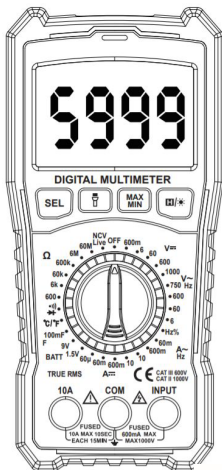


EN V31
Multimeter


SOLIGHT

Thank you for purchasing our equipment. Please read this manual carefully and heed the safety warnings and instructions before installing, using or repairing the equipment. This will ensure not only the protection of persons, but also the long life of the equipment. This meter ensures safe operation in a CAT III 600 V environment.















1. SAFETY NOTICE

The product meets IEC 61010 safety standard and CAT III 600V, RoHS, pollution degree 2 and double insulation standards.

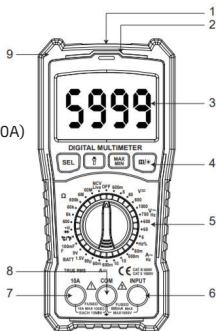
- Do not use the device or its components if they are damaged. Pay particular attention to the insulation.
- If the test leads are damaged, they shall be replaced with leads of the same type or electrical specification.
- Do not touch exposed wires, connectors, unused inputs or the circuit being measured.
- When measuring voltages higher than 60 V DC or 36 V AC rms, keep your fingers behind the finger guard on the measuring cable to prevent electric shock.
- If the range of the measured voltage is not known, the maximum range should be selected and then gradually reduced.
- Never enter a voltage and current higher than the value indicated on the instrument.
- Before switching ranges, make sure to disconnect the test leads with the circuit under test. It is strictly forbidden to switch ranges during measurement.
- Do not use or store the device in an environment with high temperature, high humidity, flammables, explosives or strong magnetic fields.
- Do not interfere with the internal circuitry of the equipment to prevent damage to the equipment and injury to the user.
- To prevent erroneous readings, replace the battery when the battery indicator " " appears.
- Use a dry cloth to clean the case, do not use cleaning agents containing solvents.

2. Description of symbols

	Double insulation
	Grounding
	DC (direct current)
	DC or AC
	Automatic range
	Non-contact voltage test
	Electromagnetic field symbol
	AC (alternating current)
	Low battery voltage symbol
	Automatic shutdown
	Celsius and Fahrenheit units
	Electric torch

3. Device description

1. NCV sensing area
2. Electric torch
3. LCD display
4. Function buttons
5. Rotary function switch
6. INPUT connector (except 10A)
7. 10A connector
8. COM connector
9. Case



TECHNICAL PARAMETERS

Accuracy guaranteed for 1 year 23±5°C, ≤80%RH

4. DC voltage (automatic range)

Range	Resolution	Accuracy
600mV	0.1mV	±(0.8% of rdg + 5dgts)
6V	1mV	±(0.8% of rdg + 3dgts)
60V	10mV	
600V	100mV	
1000V	1V	±(1.2% of rdg + 5dgts)

Input resistance: 10MΩ

Overload protection: 1000V DC/750V AC rms

Max. Input voltage: 1000V DC

4.1 Capacity (automatic range)

Range	Accuracy
10nF ~ 60mF	±(5.0% of rdg + 5dgts)

Overload protection: 250V DC/AC rms

4.2 AC voltage (automatic range)

Range	Resolution	Accuracy
600mV	0.1mV	±(1.2% of rdg + 8dgts)
6V	1mV	±(1.0% of rdg + 8dgts)
60V	10mV	
600V	100mV	
750V	1V	±(1.5% of rdg + 8dgts)

Input resistance: 10MΩ

Frequency range: 40Hz~400Hz

Overload protection: 750V DC/AC rms

Maximum input voltage: 750V AC rms

Response: True-RMS

4.3 Resistance (automatic range)

Range	Resolution	Accuracy
60 Ω	0.01 Ω	$\pm(1.5\%$ of rdg + 5dgt)
600 Ω	0.1 Ω	
6K Ω	1 Ω	
60K Ω	10 Ω	
600K Ω	100 Ω	
6M Ω	1K Ω	
60M Ω	10K Ω	

No-load voltage: approx. 0.25 V

Overload protection: 250V DC/AC rms

4.4 Frequency (automatic range)

Range	Resolution
10Hz-10MHz	$\pm(1.5\%$ of rdg + 5dgt)

Overload protection: 250 V DC/AC rms

Input sensitivity > 3vpp

4.5 DC (automatic range)

Range	Resolution	Accuracy
600 μ A	0.1 μ A	$\pm(1.0\%$ of rdg + 5dgt)
6000 μ A	1 μ A	
60mA	10 μ A	
600mA	100 μ A	
6A	1mA	$\pm(2.5\%$ of rdg + 5dgt)
10A	10mA	

Measurement voltage drop: 200 mV

4.6 AC current (automatic range)

Range	Resolution	Accuracy
600 μ A	0.1 μ A	$\pm(1.5\%$ of rdg + 10dgts)
6000 μ A	1 μ A	
60mA	10 μ A	
600mA	100 μ A	
6A	1mA	$\pm(3.0\%$ of rdg + 10dgts)
10A	10mA	

Measurement voltage drop: 200 mV

Frequency range: 40 to 400 Hz

Response: True-RMS

4.7 Temperature

Range	Resolution	Accuracy
-40~ 1000°C	1°C	-40~150°C: $\pm(1\% + 4^\circ\text{C})$
		150~1000°C: $\pm(2\% + 3^\circ\text{C})$
-40~ 1832°F	1°F	-40~302°F: $\pm(5\% + 4^\circ\text{F})$
		302~1832°F: $\pm(2.5\% + 3^\circ\text{F})$

Overload protection: 250 V DC/AC rms

4.8 Duty cycle

Range	Accuracy
10%-95%	$\pm(1.5\%$ of rdg + 5dgts)

Overload protection: 250 V DC/AC rms

4.9 Batteries

Range	Resolution	Internal resistance
9V	10mV	900 Ω
1.5V	1mV	75 Ω




Open circuit voltage: approx. 0.25 V

Overload protection: 250V DC/AC rms


5) Specifications

- Maximum voltage between input terminal and ground: 600 Vrms
- 10A clamp: fuse 10A 600V Quick Fuse Φ 5x20mm
- Input terminal: 500mA 600V fuse Quick fuse Φ 5x20mm
- Maximum display 5999, display above the range shown as "OL", update rate: 2~3 times/second
- Backlight: manual on/off or automatic switch off after 30 seconds.
- Polarity: '-' negative polarity
- Display and hold the measured value: the "H" symbol appears on the display when the function is activated.
- Low battery: When the battery is low, the symbol "E3" will appear on the LCD display.
- Battery: 2 x AAA 1.5 V
- Operating temperature: 0~40°C (32~104°F)
- Storage temperature: -10~50°C (14~122°F)
- Relative humidity: \leq 75%RH
- Operating altitude: 0 ~ 2000 m
- Dimensions: 186x87x50 mm
- Weight: approx. 310 g (including battery and case)

6) Function of the buttons

- **SEL** button: It is used for other functions assigned to the range.
- Button : Press the button to turn on the flashlight on the front of the meter, press the button again to turn it off.
- Button : Press the button to enter the maximum and minimum measurement mode. Press the button to sequentially display the maximum and minimum values in the cycle. Hold the button for more than 2 seconds to exit the maximum and minimum measurement mode.
- Button : Press the button to enter or exit the data retention mode. Long press the button to turn the backlight on/off. If you do not perform any operation, the backlight will turn off automatically after 30 seconds.

7) Operations

If the low battery symbol " " is displayed, replace the battery to prevent erroneous data from being displayed. Also pay special attention to the warning sign next to the test lead socket, which warns that the voltage or current tested must not exceed the values indicated on the instrument.


7.1 AC/DC Voltage measurement

- Set the rotary control to V_{\sim} or V_{DC} mV.
- Insert the black measuring cable into the COM connector, the red measuring cable into the INPUT connector.
Connect the test leads to the load in parallel.

Remark:

- Do not measure voltages higher than 1000 V rms, otherwise electric shock and damage to the instrument may occur. If the range of voltage to be measured is not known, select the maximum range and reduce it accordingly.
- Take extra care when measuring high voltage to avoid electric shock.
- Before using the device, it is recommended to measure a known voltage to verify functionality.

7.2 Resistance measurement

- Set the rotary function dial to .
- Insert the black test cable into the "COM" connector and the red one into the "INPUT" connector.
Connect the test leads with the resistor in parallel.

Remark:

- Before measuring the resistance, turn off the power to the circuit and completely discharge all capacitors.
- If the short-circuit resistance of the probes is greater than 0.5Ω , check the test leads for loose or damaged wires.
- If the resistance is open or above the range, the "OL" symbol will appear on the screen.

- When measuring low resistance, the test leads will produce a measurement error of $0.10 - 0.20\Omega$.
To obtain an accurate measurement, the measured value should subtract the value displayed when the two test leads are short-circuited.

- When measuring high resistance above $1M\Omega$, it is normal for the measurement to take a few seconds to stabilize. To quickly obtain stable data, use short test wires to measure high resistance.

7.3 Continuity test

- Set the function dial to Ω , press the SEL button twice, the display will show the Ω symbol and the meter will enter the continuity test mode.
- Insert the black test cable into the COM connector, the red test cable into the INPUT connector. Connect the test leads in parallel with the test points.
- If the measured resistance of the circuit is $>50\Omega$, the circuit is in an open state. If the measured circuit resistance is $\leq 50\Omega$, the circuit is in a good conductive state, a buzzer sounds.


Note: Before testing continuity, turn off all power supplies and fully discharge all capacitors.

7.4 Diode test

1. Set the function dial to Ω , press the SEL button once, the display will show the \rightarrow symbol and the meter will enter diode test mode.
2. Insert the black test cable into the COM connector, the red test cable into the INPUT connector. Connect the test leads in parallel with the diode.
3. The "OL" symbol appears when the diode is in the leaky direction or is reversed. For a silicon PN junction, the normal value is $0.5 - 0.8\text{ V}$.
4. Diode test mode, measuring voltage greater than 2.5V , current greater than 1mA .

Note: Before testing the PN transition, turn off the power to the circuit and fully discharge all capacitors.

7.5 Capacity measurement

1. Set the rotary function dial to .
2. Insert the black test cable into the COM connector and the red one into the INPUT connector. Connect the test leads with the capacitor in parallel.

Note:

- If the capacitor under test is shorted or its capacitance is above the specified range, the "OL" symbol will appear on the display.
- When measuring a large capacitor it may take several seconds to reach stable values.
- Before measuring capacitors (especially high voltage capacitors), discharge them completely.

7.6 DCA and ACA measurements

1. Set the function dial to the desired range μA , mA , A .
2. Insert the black test cable into the COM connector, the red test cable into the INPUT connector, and connect the test cables in series with the circuit under test.
To test current above 600 mA, insert the red wire into the 10A position of the connector.

Remark:

- Before measuring, turn off the power to the circuit and carefully check the input terminal and the position of the range.
- If the range of the measured current is not known, select the maximum range and then gradually reduce it.
- Replace the fuse with the same type.
- Do not connect the measuring wires in parallel to any circuit during measurement. Otherwise, there is a risk of damage to the instrument and injury to the user.
- If the current tested is higher than 10 A, the time of each measurement should be less than 10 seconds, and the next test should be performed after 15 minutes.

7.7 Temperature measurement

- Set the function dial to the $^{\circ}\text{C}/^{\circ}\text{F}$ range.
- Press the "SEL" button to select $^{\circ}\text{C}$ or $^{\circ}\text{F}$ and the $^{\circ}\text{C}$ or $^{\circ}\text{F}$ symbol will be displayed as an indicator.

- Insert the black plug of the type K thermocouple into the "COM" socket and the red plug into the "INPUT" socket. Carefully touch the end of the thermocouple to the object to be measured.
- Wait and the display will show the measured value.

Remark:

- The maximum operating temperature of the TP01 Type K thermocouple is 250°C/482°F (or 300°C/572°F for short periods). The sensor supplied with the instrument is a very fast response thermocouple that is suitable for many general purpose applications.

7.8 Frequency and duty cycle measurements

1. Set the rotary pushbutton to "Hz%".
2. The default range is frequency measurement mode, connect the black test lead to the "COM" connector and the red one to the "INPUT" connector, read the value on the display.
3. Press the "SEL" button to select the duty cycle test mode, and the "%" symbol will be displayed as an indicator.
4. The duty cycle test is only suitable for signals not exceeding 10 kHz

7.9 Battery test

1. Connect the black wire to the "COM" connector and the red wire to the "INPUT" connector (note: the polarity of the red test lead is positive "+")
2. Set the rotary dial to the desired BATT range according to the type of battery being tested (1.5V, 9V).
3. Connect the test cable in parallel to the battery under test.
4. Read the values on the LCD. The polarity of the red test lead connection will be displayed. Measuring the discharge will consume battery power, so the test time should be minimized.

Remark:

This test method is used only as a reference for assessing the capacity of the battery.

7.10 NCV Test

1. Set the rotary pushbutton to $\overset{\text{NCV}}{\text{Live}}$.
2. The LCD displays EF and the device is ready to test the electromagnetic field strength.
3. When the front of the meter comes within 5 mm of the electromagnetic field, the meter will beep and a symbol indicating the strength of the electromagnetic field will appear. The stronger the electromagnetic field, the faster the beep and the longer the electromagnetic field strength banner.

Note:

This meter is used only to determine the presence of an alternating electric field. Since the test environment may be subject to electric field disturbances from the surrounding environment or to electric field disturbances caused by irregular wiring arrangements, this measurement method can only be used to determine the existence of dangerous voltages.

7.11 Assessment of live conductor

1. Set the rotary pushbutton to $\overset{\text{NCV}}{\text{Live}}$.
2. Press the "SEL" button, the symbol will appear on the LCD display "LIVE" and the meter enters the live wire measurement mode.
3. Connect the red wire to the INPUT connector and connect the probe to the metal part of the lead, at the same time the black wire must be connected to the COM connector. If the buzzer emits a continuous beeping sound and the electromagnetic field strength symbol ---- appears, the wire is connected to a live line.


This function is for live wiring test, requires professional use, non-professionals are strictly prohibited to use.

8. Automatic shutdown

1. If you do not work with the meter for approximately 15 minutes, it will automatically shut down, before the automatic shutdown there will be an audible and light indication that the meter is about to shut down (1 minute before automatic shutdown 5 continuous beeps, before shutdown 1 long beep).

2. In the auto shutdown state, press the "SEL" button, turn on the meter with the rotary range switch, you can cancel the auto shutdown function, the "APO" symbol will disappear from the LCD display.

9. Replacing the battery and fuses

- Fuses rarely need to be replaced and almost always burn out due to operator error.
- If the display shows "", the battery needs to be replaced.
- Replacing the battery: unscrew 1 screw at the bottom of the battery case, simply remove the old battery and replace it with a new one. Take the new battery out and replace the new battery, then replace the new battery with the new one.
- Remove the case and remove the bottom cover of the meter to replace the fuse (500mA/600V or 10A/600V).

Included in the package

- Operating Instructions
- Test lead set
- Temperature probe set
- 1.5V x 2, size AAA

The product has been issued with a CE declaration of conformity in accordance with the applicable regulations. On request from the manufacturer: info@solight.cz, or downloadable from www.solight.cz.

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