User's Manual

Model 3226
Universal Leakage Current Tester

Read this user's manual before using the instrument in order to fully and correctly utilize all its functions.

Model: 322610 Universal Leakage Current Tester
322710 Test Box

Contact information of Yokogawa offices worldwide is provided on the following sheet.

PIM 113-01Z2: Inquiries List of worldwide contacts

Store this manual in an easily accessible place for quick reference.

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YOKOGAWA ◆
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General

Model 3226 is a special milliammeter for measuring leakage current of electrical appliances. The input resistance can be selected from among 1, 1.5 and 2 kΩ for easy measurement.
Model 3226 is usable for product inspection on production lines and for experimental measurement in research and design activities. **Model 3227** Test Box is available for the convenience of measurement.

Model 3226 has the following features:

(1) 4-way function: AC current, DC current, DC + AC current and AC voltage are measurable.
(2) High accuracy: ±2.5% of full scale.
(3) High sensitivity: 0.1 mA for full scale.
(4) TAUT BAND system meter free of friction and strong against vibration and shock.
(5) Overload protective circuit to prevent the meter coil from burning and the meter pointer from bending
(6) Shielded case to eliminate effect of external high-frequency electric field.
(7) Compact and lightweight for easy portable use.

Safety Precautions

When operating the instrument, be sure to observe the cautionary notes given below to ensure correct and safe use of the instrument. If you use the instrument in any way other than as instructed in this manual, the instrument's protective measures may be impaired. YOKOGAWA is by no means liable for any damage resulting from use of the instrument in contradiction to these cautionary notes.

The following safety symbols are used on the instrument and in this manual.

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

⚠WARNING

Indicates a hazard that may result in the loss of life or serious injury of the user unless the described instruction is abided by.

⚠CAUTION

Indicates a hazard that may result in an injury to the user and/or physical damage to the product or other equipment unless the described instruction is abided by.

NOTE

Indicates information that is essential for handling the instrument or should be noted in order to familiarize yourself with the instrument's operating procedures and/or functions.

~ This symbol indicates AC voltage/current.

This symbol indicates a Fuse.

⏚ This symbol indicates ground (earth).

To avoid injury, death of personnel, carefully observe and follow the warnings listed below:

⚠WARNING

- **Measurement**
  - Do not operate the instrument over 250 V of high-voltage circuit.
  - Do not touch the Input (Output) terminals, when measuring voltage.
- **Measuring leads**
  - Use the leads supplied by Yokogawa for the instrument concerned.
  - Do not use a deteriorated or damaged leads.
  - If the signal cable of the leads is torn and the inner metal is exposed or if a color different from the outer sheath appears, stop using the cable immediately.
  - Check the leads continuity.
  - Do not attach/detach the leads to /from the instrument prior to releasing it from the measured object.

⚠WARNING

- **Protection**
  - Be sure to use the designated fuse (Rating: voltage, current and type) to prevent fire.
  - If there are any cracks or other damage in the case because of being dropped or struck, the instrument may not be safety insulated. Do not use the instrument before any remedial measures are taken.
- **Replacement of batteries or fuse**
  - Prior to detaching the cover for replacing the batteries or fuse, release the lead from the measured object and turn off the switch.
- **Operating Environment**
  - Do not operate the instrument in a flammable or explosive gas atmosphere.
  - Do not operate the instrument if there is condensation on it.
- **Do Not Remove the Case or Disassemble**
  Do not open the case except when replacing batteries or fuse.
  Only Yokogawa service personnel are authorized to remove the casing or disassemble or modify the instrument.
  Do not attempt to repair the instrument yourself, as doing so is extremely dangerous.

To avoid injury of personnel or damage to the instrument, carefully observe and follow the cautions listed below:

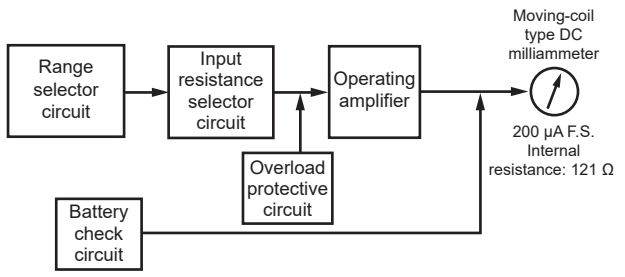
⚠CAUTION

- **Measurement**
  Do not apply a voltage and current over the allowable limits between the terminals.
- **Selector switch**
  Do not switch the Measuring range selector switch during measurements.
- **Batteries**
  - Do not use different types of batteries together or new and old batteries together.
  - If the instrument is not used for a long period, store the instrument with the batteries removed.
    Otherwise, any leakage from the batteries may damage the instrument.

NOTE

Model 3226 has AC + DCmA range. This is used mainly for the instrument which is operated by DC after rectifying, AC to DC. Therefore, measured value on this range does not indicate RMS value, but the sum of DC and AC components directly.

1. Block Diagram



2. Parts Identification and Function

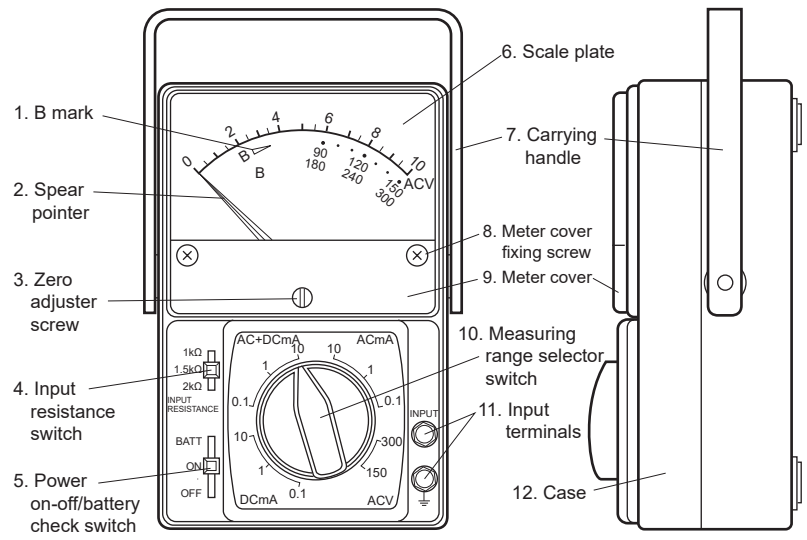


Fig. 1 Parts Identification

1. B mark: The battery is usable if the meter pointer is within this range when the BATT/ON/OFF switch is set to the BATT position.
2. Spear pointer
3. Zero adjuster screw: To be turned with a screwdriver for readjusting zero indication of the pointer.
4. Input resistance switch: Selects one of the three input resistances according to the applicable standard.
5. Power on-off/ battery check switch
6. Scale plate: The scale is double graduated in mA and AC V.
7. Carrying handle
8. Meter cover fixing screw
9. Meter cover
10. Measuring range selector switch: To be set to an appropriate position according to the measuring item and range.
11. Input terminals: Accessory H-lead is to be connected to the "INPUT" terminal, and L-lead to the " ⏚ " (ground) terminal.
12. Case

3. Operation

3.1 Precautions

1. The most accurate measurement is attained when Model 3226 is placed horizontally.
2. After placing Model 3226 at the position of use, check that the meter pointer coincides with the zero point of the scale, if not, adjust it accurately by turning the zero adjuster screw.
3. When the approximate value of the leakage current to be measured is unpredictable, measure by first setting the measuring range selector switch to the 10 mA position.
4. Before measurement, be sure to check that the measuring range selector switch is in a position proper for the measurement.
   Do not operate the switch while the meter pointer is deflecting.
5. When storing of carrying Model 3226 after use, set power on-off/battery check switch.

3.2 When using Model 322710 Test Box

⚠WARNING

Before using this instrument, it is necessary to match the polarity with that of the power plug. Applying 100 V AC to the cabinet of the appliance to be tested without matching the polarities may cause an electric shock.

● Matching the polarity

Connect the power cord to the power supply.
Turn the power switch to ON and measure the voltage between the earth and the TEST terminal of this instrument using a Universal leakage voltage tester (3226 or similar).
If the voltage between the earth and the TEST terminal of this instrument is

- AC30 V or less: the instrument can be used;
- More than AC30 V: use the accessory 3-2 pin adapter and reconnect the power plug opposite (i.e. turning 180 degrees).

1. Set the power ON–OFF/battery check switch to the “BATT” position and check the condition of the battery. If the meter pointer is within the battery check-line range, set the switch to the “ON” position. (If the meter pointer is not within the battery check-line range, remove the back cover and change the batteries.)
2. Set the measuring range selector switch to ACV position of Model 3226. Connect the ground terminal of Model 3226 to the TEST terminal of Model 3227, then close switch S1.
3. Connect the “INPUT” terminal (H) of Model 3226 to either of the connector C_1 of Model 3227, and measure the power voltage to check that the voltage is as rated.
   (If the polarity is opposite, the meter pointer will be zero; in this case use switch S2 to change the polarity.)
4. Open switch S1, and connect all the simultaneously accessible exposed conductive surfaces of the to-be-tested appliance together to the “INPUT” terminal (H) of Model 3226.
5. Input power plug P2 of the to-be-tested appliance, and turn on all the appliance’s switches.
6. Leakage current is not necessarily only in the AC spectrum, therefore set the measuring range selector switch to AC + DC mA range.
7. Close switch S1 of Model 3227, and read the meter of Model 3226. This reading will tell you the approximate value of the leakage current.
8. Referring to the value obtained in number 7. above, set the range of the ACmA to the optimum range, and read the meter of Model 3226.
9. Change switch S2 of Model 3227, read the meter of Model 3226, and use the greater one of the above meter readings as the leakage current value.
10. Set the measuring range selector switch of Model 3226 to the DCmA range, and read the meter of Model 3226.
11. Repeat the measurement conducted in number 9. above.
12. Start operating the appliance. When the appliance has reached its steady operating status, measure its leakage current. When not using the Model 3227 Test Box, compose a circuit similar to that shown in Figure 2 and measure.

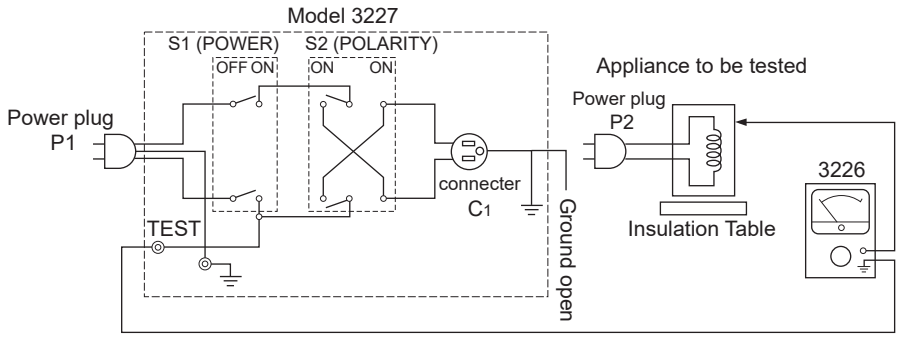


Fig. 2 Connection Diagram

4. Calibration

4.1 Instruments necessary for calibration

Instrument	Requirements	YOKOGAWA equivalent
Standard DC power supply	Output: 10 mA Accuracy: 0.5 %	Model 2552
Standard AC power supply	Output: 10 mA Accuracy: 0.5 %	Model 2558 Model 2558A

4.2 Procedure

1 Set the input resistance to 1 kΩ by using the input resistance switch of Model 3226.
2 Set the power on-off/battery check switch to the “ON’’ position, and adjust the meter pointer to the zero point of the scale by using the variable resistor RV2 inside the case.
3 Set the measuring range selector switch to the DC 1 mA position, supply 1 mA from the standard PC power supply, and adjust the RV1 variable resistor inside the case so that the meter is showing the full scale.
4 Conduct adjustment in the same manner as above, while the measuring range selector switch is set to DC 10 mA, AC 1 mA and AC 10 mA positions in sequence. If indication error is large, test and adjust for the most uniform and highest accuracy of all the measuring ranges.
5 Repeat the foregoing, with the input resistance set to 1.5 and 2 kΩ in sequence.

5. Specifications

5.1 Model 322610

Measuring ranges:	DC current:	0.1, 1 and 10 mA
	AC current:	0.1, 1 and 10 mA
	DC+AC current:	0.1, 1 and 10 mA
	AC voltage:	150 and 300 V (50 or 60 Hz)
Accuracy:	±2.5% of F.S. (at each range)	
Input resistance:	Current measuring range: 1, 1.5 and 2 kΩ Voltage measuring range: Higher than 100 kΩ	
Working frequency range:	20 Hz to 5 kHz	
Overload protection:	Withstands 30 mA AC for 1 minute for each current measuring range.	
Effect of temperature:	Less than ±0.2%/°C with respect to rated value (within 20 ±10°C)	
Insulation resistance:	Higher than 100 MΩ at 1000 V DC between electric circuit and case.	
Withstand voltage:	1500 V AC (50 Hz) for 1 minute between electric circuit and case.	
Power source:	Two 9 V dry batteries 6F22. Usable for approx.: 290 hour.	
Dimensions	Approx. 190×124×90 mm (excluding carrying handle)	
Weight:	Approx. 1 kg	
Accessories:	Measuring lead (B9607GT)	1
	Carrying bag (B9646BU)	1
	User’s manual	1

5.2 Model 322710

Current capacity:	10 AAC (125 V)
Contact resistance:	Lower than 0.005 Ω
Insulation resistance:	Higher than 100 MΩ at 500 V DC between electric circuit and case.
Withstand voltage:	1000 V AC for 1 minute between electric circuit and case.
Dimensions	Approx. 70×155×65 mm
Weight:	Approx. 0.6 kg
Accessories:	3 to 2 pin adapter

Model 3227 Test Box

6. Maintenance

For accurate measurement at all times, Model 3226 must be kept in the best condition.
For this purpose, avoid using Model 3226 at a place subject to:

(1) Severe vibration
(2) Fill of dust or corrosive gas
(3) Direct sunlight
(4) Much moisture
(5) Large variation of ambient temperature
(6) Strong external magnetic field

- Both surfaces of the meter cover are coated with anti-static agent. Do not wipe them hard or clean them with wet cloth, because such may deteriorate the anti-static effect. (Use dry, soft cloth, and wipe them lightly with it.)
- The case and meter cover are made of thermoplastic material. Be careful not to touch them with a soldering iron or other hot object. Do not clean them with a large quantity of lacquer thinner, benzine or alcohol.