

Dissolve Gas Analysis Set with 10 SS bottles compatible for oil sample

Tel: +86-312-6775511

E-mail: sales09@bdhuazheng.com

www.piyou.com



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Insulation Resistance Tester

Cable Locator

Pulse Capacitor

Insulation Protect Products

Animal Repeller

Earth Resistance Tester

SF6 Gas Analyzer

HV Switch Tester

Uni-t Series

Lidar

Battery Tester

New Products



Transformer Oil DGA Dissolved Gas Analyzer

Transformer Oil DGA Dissolved Gas Analyzer I. Introduction of Gas Chromatography Insulating Oil Chromatographic Dissolved Gas Analyzer HZGC-1212 electric power special gas chromatography using the national standard recommended three detector processes. An analysis of the contents of seven...

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Product Details

Transformer Oil DGA Dissolved Gas Analyzer

Transformer Oil DGA Dissolved Gas Analyzer Product Description

Huazheng Electric
Manufacturing (Baoding)
Co.,Ltd
Contact:Julia
Email:
sales09@bdhuazheng.com
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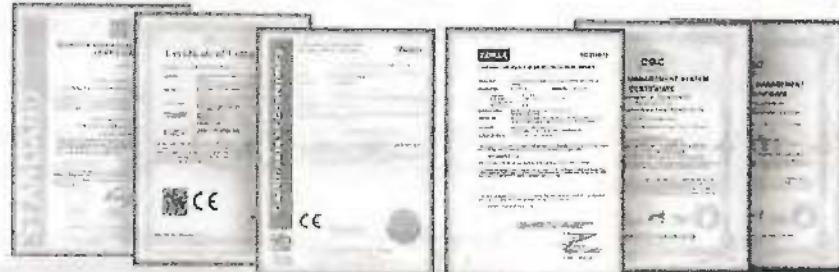
Transformer Oil DGA Dissolved Gas Analyzer Main Feature:

Determination of dissolved gases in the insulating oil component content by gas chromatography, is made to determine the operation of the power supply enterprises oil-filled electrical equipment if there is latent heat, discharge, such as failure to protect an effective means of safe and efficient operation of the grid. Also oil-filled electrical equipment manufacturers to make the necessary means for its equipment factory inspection.

Transformer Oil DGA Dissolved Gas Analyzer Technical Index

- (1)Operation display:5.7 inch lattice localization color LCD
- (2)Temperature control region:8 Road
- (3)Temperature range: Above room temperature 8 °C ~ 450 °C,incremental: 1 °C,Accuracy: + / - 0.1 °C
- (4)Temperature programmed order number:16 order
- (5)Cheng Sheng rate:0.1~39°C/min
- (6)Gas Control:Mechanical valve control mode, electronic flow controller (EFC) and electronic pressure controller (EPC) method
- (7)External event:4 way; Auxiliary control output 4 road.
- (8)Injector type:Packed column sample or 10 quantitative sampling valves.
- (9)Number of detector:3; double FID, TCD
- (10)The parameters of the Ni conversion furnace:More than 85% or higher; Working temperature 350 °C
- (11)Boot into the sample: manual, automatic optional
- (12)Communication interface: Ethernet: IEEE802.3
- Flame ionization detection (GC-FID).
- Detection limit: Mt≤3×10-12g/s (Sixteen alkanes)
- Noise:≤5×10-14A;
- Drift:≤1×10-13A/30min;
- Linearity range: ≥106
- Thermal conductivity detector(TCD)
- Sensitivity:S≥3500mV·ml/mg(Sixteen alkanes)(1, 2, 4, 8 x magnification optional)
- Noise:≤10μV;
- Baseline drift:≤30μV/30min

Certifications



Exhibition

We have attended Power-gen Exhibition in South Africa on July 19-21, 2016.

and the MEE Exhibition in Dubai on 1st to 3rd March 2016. And they are very successful. The follow is the photos that we attended the Power-gen Exhibition and the MEE Exhibition.



Welcome

Sincerely welcome to visit our company.



Company Information

COMPANY PROFILE

Huazheng Electric Manufacturing Co., Ltd is ISO and CE certificated manufacturer electric testing equipment, such as transformer oil tester, high voltage test set and transformer test kit

and so on , which are advanced in China. In addition, we also offer transformers with specifications and uses according to clients' requirements.

Our company has carried out a completed management system of production, scientific research and sales service. Our products are widely used in various electric power stations, electric power plants, factories and electric power systems.

Warmly welcome worldwide customers to cooperate with us. You will be deserved with the high qualified products, favorable price, on-time delivery and our best service.



Verified information



Verifier Information

This information was verified by TTS Data Solutions for the following period: 2016/07/21 - 2017/07/20

344 J. R. COOPER

The competitive advantage of product line:

CEM 2019-2020

Production Capacity

Product Line Name	Previous Month Capacity	Actual Usage Produced/Previous Month
Cable Fault Locator, Insulation Oil Tester, High Voltage Tester, Transformer Tester	Cable Fault Locator 25 pieces per month, Insulation Oil Tester 60 pieces per month, High Voltage Tester 25 pieces per month, Transformer Tester 45 pieces per month	confidential

Export Market Distribution:

Market	Revenue (Previous Year)	Total Revenue (L1)
North America	confidential	1.0
South America	confidential	4.0
Eastern Europe	confidential	1.0
Southeast Asia	confidential	15.0
Africa	confidential	1.0
Oceania	confidential	2.0
Middle East	confidential	10.0
Eastern Asia	confidential	16.0
Central America	confidential	1.0
South Asia	confidential	5.0
Emerging Markets	confidential	50.0

Production Machinery

Machine Name	Brand & Model #	Capacity	Number of Years Used	Condition
Lathe	RAMSGRU Star CORI	1	3.0	Acceptable
Bench Multi-purpose Electric Drill	C216-1A	4	5.0	Acceptable

Testing machinery.

Equipment Name	Brand & Model No.	Quantity	Number of Years Used	Condition
Oscilloscope	TAIKE Tektronix TDS1022CSC	1	6.0	Acceptable
AC Voltage Divider	BEIJING JIUYUAN B3AU	1	4.6	Acceptable
Digital LCR Meter Standard Bridge	JNDJ-2A-II A-6201	1	4.0	Acceptable
Digital Multimeter	Foster MT-1217	4	4.6	Acceptable

Production Flow:



ເປົ້າຕົກລາງ



સુરત



Dettagli

Real Case for Lower MOQ

Find the last 3 months
1 place

Request for Large Contributions

Product Name: **Cake Pan Locator** Order in the last 12 months: **5 pieces**

Short Lead Time

Transformer Tester	Test Piece	Test Days			
Certification:					
Certified Article	Certified Article Name	Certified By	Certificate No.	Product Name & Model No.	Available Date -- Expired Date
	ISO 9001:2000	STRV CARD	064-154-1709-R0-M	Quality Fault Location Transformer Tester, Line Transformer Tester Detectors, Monitoring And Protection Products Of Transformation And Distribution Line Research Building And Service Except For Those Which Need Production License	2015/07/02 ~ 2016/07/01
	CE	EST	SHB03T1809006026495EC	IEC/IEC 60068-2-22 INSULATING OIL CHEMICAL LOGS AND RESISTIVITY TESTER WITH AUTO WASHING HZJD-ZZ	2016/05/07 ~ 2049/12/31
	CE	SEIUE	E-E16154769	Transformer Turns Ratio Tester HZBB-10A HZBB-10B	2016/03/12 ~ 2049/12/31

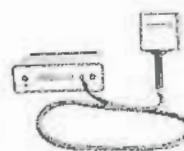
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Hot tags: Transformed Oil Dissolved Gas Analyzer Dissolved Gas Analyzer Oil Dissolved Gas Analyzer
dissolved gas analysis monitor Gas Chromatograph



Transformer Oil Analyzer, Gas Analyzer mode including
Transformer Oil Analysis (part number:[HZA-1000](#))
Transformer Oil Analysis.

Related Products:



HZR-2000 SPM Gas Quantitative
Leak Detector



Grounding Resistance Tester



HZ-3105 Transformer Wind
DC Resistance Tester



HZ-3110 Transformer DC
Resistance Tester



HZCS-1 Automatic Oil Acidity
Test Kit Single Cup Ex...



HZ-4000 TDP Cable Fault
Locator

Integrity

Your Name:

E-mail: Please input your email here. It is very important!

Phone:

Company:

Title:

Content: Please include details like size, weight, destination port and etc., so that we can quote the best price.





[Product Lookup](#) **Monitoring & Diagnostics**

- » [Multiple Gas Transformer DGA](#)
- » [Switchgear Monitoring](#)
- » [Single Gas Transformer DGA](#)
- » [Software & Services](#)
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Resources

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Kelman TRANSPORT X

Analysis of a transformer oil sample for dissolved gases by a laboratory is an established technique recognised as the most important test for monitoring power transformers.

The Kelman TRANSPORT X is a compact portable Dissolved Gas Analysis (DGA) system which can be used to analyze oil samples for all dissolved fault gases and moisture. If abnormal levels are detected, it further provides a diagnostic using various IEEE/IEC approved interpretation rules.

This is a vital piece of equipment when more frequent oil tests need to be performed on aging transformers or when an immediate on-site diagnostic is required following an alarm from a single gas DGA monitor.

**Benefits**

- Measures individually all 7 fault-gases plus water content (moisture) from a manually taken oil sample.
- Provides all results and a diagnostic based on several methods in less than 30 minutes.
- Measurement results analysis using onboard IEEE/IEC/ETRA/Dnv/diagnostics tools
- Easy to operate with minimal training.
- No moving parts, no pumps and no extra piping required.
- Ability to go from high gassed samples (such as tap changers) to low gassed samples (such as main tanks) with no contamination of results

Features

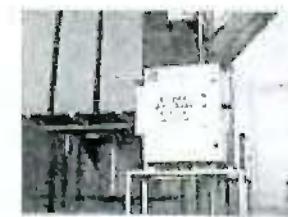
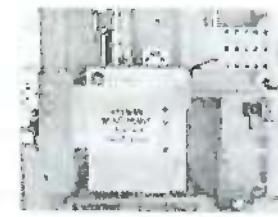
- Wide detection range with excellent accuracy for all seven fault gases (typically 1-50,000 ppm).
- Only 1.1kg (2.4lbs) in a rugged convenient carry case.
- No carrier or calibration gases needed.
- Suitable for transport on plane as hand luggage.
- Extremely easy step-by-step operation.
- Color screen with touch control for operation and results display.
- Up to 20,000 records stored in internal memory.
- Embedded thermal printer for hard copy of results.

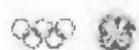
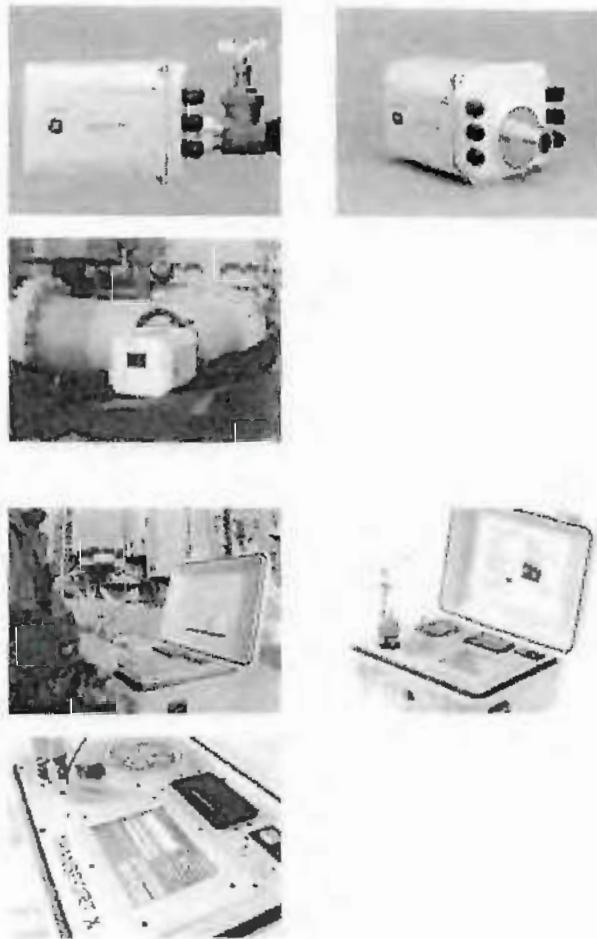
Applications

- All sizes of transformers.
- Ideal for site intervention teams.
- Perfect companion for single gas online DGA monitors
- Generation to Distribution transformers.
- OLTC and mineral oil filled equipment.
- Measurement of gas extracted from Buchholz relay's

Image Gallery

To view and download high resolution images of our products, please click on the thumbnails below.





GEORGE EASTMAN

General Electric Company

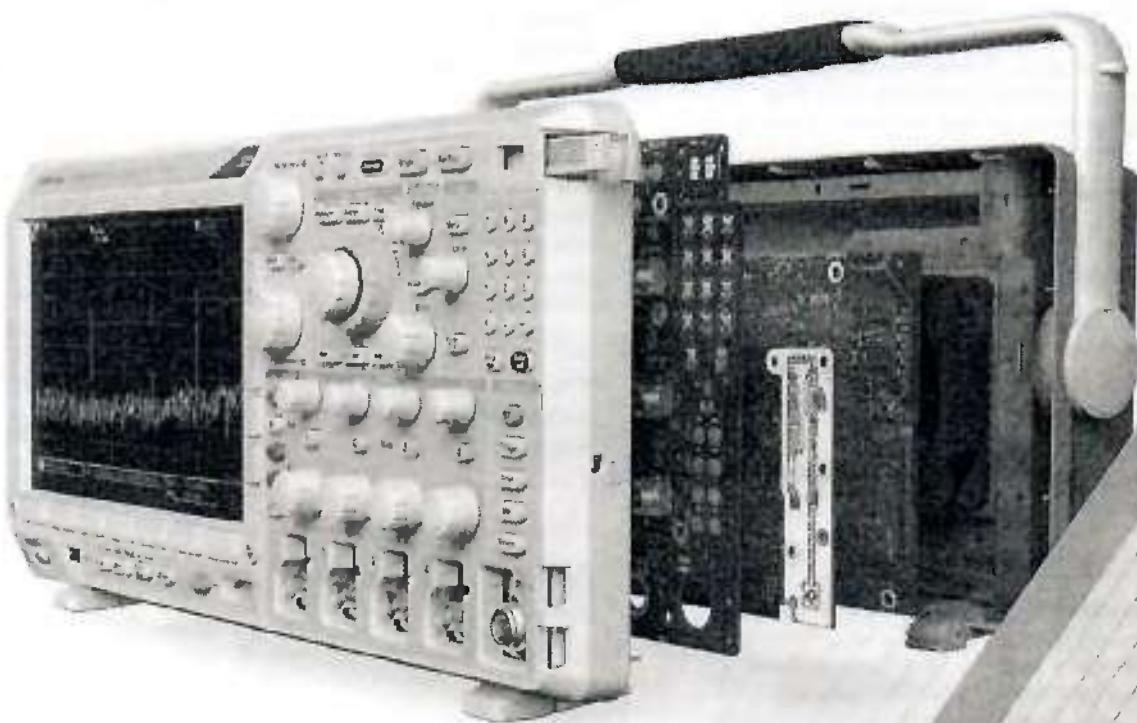
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Oscilloscope

OSCILLOSCOPE

SELECTION GUIDE



Tektronix®

OSCILLOSCOPE SELECTION GUIDE

Tektronix offers oscilloscopes for many different applications and uses. To help you choose the right scope for your needs, the most common criteria for selecting a scope are listed below, along with helpful tips for determining your requirements.

1 Bandwidth

All oscilloscopes have a low-pass frequency response that rolls off at higher frequencies. Oscilloscope bandwidth is specified as being the frequency at which a sinusoidal input signal is attenuated to 70.7% of the signal's true amplitude – the -3 dB point. Your oscilloscope must have sufficient bandwidth to capture all relevant frequency components of your signal. If you regularly work with digital signals, it may be easier to consider bandwidth by comparing signal and oscilloscope rise time specifications. Use an oscilloscope with a rise time specification five times faster than your signal rise time to keep error below 2%.

Rule: Bandwidth > 5 x Highest Signal Frequency

2 Sample Rate

The faster an oscilloscope samples, the greater the resolution and detail of the displayed waveform, and the less likely that critical information or events will be lost. Tektronix recommends at least 5X oversampling to ensure signal details are captured and to avoid aliasing.

Rule: Sample Rate > 5 x (Highest Frequency Component)

3 Record Length

Record length is the number of samples the oscilloscope can digitize and store in a single acquisition. Since an oscilloscope can store only a limited number of samples, the waveform duration – or length of “time” captured – will be inversely proportional to the oscilloscope’s sample rate. A longer record length enables a longer time window to be captured with high resolution.

Rule: Captured Time = (Record Length) / (Sample Rate)

4 Digital Channels and Spectrum Analysis

Today's oscilloscopes offer more than just analog channels for system-level troubleshooting of complex designs.

- If you need to analyze a parallel bus or multiple serial buses, the Tektronix MSO Series of mixed signal oscilloscopes and MDO Series of mixed domain oscilloscopes offer 16 digital channels and up to 4 analog channels for analyzing multiple signals at once.
- If you are working with RF signals, the Tektronix MDO Series of mixed domain oscilloscopes offers a built-in spectrum analyzer for time-correlated analysis of analog, digital and RF signals.

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Tektronix oscilloscopes offer a range of features and analysis capabilities. When choosing your scope, you should review available triggers, waveform search tools, automated measurements, and analysis packages such as serial bus analysis, jitter and power analysis to ensure they meet your needs.

CHOOSING YOUR OSCILLOSCOPE

Engineers, technicians and educators all have different workloads, different measurement needs, and different environments. To meet your needs Tektronix offers a wide range of oscilloscopes. This guide gives an overview of the various types of oscilloscopes currently available, along with high-level specifications that you can use for comparison.

If you need a reminder on oscilloscope specifications, download the [Types of Oscilloscopes Primer](#).



TYPES OF OSCILLOSCOPES



Mixed Domain Oscilloscopes – 100 MHz to 1 GHz

The new standard for design and debug work. They offer the same capabilities as mixed signal oscilloscopes, but also offer a built-in spectrum analyzer, adding RF debugging to the analog/digital capabilities.



Mixed Signal Oscilloscopes – 70 MHz to 8 GHz

The engineer's choice for design and debug. They combine traditional oscilloscope input channels with digital input channels, long record length with powerful search features, and protocol support for serial buses.



Advanced Signal Analysis Oscilloscopes – 350 MHz to 70 GHz

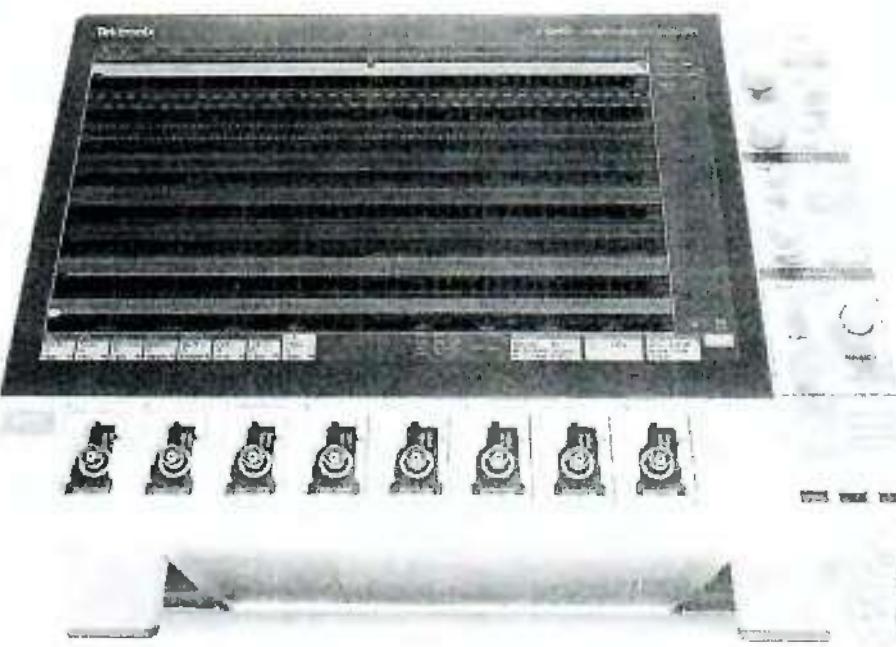
The emphasis is on analysis. They provide high acquisition performance and run Windows, thus supporting a wide range of analysis software. MSO versions include digital channels. They can be equipped for serial data analysis, jitter analysis, standards testing, and serial decoding capability.



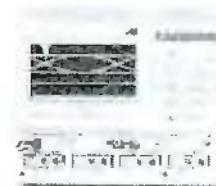
Low Profile Oscilloscopes

When performance, channel density and cost-per-channel are critical, these low-profile instruments are a great fit. They offer the same performance as bench instruments in a rack-friendly form factor.

OSCILLOSCOPE SELECTION GUIDE

VOTED 2017
INDUSTRY BEST -

With a remarkably innovative pinch-swipe-zoom touchscreen user interface, the industry's largest high-definition display and 1, 2, 4, or 8 FlexChannel™ inputs that let you measure one analog or eight digital signals, the 5 Series MSO is ready for today's toughest challenges, and tomorrow's too. It sets a new standard for performance, analysis, and overall user experience.



For very high speed signal analysis, both electrical and optical, our sampling oscilloscopes support jitter and noise analysis with ultra-low jitter acquisitions. They also perform TDR and S-parameter measurements.



For basic signal visualization and more, these instruments are solid performers with ample supporting materials, and generous warranties. Special features for education.



Safely and easily make 4-channel floating measurements, including 3-phase power measurements.



These capable industry-favorites have a large installed base, and thousands of companies rely on them as part of their test and measurement fleets. They continue to be fully supported.

OSCILLOSCOPE SELECTION GUIDE

MIXED SIGNAL AND MIXED DOMAIN OSCILLOSCOPES



View of a Mixed Signal Oscilloscope

View of a Mixed Domain Oscilloscope

Additional Resources	DATA SHEET	Additional Resources	DATA SHEET VIRTUAL TOUR
Channels	2, 4 analog channels; 16 digital channels (MSO2000B)		2, 4 analog channels; 16 digital channels (MDO3MSO option) 1 spectrum analyzer input 1 Arbitrary/Function Generator (MDO3AFG option)
Bandwidth	70 MHz to 200 MHz		100 MHz to 1 GHz
Spectrum Analyzer Frequency Range	—		Standard: 9 kHz to Analog Bandwidth Optional: 9 kHz to 3 GHz
Sample Rate	1 GS/s (analog); 1 GS/s (digital, only 1 pod); 500 MS/s (digital, both pods)		2.5 GS/s to 5 GS/s (analog); 121.2 ps (8.25 GS/s) MagniVu™ (digital)
Max Record Length	1 Mpoints		10 Mpoints
Trigger Types	Edge, Logic, Pulse Width, Runt, Setup and Hold, Rise/Fall Time, Video, I ^C , SPI*, CAN*, LIN*, RS-232/422/485/UART*, Parallel (MSO2000B) *Optional		Edge, Sequence, Logic, Pulse Width, Runt, Timeout, Setup and Hold, Rise/Full Time, Video, Extended Video, FC*, SPI*, CAN FD*, CAN*, LIN*, FlexRay®, RS-232/422/485/UART*, I ^{S/LJ/J/TDM} , MIL-STD-1553*, ARINC 429, USB 2.0*, Parallel (with MDO3MSO option) *Optional
Optional Serial Bus Decode and Analysis	DPO2AUTO: CAN and LIN DPO2COMP: RS-232/422/485/UART DPO2EMBD: I ^C , SPI DPO2BND: Includes DPO2AUTO, DPO2COMP, DPO2EMBD		MDO3AERO: ARINC 429, MIL-STD-1553 MDO3AUDIO: I ^S , I ^J , RJ, TDM MDO3AUTO: CAN FD, CAN and LIN MDO3COMP: RS-232/422/485/UART MDO3EMBD: I ^C , SPI MDO3FLEX: FlexRay MDO3USB: USB2.0 MDO3BND: Enables MDO3AERO, MDO3AUDIO, MDO3AUTO, MDO3COMP, MDO3EMBD, MDO3FLEX, MDO3LMT, MDO3PWR, MDO3USB
Connectivity	USB Host, USB Device, GPIB*, Optional DPO2CONN Module: LAN (10/100 Base-T Ethernet) and Video Out *Optional		USB Host (x2), USB Device, LAN (10/100 Base-T Ethernet, LXI Core 2011 Compliant), Video Out, GPIB* *Optional
Waveform Math and Analysis	29 Automated Measurements, Waveform and Screen Cursors; Arithmetic Waveform Math, FFT		44 Automated Measurements, Waveform and Screen Cursors, Advanced Math, FFT, Measurement Statistics, Waveform Histograms Optional: MDO3PWR: Power Analysis MDO3LMT: Limit/mask test MDO3BND: Enables MDO3AERO, MDO3AUDIO, MDO3AUTO, MDO3COMP, MDO3EMBD, MDO3FLEX, MDO3LMT, MDO3PWR, MDO3USB
Software	PC communications software: OpenChoice® Desktop		PC Communications Software: OpenChoice® Desktop
Upgrade	All serial bus triggering and decode		<ul style="list-style-type: none"> • Increase bandwidth • Add Arbitrary/Function generator • Add 16 digital channels • Increase spectrum analyzer maximum frequency to 3 GHz • Add measurements and analysis (power, limit/mask) • Add serial bus triggering and decode • Add security for password control of ports and firmware updates

OSCILLOSCOPE SELECTION GUIDE

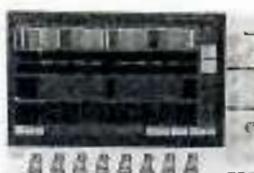


MIXED SIGNAL ANALYZER	
Additional Resources	DATA SHEET
Channels	4 analog channels; 16 digital channels (with MDO4MSO option); 1 spectrum analyzer input (with SA3 or GM3 option); 1 Arbitrary/Function Generator (with MDO4AFG option)
Bandwidth	200 MHz to 1 GHz
Spectrum Analyzer Frequency Range	Options: 5 kHz - 3 GHz or 9 kHz - 6 GHz
Sample Rate	2.5 GS/s to 8 GS/s (analog); 60.6 ps (16.6 GS/s MagniVu™ digital)
Max Record Length	39 Mpoints
Trigger Types	RF Power Level**, Edge, Sequence, Edge, Pulse Width, Runt, Timeout, Setup and Hold, Black Fall Time, Video, Extended Video*, I _C *, SPI*, USB*, Ethernet*, CAN FD*, CAN*, LIN*, FlexRay*, RS-232/422/485-LART*, RS/LJ/TJ/TDM*, MIL-STD-1553*, ARINC 429, Parallel*
*With optional MDO4TRIG module, RF power level can be used as setup for Pulse Width, Timeout, Runt, Edge, Sequence	
Optional Serial Bus Decode and Analysis	DPO4AERO: ARINC 429, MIL-STD-1553 DPO4ALINQ: I _G , I _L , RJ, TDM DPO4AUTOLIN: CAN FD, CAN and LIN DPO4AUTOMAX: CAN FD, CAN, LIN and FlexRay DPO4COMPI: RS-232/422/485, LART DPO4EMBED: I _C , SPI DPO4ENET: 10Base-T, 100Base-TX Ethernet DPO4USB: USB DPO4BND: Enables DPO4AERO, DPO4AUDIO, DPO4AUTO, DPO4COMPI, DPO4EMBED, DPO4ENET, DPO4LMT, DPO4PWR, DPO4USB, DPO4VID
Connectivity	USB Host (x4), USB Device, LAN (10/100/1000 Base-T Ethernet) eXtreme 2011 Compliant: Video Out, GPIB* *Optional
Waveform Math and Analysis	44 Automated Measurements, Waveform and Screen Capture, Spectrum Math, FFT, Advanced Math, Measurement Statistics, Waveform Histograms Optional: DPO4LMT: Limit and Mask Testing MDO4TRIG: Activ. RF Power Level Trigger DPO4PWR: Power Analysis DPO4VID: HDTV and Custom Triggering DPO4BND: Enables DPO4AERO, DPO4AUDIO, DPO4AUTO, DPO4COMPI, DPO4EMBED, DPO4ENET, DPO4LMT, DPO4PWR, DPO4USB, DPO4VID
Software	PC Communications Software: OpenChoice® Desktop Vector Signal Analysis Software: SignalVu-PR
Upgrade	<ul style="list-style-type: none">• Increase bandwidth• Add Arbitrary/Function Generator• Add 16 digital channels• Add or upgrade spectrum analyzer channel• Add measurements (analog power, limit mask, video, RF trigger)• Add serial bus triggering and decode• Add security for password protected imports and firmware upgrades



OSCILLOSCOPE SELECTION GUIDE

ADVANCED SIGNAL ANALYSIS OSCILLOSCOPES



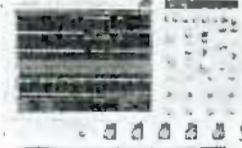
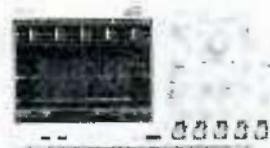
TEKTRONIX MDO

TEKTRONIX DPO

Additional Resources	DATA SHEET	DATA SHEET
Channels	4, 6, or 8 FlexChannel® inputs; 8 digital channels per FlexChannel input (optional); 1 Arbitrary/Function Generator (with 5-AFG option)	4 FlexChannel® inputs; 8 digital channels per FlexChannel input (optional); 1 Arbitrary/Function Generator (with 6-AFG option)
Bandwidth	350 MHz to 2 GHz	1 GHz to 8 GHz
Sample Rate	6.25 GS/s (analog); 6.25 GS/s (digital)	25 GS/s / channel (analog); 25 GS/s / channel (digital)
Max Record Length	Up to 125 Mpoints	Up to 260 Mpoints
Trigger Types	Edge, Sequence, Logic, Pulse Width, Runt, Visual Trigger, Timeout, Window, Setup and Hold, Rise/Fall Time, I²C®, SPI®, USB®, Ethernet®, CAN®, CAN FD®, LIN®, FlexRay®, RS-232/422/485®, UART®, HS/LJ/TJ/TDM®, MIL-STD-1553®, ARINC 429®, SENT®, SPMI®, Parallel *Optional	Edge, Sequence, Logic, Pulse Width, Runt, Visual Trigger, Timeout, Window, Setup and Hold, Rise/Fall Time, I²C®, SPI®, USB®, Ethernet®, CAN®, CAN FD®, LIN®, FlexRay®, RS-232/422/485®, UART®, HS/LJ/TJ/TDM®, MIL-STD-1553®, ARINC 429®, SENT®, SPMI®, Parallel *Optional
Optional Serial Bus Decode and Analysis	5-SRAERO: MIL-STD-1553, ARINC 429 5-SRALUDIO: I²S, LJ, RJ, TDM 5-SRAUTO: CAN, CAN FD, LIN, FlexRay 5-SRAUTOSEN: SENT 5-SRCCOMP: RS-232/422/485/UART 5-SREMBD: I²C, SPI 5-SRENETH: Ethernet 5-SRPWM: SPMI 5-SRUSB2: USB 2.0	6-SRAERO: MIL-STD-1553, ARINC 429 6-SRALUDIO: I²S, LJ, RJ, TDM 6-SRAUTO: CAN, CAN FD, LIN, FlexRay 6-SRAUTOSEN: SENT 6-SRCCOMP: RS-232/422/485/UART 6-SREMBD: I²C, SPI 6-SRENETH: Ethernet 6-SRPWM: SPMI 6-SRUSB2: USB 2.0
Connectivity	USB Host (x7), USB 3.0 Device, LAN (10/100/1000) Base-T Ethernet, 1.4 LXI Core 2011 Compliant, Display Port, DVI-D, Video Out	USB Host (x7), USB 3.0 Device, LAN (10/100/1000) Base-T Ethernet, 1.4 LXI Core 2011 Compliant, Display Port, DVI-D, Video Out
Waveform Math and Analysis	36 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, FFT, Advanced Math, Measurement Statistics Optional: 5-CMAUTOEN: Automotive Ethernet Compliance; 5-CMUSB2: USB 2.0 Compliance; 5-DJA: Advanced Jitter and Eye Diagram Analysis; 5-PWR: Advanced Power Measurements.	36 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, FFT, Advanced Math, Measurement Statistics Optional: 6-CMAUTOEN: Automotive Ethernet Compliance; 6-CMUSB2: USB 2.0 Compliance; 6-DJA: Advanced Jitter and Eye Diagram Analysis; 6-PWR: Advanced Power Measurements
Software	Optional: "TekScope Anywhere™"	Optional: "TekScope Anywhere™"
Upgrade	<ul style="list-style-type: none">• Add serial bus triggering and decode• Add serial bus compliance testing• Add digital channels with each TLP056 logic probe• Add extended record length, up to 250 Mpoints• Add advanced measurements and analysis (power, jitter)	<ul style="list-style-type: none">• Add serial bus triggering and decode• Add serial bus compliance testing• Add digital channels with each TLP056 logic probe• Add extended record length, up to 250 Mpoints• Add advanced measurements and analysis (power, jitter)



Oscilloscope Selection Guide



Additional Resources

DATA SHEET

Channels 4 analog channels; 16 digital channels (MSO/DSO)

Bandwidth 350 MHz to 2 GHz

Sample Rate 5 GS/s to 10 GS/s (analog);
60.8 ps (16.5 GS/s); MagniVu® (digital)

Max Record Length Up to 250 Mpoints

Trigger Types Edge, Sequence, Logic, Pulse Width, Glitch, Runt, Time, et.
Transition, Setup and Hold, Rise/Fall Time, Video, I2C®, SPI®,
USB (Low, Full, High), RS-232/422/485/UART, I2S®, Ethernet®,
CAN®, LIN®, FlexRay®, MIL-STD-1553®, Parallel (MAX30000B),
Visual Trigger *Optional

**Optional Serial
Bus Decode
and Analysis**

SR-AERO: MIL-STD-1553
SR-AUTO: CAN/I²C/FlexRay
SR-COMP: RS-232/422/485/UART
SR-DPHY: MIPI D-PHY
SR-EMBD: I²C, SPI
SR-EIET: 10/100Base-T Ethernet
SR-USB: USB

DATA SHEET

4 analog channels

520 MHz to 5.5 GHz

10 GS/s to 40 GS/s

Up to 500 Mpoints

Pingpong Triggering, Edge, Glitch, Pulse Width, Fall, Time-out,
Transition, Setup/Hold, Pattern, State, Window, Trigger Today by Tomorrow
and by Event, I2C®, SPI®, USB (Low, Full, RS-232, 422, 485), UART, I2S®,
CAN®, LIN®, Ethernet®, CAN®, LIN®, FlexRay®, PS/2®, RS-232, 422, 485,
UART®, MIL-STD-1553®, Visual Trigger *Optional

SR-AERO: MIL-STD-1553
SR-AUTO: CAN/I²C/FlexRay
SR-COMP: RS-232/422/485/UART
SR-DPHY: MIPI D-PHY
SR-EIET: I²C, SPI
SR-ENET: 10/100Base-T Ethernet
SR-FCIF: PCI Express
SR-USB: USB

Connectivity

USB Host (x6), USB Device, LAN (10/100/1000 Base-T)
Ethernet, I²C Bus Class C Compliant, Video Out, GPIB* *Optional

USB Host (x6), LAN (10/100/1000 Base-T) Ethernet, LVDS Class C
Compliant, GPIB, eSATA, DVI, VGA

Waveform Math and Analysis

53 Automated Measurements, Waveform and Screen Cursors,
Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics,
Waveform Histograms, Waveform Limit Testing
Optional:

BRR: BroadR-Burst Compliance Test; DDR4: DDR Memory
Bus Analysis; DJA: DPO/JET Advanced Jitter and Clock Diagram
Analysis; ETs: Ethernet Compliance Test Solution; MTM: Mask
Testing; PWA: Power Analysis; SignalVu: Vector Signal Analysis;
USB2: USB Compliance Test Solution; MOST: MOST 50/150
Compliance Test Solution; HSIC: HSIC Electrical Validation; USB-PWA:
USB Power Adapter; RIG: Compliance Automated
Test Solution

53 Automated Measurements, Waveform and Screen Cursors,
Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics,
Waveform Histograms, Waveform Limit Testing
Optional:

BRR: BroadR-Burst Compliance Test; DDR4: DDR Memory Bus
Analysis; DJA: DPO/JET Advanced Jitter and Eye Diagram Analysis;
D-PHY: MIPI D-PHY Essential; ETs: Ethernet Compliance Test Solution;
MTM: Mask Testing; PWA: Power Analysis; SignalVu: Vector Signal
Analysis; USB2: USB Compliance Test Solution; MOST: MOST 50/150
Compliance Test Solution; HSIC: HSIC Electrical Validation; USB-PWA:
USB Power Adapter; RIG: Compliance Automated Test Solution

Software

Optional: TekScope Anywhere™

Optional: TekScope Anywhere™

Upgrade

- Add 16 digital channels
- Add extended record length, up to 250 Mpoints
- Add serial bus compliance testing
- Add measurements and analysis (power, jitter, mask, I²C)
- Add serial bus triggering and decode

- Trade in older DPO7000 series models for credit toward the new DPO7000G version (EGV) credit of the old scope price
- Add extended record length, up to 500 Mpoints
- Add serial bus compliance testing
- Add measurements and analysis (power, jitter, mask, I²C)
- Add serial bus triggering and decode

OSCILLOSCOPE SELECTION GUIDE

ADVANCED SIGNAL ANALYSIS OSCILLOSCOPES



Additional Resources

[DATA SHEET](#)
[VIRTUAL TOUR](#)
[DATA SHEET](#)

Channels

4 analog channels;
16 digital channels (MSO7000)

2 or 4 analog channels

Bandwidth

4 GHz to 33 GHz Analog

20 GHz to 70 GHz

Sample Rate

25 GS/s to 100 GS/s (analog);
50 ps (12.5 GS/s) (digital)

50 GS/s to 200 GS/s

Max Record Length

Up to 1 Gpoints

Up to 1 Gpoints

Trigger Types

Pinpoint™ Triggering, Edge, Glitch, Pulse Width, Runt, Time-out, Transition, Setup/Hold, Pattern, State, Window, Trigger Delay (by Time and by Event), I_C*, SPI*, USB (Low, Full*, RS-232/422/485/UART*, Serial Pattern*, Visual Trigger*) *Optional

Pinpoint™ Triggering, Edge, Glitch, Pulse Width, Runt, Time-out, Transition, Setup/Hold, Pattern, State, Window, Trigger Delay (by Time and by Event), Visual Trigger* *Optional

Optional Serial Bus Decode and Analysis

SR-AERO; MIL-STD-1563; SR-AUTO: CAN/LIN; FlexRay; SR-COMP: RS-232/422/485/UART; SR-DPHY: MIPI D-PHY; SR-EMBD: I_C, SPI; SR-ENET: 10/100Base-T Ethernet; SR-PCIe: PCI Express; SR-USB: USB; SR-810B: 8b/10b; 10G KR: 10GBASE-KR/KR4

SR-COMP: RS-232/422/485/UART; SR-EMBD: I_C, SPI; SR-ENET: 10/100Base-T Ethernet SR-PCIe: PCI Express; SR-USB: USB; SR-810B: 8b/10b

Connectivity

USB Host (x5), LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), GPIB, eSATA, DVI, VGA

USB2.0 Host (4 on front)/3.0 Host (4 on rear), USB Device, LAN (10/100/1000 Base-T Ethernet, LXI Class C Compliant), DVI, VGA, DisplayPort (2)

Waveform Math and Analysis

53 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics, Waveform Histograms
Optional:
BERT: Broadband Compliance Test; EDIPI Memory Bus Analysis; DPOJET Advanced Jitter and Eye Diagram Analysis; Ethernet Compliance; Waveform Limit Testing; Mask Testing; Power Analysis; USB2 and USB3 Compliance and Analysis; USB Power Adapter; EPS Compliance Automated Test Solution; MNGT 50/150 Compliance Test; SignalVu Vector Signal Analysis; HDMI Compliance Test; HSIC Electrical Validation; MIPI D-PHY and M-PHY Characterization and Analysis; SAS Testing; SFP+ Compliance and Debug; Serial Data Link Analysis; 10G-KR Compliance and Debug; PCIe Compliance and Debug; Thunderbolt Characterization, Compliance and Debug; UHD Measurements; PAM4 Transmitter Analysis Software; SignalCorrect Cable, Channel and Probe Compensation Software

53 Automated Measurements, Waveform and Screen Cursors, Arithmetic and Advanced Waveform Math, FFT, Measurement Statistics, Waveform Histograms
Optional: DPOJET Noise, Jitter and Eye Analysis Tools; Frequency Counter-Timer; PAM4 Transmitter Analysis Software; Serial Data Link Analysis; 10G/40G/100G KR4/CR4 Transmitter Compliance; DDR Memory Bus Analysis; DisplayPort 1.2/1.4 Test Software; MIPI D-PHY Transmitter Debug and Compliance Test Solution; ETAP Compliance Test Package; Ethernet Compliance Testing; Fiber Channel Essentials; HDMI 2.0 Analysis and Compliance; High Speed Serial Link Training Analysis; HDMI Compliance Testing; MIPI M-PHY Debug and Compliance Test; NBASE-T TekExpress Conformance and Debug Software; PCI Express Gen1/2/3/4 TekExpress Compliance/Debug; Power Measurement and Analysis Software; SAS-3 Tx Compliance Test; SATA PHY Transmitter Test; SignalCorrect Cable, Channel, and Probe Compensation Software; SFP+ Compliance and Debug Solution; Embedded Serial Triggering and Analysis (I_C, SPI); USB 2.0/3.0/3.1 Automated Compliance Test; SignalVu Vector Signal Analysis

Software

Optional: TekScope Anywhere™

Optional: TekScope Anywhere™

- Increase bandwidth
- Add 16 digital channels
- Upgrade older platforms to the latest platforms
- Add extended record length, up to 1 Gpoints
- Add serial bus compliance testing
- Add measurements and analysis (jitter, DDR, mask, RF)
- Add serial bus triggering and decode

- Increase bandwidth
- Upgrade older platforms to the latest platforms
- Add extended record length, up to 1 G points
- Add measurements and analysis (glitch, mask, RF)

OSCILLOSCOPE SELECTION GUIDE



Additional Resources	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR	DATA SHEET VIRTUAL TOUR
Channels	4	2	2, 4
Bandwidth	80 MHz to 150 MHz	30 MHz* to 260 MHz * 30 MHz TBS1000B-EDU and TBS1000B-PRO only	70 MHz, 150 MHz
Sample Rate	1.6 GS/s	500 MS/s to 2.0 GS/s	1.6 GS/s
Max Record Length	2.5 k points	2.5 k points	20 M points
Trigger Types	Edge, Pulse Width, Video	Edge, Pulse Width, Video	Edge, Pulse Width, Video
Optional Serial Bus Decode and Analysis	—	—	—
Connectivity	USB Host, USB Device, Optional: GPIB	USB Host, USB Device Optional: GPIB	USB Host, Wi-Fi/Bluetooth support*, 10/100 Base-T Ethernet port
Waveform Math and Analysis	16 Automated Measurements, Arithmetic Waveform Math, FFT, Waveform Limit Testing, Automated Datalogging	94 Automated Measurements, Arithmetic Waveform Math, FFT, Dual Channel Frequency Counter, Waveform Limit Testing*, “rendPlot” function*, Automated Datalogging*, *Not available on EDU models	32 Automated Measurements, Arithmetic Waveform Math, FFT, Frequency Counter
Software	PC Communications Software: OpenChoice Desktop, Educator Courseware and Lab Resources CD	PC Communications Software: OpenChoice Desktop Software, PC Courseware Editor Tool, Product Documentation and Lab Resource CD	PC Communications Software: OpenChoice Desktop, PC Courseware Editor
Battery Operation	—	—	—



TBS2000 and TBS1000B-EDU Oscilloscopes have unique features designed to meet the needs of schools and universities. They use an innovative courseware system that enables educators to build teaching materials into the oscilloscope. Along with a powerful PC Courseware Editor Tool and a courseware website, these oscilloscopes support a complete education ecosystem that makes it easier to teach engineering and easier to learn.



OSCILLOSCOPE SELECTION GUIDE

LOW PROFILE AND SAMPLING OSCILLOSCOPES



TEKTRONIX MDO4000 SERIES

MDO4000 Series

Additional Resources	DATA SHEET	DATA SHEET
Channels	5 FlexChannel® inputs; 8 digital channels per FlexChannel input (optional); 1 Arbitrary/Function Generator (5 APG option); Aux trigger	Six modules support up to 8 single-ended or 4 differential channels and/or 2 optical channels
Bandwidth	1 GHz	Up to 70+ GHz Electrical bandwidth and 80+ Optical bandwidth modules available with intrinsic jitter as low as <100 fs RMS
Sample Rate	8.25 GS/s (analog); 0.25 GS/s (digital)	300 ks/s Maximum sample rate
Max Record Length	125 Mpoints	50 to 16,000 per channel native record length; with up to 1M points when using available IConnect Signal Integrity Software, 10M samples (100k unit intervals, 100 samples per unit interval) when equipped with available 80S.JNB Jitter, Noise and BER Analysis software
Trigger Types	Edge, Sequence, Logic, Pulse Width, Runit, Visual Trigger, Timeout, Window, Setup and Hold, Rise/Fall Time, I _C , SPI, USB®, Ethernet®, CAN®, CAN FD®, LIN®, FlexRay®, RS-232/422/485/UART®, RS-422/485/TDM®, MIL-STD-1553®, ARINC 429®, SENT®, SPMI®, Parallel [†] optional	Clock Input/Prescale Trigger, TDR clock (generated internally), Clock Recovery from Optical Sampling modules and Electrical Clock Recovery modules, and Phase Reference time base supports acquisitions Free Run mode and Trigger Direct Input for <100 fs RMS intrinsic jitter typical
Optional Serial Bus Decode and Analysis	5-SRAERO: MIL-STD-1553, ARINC 429, 5-SRAUDIO: HS, LJ, RJ, TDM, 5-SRAUTO: CAN, CAN FD, LIN, FlexRay, 5-SRAUTGEN: SENT, 5-SRCOMP: RS-232/422/485/UART, 5-SREMBD: I _C , SPI, 5-SRENETH: Ethernet, 5-SRPM: SPMI, 5-SRUSB2: USB 2.0	80S.JNB Jitter, Noise, BER, Serial Data Link and PAM4 Analysis Software; IConnect Signal Integrity Software; 100GBASE-SR4 Transmitter and Dispersion Eye Closure (TDEC) Automation Test Solution
Connectivity	USB Host (x6), USB 3.0 Device, LAN (10/100/1000 Base-T Ethernet, 1.4 LXI Core 2011 Compliant), DisplayPort, DVI-D, Video Out	3 USB 2.0 Ports/1 connector on the front panel, 4 USB 2.0 Ports on the rear panel; LAN PORT, RJ-45 connector, supports 10BASE-T, 100BASE-T, 1000BASE-T on rear panel; 1 Serial Port, DB-9 COM1, COM2 ports; 1 DVI IEEE488.2 connector on rear panel; 1 DVI connector, female on rear panel, DVI to VGA 15-pin D-sub connector adapter provided; PS2 Serial Ports Mouse and keyboard inputs; Audio Ports: 1/8 in. microphone input and line output
Waveform Math and Analysis	36 Automated Measurements, Waveform and Screen Cursors, Arithmetic Waveform Math, FFT, Advanced Math, Measurement Statistics Optional: 5-DJA: Advanced Jitter and Eye Diagram Analysis; 5-PWR: Advanced Power Measurements	Over 120 automated measurements include RZ, NRZ, and pulse signal types, and the following measurement types, plus 8 math waveforms using the following math functions: Add, Subtract, Multiply, Divide, Average, Differentiate, Exponential, Integrate, Natural Log, Log, Magnitude, Min, Max, Square Root, and Filter. In addition, measurement values can be utilized as scalars in math waveform definitions; Mask support for many applications; standard masks are available as predefined, built-in masks; Automated Masked Margin based on Mask Hit Ratio as required by many standards.
Software	Optional: TekScope Anywhere™	Windows® 7 Ultimate (64 bit) Operating System; IConnect Signal Integrity Software for frequency domain analysis, S-parameter measurements, and impedance characterization 80S.JNB Jitter, Noise, BER, and Serial Link analysis including Cross-Talk aware TJ (ITU and PAM4 Analysis); 80S.JBAR Jitter Analysis of Arbitrary Data with J2-J9 measurements, and support for pattern lengths to PRBS31; 100GBASE-SR4 (IEEE 802.3bm) optical transmitter characterization measurements, including TDEC, signalling rate, Average Launch Power, OMA, ER, Transmitter Eye Mask
Upgrade	<ul style="list-style-type: none">• Add serial bus triggering and decode• Add digital channels with each TLP058 logic probe• Add advanced measurements and analysis	<ul style="list-style-type: none">• Modular architecture lets you add channels or bandwidth• Add TDR, optical and electrical standards support• Add advanced analysis, compliance test, frequency domain analysis software• Add clock recovery trigger pickoff (CRTP) to select optical modules• Enhance system jitter floor performance to <100 fs RMS



OSCILLOSCOPE SELECTION GUIDE



Additional Resources	DATA SHEET	DATA SHEET	DATA SHEET	DATA SHEET
Channels	4 (isolated)	2, 4 (isolated)	2, 4	2, 4
Bandwidth	100 MHz to 200 MHz	100 MHz to 200 MHz	50 MHz to 200 MHz	100 MHz to 500 MHz
Sample Rate	2.5 GS/s to 5 GS/s	1 GS/s to 2 GS/s	500 MS/s to 2.0 GS/s	1.25 GS/s to 5 GS/s
Max Record Length	10 k points	2.5 k points	2.5 k points	10 k points
Trigger Types	Edge, Pulse Width, Event, Video, Non-intrusive	Edge, Pulse Width, Video	Edge, Pulse Width, Video	Edge, Logic (Pattern, State), Pulse (Glitch, Width, Runt, Slow Rate), Video, Optional: Extended Video Channel
Optional Serial Bus Decode and Analysis	—	—	—	—
Connectivity	USB Host, USB Device	RS-232 (includes RS-232-to-USB Host Serial Cable), Centronics, CompactFlash	USB Host, USB Device, Optional: GPIB	USB Host, LAN (10Base-T Ethernet), Optional: TDG36GV Modular GPIB, RS-232, and Video OUT
Waveform Math and Analysis	21 Automated Measurements, Arithmetic, Waveform Math, FFT	11 Automated Measurements, Arithmetic, Waveform Math, FFT, Optional: TRS2FWP1: Power Measurement and Analysis	16 Automated Measurements, Arithmetic, Waveform Math, FFT, Waveform Limit Testing, Automated Debugging	26 Automated Measurements, Arithmetic, Waveform Math, FFT, Optional: TDG3400: Power Measurement and Analysis, TDG3TM1: Telecom Modem Testing, TDG3WIF: HIGH E-Code to Video Triggering
Software	PC Communications Software: OpenChoice Desktop	PC Communications Software: OpenChoice Desktop	PC Communications Software: OpenChoice Desktop	PC Communications Software: OpenChoice Desktop
Battery Operation	One TH50A1 Battery Pack Included Standard	One TH50BAT Battery Pack Included Standard	—	Requires Optional TDG3BATC Battery Pack



OSCILLOSCOPE SELECTION GUIDE

INTERACTIVE PROBE SELECTOR TOOL

Need help finding the right probe for your application? The online Tektronix Probe Selector Tool will guide you through a few easy questions to match your need to the right probe. Visit us anytime, anywhere at: TEK.COM/PS.



Tektronix | Solutions | Products & Services | Support & Training | Contact Us | Log In

Probe Selector Tool

Select a measurement

Current Probe	Low Voltage Differential Probes
High Voltage Differential Probes	Low Voltage Single Probe Probes
High Voltage Single Ended Probes	Isolated Measurement Probes
Logic Analyzer Probes	RF Probes

Select an instrument

MSO/DPO2000	MSO/DPO2000X	MDO3000	MDO4000S
MSO/DPO3000	MSO/DPO3000X	MDO3000Z	MDO4000Z
MDO4000Z	DPO4000	MDO4000Z	TDS2000
TDS3000	TDS3000X	TDS3000Z	TDS4000Z

Recommended Probes:

TPP1000 Bandwidth: 100 MHz Input Range: 100 V/200 V
List Price: US \$399

TPP1502 Bandwidth: 200 MHz Input Range: 200 V/400 V
List Price: US \$499

IsoVu® Isolated Probes See What's Been Hidden - Until Now



Common mode interference often causes engineers to design, debug, evaluate, and optimize "blind." Revolutionary IsoVu™ technology uses optical communications and power-over-fiber for complete galvanic isolation. When combined with an oscilloscope equipped with the TekVPI interface, it is the first, and only, measurement system capable of accurately resolving high bandwidth differential signals in the presence of large common mode voltage.



OSCILLOSCOPE PROBE ACCESSORIES

Tektronix probes and accessories are perfectly matched to our industry-leading oscilloscopes.

With over 100 choices available, you will find the probe you need. Need help finding the right probe for your application? The online Tektronix Probe Selector Tool will guide you through a few easy questions to match your need to the right probe.



Standard Probe

- High-resolution measurements in the presence of common mode signals or noise
- Up to 1 GHz bandwidth
- Complete galvanic isolation
- 1 Million to 1 (120 dB) of common mode rejection at 100 MHz



- Bandwidth up to 33 GHz
- Easily measure differential signals
- Low input capacitance: down to < 0.3 pF
- High common mode rejection ratio (CMRR)
- Wide range of probe tips for easier circuit access



Current Probe

- Dynamic range to ± 6000 V
- Bandwidth up to 200 MHz
- Most extensive set of probe accessories



- Easy to use and accurate AC/DC current measurements
- DC up to 2 GHz
- Amplitude measurements from 1 mA to 2,000 A
- Split core and solid core construction

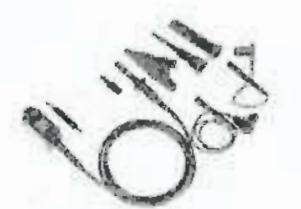


High-Speed Probe

- Best-in-class bandwidth up to 1 GHz
- Best-in-class input capacitance as low as 3.9 pF, which minimizes probe loading effects
- Dynamic range to 300 V CAT II
- Rugged and reliable



- Bandwidth up to 4 GHz
- True signal reproduction and fidelity
- Low input capacitance: down to < 0.8 pF
- Small, compact probe heads for probing small geometry circuit elements



Low-Noise Probe

- Bandwidth up to 800 MHz
- Dynamic range to 2500 V
- Best-in-class probe loading with input capacitance as low as 1.8 pF



High-Current Probe

- Broad Wavelength Response: 500 to 850 nm or 1100 to 1700 nm
- High-bandwidth DC up to 1.2 GHz
- High Gain 1 V/mW
- Low Noise <11 pW/ $\sqrt{\text{Hz}}$
- DC to 33 GHz (DC to 7.5 GHz)

Optical Probe (OPTOPI)



OSCILLOSCOPE SELECTION GUIDE

SERIAL SUPPORT BY MSO/DPO PRODUCT SERIES AND REQUIRED OPTIONAL SOFTWARE

MSO/DPO7000 Series Serial				DPD7000C Series		
Serial Standard	Decode & Search	Serial Trigger	Compliance Test	Decode & Search	Serial Trigger	Compliance Test
I ² C	SR-EMBD	SR-EMBD	-	SR-EMBD	SR-EMBD	-
SPI	SR-EMBD	SR-EMBD	-	SR-EMBD	SR-EMBD	-
RS-232/UART	SR-COMP	SR-COMP	-	SR-COMP	SR-COMP	-
SPMI	-	-	-	-	-	-
PS	-	-	-	-	-	-
CAN	SR-AUTO	SR-AUTO	-	SR-AUTO	SR-AUTO	-
CAN FD	-	-	-	-	-	-
LIN	SR-AUTO	SR-AUTO	-	SR-AUTO	SR-AUTO	-
FlexRay	SR-AUTO	SR-AUTO	-	SR-AUTO	SR-AUTO	-
MOST	-	-	MOST	-	-	MOST
SENT	-	-	-	-	-	-
Automotive Ethernet	-	-	BRR	-	-	BRR
ARINC 429	-	-	-	-	-	-
MIL-STD-1553B	SR-AERO	SR-AERO	-	SR-AERO	SR-AERO	-
USB 2.0	SR-USB	SR-USB (LS, FS)	USB2	SR-USB	SR-USB (LS, FS)	USB2
USB 3.0	SR-USB	-	USB3, TEKEXP Opt. USB-RMT, USB-TX	SR-DPHY	-	D-PHY TEKEXP Opt. D-PHYTX
MIPI D-PHY	SR-DPHY	-	D-PHY, TEKEXP Opt. D-PHYTX	MIPI M-PHY	-	M-PHY, M-PHYTX, M-PHYRX
MIPI M-PHY	-	-	M-PHY, M-PHYTX, M-PHYRX	PCIe	SR-PCIE	-
PCIe	SR-PCIE	-	PCE3	DisplayPort	-	TEKEXP Opt. DP-SINK
DVI/A	-	-	TEKEXP Opt. DINA	HDMI	-	DP12, TEKEXP Opt. DP-SINK
DisplayPort	-	-	DP12, TEKEXP Opt. DP-SINK	MHL	-	HT3, HT3DS
HDMI	-	-	HT3, HT3DS	SATA	-	MHD
MHL	-	-	MHD	SAS3	-	SATA-RSG, SATA-TSG
SATA	-	-	SATA-RSG, SATA-TSG	Thunderbolt	-	SAS3, SAS-TSG, SAS-TSGW
SAS3	-	-	SAS3, SAS-TSG, SAS-TSGW	Thunderbolt	-	TBT-TX
Thunderbolt	-	-	TBT-TX	UHS-II	-	UHS2
UHS-II	-	-	UHS2	DDR	-	DDRA, DDR-LP4
DDR	-	-	DDRA, DDR-LP4	Ethernet	SR-ENET	-
Ethernet	SR-ENET	-	ET3, XBGT2, NBASET	Comm. Mask Testing	-	ET3, XBGT2, NBASET
Comm. Mask Testing	-	-	MTH	Fibre Channel	-	MTM
Fibre Channel	-	-	FC-10G	10GBASE-T KR	-	-
10GBASE-T KR	-	-	10G-KR	SFP+	-	-
SFP+	-	-	SFP-TX, SFP-WDP	Custom Serial	SR-CUST	-
Custom Serial	SR-CUST	-	-	8b/10b	SR-810B	-
8b/10b	SR-810B	-	-	NRZ Serial	-	ST1G
NRZ Serial	-	ST6G	-	PAM4	-	-
PAM4	-	-	PAM4	Serial Data Link Analysis	-	-
Serial Data Link Analysis	-	-	SDLA64	Jitter & Eye Diagram Analysis	-	DJA (DJE incl. std), DJAN
Jitter & Eye Diagram Analysis	-	-	DJA (DJE incl. std), DJAN			

Protocol Support			
I ² C	5-SNEMBD	5-SHEMBD	-
SPI	5-SREMBD	5-SREMUR	-
RS-232/DART	5-SRCOMP	5-SNCOMP	-
SPMI	5-SRPM	5-SRPM	-
I ² S	5-SRAUDIO	5-SRAUDIO	-
CAN	5-SRAUTO	5-SRAUTO	-
CAN FD	5-SRAUTO	5-SRAUTO	-
LIN	5-SRAUTO	5-SRAUTO	-
FlexRay	5-SRAUTO	5-SRAUTO	-
MOST	-	-	-
SENT	5-SRAUTOSEN	5-SRAUTOSEN	-
Automotive Ethernet	-	-	5-CMAUTOEN
ARINC 429	5-SRAERU	5-SRAERO	-
MIL-STD-1553B	5-SRAEHC	5-SRAERO	-
USB 2.0	5-SRU382	5-SRU382	5-CMUSB2
USB 3.0	-	-	-
MIPI D-PHY	-	-	-
MIPI M-PHY	-	-	-
PCIe	-	-	-
DVI/A	-	-	-
DisplayPort	-	-	-
HDMI	-	-	-
MHL	-	-	-
SATA	-	-	-
SAS3	-	-	-
Thunderbolt	-	-	-
UHS-II	-	-	-
DDR	-	-	-
Ethernet	5-SRENET	5-SRENET	-
Comm. Mask Testing	-	-	-
Fibre Channel	-	-	-
10GBASE-T KR	-	-	-
SFP+	-	-	-
Custom Serial	-	-	-
8b/10b	-	-	-
NRZ Serial	-	-	-
PAM4	-	-	-
Serial Data Link Analysis	-	-	-
Jitter & Eye Diagram Analysis	-	-	5-DJA



3 Phase Voltage Recorders

Extech Instruments (2)

Versalog (1)

Voltage and Current Data Loggers and Recorders



<https://www.microdaq.com/instrument/voltcurrentrecording-power-meter.php>

EXC-U-N-C

\$1,500.00

ElitePro XC Recording Power Meter (<https://www.microdaq.com/instrument/voltcurrentrecording-power-meter.php>)

- Measures, Stores and Analyzes 144 Different Electrical Parameters Including Volts, Amps, Watts, Frequency, Power Factor, Harmonics, Crest Factor, Total Harmonic Distortion (THD), Power Quality and More
- Built-in USB and Ethernet Ports with Optional Bluetooth and WiFi Communication Port Options
- (4) Current (up to 6000 Amps) and (3) Voltage (0 to 600 Volts AC or DC) Channels
- (4) Analog Inputs for Voltage or Current, Temperature or Process Control Conditions
- Reports Total Harmonic Distortion (THD), Crest Factor, Peak Voltage and Current
- Line Powered and Draws Power from the USB Cable When Connected to a Computer
- Recorded Readings Are Stored Internally onto 16MB of Non-Volatile Memory
- (3) 2-Position and (1) 3-Position CT Connector Inputs
- ELOG™ Software for ElitePro XC for Set-up, Data Retrieval, Analysis and Export
- New! Mobile App for Access to Real-Time Data from Wi-Fi Enabled Elite Pro Meter

Includes Soft-Side Carrying Case, NIST-Traceable Calibration Certificate, Crocodile Voltmeter Probe, and 1 Year Manufacturer's Warranty.

Learn More (<https://www.microdaq.com/instrument/voltcurrentrecording-power-meter.php>)

<https://www.microdaq.com/product/versalog-dcvc-hr.html>



<https://www.microdaq.com/versalog-dcvc-hr.html>

VERSALOG-DCVC-HR

\$638.00

Versalog 8 Channel DC Voltage and Current Data Logger (<https://www.microdaq.com/versalog-dcvc-hr.html>)

- 4 Input Channels for DC Voltage, 3 Input Channels for Current and 1 Internal Temperature Sensor
- 20 milliseconds to 12 hour Sampling Interval
- Fast Sampling Mode, Alarm and Excitation Output
- 10 Year Battery Life (1 Minute Sampling Rate)
- Stores up to 2 Million Recorded Readings onto Non-Volatile Memory
- Excitation Control Output for Powering Connected Devices

Learn More (<https://www.microdaq.com/versalog-dcvc-hr.html>)

<https://www.microdaq.com/product/versalog-dcvc-hr.html>



<https://www.microdaq.com/acuvim-l-series-power-meter.php>

Acuvim-L Series Multiphase Power Meter (<https://www.microdaq.com/acuvim-l-series-power-meter.php>)

- Power Meter Measures 3-Phase Voltage, Current, Power (Reactive, Apparent, Active)
- (6) Different Model Options Provide for Digital Output, RS-485 Communications and Modbus RTU
- (2) Different Alarm Parameters for High and Low Alarm Alerts
- Compatible with Single or Three-Phase Electrical Systems
- (2) Pulse Digital Outputs for kWh and kvarh with Configurable Rate and Width
- ±0.2% Accuracy with ANSI C12.20 Standard for Revenue Grade Meters

Includes AcuView Software

Learn More (<https://www.microdaq.com/acuvim-l-series-power-meter.php>)

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FTS-1000

Dynamic Frequency Relay Test Set

FTS-1000

Dynamic Frequency Relay Test Set



- **Dynamic frequency generator**
- **Microprocessor-based relay test equipment**
- **Output 10 - 400 Hz**

DESCRIPTION

The FTS-1000 integrates advanced microprocessor-based technology in the application, design and manufacture of equipment for calibrating protective relays to provide an extremely accurate, versatile and easy-to-use dynamic frequency relay test set. The FTS-1000 is a portable, lightweight and very rugged test set that is equally at home in the relay shop, in the field or on the production line.

APPLICATIONS

The FTS-1000 provides a variable voltage and dynamic frequency output, comprehensive controls, timing and monitoring circuits for testing and calibrating solid-state and electromechanical instantaneous and time-delay frequency relays. The following table is a listing of the different types of relays by device numbers and types that the FTS-1000 can test.

In addition, the 500 Hz range makes the FTS-1000 ideally suited to test aircraft and military frequency meters, transducers and other devices.

Relay Types	IEEE Device Number
Frequency	81
Volt/Hertz	21
Undervoltage	27
Overvoltage	59
Autosynchronizing	25A

FEATURES

Many standard features are incorporated in each FTS-1000 to reduce setup time, simplify test procedures and increase accuracy. Among these are:

- Each FTS-1000 is a self-contained test set and provides variable frequency, variable voltage, timing, control and monitoring functions.
- Voltage and frequency settings are each independently incremented by a rotary knob or pushbutton controls.
- Amplitude and frequency of the output voltages are displayed on a large, high-intensity LED display.
- The accuracy of the voltage output is $\pm 0.5\%$ of setting.
- Typical accuracy of the frequency output is $\pm 0.005\%$ of setting.
- Universal operation from a single-phase source of 85 to 265 volts, 50/60 Hz.
- Output potential source has a continuous duty cycle rating of 60 volt-amperes.
- Numerous protective circuits are incorporated, including thermal protection of the power amplifier.
- An isolated contact monitoring and sensing circuit is incorporated to monitor dry contacts, SCR conduction and voltage signals.
- A circuit is incorporated to initiate the timer simultaneously with any selected output frequency.
- Compatible, with six languages; English, Spanish, German, Portuguese, French and Japanese.
- Recessed front panel eliminates the need for a front panel cover.
- Soft-side carrying case provides for easy carrying and superior protection of the test set.
- Modular design permits replacement of individual modules and NIST calibration.



Megger

SPECIFICATIONS

Input Voltage
85 to 265 Vac, 50/60 Hz

Voltage Outputs

Ranges

Two voltage channels can provide:

0 to 120 V at 60 VA

0 to 240 V at 60 VA

Output power and voltage are linearly derated to 70% from 40 to 10 Hz

Resolution: 0.1 V

Accuracy: From 10 to 100% of range at full load, 40 to 60 Hertz, maximum 1%, Typical 0.5%

Voltage accuracy varies with output frequency 10 to 39 Hertz accuracy may be calculated as:

$$\pm \left[1.7 - \left(\frac{F_{OUTPUT}}{60} \right) \right] \%$$

81 to 500 Hertz accuracy may be calculated as:

$$1.1 + (F_{OUTPUT} * 0.0033) \%$$

Harmonic Distortion: <1% typical 2% maximum

Overload Protection

Input: Fuse-protected

Power Supply: Overcurrent, under-voltage/overvoltage, thermal

Amplifiers: Current-limiting, thermal, fused

Test Model Selection

Normal, Fault, Post-Fault Test mode selection has a programmable delay from 0 to 9999.9 cycles before initiation of test.

Output Frequency

Frequency is adjusted using push-buttons or rotary knob control.

Range: 10 to 400 Hz

Resolution: 0.001 Hz

Accuracy: Less than 50 ppm for frequencies above 40 Hz.

Frequency accuracy is linearly derated to 200 ppm at 10 Hz.

Dynamic Capabilities: The frequency can be ramped or a step function is available.

Delta Rate Range: 0.01 to 99.99 Hz/second

Resolution: 0.01 Hz/second

Duration Range: Frequency may be ramped to a set value and held at that frequency for a set duration in seconds 0.000 to 9999.990.

Digital Timer

Display: Six (6) digits

Ranges: Seconds and cycles

Autoranging in the seconds mode, starting at 00.0000 and going up 9999.99. In the cycles mode, 00000.0 cycles, to 99999.9.

Accuracy: ± least significant digit or ± 0.005% of reading whichever is greater, in the seconds mode, ±0.5 cycles in the cycles mode

Stop Gate

The following modes are provided for the stop gate:

- a) Dry contact closure (NO). Timer stops at the closure of a normally open contact or upon conduction through a semiconductor device such as a SCR, triac, or transistor.
- b) Dry contact opens (NC). Timer stops at the opening of a normally closed contact or when conduction through a semiconductor device such as a SCR, triac, or transistor is interrupted.
- c) Application of ac or dc potential (ac/dc APPLIED). Timer stops when an ac potential (60-300 volt rms) or dc potential (5-300 volts) is applied.
- d) Removal of ac or dc potential (ac/dc REMOVED). Timer stops when an ac potential (60-300 volts rms) or dc potential (5-300 volts) is removed.

Timer Start

- a) Internal voltage initiate. Timer starts when voltage output is initiated
- b) Internal frequency initiate. Timer starts when preselected frequency is crossed.

Operating Temperature Range

32 to 113° F (0 to 45° C)

Storage Temperature Range

-20 to +158° F (-20 to 70° C)

Dimensions

Model FTS-1000:

7.25 H x 21.25 W x 9.0 D in.
(184 H x 540 W x 229 D mm)

Model FTS-1000 with carrying case

16.25 H x 24.5 W x 13.75 D in.
(413 H x 622 W x 349 D mm)

Weight

FTS-1000

35 lb (15.9 kg)

FTS-1000 with carrying case

42 lb (19 kg)

Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
Model FTS-1000	FTS1000	Test leads [3 pr]	1282
Included Accessories			
Line cord, North American [1 ea]	6628	10 A fuse [5 ea]	11333
Line cord, International [1 ea]	15065	5 A fuse [5 ea]	11335
Instruction manual [1 ea]	50685	8 A fuse [5 ea]	962
Carry case, soft-sided [1 ea]	15493	0.0625 fuse [5 ea]	987

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T +1 214 330 3203
F +1 214 337 3038

OVERSEAS TECHNICAL SUPPORT

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Mumbai INDIA, Trappes FRANCE,
Sydney AUSTRALIA, Madrid SPAIN
and the Kingdom of BAHRAIN.

Registered to ISO 9001:2000 Reg no. Q 09290

Registered to ISO 14001 Reg no. EMS 61262

EPA 2003-2004 Rev 07/02

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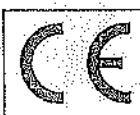
calibrator

YOKOGAWA

Handy Calibrators

EATON

- Source and measure operations can be performed at the same time.
(Select from the following source signal and measurement signal options: voltage, current, resistance, thermocouple (TC), resistance temperature detector (RTD), frequency, pulse).
- AC voltages, including supply voltage, can be measured.
- Includes a wide array of additional functions.
- Easy operation.
- Compact size and Lightweight



Actual Size

Yokogawa M&C Corporation

Bulletin CA71E



CA51/CA71

Handy Calibrators

Comprehensive source/measure instruments for all your calibration and equipment checking needs at maintenance sites

Sensors and instruments require a wide variety of operation checks in the field. The CA71 Handy Calibrator is a small, lightweight, multifunction calibrator that can simultaneously source and measure voltage, current, resistance, TC, RTD, frequency, and pulse signals. The CA51 Handy Calibrator is a basic model with the same functions as the CA71 except TC and RTD measurement functions and online communication functions.

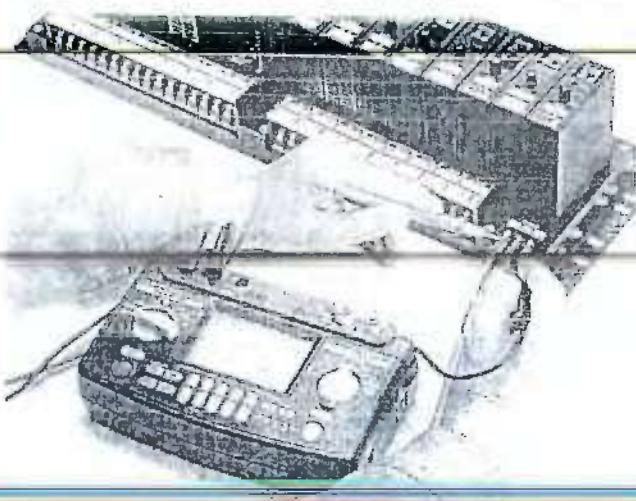
Simultaneous signal source and measurement capability

The CA71 lets you handle regular tests on TCs, RTDs and various other types of sensors and instruments, as well as operation checks when a problem has occurred. By itself it can source signals for input to equipment, and check output signal from equipment. With the CA71, you don't need to worry about synchronizing operations with other setting devices. (TC and RTD measurement functions are CA71 only.)



AC voltage (including supply voltage) measurement capability

In cases where numerous signal converters and other devices are mounted on a rack or panel, the Handy Calibrator can be used to check the input and output signals of each device, while simultaneously checking the power supply. There is no need for a separate multimeter to measure supply voltage.



A wide array of useful functions

• Source

Values set in steps of 4–20 mA
24V DC Power Supply to Transmitter

• Divided output (n/m) function

Output settings are divided, eliminating the need for bothersome calculations for percentage output.

• Autostep function

Changes the output value in step form based on the setting from the divided output (n/m) function. Changes can be sourced automatically every 10% or 25%.

• Online communication (CA71 only)

RS-232C-compliant optically isolated interface

• Sweep function

Linearly increases or decrease the output. The increasing/decreasing time can be set to either 16 or 32 seconds.

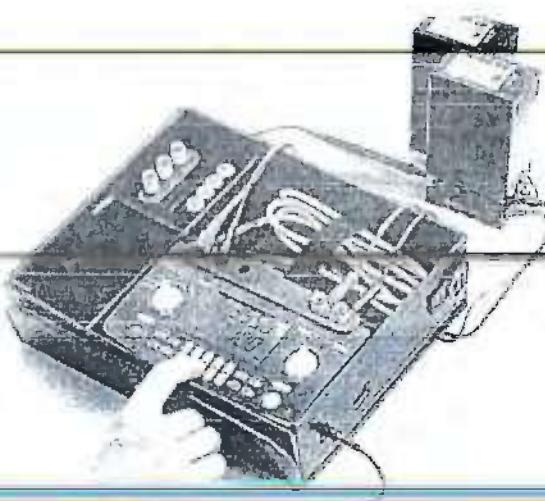
• Memory function

Source values and measurements forming individual value sets can be saved to or read from the Handy Calibrator's internal memory (maximum 50 value sets).

• Temperature monitor function

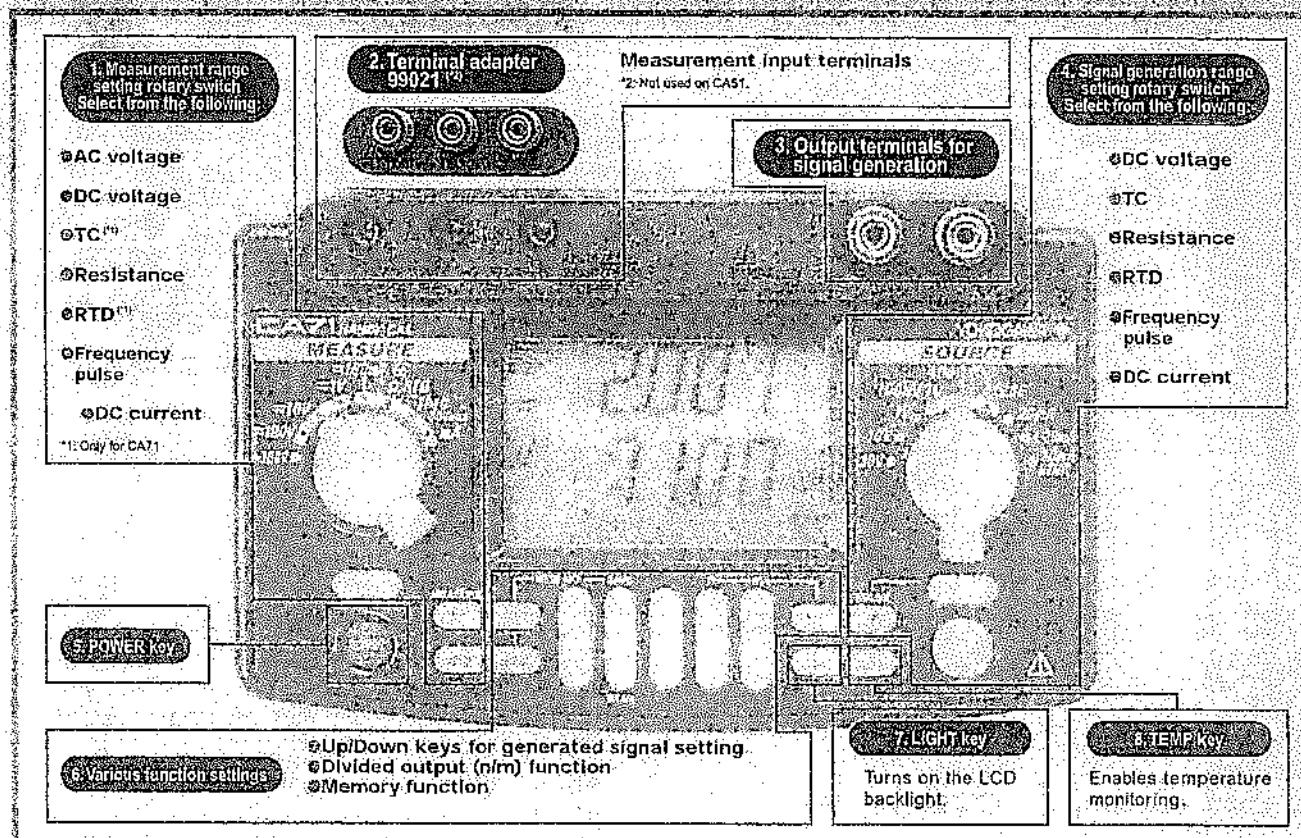
Easy operation

The Handy Calibrator incorporates rotary switches for simple handling. Just open the carrying case cover and connect the cables, and you're ready to take measurements.



Page no 26

Panel layout



Spare parts

Product	Source signal lead cable	Measurement lead cable	Carrying case	Terminal adapter	Fuses
Model	98020	RD031	93016	99021	A1501EF
Remarks	One set, including one red cable and two black cables. Length: approximately 1.7 meters	One set, including one red cable and one black cable. Length: approximately 1.0 meter	The carrying case can hold the source signal and measurement lead cables; terminal adapter, four spare batteries, fuses, AC adapter, and user's manual.	Used in temperature measurement (for CA71).	For current terminal input protection (10pcs/set)

Optional accessories (sold separately)

Product	AC adapter	RJ sensor	Accessories/Carrying case	Computer cable
Model	A1020UP, A1022UP, B9108WB	B9108WA	B9108XA	91017
Remarks	A1020UP: 100 V AC power supply adapter A1022UP: 120 V AC power supply adapter B9108WB: 220–240 V AC power supply adapter	For reference junction compensation	Can hold lead cables, RJ sensor, etc.	D-sub 9-pin (female)

Handy Calibrator main unit

Product	CA71 Handy Calibrator	CA51 Handy Calibrator
Model	CA71	CA51
Standard accessories	All of the following are included: Source signal lead cables (one red, two black): 98020 Measurement lead cables (one red, one black): RD031 Carrying case: 93016 Terminal adapter for CA71: 99021 User's manual: IM CA71-E Fuse: A1501EF (for current terminal input protection) Four AA alkaline batteries: A1070EB x4	

Related product

Product	Handy Calibrator test kit
Model	71010/21/30
Remarks	CA11: Voltage/current model CA12: Temperature model CA13: Frequency mode



CA51 and CA71 Specifications

Signal sourcing unit range and accuracy (for both CA51 and CA71)					
Parameter	Reference	Range	Accuracy (20°C per year)	Resolution	Remarks
DC voltage	100 mV	-10.00-110.00 mV	$\pm(0.02\% + 15 \mu V)$	10 μV	
	1 V	0-1.000 V	$\pm(0.02\% + 0.1 mV)$	0.1 mV	Maximum output 5 mA
	10 V	0-11.000 V	$\pm(0.02\% + 1 mV)$	1 mV	Maximum output 10 mA
	30 V	0-30.00 V	$\pm(0.02\% + 10 mV)$	10 mV	Maximum output 10 mA **
DC current	20 mA	0-24.999 mA	$\pm(0.025\% + 3 \mu A)$	1 μA	
	4-20 mA	4/6/12/16/20 mA	$\pm(0.025\% + 3 \mu A)$	4 mA	Maximum load: 12 V
mA SINK	20 mA	0.1-24.000 mA	$\pm(0.05\% + 3 \mu A)$	1 μA	External power supply: 5-28 V
Resistance	400 Ω	0-400.00 Ω	$\pm(0.02\% + 0.1 \Omega)$	0.01 Ω	
RTD	Pt100 **	-200.0-850 °C	$\pm(0.025\% + 0.3 ^\circ C)$	0.1 ^\circ C	If 0.1 mA, add 0.25 Ω or 0.5 °C. Subject device input capacitance: 0.1 μF or less
	JPt100	-200.0-500 °C	$\pm(0.025\% + 0.3 ^\circ C)$	0.1 ^\circ C	
TC **	K	-200.0-1372.0 °C	$\pm(0.02\% + 0.5 ^\circ C)$		
	E	-200.0-1000.0 °C	$\pm(0.02\% + 1.5 ^\circ C)$		
	J	-200.0-1200.0 °C	$\pm(0.02\% + 1 ^\circ C)$		
	T	-200.0-400.0 °C	$\pm(0.02\% + 0.5 ^\circ C)$		
	N	-200.0-1300.0 °C	$\pm(0.02\% + 1.5 ^\circ C)$		
	L	-200.0-900.0 °C	$\pm(0.02\% + 1 ^\circ C)$		
	U	-200.0-400.0 °C	$\pm(0.02\% + 1 ^\circ C)$		
	R	-200.0-1000.0 °C	$\pm(0.02\% + 2.5 ^\circ C)$		
Frequency pulse	S	-1768 °C	$\pm(0.02\% + 1.5 ^\circ C)$		
	B	(100 °C or greater)	$\pm(0.02\% + 1.5 ^\circ C)$		
	D	600-1800 °C	$\pm(0.02\% + 2 ^\circ C)$	1 ^\circ C	
		(1800 °C or greater)	$\pm(0.02\% + 1.5 ^\circ C)$		
Frequency pulse	500 Hz	1.0-500.0 Hz	0.1 Hz		Output voltage: +0.1-+15 V (zero base waveform)
	1000 Hz	9.0-1000 Hz	1 Hz		Amplitude accuracy: 10% + 0.1 V
	10 kHz	0.9 kHz-11.0 kHz	0.1 kHz		Maximum load current: 10 mA
	Pulse	1-99,999 cycles	1 cycle		Control output (with 0.5 V amplitude setting, FET switch ON/OFF): Maximum open/close voltage/duty: +24 VDC (100 ns)

*Temperature coefficient: Accuracy shown above ±1159°C.

**1. Output in Pt100 is possible when using the AC adapter.

2. As per JIS C 1602, 1603, 1604, 1605, 1606, 1607 through internal settings (DIP switch).

3. As per IEC 60068-2-29, if less than 1 ms to 0.5 ms, then add 0.035% (0.05%) or 0.06% (0.1%)

4. As per JIS C 1602, 1603, 1604, 1605, 1606, 1607 and L and U are DIP switch.

5. Frequency (interval between one pulse and another) and amplitude during pulse cyclic generation may have the same range as during frequency generation.

General specifications (for both CA51 and CA71)

Parameter	Specification
Signal generating unit response time	Approximately 1 second (time between start of voltage change and when voltage enters accuracy range)
Signal generating unit voltage limiter	Approximately 32 V
Signal generating unit current limiter	Approximately 25 mA
Divided output (mV) function	Output = setting × (mV) n = 0-n, m = 1-19 or 5 m
Auto-step output function	n value sent automatically when mV function selection is selected (two options: approximately 2.5 seconds/step or approximately 5 seconds/step)
Sweep function	Sweep time (two options: approximately 15 seconds or approximately 32 seconds)
Memory function	50 value sets (generated and measured values are stored as value sets with the same address [up to 50 value sets can be stored])
Measuring unit maximum input	Voltage terminal: 300 V AC. Current terminal: 120 mA DC
Current terminal input protection	Fuses: 125 mA/250 V
Measuring unit ground voltage	Maximum: 100 V AC
Measurement display updating rate	Approximately once per second
Serial interface	Enabled when communication cable (F15212) is connected, sold separately as optional accessory (CA71 only)
Display	Segmented LCD (approximately 76 mm × 48 mm)
Backlight	LED backlight, auto-off after one minute (from when LIGHT key is turned on)
Power supply	Four AA alkaline batteries, or special AC adapter (sold separately)
Battery life	Measurement off, output 5 V DC/10 h or greater: Approximately 40 hours Simultaneous sweep/selection/measurement, output 5 V DC/10 h or greater: Approximately 20 hours Simultaneous signal generation/measurement, output 20 mV 5 V: Approximately 12 hours (using alkaline batteries, with backlight off)
Consumed power	Approximately 7 VA (using 100 V AC adapter)
Auto power off function	Approximately 10 minutes (factory default setting) or selectable through a DIP switch setting
Applicable standards	IEC61913-5, IEC61913-5.3/1, IEC61913-5.1/2, IEC61913-5.4/5, IEC61913-5.5/6, IEC61913-5.7/8, IEC61913-5.9/10, IEC61913-5.11/12, IEC61913-5.13/14, IEC61913-5.15/16, IEC61913-5.17/18, IEC61913-5.19/20, IEC61913-5.21/22, IEC61913-5.23/24, IEC61913-5.25/26, IEC61913-5.27/28, IEC61913-5.29/30, IEC61913-5.31/32, IEC61913-5.33/34, IEC61913-5.35/36, IEC61913-5.37/38, IEC61913-5.39/40, IEC61913-5.41/42, IEC61913-5.43/44, IEC61913-5.45/46, IEC61913-5.47/48, IEC61913-5.49/50, IEC61913-5.51/52, IEC61913-5.53/54, IEC61913-5.55/56, IEC61913-5.57/58, IEC61913-5.59/60, IEC61913-5.61/62, IEC61913-5.63/64, IEC61913-5.65/66, IEC61913-5.67/68, IEC61913-5.69/70, IEC61913-5.71/72, IEC61913-5.73/74, IEC61913-5.75/76, IEC61913-5.77/78, IEC61913-5.79/80, IEC61913-5.81/82, IEC61913-5.83/84, IEC61913-5.85/86, IEC61913-5.87/88, IEC61913-5.89/90, IEC61913-5.91/92, IEC61913-5.93/94, IEC61913-5.95/96, IEC61913-5.97/98, IEC61913-5.99/100, IEC61913-5.101/102, IEC61913-5.103/104, IEC61913-5.105/106, 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IEC61913-5.795/796, IEC61913-5.797/798, IEC61913-5.79

Decade Inductance Box/ Decade Capacitance Box

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Decade Substitutors

Resistance • Capacitance • Inductance

RS-CS-LS Series

Economical, indispensable tools for a variety of uses in engineering, design, troubleshooting, or service.

These small, rugged substitutors can satisfy most requirements.

Features:

- Direct reading — No fumbling with multiple slide or rotary switches.
The IET family of digital substitutors uses convenient side-by-side thumbwheel switches. Simply dial in the desired values and use.
- Standard accuracies of 1%, 0.1%, and 0.05% available.
- Broad choice of standard and optional models.
A full line of standard substitutors satisfies most requirements.
- Direct readings eliminate potential mistakes that come from rotary or slide-switch boxes.
- For easy value readings, ranges are separated by color-coded switches and numbers.
- The units are small, rugged, and portable.
- Combination units, such as Resistance and Capacitance Substitutor (RCS-500), are available!

Options:

- Shielded case with grounding post
- Panel mounting
- Protection fuse

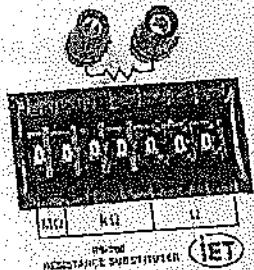
See also:

- [Decade box product guide](#)
- [LCR meter product guide](#)

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R-Box

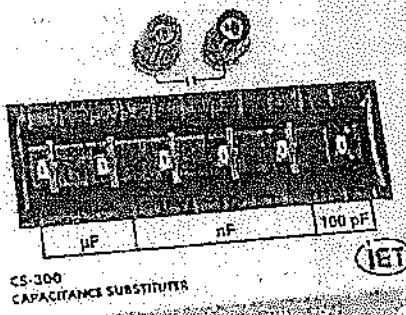
RS Series: Digital Resistance Substitutor



Available from 0.01 Ω to 299,999,999.9 Ω
(RS-200 Shown)

C-Box

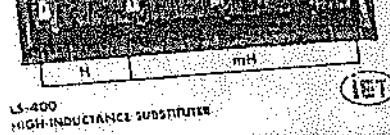
CS Series: Digital Capacitance Substitutor



Available from 1 pF to 999,999.9 μF
(CS-300 Shown)

L-Box

LS Series: Digital Inductance Substitutor



Available from 1 μH to 99,999.99 H
(LS-400 Shown)

RC-Box

RCS Series: Digital Resistance-Capacitance Substitutor



Combines RS and CS units in one box
(RCS-500 Shown)



IET LABS, INC. in the GenRad Tradition
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Decade Substitutors

Resistance • Capacitance • Inductance

RS-CS-LS Series

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Standard Models

RS Series -- Standard Models

Model	RS-200	RS-201	RS-200W	RS-201W	RS-200-2W	RS-201W-2W	RTD Simulator	RCS-500	RCS-502
Type	Resistance	Precision Resistance	Wide-Range Resistance	Wide-Range Precision Resistance	High-Power Resistance	High-Power Wide-Range Resistance			
Accuracy*	$\pm(1\% + 25 \text{ m}\Omega)$	$\pm(0.1\% + 25 \text{ m}\Omega)$	$\pm(1\% + 36 \text{ m}\Omega)$	$\pm(0.1\% + 36 \text{ m}\Omega)^{**}$	$\pm(1\% + 25 \text{ m}\Omega)$	$\pm(0.1\% + 36 \text{ m}\Omega)^{**}$	$\pm(0.1\% + 25 \text{ m}\Omega)$		
Decades	7		9		7	9	6		
Range	0 to 9,999,999 Ω		0 - 99,999,999.9 Ω		0 - 9,999,999 Ω	0 - 99,999,999.9 Ω	0-999.99 Ω		
Resolution	1 Ω		0.1 Ω		1 Ω	0.1 Ω	0.01 Ω		
Ratings***		0.5 W (rising to 2.5 W at step 9)			2 W (rising to 10 W at step 9)		0.5 W		
Residual	$\leq 0.39 \Omega$ ($\leq 0.056 \Omega/\text{decade}$)		$\leq 0.5 \Omega$ ($\leq 0.056 \Omega/\text{decade}$)		$\leq 0.39 \Omega$	$\leq 0.5 \Omega$	$\leq 0.34 \Omega$		
Components				Metal-film resistors; Manganin wire $\leq 0.9 \Omega$					
Mechanical	A		B		A	B	A	C	

CS Series -- Standard Models

Model	CS-300	CS-301	CS-301L	CS-300H
Type	Capacitance	Precision Capacitance	Precision, Low Capacitance	High Capacitance
Accuracy*	$\pm(4\% + 3 \mu\text{F})$	$\pm(10 \mu\text{F}; \pm(1\% + 3 \mu\text{F})$	$\pm(1\% + 3 \mu\text{F})$	$\pm(100 \mu\text{F}; \pm(4\% + 3 \mu\text{F})$
Decades	6		7	
Range	0 to 99,999.9 μF	0 - 9,999,999 μF	0 - 999,999.9 μF	
Resolution	100 μF	1 μF	100 μF	
Ratings***	100 V (25 V for 10 - 100 μF)	100 V (25 V for 10 - 1000 μF)	100 V (25 V for 10 - 1000 μF)	
Residual	$\leq 42 \mu\text{F}$ ($\leq 7 \mu\text{F}/\text{decade}$)	$\leq 49 \mu\text{F}$ ($\leq 7 \mu\text{F}/\text{decade}$)		
Components	1-900 μF , mica 1-9 μF , Polyester	0.001 - 6.9 μF , Polypropylene 10-900 μF , Tantalum		
Test Cond.	1 kHz; 1 Vrms; for $\geq 10 \mu\text{F}$: 120 Hz, series model, 23°C			
Mechanical		B		

LS Series -- Standard Models

Model	LS-400A	LS-400	LS-400L
Type	Inductance	High Inductance	Low Inductance
Accuracy*		$\pm(2\% + 0.5 \mu\text{H})$	
Decades	3	4	5
Range	0 to 999 mH	0 - 9.999 H	0-999,999 mH
Resolution	1 mH	1 mH	1 μH
Frequency Response		See http://www.ieltlabs.com/ls-series-inductance-decade-box.htm	
Residual	$\leq 0.17 \Omega; \leq 1 \mu\text{H}$ ($\leq 0.056 \Omega/\text{decade}$)	$\leq 0.23 \Omega; \leq 1 \mu\text{H}$ ($\leq 0.056 \Omega/\text{decade}$)	$\leq 0.34 \Omega; \leq 1.5 \mu\text{H}$ ($\leq 0.056 \Omega/\text{decade}$)
Components		Toroidal Inductors	
Test Cond.		1 kHz, 0.1 Vrms; series model, 23°C	
Mechanical		B	C

*Accuracy:

After subtraction of residual impedance
Traceable to SI

**Accuracy for RS-201W & RS-201W-2W:

$\leq 10 \text{ m}\Omega$: as shown above
 $\geq 10 \text{ m}\Omega$: 0.2%

***Rating:

Subject to switch maximum dielectric strength of 750 Vdc peak
or 550 Vrms, switching

Switches:

10-position thumbwheel switches
make-before-break

Maximum switch voltage:

750 Vdc peak or 550 Vrms, switching

Mechanical:

A: 8.1 x 7.9 x 5.6 cm, 184 g (3.2" x 3.1" x 2.2"; 6.5 oz)
B: 12.1 x 7.9 x 5.6 cm; 235 g (4.7" x 3.1" x 2.2"; 8.3 oz)
C: 18.8 x 11.6 x 6 cm; 410 g (7.4" x 4.3" x 2.4"; 14 oz)

Optional Models

RS - E - 4 - 0.1 - WG -

(Example: 0.1 Ω - 999.9 Ω , 1%
Resistance Substitutor in a standard case)

Type of Substitutor	Tolerance	No. of Decades	Resolution	Packaging/Options	Rating
RS: Resistance	A: 0.05%	1 to 10	0.01 Ω to 100 M Ω	WC: Standard	0.05, Standard
CS: Capacitance	B: 0.1%		1 pF to 100 pF	PM: Panel Mount w/out case	1W
LS: Inductance	C: 0.5%		1 μH to 10 H	SC: Shielded Case	2W
	D: 1%			FP: Supplied with 2A fuse	Other: Consult IET Labs
	E: 2%				
	F: 4%				
	G: 2%				
	H: 4%				



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TEL: (516) 334-5959 • EMAIL: info@ietlabs.com
HS/CS-LS Rev Catalog - May 2017

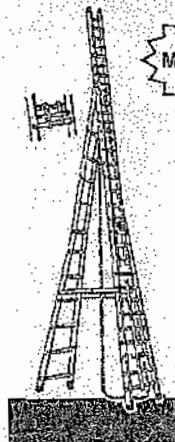
Truck with ladder

CD 190

"ALUMINIUM" LADDERS

Designed for Household / Commercial / Industrial Use

Light in weight * Convenient & Safe **Heavy Duty



SELF SUPPORTING CUM
EXTENSION LADDER

TECH. SPECIFICATIONS

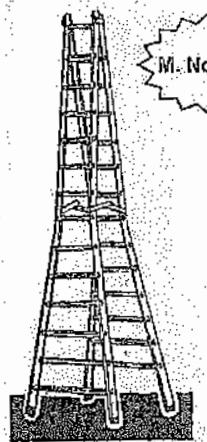
Closed	Extended
10 Ft.	18 Ft.
12 Ft.	21 Ft.
14 Ft.	25 Ft.
16 Ft.	29 Ft./30 Ft.
18 Ft.	32 Ft.
20 Ft.	35 Ft.
23 Ft.	40 Ft.
24 Ft.	43 Ft.



M. No. 502

SAFE LOAD
120 Kgs.

AVAILABLE IN
3 FEET
4 FEET
5 FEET
6 FEET
7 FEET
8 FEET

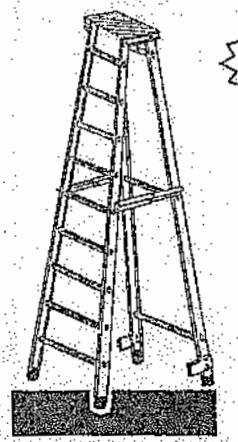


HY-STAGE Double Step
Trestle Ladder

TECH. SPECIFICATIONS

Height (in Feet) Available	
6 Ft.	14 Ft.
8 Ft.	16 Ft.
10 Ft.	18 Ft.
12 Ft.	20 Ft.

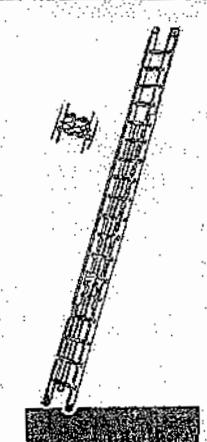
SPECIAL SIZE ON REQUEST



Folding Ladder

TECH. SPECIFICATIONS

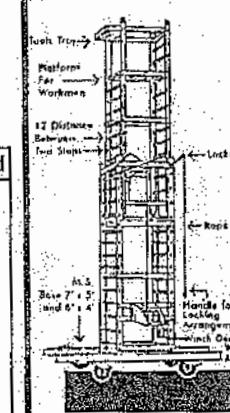
Height (in Feet) Available		
4 Ft.	10 Ft.	16 Ft.
5 Ft.	12 Ft.	18 Ft.
6 Ft.	14 Ft.	20 Ft.
8 Ft.	15 Ft.	



Wall supported Extension
Ladder

TECHNICAL SPECIFICATIONS

TWO SECTION		THREE SECTION	
Closed	Extended	Closed	Extended
8 Ft.	14 Ft.	10 Ft.	24 Ft.
10 Ft.	18 Ft.	12 Ft.	30 Ft.
12 Ft.	21 Ft.	14 Ft.	36 Ft.
14 Ft.	25 Ft.	16 Ft.	40 Ft.
16 Ft.	29/30 Ft.	20 Ft.	50 Ft.
18 Ft.	32 Ft.		
20 Ft.	35 Ft.		
23 Ft.	40 Ft.		
24 Ft.	43 Ft.		



M. No. 506

TECHNICAL SPECIFICATIONS

TWO SECTION		THREE SECTION	
Closed	Extended	Closed	Extended
8 Ft.	14 Ft.	10 Ft.	24 Ft.
10 Ft.	18 Ft.	12 Ft.	30 Ft.
12 Ft.	21 Ft.	14 Ft.	36 Ft.
14 Ft.	25 Ft.	16 Ft.	40 Ft.
16 Ft.	29/30 Ft.	20 Ft.	50 Ft.
18 Ft.	32 Ft.		
20 Ft.	35 Ft.		
23 Ft.	40 Ft.		
24 Ft.	43 Ft.		

SAI SIDDHI CORPORATION

416, Mangalwar Peth, Maldhakka Chowk, Behind Hotel Orient, Opp. Hotel Sai Heritage, Pune-411 011.
Tel.: 020-26140111 / Mob.: 9822602310 www.puneladders.com E-mail : gokulsatav@yahoo.com

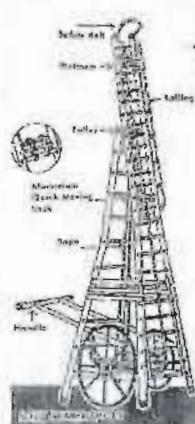


CP 191



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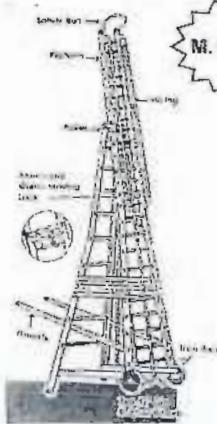
M. No. 507

SKY-LIGHT Road Star Tower Ladder

Spacial Size on Request

TECH. SPECIFICATIONS

Closed	Extended
10 Ft.	17 Ft.
12 Ft.	21 Ft.
14 Ft.	25 Ft.
16 Ft.	29 Ft/30 Ft.
18 Ft.	32 Ft.
20 Ft.	35 Ft.
23 Ft.	40 Ft.
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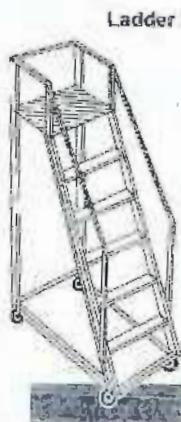


M. No. 513

SKY-LARK Trolley Telescopic Tower Ladder

TECH. SPECIFICATIONS

Closed	Extended
10 Ft.	17 Ft.
12 Ft.	21 Ft.
14 Ft.	25 Ft.
16 Ft.	29 Ft/30 Ft.
18 Ft.	32 Ft.
20 Ft.	35 Ft.
23 Ft.	40 Ft.
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Ladder Step Trolley

LST 101

TECHNICAL SPECIFICATIONS

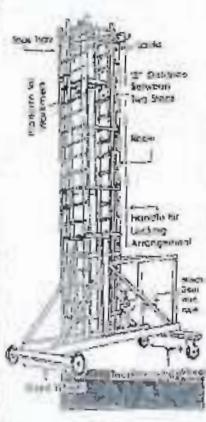
Height (in feet) Avb.
6 Ft.
8 Ft.
10 Ft.
12 Ft.
SPECIAL SIZE ON REQUEST

TILTABLE TOWER LADDER

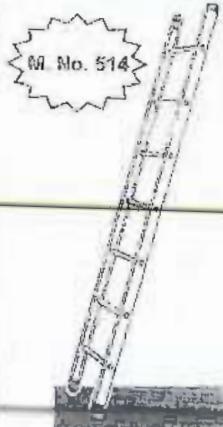
M. No. 512

TECHNICAL SPECIFICATIONS
TWO SECTION THREE SECTION

Closed	Extended	Closed	Extended
8 Ft.	14 Ft.	10 Ft.	24 Ft.
10 Ft.	18 Ft.	12 Ft.	30 Ft.
12 Ft.	21 Ft.	14 Ft.	36 Ft.
14 Ft.	25 Ft.	16 Ft.	40 Ft.
16 Ft.	29/30 Ft.	20 Ft.	50 Ft.
18 Ft.	32 Ft.	24 Ft.	60 Ft.
20 Ft.	35 Ft.		
23 Ft.	40 Ft.		
24 Ft.	43 Ft.		



Wall Single Ladder



M. No. 514

TECH. SPECIFICATIONS

Height (in feet) Avb.
5 Ft.
6 Ft.
8 Ft.
10 Ft.
12 Ft.
14 Ft.
15 Ft.
16 Ft.
18 Ft.
20 Ft.
24 Ft.
30 Ft.



M. No. 517

TECH. SPECIFICATIONS
TWO SECTION THREE SECTION

Closed	Extended	Closed	Extended
8 Ft.	14 Ft.	10 Ft.	24 Ft.
10 Ft.	18 Ft.	12 Ft.	30 Ft.
12 Ft.	21 Ft.	14 Ft.	36 Ft.
14 Ft.	25 Ft.	16 Ft.	40 Ft.
16 Ft.	29/30 Ft.	20 Ft.	50 Ft.
18 Ft.	32 Ft.	24 Ft.	60 Ft.
20 Ft.	35 Ft.		
23 Ft.	40 Ft.		
24 Ft.	43 Ft.		

- AVAILABLE IN 3 TO 8 STEPS
- 3 Ft. to 70 Ft. available

- 2 YEARS WARRANTY
- SAFE LOAD 120 Kgs.

Service Is The Best At your Door Steps