

User Manual



Multifunction AC/DC Voltage Tester

Model 20250-59



THE STANDARD IN PRECISION MEASUREMENT



Introduction

The Digi-Sense AC/DC Voltage Tester (Model 20250-59) is versatile and easy to use. The instrument is a must-have on your electrical tool belt. It safely measures AC/DC voltage, polarity direction, and circuit continuity. The instrument also provides rotary field indication and low impedance testing. Careful use of this meter will provide years of reliable service.

Safety Precautions

- Do not exceed the maximum allowable input range of any function.
- Wear insulated body protective equipment rated to 690 V.
- Close attention must be paid when testing any electrical circuits.

International Safety Symbols



This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present.



Meter is protected throughout by double insulation.

WARNINGS



In order to avoid electrical shock, valid safety regulations regarding excessive contact voltages must be followed. These include voltages exceeding 60 VDC and 25 VAC RMS.



Prior to measurement, make sure that the test leads and instrument are in working order.



When using this instrument only the handles of the probes may be touched – do not touch the probe tips.



This instrument may only be used within the ranges specified and within low voltage systems up to 690 V.



Prior to use, make sure the instrument function intended for use is in working order. Do not use the instrument if one or more functions are not working properly.



Do not use this instrument in damp conditions.



Proper operating conditions for this instrument are -10 to 55°C, <85% RH.



This instrument should not be used if the operator's safety cannot be assured.

Safe operation can no longer be assured if the instrument:

- Shows obvious damage
- Does not perform desired measurements
- Has been stored too long under unfavorable conditions
- Has been subjected to mechanical stress during transport
- All relevant statutory regulations must be adhered to when using this instrument

Appropriate Usage

This instrument may only be used under those conditions and for those purposes for which it was conceived. For this reason, the safety references, the technical data including environmental conditions and the usage in dry environments must be followed. When modifying or changing the instrument, the operational safety is no longer ensured. The instrument may only be opened by an authorized service technician, e.g. for repair.

Unpacking

Check individual parts against the list of items below. If anything is missing or damaged, please contact your instrument supplier immediately.

1. Instrument with integrated probes
2. Carrying case
3. Two AAA batteries
4. User manual

Meter Description

1. Handle test probe – (L1)
2. Instrument test probe + (L2)
3. Measurement point illumination
4. 2000-count LCD
5. LED for single-pole phase test
6. LED for low impedance test
7. LED for continuity
8. Low impedance switch (L2)
9. Measurement point lighting button
10. Battery case
11. Low impedance switch (L1)



Explanation of Symbols

DC	DC voltage
AC	AC voltage
-	DC voltage negative potential (DC)
•)))	Phase display from 100 to 690 V to 50/60 Hz
	Continuity test symbol when used as a single-pole phase tester
R	Rotating field display clockwise
L	Rotating field display counterclockwise
	Device for work to be performed with voltage present
	Battery replacement symbol

Setup and Operation

Measuring Point Lighting

The voltage tester has a battery-operated measuring point lamp. Press button (9) to switch this lamp on. The lamp stays on as long as this button is pressed. When the button is released, the lamp goes off. The lighting button is arranged in such a way that it can also be pressed during low impedance measurements.

Carrying Out Measurements

The twin-pole voltage tester has two handle components connected by a cable. Always hold the voltage tester in such a way that you get a vertical view of the display. Strong incidence of light may have an adverse effect on the display. For DC measurements, test tip (L2) is the positive pole, and test tip (L1) is the negative pole.



Before each voltage measurement, check that the device is working properly by measuring a known voltage source. If the tester's LCD remains blank, take the voltage tester out of operation. A defective voltage tester must not be used. Do not operate the device with flat batteries or without batteries. Observe the regulations regarding work with electrical systems.

Voltage Measurement with High Internal Impedance

Always hold the voltage tester by the handles designed for this purpose. Never touch the device beyond the handle ends. Hold the two test tips into the measuring points to be tested. The voltage tester switches on automatically with voltages higher than 4.5 V AC/DC. The voltage measured is shown on the LCD. If the measured voltage falls below 4.5 V AC/DC, the voltage tester switches off automatically.

The LCD shows the voltage values numerically and in the form of a bar graph. The type of voltage (alternating current = AC, direct current = DC) and the polarity are also shown on the LCD. In the event of negative DC voltage, the numeric voltage value is preceded by "-". Positive DC voltage is shown without a positive sign preceding the numeric value.



Thanks to the input impedance of approximately 1 MΩ, it is possible to perform voltage tests with high input impedances without time restrictions. The voltage tester also indicates a rotating direction (L or R) with measurements on single phase mains (L1 against N). This is not a device malfunction.

Voltage Measurement with Low Internal Impedance

This function is particularly useful for testing installations. Due to the lowered internal impedance, capacitive voltage is suppressed. The reading shows the actual voltage applied. Similarly, measuring phase (L1) on earth wire (PE) may trigger fault-current circuit breakers (FI or RCI). This measuring procedure can be used for measurements above 12 V. Always hold the voltage tester by the handles designed for this purpose. Never touch the device beyond the handle ends. Hold the two test tips on the measuring points to be tested. Press the two push-buttons simultaneously. The applied voltage is shown on the LCD. The Low-Imp LED signals low impedance measurement.



The maximum permitted duty cycle in low impedance operating mode is 5 seconds for voltages up to 250 V and 3 seconds for voltages up to 690 V. When this time has elapsed, wait for 10 minutes before taking the next measurement.

Rotating Field Direction Display

The voltage tester can show the direction of the rotating field with three-phase systems. Always hold the voltage tester by the handles designed for this purpose. Never touch the device beyond the handle ends. Hold the two test tips on the measuring points to be tested. Test tip corresponds to L1 and test tip corresponds to L2. The applied voltage and the rotating field direction is shown on the LCD. The rotating field symbols (D) show the corresponding field direction (L = counterclockwise, R = clockwise).

Continuity Check

The voltage tester can also be used as a continuity checker. Always hold the voltage tester by the handles designed for this purpose. Never touch the device beyond the handle ends. The continuity checker switches itself on automatically when the test starts, and switches itself back off when the test has been completed. Check for correct functioning before beginning the test. If you connect the two test clips to each other, you should hear a beep, and the continuity LED should light up. If this does not happen, then replace the batteries as described on page 12. The continuity tester indicates resistances up to 400 k Ω .

Using Voltage Tester as a Single-Pole Phase Tester



The voltage tester can also be used as a single-pole phase tester. Always hold the voltage tester by the handles designed for this purpose. Never touch the device beyond the handle ends. This phase test serves as a quick test only. Check for zero potential with the twin-pole measuring method as described above before doing work on this circuit. Observe regulations regarding work on electrical circuits.

Before beginning the test, check the conditions of the batteries by touching the two tips together. Check for correct functioning at a known alternating voltage source. Contact test tip L2 with the measuring point to be tested. In the response to a phase event (alternating voltage between 100 V to 690 V), the lighting symbol LED lights up.



The single-pole phase display can be adversely affected by unfavorable ambient conditions (electrostatic fields, good insulation, etc.). In all cases, conduct an additional twin-pole voltage test.

Specifications

Voltage test	
Voltage range	6, 12, 24, 50, 120, 230, 400 VAC/DC, 690 VDC
Resolution	1 VAC/DC
Tolerances	DCV: +1.0% rdg + 3 digits ACV: +1.5% rdg + 5 digits
400 VAC Max. measuring current	Approximately ≤ 1.0 mA
690 VDC Max. measuring current	Approximately ≤ 1.5 mA
Voltage detection	Automatic
Polarity detection	Full range
Range detection	Automatic
Response time	Updates 2 to 3 sec
Operation time	30 sec
Recovery time	240 sec
ACV frequency range	50/60 Hz
Internal impedance	Approximately ≤ 1 M Ω
Operation time	Long
LCD on	>4.5 VAC/DC
Single-pole phase test	
Voltage range	100 to 400 VAC
ACV frequency range	50/60 Hz
Continuity test	
Resistance range	<200 k Ω
Test current	<1 μ A
Overvoltage protection	400 VAC/690 VDC
Rotary field indication	
Voltage range (LEDs)	100 V to 400 V
Frequency range	50/60 Hz
Measurement principle	Double pole and contact electrode

Low impedance test	
Voltage range	12 to 230 VAC/DC
Low impedance	<6 k Ω
Operation time	5s <250 VAC/DC, 1s \leq 0.2 A (690 V) / 30s Max.
Overvoltage protection	3s <400 VAC/690 VDC
General	
LCD	2000 counts (3½ digits) LCD with bar graph and backlight
Housing	IP64
Safety rating	CAT III-1000 V / CAT IV-600 V
Dimensions (L x W x H):	9 ⁷ / ₁₆ " x 3 ¹ / ₁₆ " x 1 ⁹ / ₁₆ " (24 x 7.8 x 4 cm)
Operating conditions	14 to 131°F (–10 to 55°C), <85% RH
Power supply	Two AAA batteries (included)
Temperature range	–10 to 55°C
Humidity	<85% RH
Overvoltage class	CAT III 690 AC/DC

Maintenance and Repair

Maintenance and Disposal

Check the correct operation of the voltage tester regularly. It can be assumed that risk-free operation is no longer possible if:

- There is visible evidence that the device has been damaged.
- The device has been stored under unfavorable conditions for a long period of time.
- The device has been subjected to physical abuse.

The outside of the device should be cleaned with a soft damp cloth or brush only. Do not use abrasive or chemical cleaning agents which could damage the housing or impair operation.

Note: Never try to open the housing except for the battery compartment.

If the instrument has become unusable, dispose of it in accordance with current statutory requirements.

Battery Replacement

The voltage tester is powered by two AAA batteries supplied with the instrument. They are replaced as follows:

1. Loosen the screw on the battery compartment lid (10) with a screwdriver and remove it.
2. Insert two AAA batteries into the compartment observing the correct polarity information in the compartment. Alkaline batteries are recommended.
3. Replace the compartment lid and retighten the screw.

The batteries need to be changed if the low battery symbol lights up on the LCD or when the LCD stays dark when touching the two probe tips together.



The voltage tester will show no reading if the batteries are drained. The device must not be operated with drained or removed batteries.

To prevent damage from leaking batteries, remove the batteries if you will not be using the instrument for an extended time. For the same reason, remove drained batteries immediately once discovered.