

KIKUSUI ELECTRONICS CORPORATION

MODEL 149-30A

DC HIGH-VOLTAGE DIGITALMETER

INSTRUCTION MANUAL

Power Requirements of this Product

er requirements of this product have been changed and the relevant sections of the Operation manual should be revised accordingly.
 revision should be applied to items indicated by a check mark (R)

input voltage

the input voltage of this product is $\frac{120}{VAC}$

and the voltage range is $\frac{108}{132}$ to $\frac{132}{VAC}$. Use the product within this range only.

input fuse

the rating of this product's input fuse is _____ A, _____ VAC, and _____

WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.

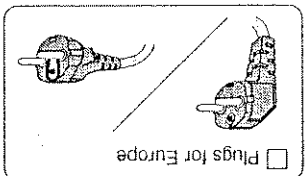
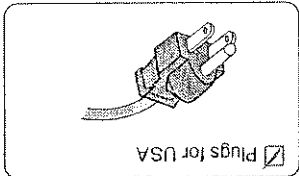
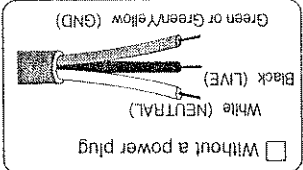
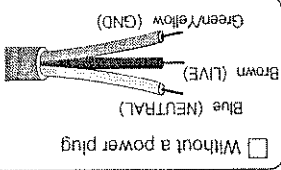
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

AC power cable

The product is provided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.



Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable. For further information, contact your Kikusui agent.

Another Cable

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Kikusui Model 149-30A DC High Voltage Digitalmeter measures a DC voltage of up to ± 30 kV, with a high accuracy.

As the meter input impedance is as high as 1000 M Ω , the meter is best suited for measurement of the high DC voltage of a high source impedance circuit, such as the high voltage circuit of a television set.

The meter is compact and light (approx. 7.5 kg or 17 lbs), but its measuring accuracy is high. Thus the meter can also be used conveniently as a portable calibration instrument.

1. GENERAL

2. SPECIFICATIONS

| | |
|---|---|
| External dimensions: | 203 W x 273 H x 313 D mm (7.99 W x 10.75 H x 12.32 D in.) |
| (Maximum dimensions): | 210 W x 300 H x 385 D mm (8.27 W x 11.81 H x 15.16 D in.) |
| Weight (net): | Approx. 7.5 kg (17 lbs) |
| Power requirements: | 100 V \pm 10%, 50/60 Hz AC, approx. 7 VA |
| Measuring range: | \pm (0.50 to 30.00) kV |
| Measuring accuracy: | \pm (0.5% rdg + 2 digits) |
| Maximum allowable input voltages | DC: \pm 33 kV Pulse: 40 kV peak |
| Display: | 7-segment LEDs |
| Type of voltmeter: | Double integration type. 3 samples/sec. |
| Input resistance: | 1000 M Ω \pm 2% |
| Specification ambient temperature and humidity: | 5°C to 35°C (41°F to 95°F), less than 80% Operable ambient temperature and humidity: 0°C to 40°C (32°F to 104°F), less than 80% |
| Accessories: | Input terminal cover..... 1 Wrench (hex bar) 1 Instruction manual 1 |

3. PRECAUTIONS BEFORE USE

3.1 Unpacking

The instrument is shipped after fully inspected and tested. When it is delivered, immediately unpack and check it. If there is any damaged sustained when in transportation, immediately notify the bearer and the dealer.

3.2 Precautions

- (1) Pay attention to the high voltage to be measured. When the voltage is being generated, keep hands off from the high voltage circuit.
- (2) Be sure to ground the GND terminal on the rear panel of the instrument to a good earth ground.

- (3) Be sure to securely connect both high and low lines between this instrument and the measured object. Hazards may be caused if the high voltage line is disconnected from the input terminal of the instrument when a high voltage is being applied. Also note that, even when the low voltage line is disconnected, the instrument casing may be charged up to a hazardously high voltage and the instrument may be damaged also.

- (4) Operate the instrument within the ambient temperature and humidity ranges and the input power voltage range mentioned in the specifications.

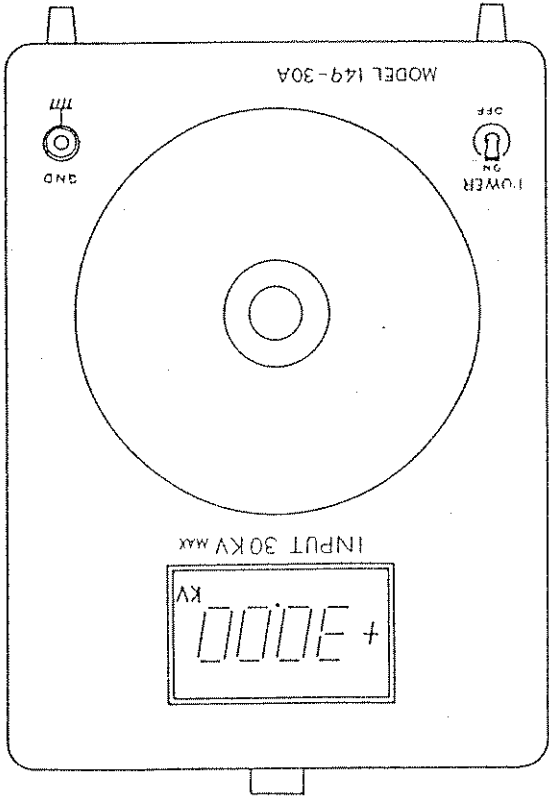
- (5) Calibrate the instrument once a year at least.

(6) When the instrument is operated for a long time in dusty atmosphere, dust may be collected on the high voltage terminal section, thereby resulting in input resistance degradation and indication error. At appropriate intervals clean the high voltage terminal section and internal insulators using a clean, dry cloth.

4. OPERATION METHOD

4.1 Explanation of Front Panel

DISPLAY:
Indicates measured voltage.



GND TERMINAL:
Connect low voltage
line of measured
voltage to this
terminal.

INPUT TERMINAL:
Connect high voltage line of
measured voltage to this terminal.
POWER SW:
For ON-OFF control
of instrument power.

(4) Connect the high voltage input terminal of this instrument to the high voltage line of the measured input voltage using a cable of rated withstanding voltage of 30 kV or over. Make it double sure that the cable is securely connected to the terminal using the hex bar wrench supplied, for very dangerous state can be caused if the cable is disconnected.

(3) Turn off the measured voltage source. Connect the low voltage line of the measured voltage to the GND terminal, thereby connecting the low voltage line also to the earth. Make it sure that no problem occurs when the low voltage line of the measured voltage source is connected to the earth.

(2) Connect the AC power cord to an AC power line outlet of the correct voltage, and turn-ON the POWER switch. Allow more than 15 minutes of stabilization period.

(1) Connect the GND terminal of the rear panel to a good earth ground. Note that, unless the GND terminal is securely connected to the earth, a hazardously high voltage will be induced on the casing when the ground line from the measured voltage source is disconnected accidentally. Be sure to check the earth ground when using this instrument.

4.3 Measuring Method

FUSE: Power line fuse, 0.5 A
GND: For grounding the instrument casing to earth.

CALIBRATION: Semi-fixed resistor for adjustment of full scale of the display.

4.2 Explanation of Rear Panel

As above, when the source impedance is lower than 10 M Ω , the error caused impedance-wise is less than 1%. Measurement can be done with an accuracy of this error plus meter accuracy.

$$E_0 < E \leq 1.01 \times E_0$$

When $r_0 \leq 10 \text{ M}\Omega$ for example,

In most cases the value of source impedance (r_0) is unknown. In such cases, use the above equation as follows:

where, E: True voltage
E₀: Meter reading
r₀: Source impedance of measured voltage

$$E = E_0 \left(1 + \frac{1000 \text{ M}\Omega}{r_0} \right)$$

follows:
The meter input impedance is very high (1000 M Ω). When the voltage source impedance is substantially high, however, errors can be caused. In such cases, make correction calculation as follows:

4.4 Correction of Errors Caused by Impedance

(5) Turn on the power of the measured voltage source. The measured voltage will be applied to the instrument which will indicate the measured voltage on its display.

To measure a voltage higher than $\pm 20 \text{ kV}$, use the input terminal cover to prevent discharge from the high voltage input terminal section.

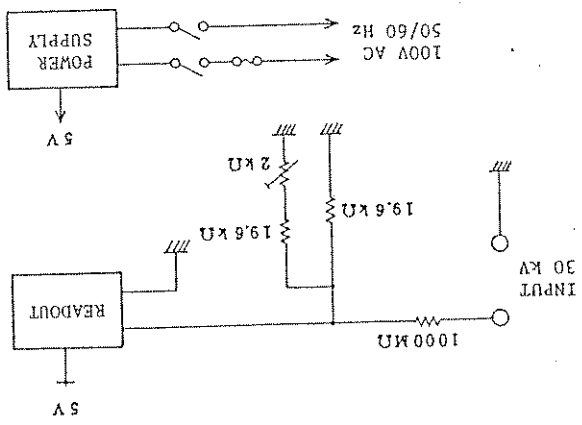
when in measurement. If no suitable cable is available, contact Kikusui agent in your area.

(3) Power supply: Provides a 5-V supply power for the display unit.
 this voltage as "30.00".
 0.3-V voltage and the display unit indicates

(2) Display: The display unit is a digital voltmeter of 2.0000 V full scale. The 30-kV input voltage is divided by the divider into a

(1) Voltage divider: The 1000-megohm voltage divider consists of thirty 33-megohm resistors and one 10-megohm resistor of high voltage type. The divider provides a high voltage dividing accuracy. The dividing ratio is $1/10^5$.

5.2 Description of Components



5.1 Block Diagram

5. OPERATING PRINCIPLE

6. MAINTENANCE

6.1 Calibration

(1) Instruments required for calibration

Prepare a standard voltage generator which will provide a DC voltage of 30 kV $\pm 0.05\%$. If no such standard voltage generator is available, use other voltage source available and known to be accurate or contact Kikusui agent in your area.

(2) Precautions

(a) A hazardously high voltage of 30 kV is used for calibration of the instrument. Be extremely careful when handling such high voltage.

(b) Before calibration, allow more than 30 minutes of stabilization time.

(3) Calibration

Apply a standard voltage of 30 kV DC to the input terminal of the instrument and so adjust the CALIBRATION semi-fixed resistor on the rear panel that the readout unit indicates "30.00".

