EN - Quick start guide

CHAUVIN ARNOUX

C.A 6165

Appliance multitester

Measure up

Contents

1 General description

1.1 Warnings and notes

1.1.1 Safety warnings

In order to reach high level of operator safety while carrying out various measurements using the C.A 6165 instrument, as well as to keep the test equipment undamaged, it is necessary to consider the following general warnings:

- Read this Instruction manual carefully, otherwise use of the instrument may be dangerous for the operator, for the instrument or for the equipment under test!
- Consider warning markings on the instrument!
- If the test equipment is used in manner not specified in this Instruction manual the protection provided by the equipment may be impaired!
- Do not use the instrument and accessories if any damage is noticed!
- Regularly check the instrument and accessories for correct functioning to avoid hazard that could occur from misleading results.
- Consider all generally known precautions in order to avoid risk of electric shock while dealing with hazardous voltages!
- Use only standard or optional test accessories supplied by your distributor!
- Only test adapters provided or approved by Chauvin Arnoux should be connected to TC1 (test and communication) connectors.
- Use only earthed mains outlets to supply the instrument!
- In case a fuse has blown refer to chapter *5.1 Fuses* in this Instruction manual to replace it!
- Instrument servicing and calibration is allowed to be carried out only by a competent authorized person!
- Chauvin Arnoux is not responsible for the content of the user-programmed Auto Sequences®!

1.1.2 Warnings related to safety of measurement functions

1.1.2.1 HV AC, HV DC, HV AC programmable, HV DC programmable

- A dangerous voltage up to 5 kV_{AC} or 6 kV_{DC} is applied to the HV instrument outputs during the test. Therefore special safety consideration must be taken when performing this test!
- Only a skilled person familiar with hazardous voltages can perform this measurement!
- DO NOT perform this test if any damage or abnormality (test leads, instrument) is noted!
- Never touch exposed probe tip, connections equipment under test or any other energized part during the measurements. Make sure that NOBODY can contact them either!

- DO NOT touch any part of test probe in front of the barrier (keep your fingers behind the finger guards on the probe) – possible danger of electric shock!
- It is a good practice to use lowest possible trip-out current.

1.1.2.2 Diff. Leakage, Ipe Leakage, Touch Leakage, Power, Leak's & Power

- Load currents higher than 10 A can result in high temperatures of fuse holders and On/Off switch! It is advisable not to run tested devices with load currents above 10 A for more than 15 minutes. Recovery period for cooling is required before proceeding with tests! Maximum intermittent duty cycle for measurements with load currents higher than 10 A is 50 %.

1.1.2.3 Insulation resistance

- Do not touch the test object during the measurement or before it is fully discharged! Risk of electric shock!

1.1.3 Markings on the instrument

-  WARNING, risk of DANGER! The operator should refer to this user's manual whenever this danger symbol appears.
-  WARNING! Risk of electric shock. The voltage on the parts marked with this symbol may be dangerous.
-  The CE marking indicates compliance with the European Low Voltage Directive (2014/35/EU), Electromagnetic Compatibility Directive (2014/30/EU), Radio Equipment Directive (2014/53/EU), and Restriction of Hazardous Substances Directive (RoHS, 2011/65/EU and 2015/863/EU).
-  The rubbish bin with a line through it indicates that, in the European Union, the product must undergo selective disposal in compliance with Directive WEEE 2012/19/EU. This equipment must not be treated as household waste.

2 Download

2.1 User's manual

Visit our web site to download the user's manual for your instrument:
www.chauvin-arnoux.com

Search on the name of your instrument. When you have found the instrument, go to its page. The user's manual is on the right.
Download it.

2.2 MTLink Software

Visit our web site to download the latest version of the application software:
www.chauvin-arnoux.com

Go to the **Support** tab, then **Download our software**. Then search on the name of your instrument.
Download the software, then install it on your PC.

You must have administrator privileges on your PC to install the MTLink software.

3 Instrument description

3.1 Front panel

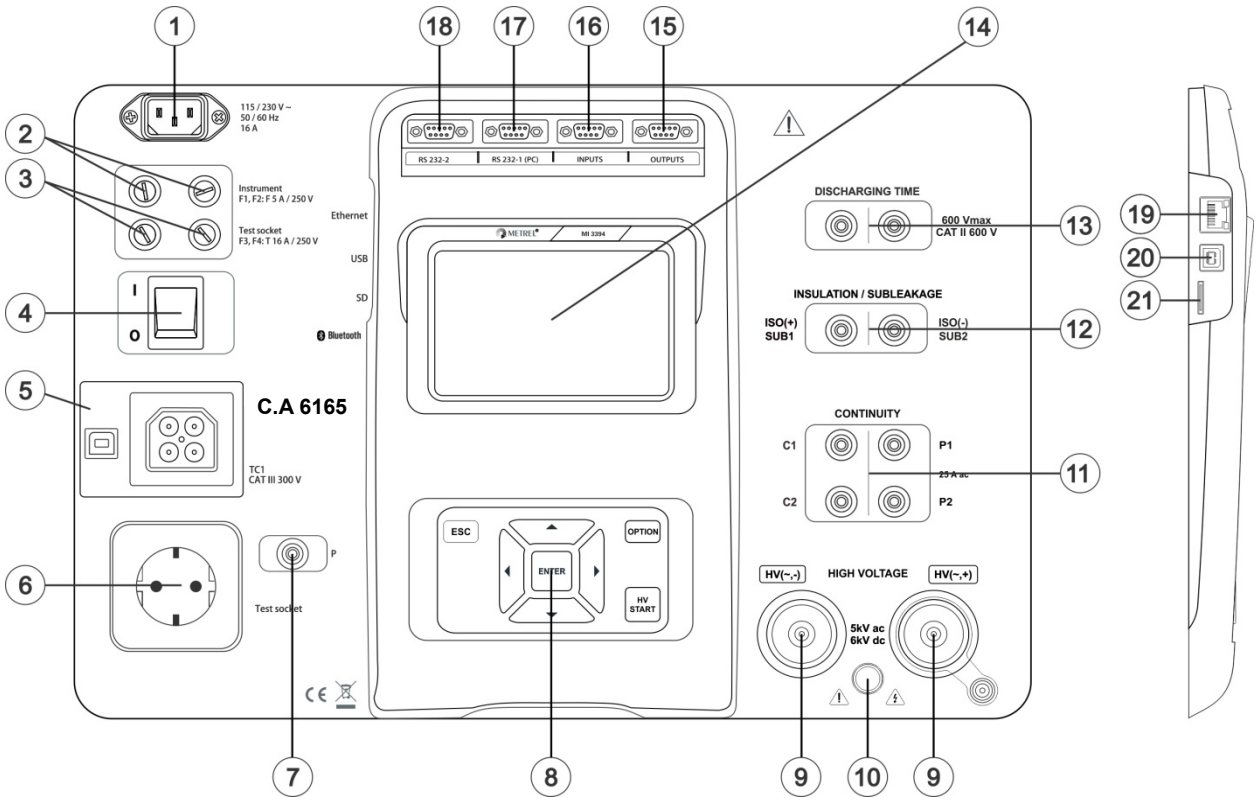


Figure 2.1: Front panel

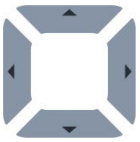
1	Mains supply connector
2	F1, F2 fuses (F 5 A / 250 V)
3	F3, F4 fuses (T 16 A / 250 V)
4	On / Off switch
5	Test connections TC1 for external test adapters
6	Mains test socket
7	P/S (probe) connector
8	Keypad
9	HV output connectors
10	HV output warning lamp
11	Continuity connectors
12	Insulation / Subleakage connectors
13	Discharging time connectors
14	Colour TFT display with touch screen
15	Control outputs
16	Control inputs
17	Multipurpose RS232-1 port
18	Multipurpose RS232-2 port
19	Ethernet connector
20	USB connector
21	MicroSD card slot

Note : The instrument contains dedicated connectors intended to be connected only to dedicated accessories provided or approved by Chauvin Arnoux.

4 Instrument operation

The C.A 6165 can be manipulated via a keypad or touch screen.

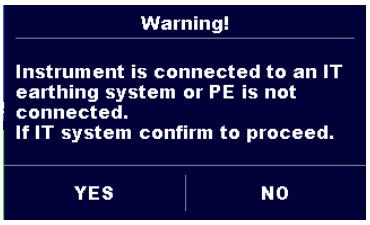
4.1 General meaning of keys

	Cursor keys are used to: - select appropriate option
	Enter key is used to: - confirm selected option - start and stop measurements
	Escape key is used to: - return to previous menu without changes - abort measurements
	Option key is used to: - expand column in control panel - show detailed view of options
	HV Test key is used to: - start and stop HV tests

4.2 General meaning of touch gestures:

	Tap (briefly touch surface with fingertip) is used to: - select appropriate option - confirm selected option - start and stop measurements
	Swipe (press, move, lift) up/ down is used to: - scroll content in same level - navigate between views in same level
 **long**	Long press (touch surface with fingertip for at least 1 s) is used to: - select additional keys (virtual keyboard) - enter cross selector from single test screens
	Tap Escape icon is used to: - return to previous menu without changes - abort measurements

4.3 Symbols and messages



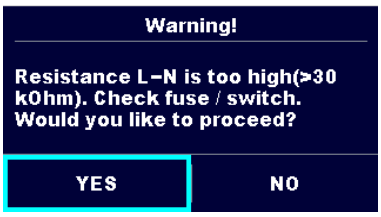
Supply voltage warning

Possible causes:

- No earth connection.
- Instrument is connected to an IT earthing system. Press **YES** to continue normally or **NO** to continue in a limited mode (measurements are disabled).

Warning:

The instrument must be earthed properly to work safely!

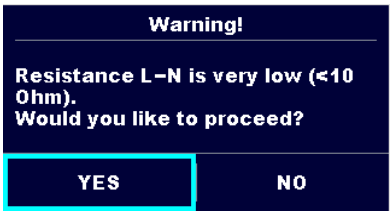


Resistance L-N > 30 kΩ

In pre-test a high input resistance was measured. Possible causes:

- Device under test is not connected or switched on
- Input fuse of device under test is blown.

Select **YES** to proceed with or **NO** to cancel measurement.



Resistance L-N < 10 Ω

In pre-test a very low resistance of the device under test supply input was measured. This can result in a high current after applying power to the device under test. If the too high current is only of short duration (caused by a short inrush current) the test can be performed otherwise not.

Select **YES** to proceed with or **NO** to cancel measurement

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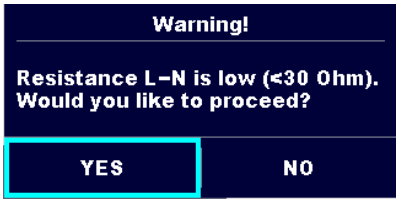
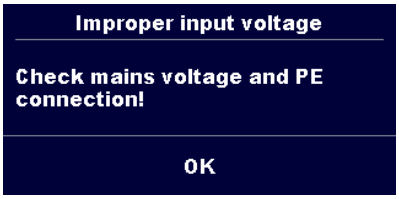


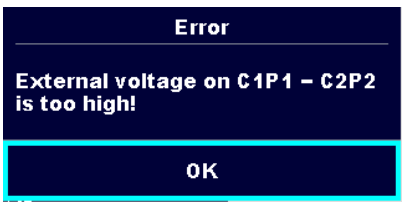
Resistance L-N < 30 Ω

In pre-test a low input resistance of the device under test was measured. This can result in a high current after applying power to the device. If the high current is only of short duration (caused by a short inrush current) the test can be performed, otherwise not.

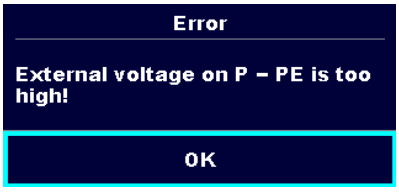
Select **YES** to proceed with or **NO** to cancel measurement.



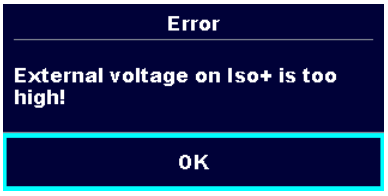
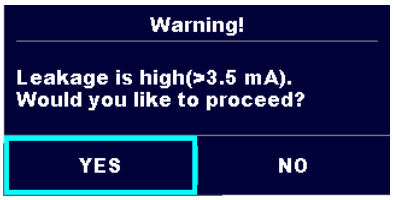
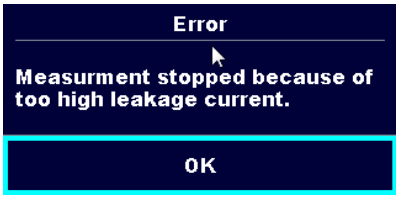
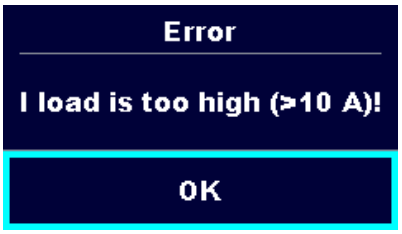
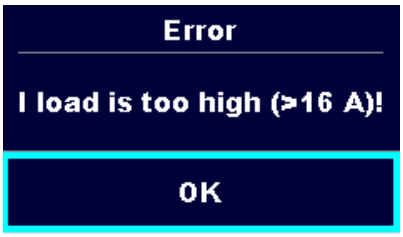
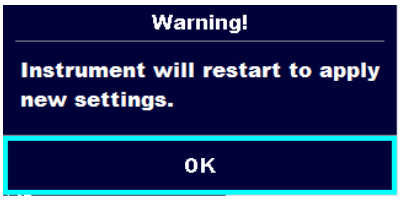
Warning for improper supply voltage condition. If pressing **OK** instrument will continue to work in a limited mode (measurements are disabled).

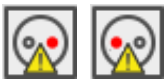


In pre-test an external voltage between C1/P1 and C2/P2 terminals was detected. The measurement was cancelled. Press **OK** to continue.



In pre-test a too high external voltage was detected between P and PE terminals. The measurement was cancelled. Press **OK** to continue.

	In pre-test a too high external voltage was detected between ISO/SUB and PE terminals. The measurement was cancelled. Press **OK** to continue.
	In pre-test a possible high leakage current was detected. It is likely that a dangerous leakage current (higher than 3.5 mA) will flow after applying power to the device under test. Select **YES** to proceed with or **NO** to cancel measurement.
	The measured leakage (Idiff, Ipe, Itouch) current was higher than 20 mA. Measurement was aborted. Press **OK** to continue.
	The load current exceeded the highest upper limit of 10 A for the Discharging time test. Measurement was aborted. Press **OK** to continue. The load current continuously exceeded 10 A for more than 4 min (moving average) in Power and Leakage tests. Measurement was stopped for safety. Press **OK** to continue.
	The load current exceeded the highest upper limit of 16 A for the Power and Leakage tests. Measurement was aborted. Press **OK** to continue.
	Warning for restart of the instrument to set new Ethernet settings. This message appears on exit from Settings menu after changing Ethernet settings. Press **OK** to continue.
	The instrument is overheated. The measurement can't be carried out until the icon disappears. Press **OK** to continue.
	The device under test should be switched on (to ensure that the complete circuit is tested).
	Test voltage in Insulation resistance measurement is too low.
	Measurement result is scaled to 110 V.

	Red dot indicates phase of measurement where higher leakage was measured. Applicable only if phase reversal is enabled during the measurement.
	Test leads resistance in Continuity P/S - PE measurement is not compensated.
	Test leads resistance in Continuity P/S - PE measurement is compensated.
	**Warning**! A high voltage is / will be present on the instrument output! (Withstanding test voltage, Insulation test voltage, or mains voltage).
	**Warning**! Instrument is connected to an IT earthing / centre tapped system or PE is not connected. DO NOT USE THE INSTRUMENT IF PE FAULT!
	**Warning**! A very high and dangerous voltage is / will be present on the instrument output! (Withstanding test voltage).
	Test passed.
	Test failed.
	Conditions on the input terminals allow starting the measurement; consider other displayed warnings and messages.
	Conditions on the input terminals do not allow starting the measurement, consider displayed warnings and messages.
	Proceeds to next measurement step
	Stop the measurement.
	Result(s) can be stored.
	Starts test leads compensation in Continuity P/S - PE measurement.
	Expands column in control panel.

5 Single tests

5.1 Single test measurements

5.1.1 Visual inspections

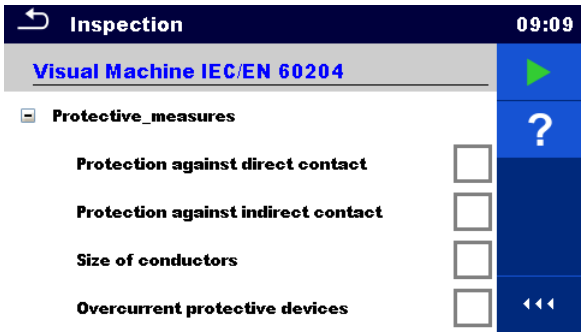


Figure 5.1: Visual inspection menu

Test circuit

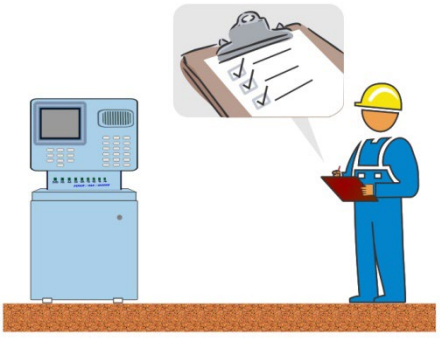


Figure 5.2: Visual inspection test circuit

Visual inspection procedure

- Select the appropriate **Visual** inspection.
- Start the inspection.
- Perform the visual inspection of the appliance / equipment.
- Apply appropriate ticker(s) to items of inspection.
- End inspection.
- Save results (optional).

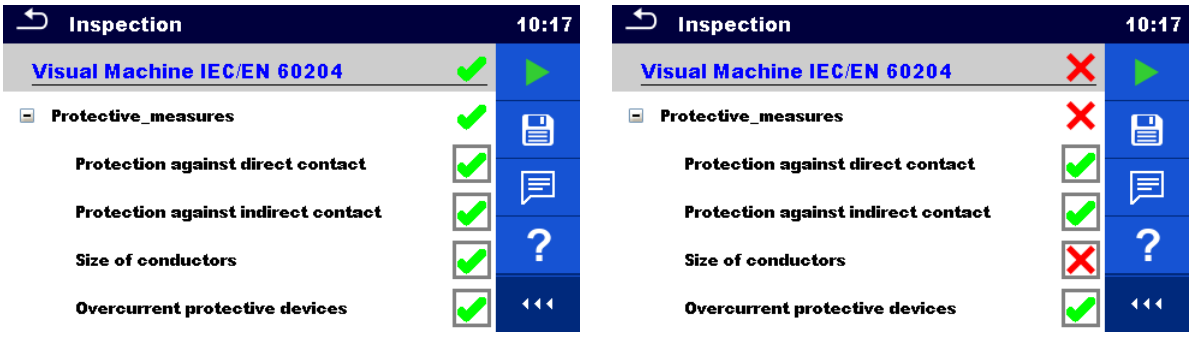


Figure 5.3: Examples of Visual inspection results

5.1.2 Continuity

Figure 5.4: Continuity test menu

Test results / sub-results

R..... Resistance
ΔU…….Voltage drop scaled to 10 A

Test parameters

Output connections	Output [4-wire, P-PE]
Test current	I out [0.2 A, 4 A, 10 A, 25 A]
Duration	Duration [Off, 2 s ... 180 s]
ΔU test*	Enables ΔU test [On, Off]
Wire section*	Wire section for ΔU test [0.5 mm^2…≥ 6mm^2]

Test limits

H Limit (R)	H limit [Off, 0.01 Ω ... 9 Ω, Custom]
L Limit (R)	L limit [Off, 0.01 Ω ... 9 Ω, Custom]
H Limit (ΔU)*	H limit [1.0 V … 5.0 V]

* Applicable only at test current 10 A.

Specific options

	Calibrate - Compensation of test lead resistance. Refer to chapter 6.2.2.1 for procedure details.
	Lim. Calculator – Continuity resistance H Limit(R) calculator.

Test circuit

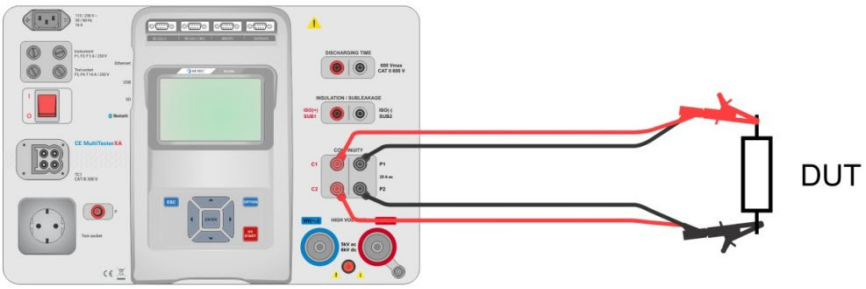


Figure 5.5: Measurement of continuity 4-wire

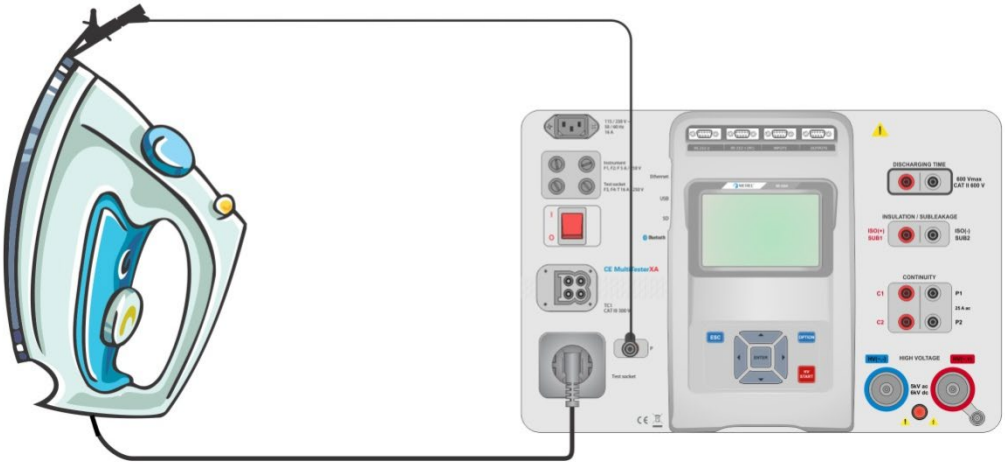


Figure 5.6: Measurement of Continuity P/S - PE

Continuity measurement procedure

- Select the **Continuity** function.
- Set test parameters / limits.
- Connect test leads to C1, P1, P2 and C2 terminals on the instrument (4 wire), or connect test lead to P/S terminal (2 wire measurement P/S – PE).
- Compensate test leads resistance (optional).
- Connect test leads to device under test.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

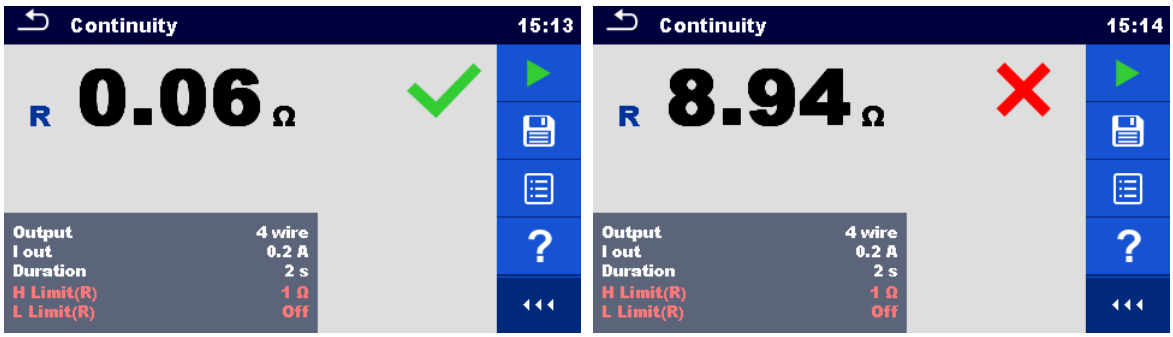


Figure 5.7: Examples of Continuity measurement results

5.1.2.1 Compensation of test leads resistance

This chapter describes how to compensate the test leads resistance in **Continuity (Output = P/S – PE)** function. Compensation can be carried out to eliminate the influence of test leads resistance and the internal resistances of the instrument on the measured resistance.

Connection for compensating the resistance of test leads

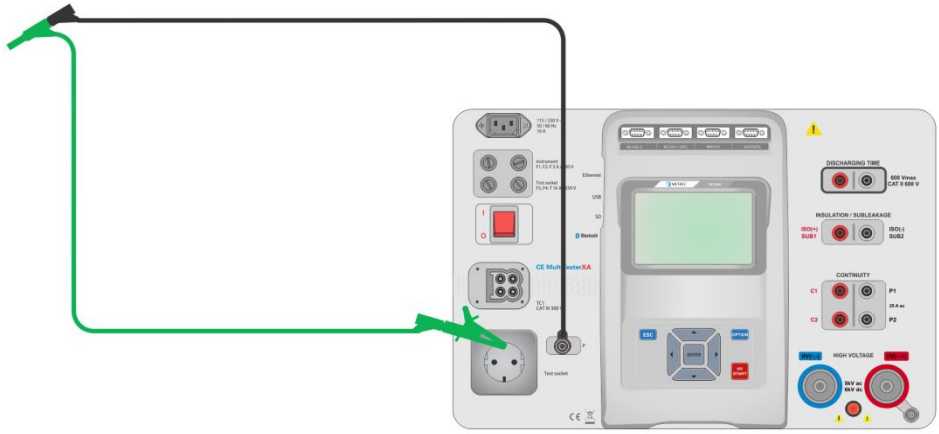


Figure 5.8: Shorted test leads

Compensation of test leads resistance procedure

- Select the **Continuity** function. Parameter Output must be set to P/S - PE.
- Connect test leads to the instrument and short the test leads together, see *Figure 4.8*.
- Touch the  key to compensate leads resistance.
- Symbol  is displayed if the compensation was carried out successfully.

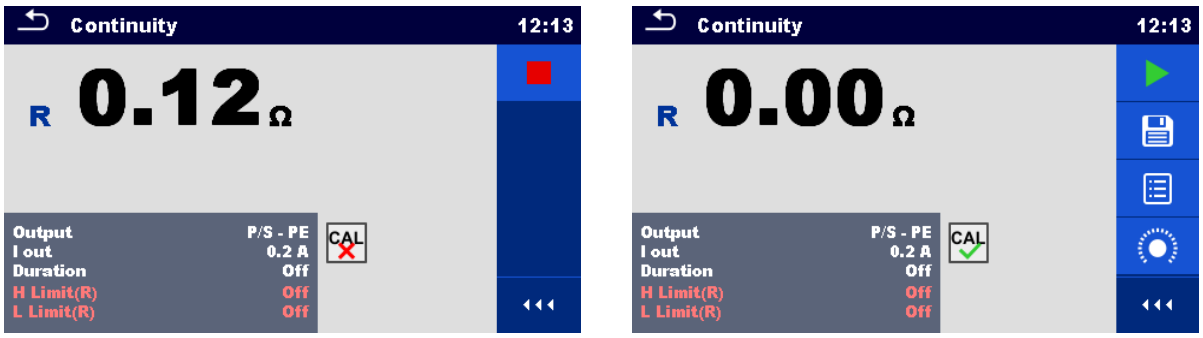


Figure 5.9: Uncompensated and compensated result

Note:

- The compensation of test leads is carried out with set test current (I out).
- For manual compensation in Continuity function, set R compensation parameter. Set value is decremented from the measured value. (Recommended for 4 wire Continuity measurement with 2 wire extension leads.) Max. allowed R compensation value is 2 Ω.

5.1.3 HV AC

IMPORTANT SAFETY NOTE

Refer to chapter *1.1 Warnings and notes* for more information regarding safe use of the instrument.

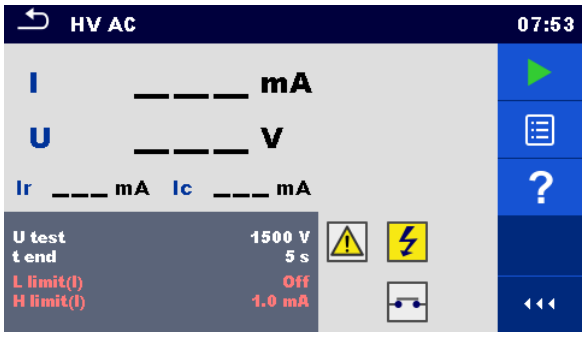


Figure 5.10: HV AC test menu

Test results / sub-results

I ..... test current
U..... measured a.c. test voltage
Ir ..... resistive portion of test current
Ic ..... capacitive portion of test current

Test parameters

AC test voltage	U test [100 V ... 5000 V in steps of 10 V]
Duration	t end [Off, 1 s ... 120 s]

Test limits

High limit (I)	H limit [0.5 mA ... 100 mA]
Low limit (I)	L limit [Off, 0.5 mA ... 100 mA]

Test circuit

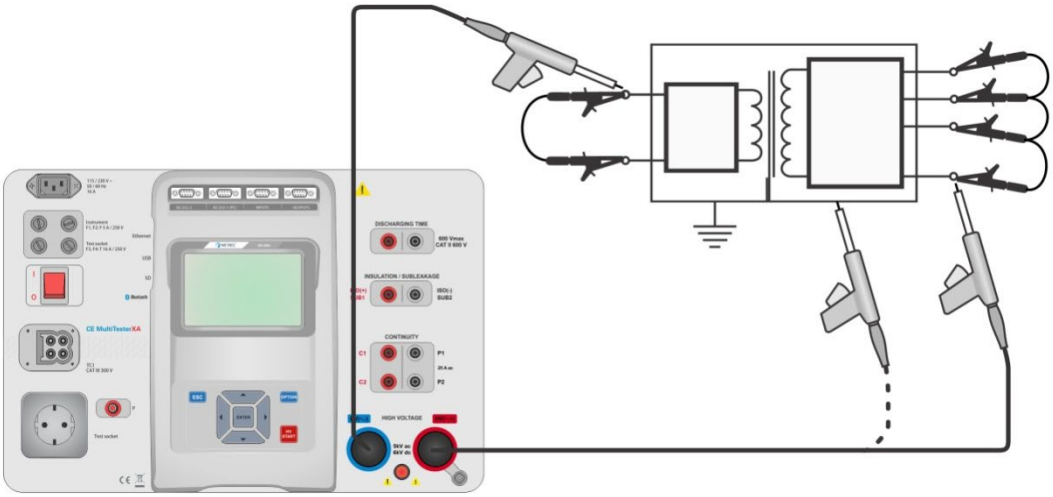


Figure 5.11: HV AC measurement

HV AC measurement procedure

- Select the **HV AC** function.
- Set test parameters / limits.
- Connect HV test leads to HV(~,+) and HV(~,-) terminals on the instrument.
- Connect HV test leads to device under test.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

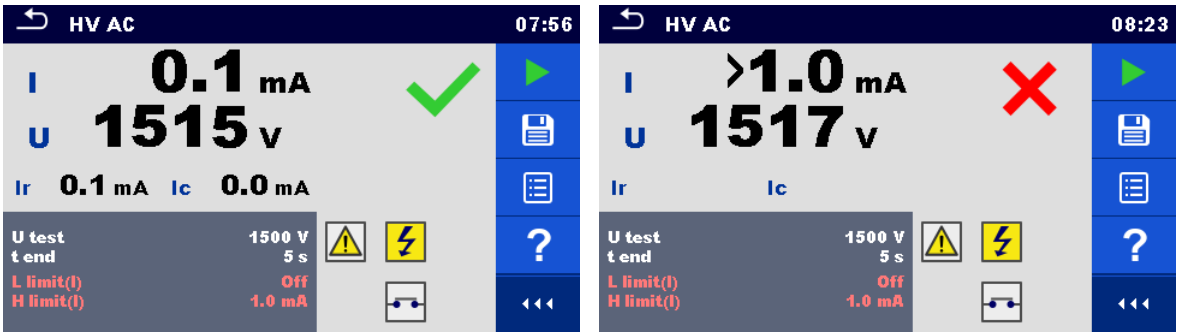


Figure 5.12: Examples of HV AC meaasurement results

Note:

- First HV measurement after power on the instrument (if password protection is enabled) or first HV measurement after enabling or changing password require entering password for enabling HV test.

5.1.4 HV DC

IMPORTANT SAFETY NOTE

Refer to chapter *1.1 Warnings and notes* for more information regarding safe use of the instrument.

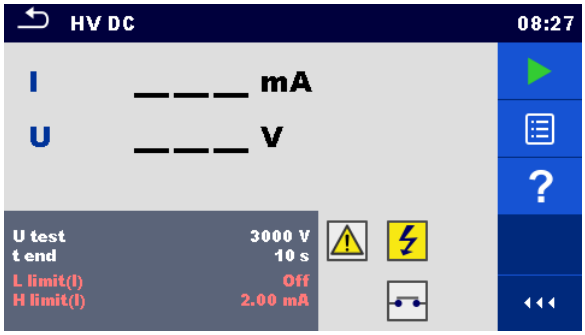


Figure 5.13: HV DC test menu

Test results / sub-results

U..... measured test voltage
I ..... test current

Test parameters

DC test voltage	U test [500 V ... 6000 V in steps of 50 V]
Duration	t end [Off, 1 s ... 120 s]

Test limits

High limit (I)	H limit [0.05 mA ... 10.0 mA]
Low limit (I)	L limit [Off, 0.05 mA ... 10.0 mA]

Test circuit

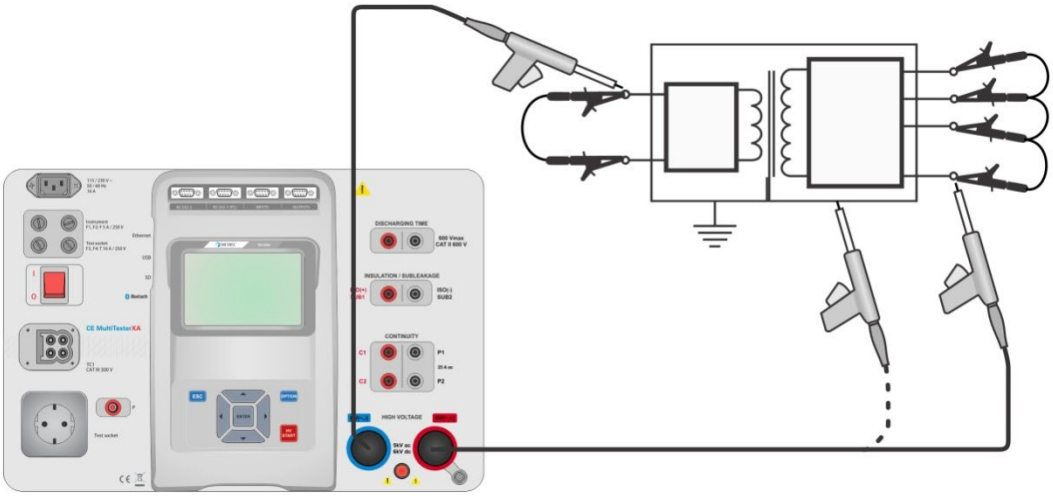


Figure 5.14: HV DC measurement

HV DC measurement procedure

- Select the **HV DC** function.
- Set test parameters / limits.
- Connect HV test leads to HV(~,+) and HV(~,-) terminals on the instrument.
- Connect HV test leads to device under test.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

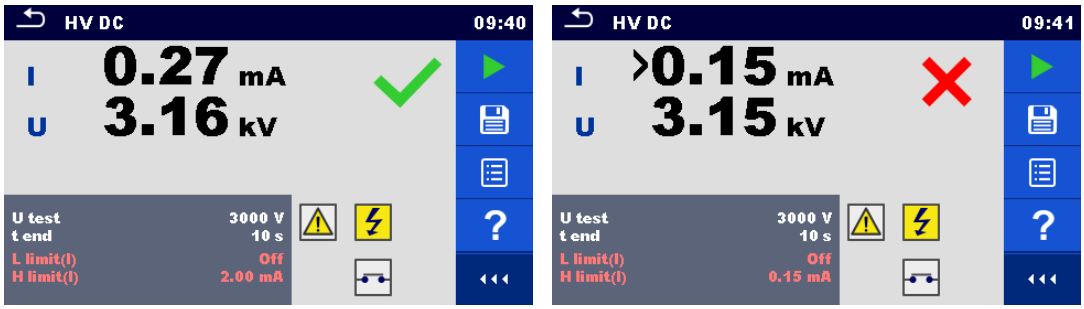


Figure 4.15: Examples of HV DC measurement results

Note:

- First HV measurement after power on the instrument (if password protection is enabled) or first HV measurement after enabling or changing password require entering password for enabling HV test.

5.1.5 HV AC programmable

IMPORTANT SAFETY NOTE

Refer to chapter *1.1 Warnings and notes* for more information regarding safe use of the instrument.

In the HV AC programmable test the time dependency of high voltage can be set according to diagram on *Figure 4.16.*

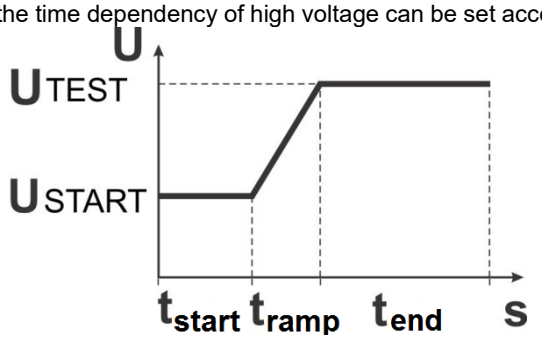


Figure 5.16: Voltage / time diagram of the HV AC programmable test

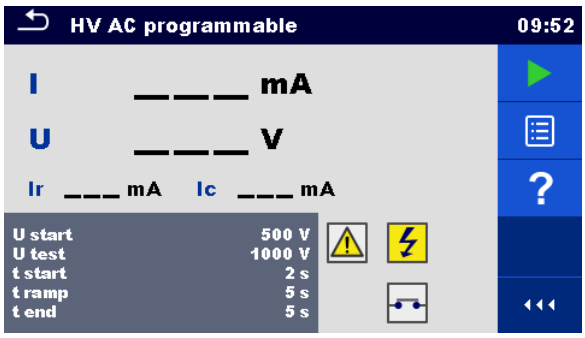


Figure 5.17: HV AC programmable test menu

Test results / sub-results

I ..... test current
U..... measured test voltage
Ir ..... resistive portion of test current
Ic ..... capacitive portion of test current

Test parameters

Starting AC test voltage	U start [100 V ... 5000 V in steps of 10 V]
AC test voltage	U test [100 V ... 5000 V in steps of 10 V]
Duration of starting voltage	t start [1 s ... 120 s]
Duration of ramp	t ramp [2 s ... 60 s]
Duration of test voltage	t end [Off, 1 s ... 120 s]

Test limits

High limit (I)	H limit [0.5 mA ... 100 mA]
Low limit (I)	L limit [Off, 0.5 mA ... 100 mA]

Test circuit

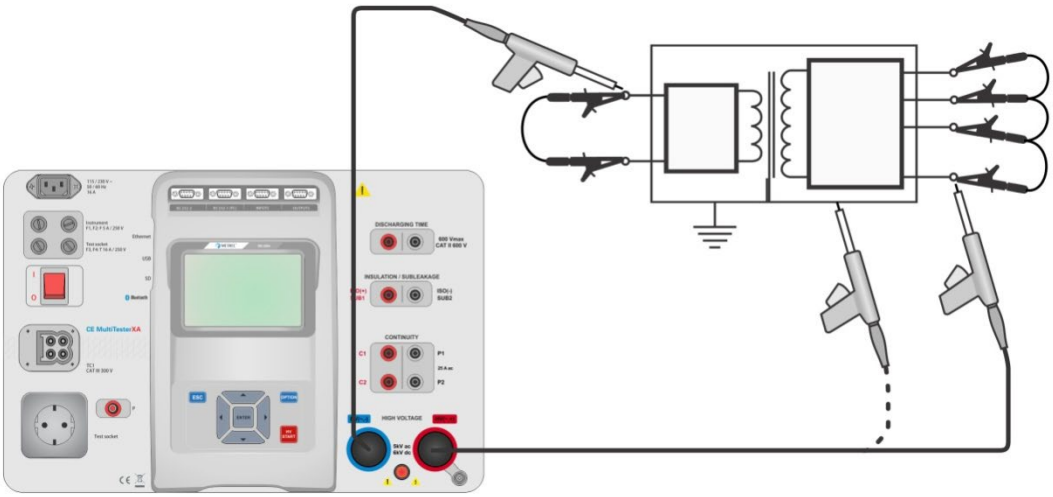


Figure 5.18: HV AC programmable test

HV AC programmable test procedure

- Select the **HV AC programmable** function.
- Set test parameters / limits.
- Connect HV test leads to HV(~,+) and HV(~,-) terminals on the instrument.
- Connect HV test leads to device under test.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

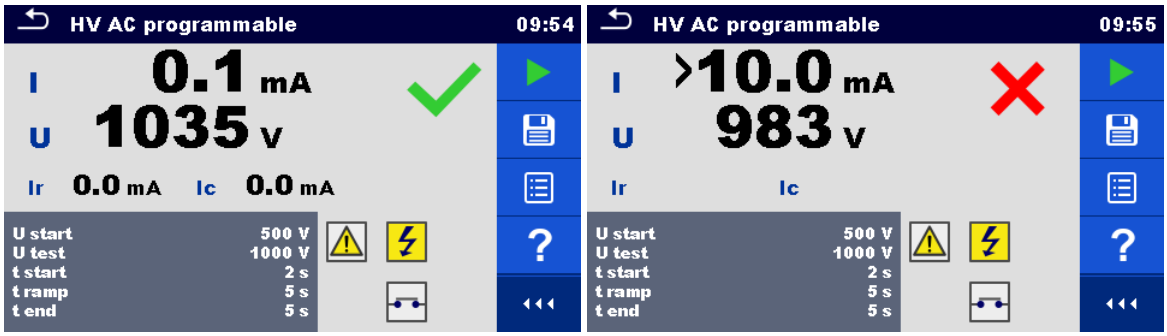


Figure 5.19: Examples of HV AC programmable test results

Note:

- First HV measurement after power on the instrument (if password protection is enabled) or first HV measurement after enabling or changing password require entering password for enabling HV test.

5.1.6 HV DC programmable

IMPORTANT SAFETY NOTE

Refer to chapter *1.1 Warnings and notes* for more information regarding safe use of the instrument.

In the HV DC programmable test the time dependency of high voltage can be set according to diagram on *Figure 4.16*.

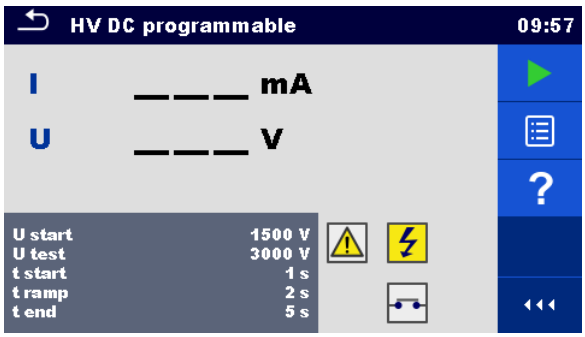


Figure 5.20: HV DC programmable test menu

Test results / sub-results

U..... measured test voltage
I ..... test current
Ic ..... capacitive portion of test current
Ir ..... resistive portion of test current

Test parameters

Starting DC test voltage	U start [500 V ... 6000 V in steps of 50 V]
DC test voltage	U test [500 V ... 6000 V in steps of 50 V]
Duration of starting voltage	t start [1 s ... 120 s]
Duration of ramp	t ramp [2 s ... 60 s]
Duration of test voltage	t end [Off, 1 s ... 120 s]

Test limits

High limit (I)	H limit [0.05 mA ... 10.0 mA]
Low limit (I)	L limit [Off, 0.05 mA ... 10.0 mA]

Test circuit

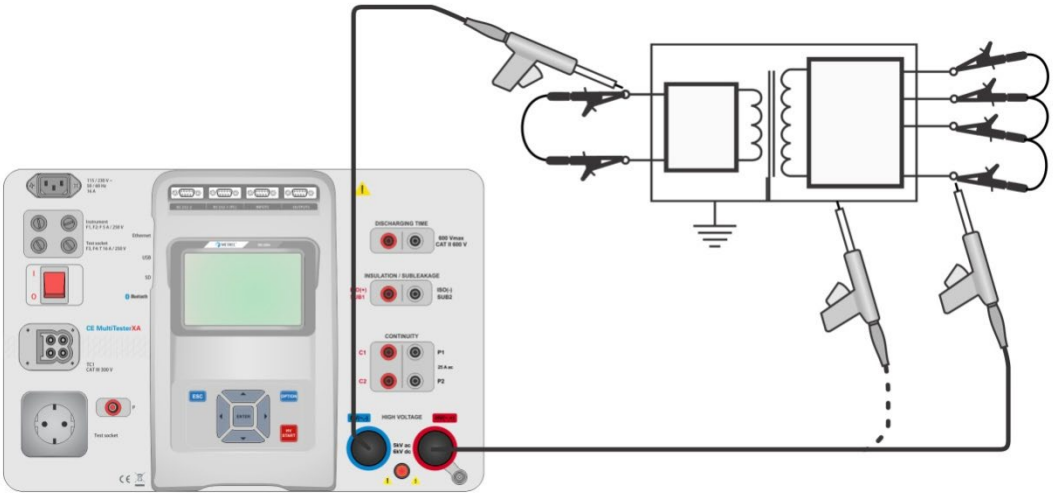


Figure 5.21: HV DC programmable test

HV DC programmable test procedure

- Select the **HV DC programmable** function.
- Set test parameters / limits.
- Connect HV test leads to HV(~,+) and HV(~,-) terminals on the instrument.
- Connect HV test leads to device under test.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

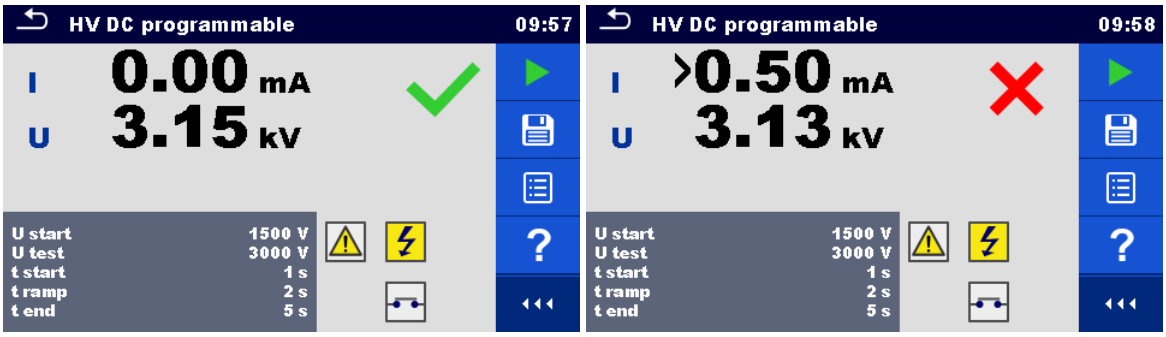


Figure 5.22: Examples of HV DC programmable test results

Note:

- First HV measurement after power on the instrument (if password protection is enabled) or first HV measurement after enabling or changing password require entering password for enabling HV test.

5.1.7 Insulation resistance (Riso, Riso-S)

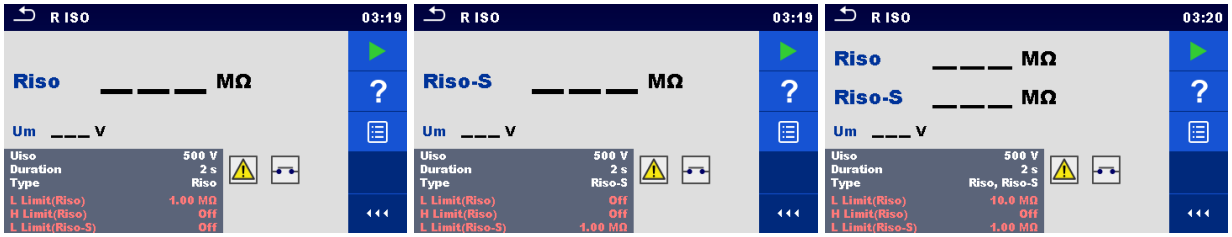


Figure 5.23: Insulation resistance test menus

Test results / sub-results

Riso ..... Insulation resistance
Riso-S ..... Insulation resistance-S
Um..... Test voltage

Test parameters

Nominal test voltage	Uiso [50 V, 100 V, 250 V, 500 V, 1000 V]
Duration	Duration [Off, 2 s ... 180 s]
Type of test	Type [Riso, Riso-S, (Riso, Riso-S)]
Output connections (Riso)	[ISO(+), ISO(-), Socket LN-PE, Socket LN-P/S]
Output connections (Riso-S)	[Socket LN-P/S]

Test limits

H Limit (Riso)	H limit [Off, 0.10 MΩ ... 10.0 MΩ]
L Limit (Riso)	L limit [Off, 0.10 MΩ ... 10.0 MΩ]
H Limit (Riso-S)	H limit [Off, 0.10 MΩ ... 10.0 MΩ]
L Limit (Riso-S)	L limit [Off, 0.10 MΩ ... 10.0 MΩ]

Test circuits

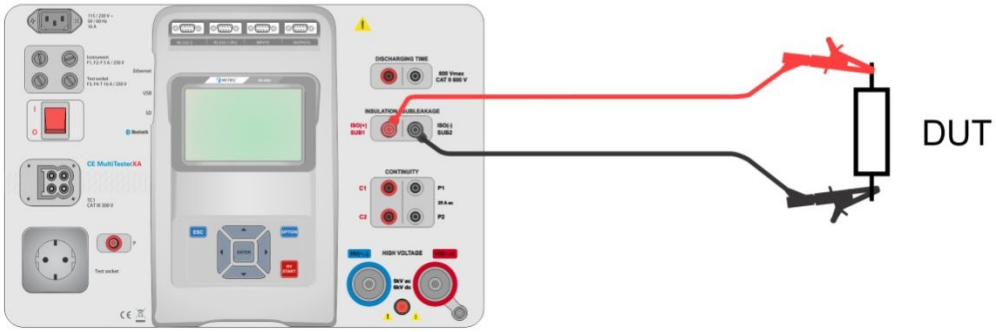


Figure 5.24: Measurement of insulation resistance (ISO(+), ISO(-))

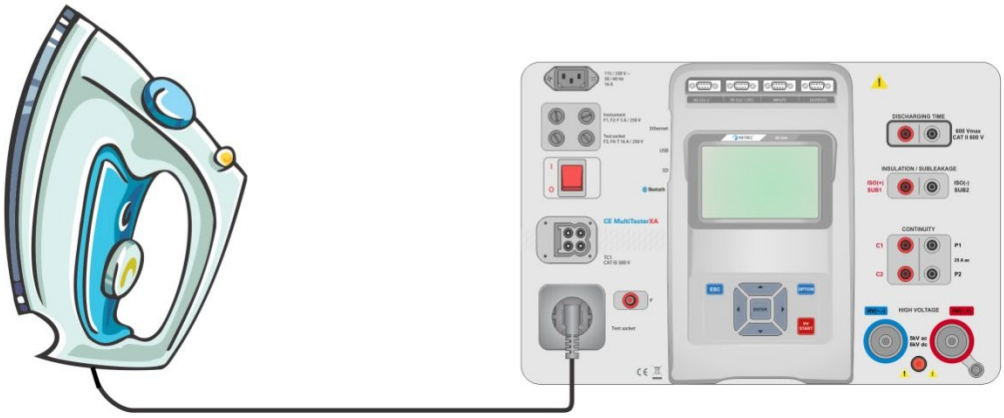


Figure 5.25: Measurement of insulation resistance (Socket LN - PE)

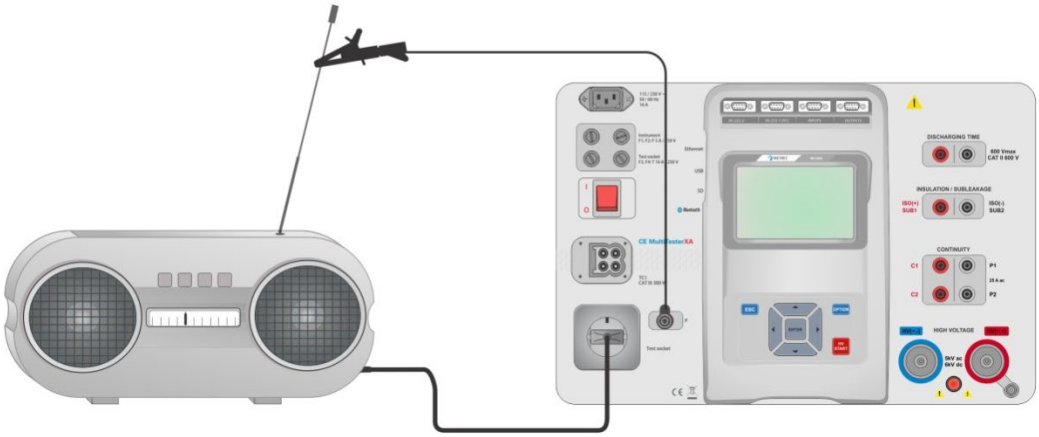


Figure 5.26: Measurement of Riso, Riso-S (socket)

RISO measurement procedure

- Select the **Riso** function.
- Set test parameters / limits.
- Connect test leads to ISO(+), ISO(-) terminals on the instrument, then connect test leads to device under test, or
- Connect device to mains test socket. For Riso-S test, additionally connect test lead to P/S terminal on instrument, and then connect test lead to device.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

Figure 5.27: Examples of Insulation resistance measurement results

Note:

- When P/S probe is connected during the Riso measurement, then the current through it is also considered.

5.1.8 Sub-leakage (Isub, Isub-S)

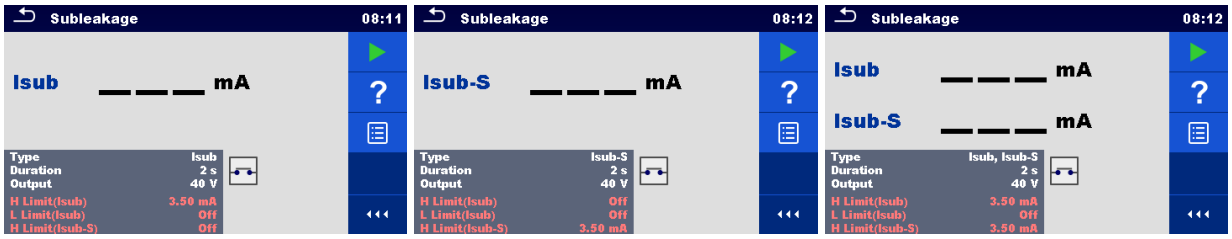


Figure 5.28: Sub Leakage test menus

Test results / sub-results

Isub ..... Sub-leakage current
Isub-S..... Sub-leakage current-S

Test parameters

Type of test	Type [Isub, Isub-S, (Isub, Isub-S)]
Output voltage	Output [40 Vac]
Duration	Duration [Off, 2 s ... 180 s]
Output connections (Isub)	[SUB1, SUB2, Socket LN-PE, Socket LN-P/S]
Output connections (Isub-S)	[Socket LN-P/S]

Test limits

H Limit (Isub)	H limit [Off, 0.25 mA ... 15.0 mA, Custom]
L Limit (Isub)	L limit [Off, 0.25 mA ... 15.0 mA, Custom]
H Limit (Isub-S)	H limit [Off, 0.25 mA ... 15.0 mA]
L Limit (Isub-S)	L limit [Off, 0.25 mA ... 15.0 mA]

Test circuits

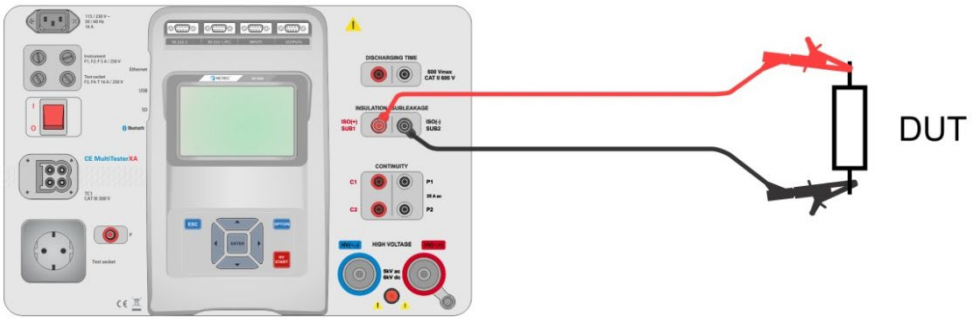


Figure 5.29: Measurement of Sub-leakage (SUB1, SUB2)

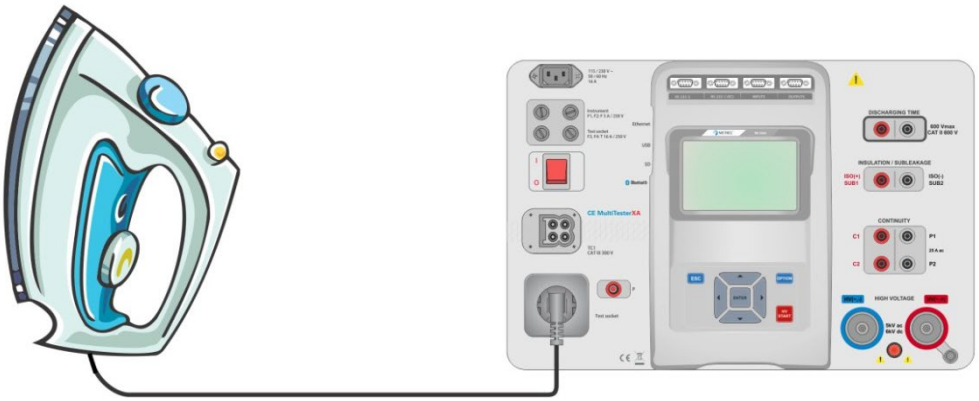


Figure 5.30: Measurement of Sub-leakage (socket LN-PE)

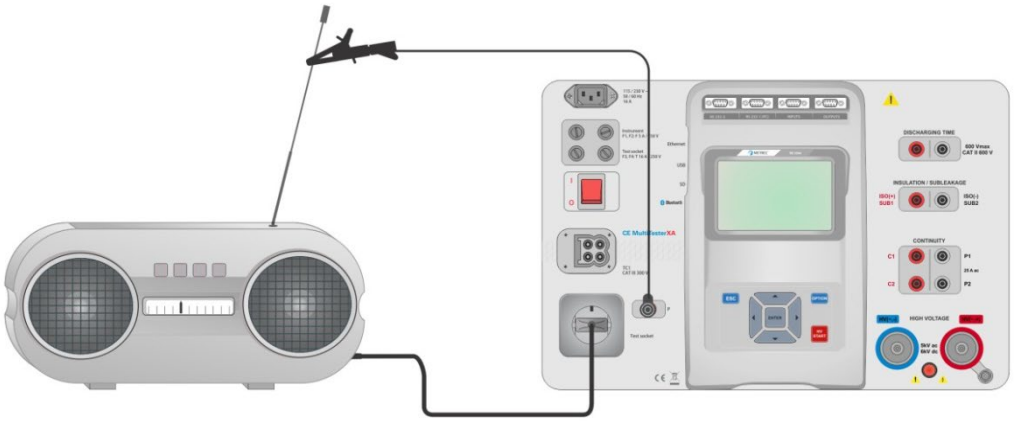


Figure 5.31: Measurement of Sub-leakage, Sub-leakage-S (socket)

Sub-leakage measurement procedure

- Select the **Sub-leakage** function.

- Set test parameters / limits.
- Connect test leads to SUB1,SUB2 terminals on the instrument, then connect test leads to device under test, or
- Connect device under test to mains test socket. For Isub-S test, additionally connect test lead to P/S terminal on the instrument, and then connect test lead to a device.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

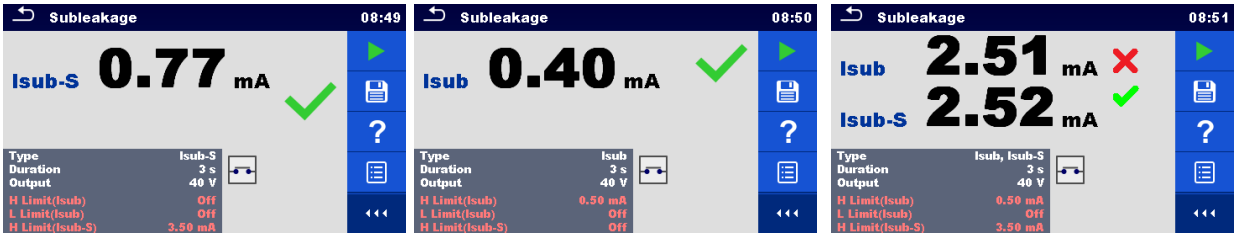


Figure 5.32: Examples of Sub-leakage measurement results

Note:

- When P/S probe is connected during the Sub-leakage measurement, then the current through it is also considered.

5.1.9 Differential Leakage

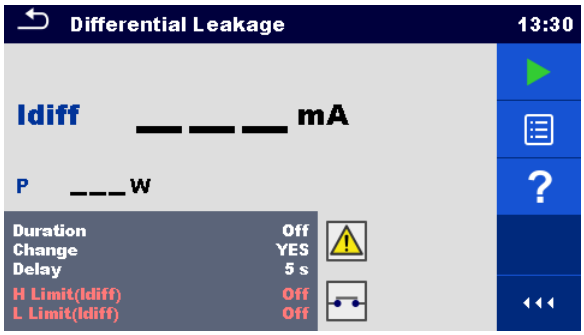


Figure 5.33: Differential Leakage test menu

Test results / sub-results

Idiff ..... Differential Leakage current
P..... Power

Test parameters

Duration	Duration [Off, 2 s ... 180 s]
Change status	Change [YES, NO] YES: The instrument measures leakage current in two sequential steps with delay* in between. The phase voltage is firstly applied to the right live output of the mains test socket and secondly to the left live output of the mains test socket. NO: The phase voltage is applied only to the right live output of the mains test socket.
*Delay time	Delay [0.2 s … 5 s]

Test limits

H Limit (Idiff)	H limit [Off, 0.25 mA ... 15.0 mA, Custom]
L Limit (Idiff)	L limit [Off, 0.25 mA ... 15.0 mA, Custom]
Output connections	[Socket L,N – PE,P/S]

Test circuit

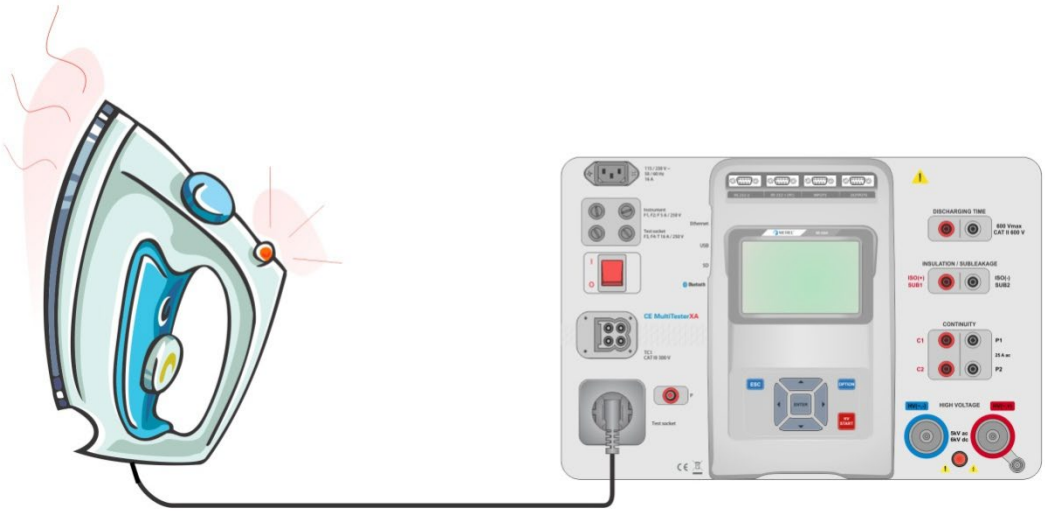


Figure 5.34: Measurement of Differential Leakage current

Differential Leakage measurement procedure

- Select the **Differential Leakage** function.
- Set test parameters / limits.
- Connect device under test to mains test socket and optionally to P/S terminal.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

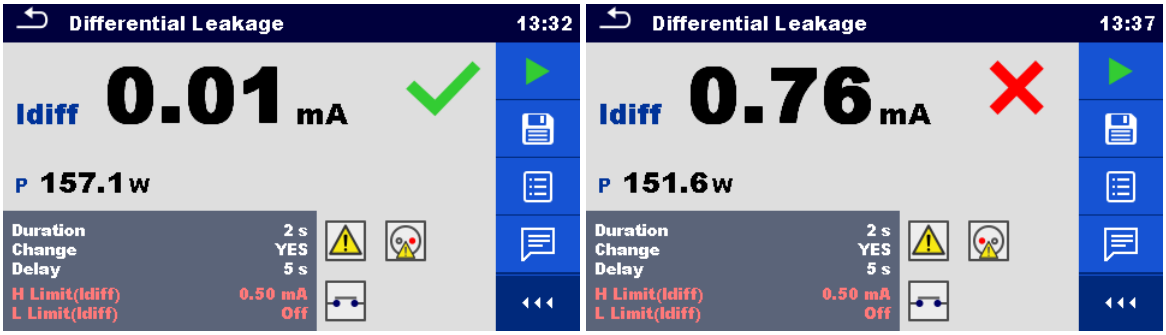


Figure 4.35: Examples of Differential Leakage measurement results

5.1.10 Ipe Leakage

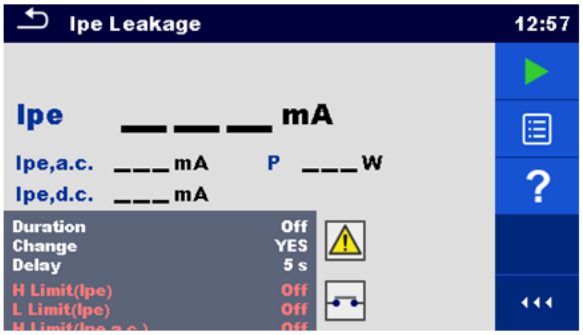


Figure 5.36: Ipe Leakage test menu

Test results / sub-results

Ipe ..... PE current
Ipe,a.c. ..... a.c. part of PE current
Ipe,d.c. ..... d.c. part of PE current
P..... Power

Test parameters

Duration	Duration [Off, 2 s ... 180 s]
Change status	Change [YES, NO] YES: The instrument measures leakage current in two sequential steps with delay* in between. The phase voltage is firstly applied to the right live output of the mains test socket and secondly to the left live output of the mains test socket. NO: The phase voltage is applied only to the right live output of the mains test socket.
*Delay time	Delay [0.2 s … 5 s]
Output connections	[Socket L,N – PE]

Test limits

H Limit (Ipe)	H limit [Off, 0.25 mA ... 15.0 mA, Custom]
L Limit (Ipe)	L limit [Off, 0.25 mA ... 15.0 mA, Custom]
H Limit (Ipe,a.c.)	H limit [Off, Custom, 0.25 mA ... 15.0 mA]
L Limit (Ipe,a.c.)	L limit [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Ipe,d.c.)	H limit [Off, Custom, 0.25 mA ... 15.0 mA]
L Limit (Ipe,d.c.)	L limit [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit

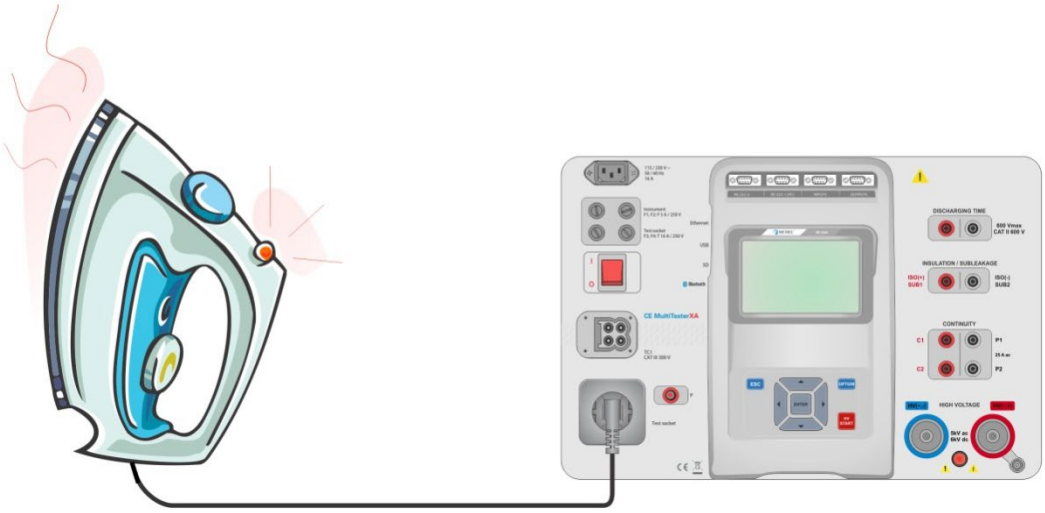


Figure 5.37: Measurement of Ipe Leakage current

Ipe Leakage measurement procedure

- Select the **Ipe Leakage** function.
- Set test parameters / limits.
- Connect device under test to mains test socket.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

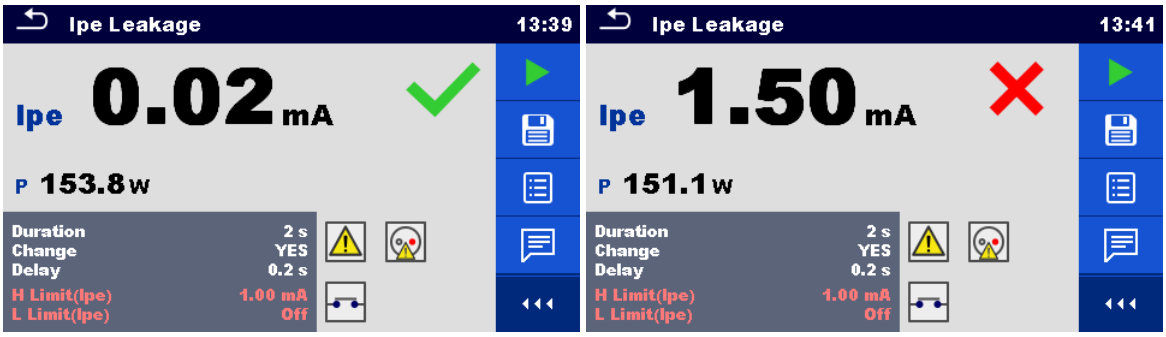


Figure 5.38: Examples of Ipe Leakage measurement results

5.1.11 Touch Leakage

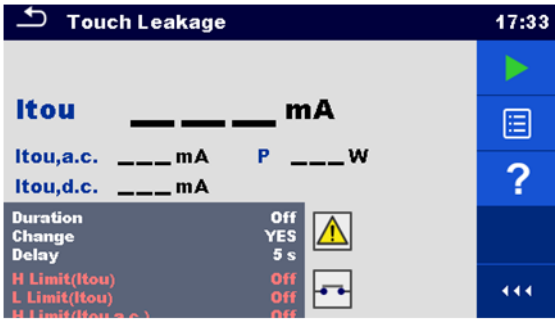


Figure 5.39: Touch Leakage test menu

Test results / sub-results

Itou ..... Touch Leakage current
Itou,a.c. ..... a.c. part of Touch Leakage current
Itou,d.c. ..... d.c. part of Touch Leakage current
P..... Power

Test parameters

Duration	Duration [Off, 2 s ... 180 s]
Change status	Change [YES, NO] YES: The instrument measures leakage current in two sequential steps with delay* in between. The phase voltage is firstly applied to the right live output of the mains test socket and secondly to the left live output of the mains test socket. NO: The phase voltage is applied only to the right live output of the mains test socket.
*Delay time	Delay [0.2 s … 5 s]
Output connections	[Socket L,N – PE,P/S]

Test limits

H Limit (Itou)	H limit [Off, 0.25 mA ... 15.0 mA]
L Limit (Itou)	L limit [Off, 0.25 mA ... 15.0 mA]
H Limit (Ipe,a.c.)	H limit [Off, Custom, 0.25 mA ... 15.0 mA]
L Limit (Ipe,a.c.)	L limit [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Ipe,d.c.)	H limit [Off, Custom, 0.25 mA ... 15.0 mA]
L Limit (Ipe,d.c.)	L limit [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit

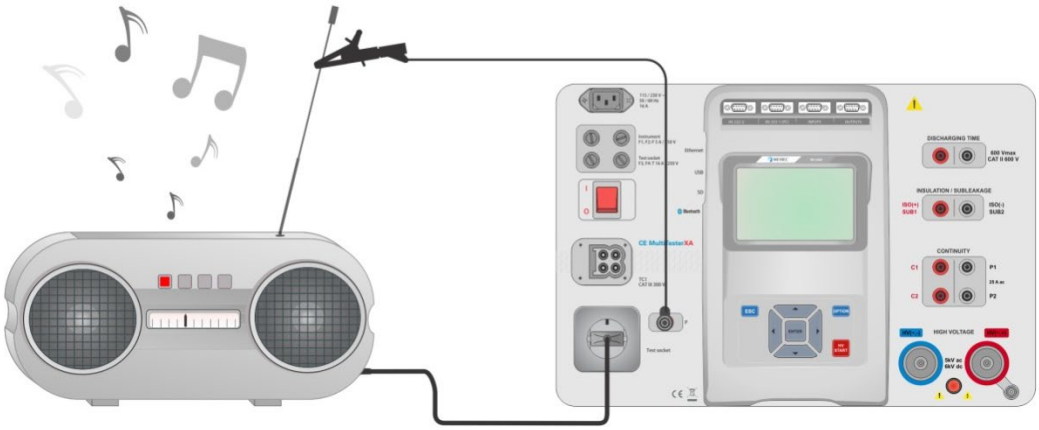


Figure 5.40: Measurement of Touch Leakage current

Touch Leakage measurement procedure

- Select the **Touch Leakage** function.
- Set test parameters / limits.
- Connect device under test to mains test socket. Connect test lead to P/S terminal on the instrument and on device under test.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

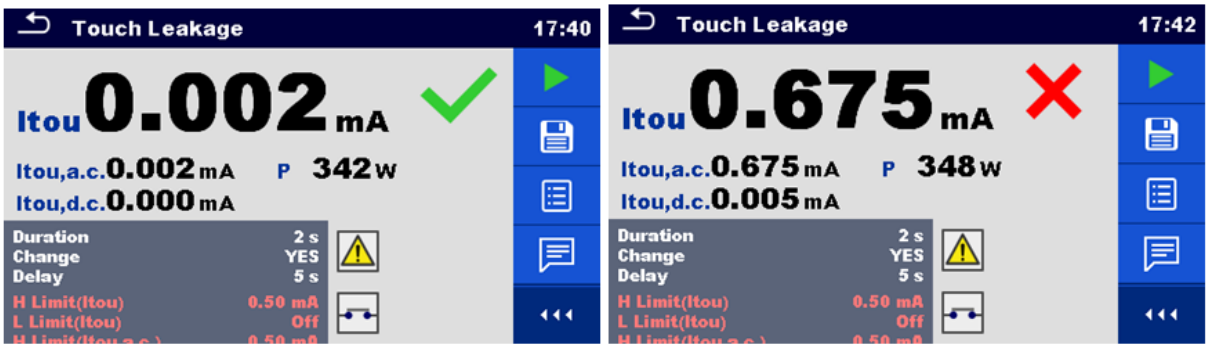


Figure 5.41: Examples of Touch Leakage measurement results

5.1.12 Power

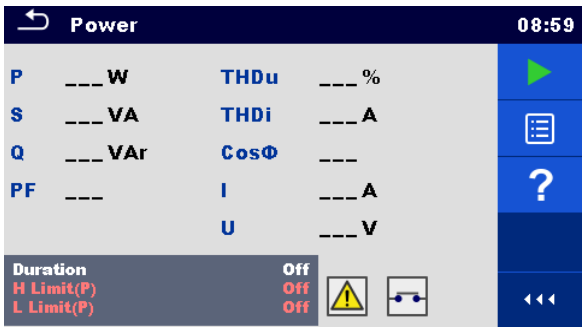


Figure 5.42: Power measurement menu

Test results / sub-results

P ..... Active power
S ..... Apparent power
Q ..... Reactive power
PF ..... Power factor
THDu ..... Total harmonic distortion – voltage
THDi ..... Total harmonic distortion – current
Cos Φ ..... cosinus Φ
I ..... Load current
U ..... Voltage

Test parameters

Duration	Duration [Off, 2 s ... 180 s]
Output connections	[Socket L–N]

Test limits

H Limit (P)	H limit [Off, 10 W ... 3.50 kW, Custom]
L Limit (P)	L limit [Off, 10 W ... 3.50 kW, Custom]

Test circuit

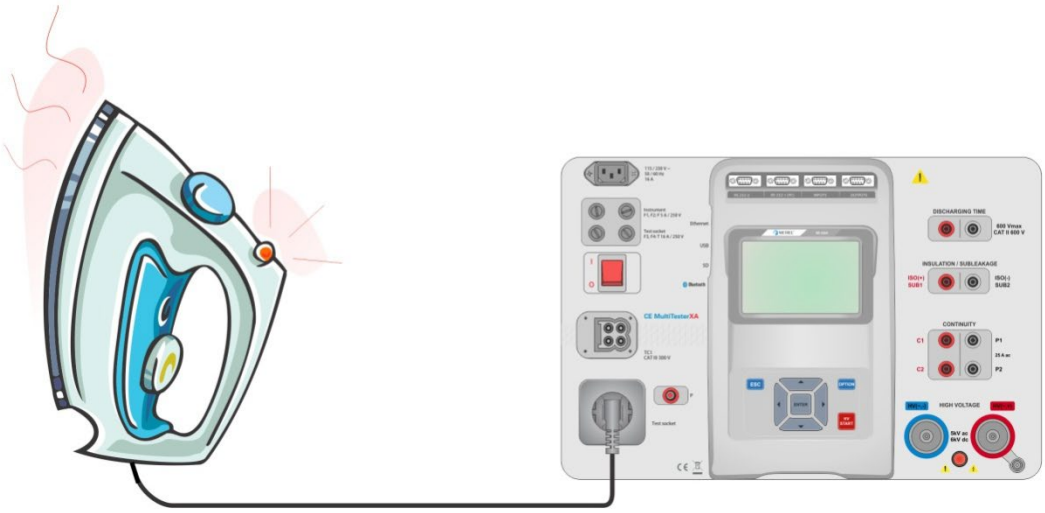


Figure 5.43: Measurement of Power

Power measurement procedure

- Select the **Power** function.
- Set test parameters / limits.
- Connect device under test to mains test socket.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

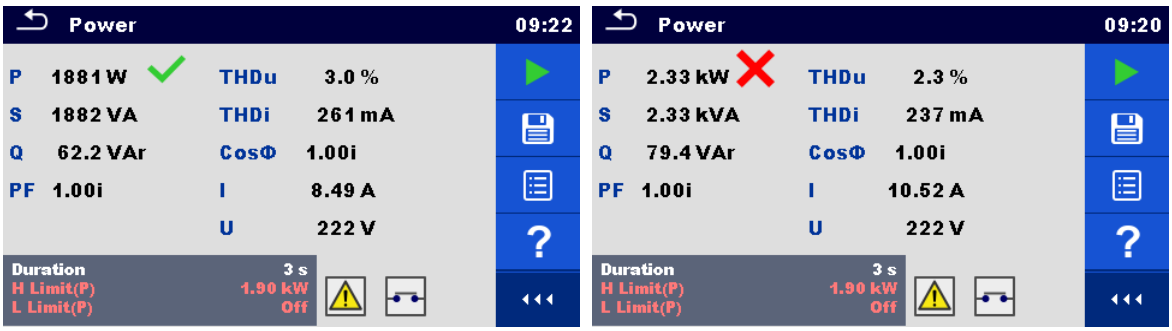


Figure 5.44: Examples of Power measurement results

5.1.13 Leak's & Power

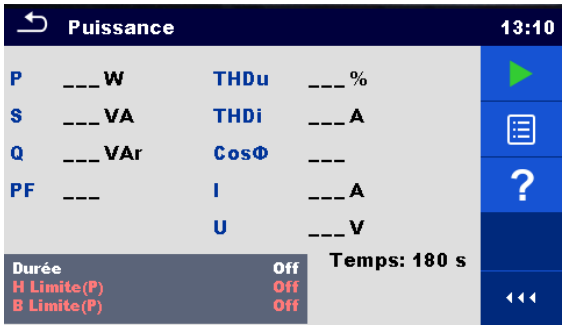


Figure 5.45: Leak's & Power measurement menu

Test results / sub-results

P..... Active power
Itou ..... Touch Leakage current
Itou,a.c. ..... a.c. part of Touch Leakage current
Itou,d.c. ..... d.c. part of Touch Leakage current
Idiff ..... Differential Leakage current
S..... Apparent power
Q ..... Reactive power
PF..... Power factor
THDu ..... Total harmonic distortion – voltage
THDi ..... Total harmonic distortion – current
Cos Φ..... cosinus Φ
I ..... Load current
U..... Voltage

Test parameters

Duration	Duration [Off, 2 s ... 180 s]
Change status	Change [YES, NO] YES: The instrument measures leakage current in two sequential steps with delay* in between. The phase voltage is firstly applied to the right live output of the mains test socket and secondly to the left live output of the mains test socket. NO: The phase voltage is applied only to the right live output of the mains test socket.
*Delay time	Delay [0.2 s … 5 s]
Output connections	[Socket L–N, Socket L,N – PE,P]

Test limits

H Limit (P)	H limit [Off, 10 W ... 3.50 kW, Custom]
L Limit (P)	L limit [Off, 10 W ... 3.50 kW, Custom]
H Limit (Idiff)	H limit [Off, 0.25 mA ... 15.0 mA, Custom]
L Limit (Idiff)	L limit [Off, 0.25 mA ... 15.0 mA, Custom]
H Limit (Itou)	H limit [Off, 0.25 mA ... 15.0 mA]
L Limit (Itou)	L limit [Off, 0.25 mA ... 15.0 mA]
H Limit (Itou,a.c.)	H limit [Off, Custom, 0.25 mA ... 15.0 mA]
L Limit (Itou,a.c.)	L limit [Off, Custom, 0.25 mA ... 15.0 mA]
H Limit (Itou,d.c.)	H limit [Off, Custom, 0.25 mA ... 15.0 mA]
L Limit (Itou,d.c.)	L limit [Off, Custom, 0.25 mA ... 15.0 mA]

Test circuit

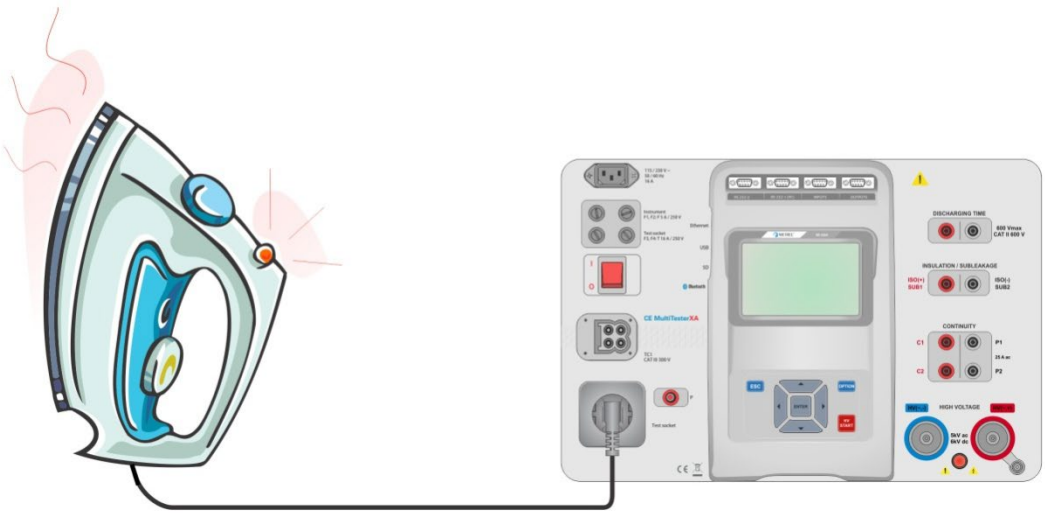


Figure 5.46: Measurement of Leak's and Power

Leak's & Power measurement procedure

- Select the **Leak's & Power** function.
- Set test parameters / limits.
- Connect device under test to mains test socket and optionally to P/S terminal.
- Start measurement.
- Measurement can be stopped manually or by timer.
- Save results (optional).

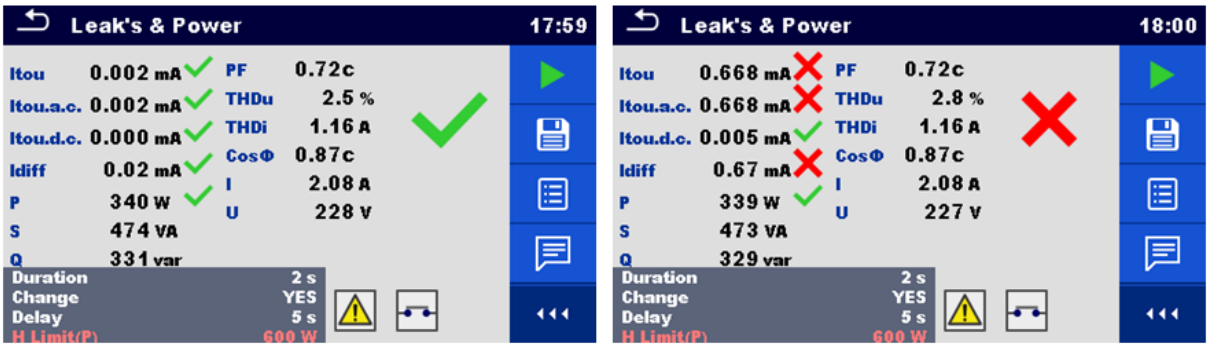


Figure 5.47: Examples of Leak's & Power measurement results

5.1.14 Discharging Time

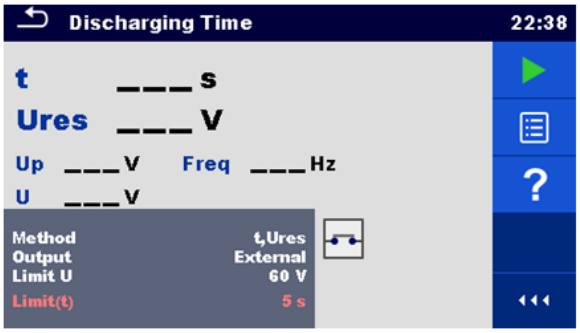


Figure 5.48: Discharging Time test menu

Test results / sub-results

t ..... Discharging time
Ures..... Residual voltage
Up..... Peak voltage of supply during the test
U..... RMS voltage
f ..... Frequency

Test parameters

Test method	Method [t, t, Ures]
Limit voltage	Limit U [34 V, 60 V, 120 V]
Output connections	Output [External, Socket]
Test mode	Mode [Manual, Auto]
Delay time for AUTO mode	Delay [2 s ... 30 s]

Test limits

Discharging time limit	Limit(t) [1 s, 5 s]

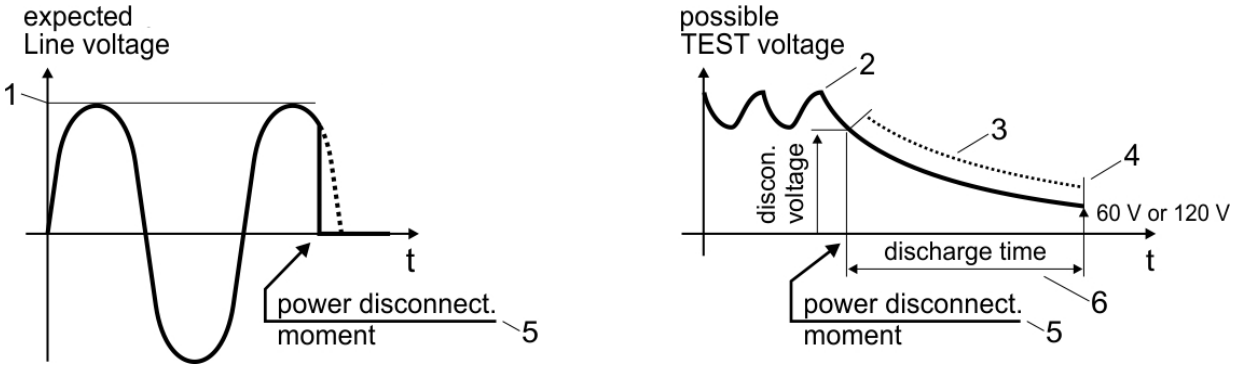
Measuring principle (Output = External)

The measuring principle of the Discharging time function is as following:

Phase ① The device under test is connected to supply voltage via an external socket. The instrument monitors the voltage (on supply or internal connections) and internally stores the peak voltage value, RMS. voltage and frequency values.

Phase ② The device under test is disconnected from the supply and the voltage at the test terminals starts to fall. Once the rms voltage falls for 10 V the instrument starts the timer.

Phase ③ After the voltage drops below an internally calculated voltage value the timer is stopped. The instrument re-calculates the measured time to a value as it would be if the disconnection occurred at the maximum voltage value.



(1) peak voltage
(2) voltage at disconnection time
(3) calculated voltage value
(4) Ulim
(5) moment of disconnection
(6) discharging time

Figure 5.49: Measuring principle (external)

Test circuit (Output = External)

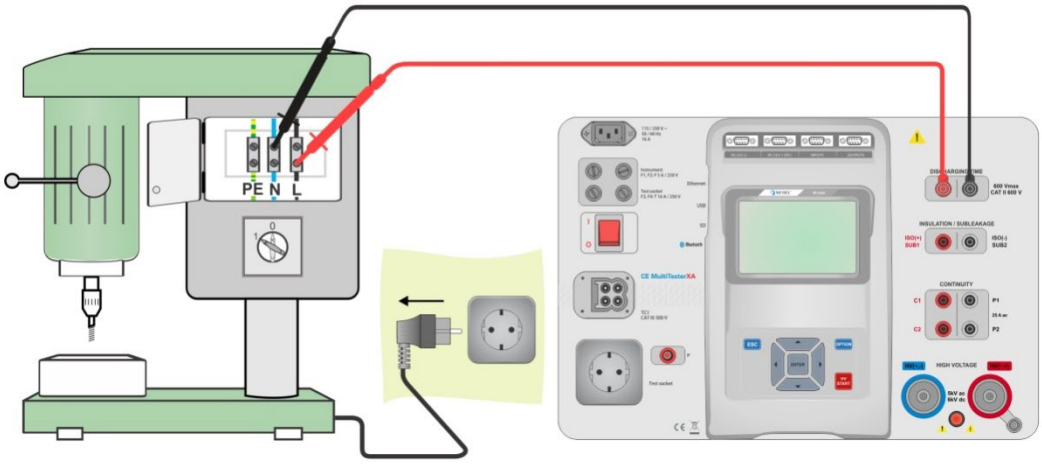


Figure 5.50: Discharging Time test (Output = External)

Discharging Time test procedure (Output = External)

- Select the **Discharging Time** function.
- Set test parameters / limits.
- Connect test leads to the DISCHARGING TIME terminals on the instrument and on the device under test.
- Connect device under test to the mains supply and Switch it ON.
- Start measurement.
- Measurement is stopped manually by disconnecting device under test mains supply.
- Save results (optional).

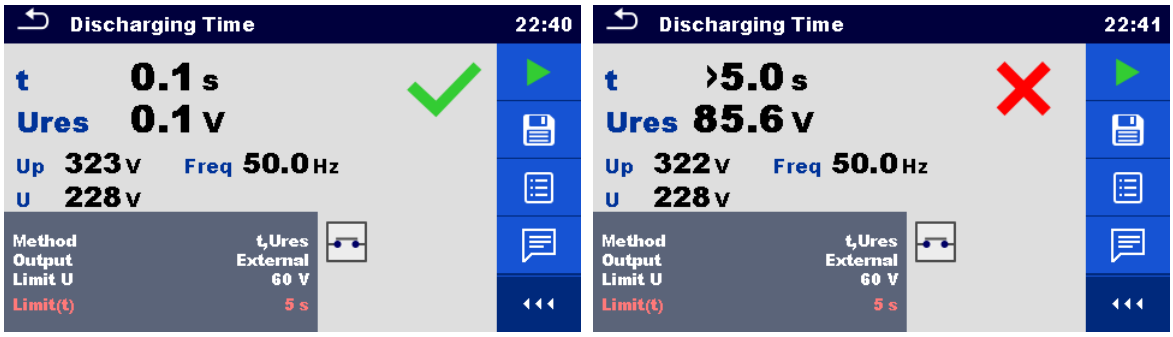


Figure 5.51: Examples of Discharging Time measurement results (Output = External)

Note:

- Interpretation of the '**Repeat**' message:
  It is not possible to differentiate between a disconnection moment at very low voltage and a machine with a very low discharging time. In both cases the reading will be 0.0 s together with the "Repeat" warning. If after few repetitions the result is always 0.0 s with the "Repeat" message it can be considered as a valid 0.0 s result.
  A 0.0 s reading without the "Repeat" message is a valid result.

Measuring principle (Output = Socket)

The measuring principle of the Discharging time function is as following:

Phase ① The DEVICE UNDER TEST is connected to the mains test socket.The instrument monitors the mains voltage and internally stores the peak voltage value.

Phase ② The instrument disconnects the DEVICE UNDER TEST from the supply and the voltage at the supply connections starts to fall. Disconnection moment is always at peak voltage.

Phase ③ After the voltage drops below the limit value the timer is stopped.

Test circuit (Output = Socket)

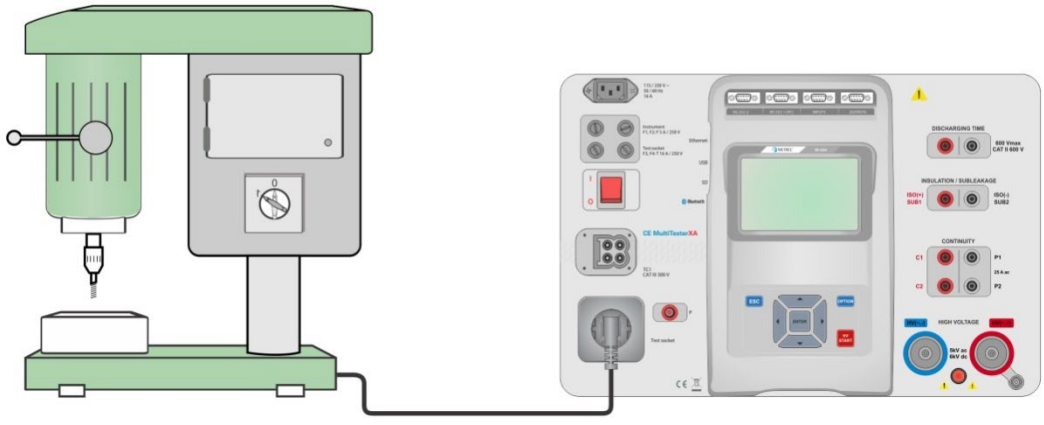


Figure 5.52: Discharging Time test (Output = Socket)

Discharging Time test procedure (Output = Socket)

- Select the **Discharging Time** function.
- Set test parameters / limits.
- Connect the device under test to the mains test socket on the instrument.
- Start measurement.
- Measurement can be stopped manually or automatically.
- Save results (optional).

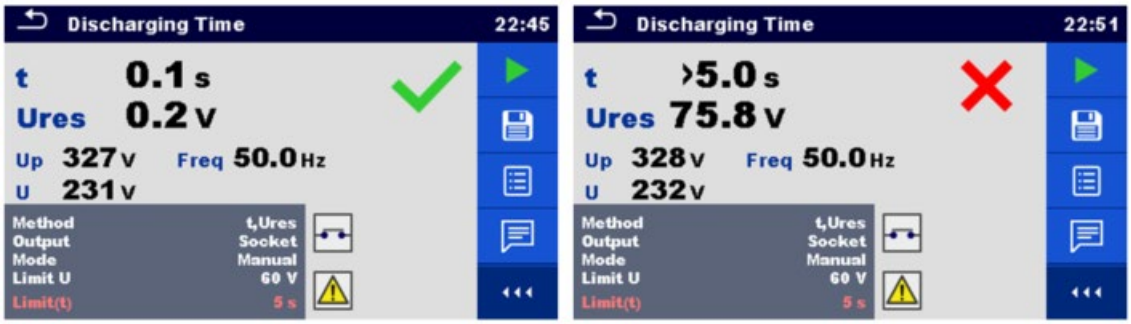


Figure 5.53: Examples of Discharging Time measurement results (Output = Socket)

5.1.15 Functional inspections

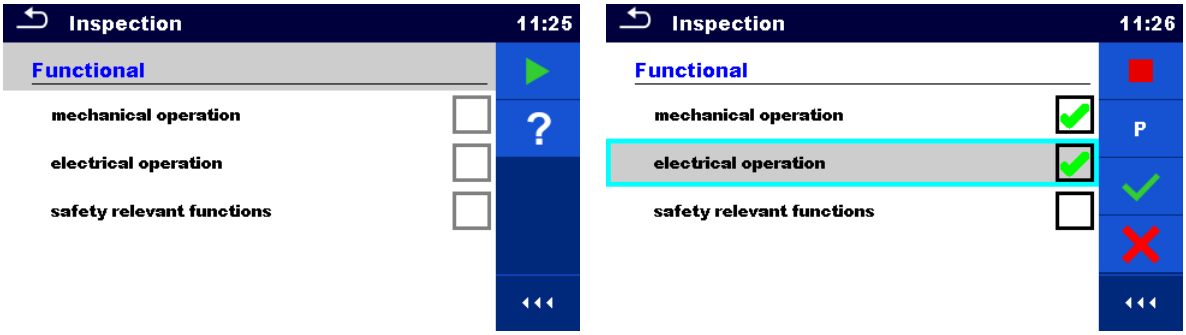


Figure 5.54: Functional inspection start menu (left) and menu during inspection (right)

Test parameters (optional)

For the optional Power measurement test the parameters and limits are the same as set in the Power single test, see chapter *4.1.12 Power.*

Test circuit

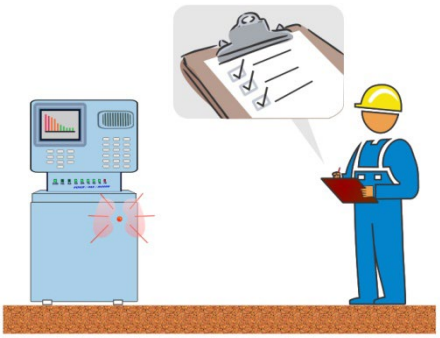


Figure 5.55: Functional inspection

Functional inspection procedure

- Select the appropriate **Functional** inspection.
- Start the inspection.
- Perform the functional inspection of the appliance / equipment.
- Perform the Power measurement test through the mains test socket (optional).
- Apply appropriate ticker(s) to items of inspection.
- End the inspection.
- Save results (optional).

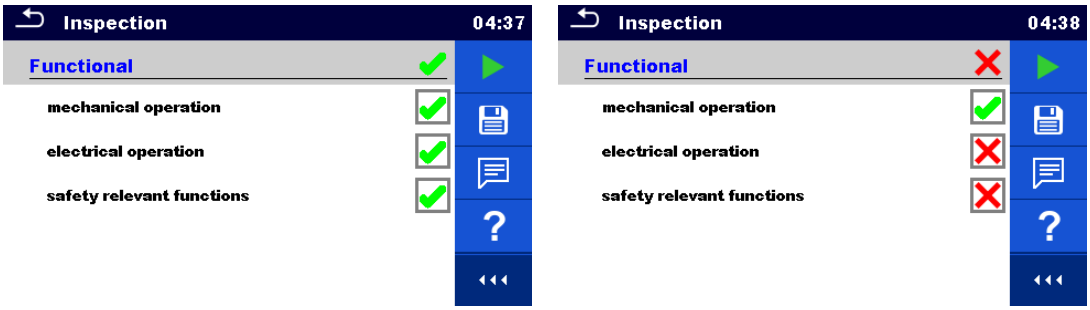


Figure 5.56: Examples of Functional Inspection results

6 Maintenance

Except for the fuse, the instrument contains no parts that can be replaced by personnel who have not been specially trained and accredited. Any unauthorized repair or replacement of a part by an “equivalent” may gravely impair safety.

6.1 Fuses

There are four fuses on the front panel:

F1, F2: F 5 A / 250 V / (20 × 5) mm / 1500 A: intended for instrument protection.
For position of fuses refer to chapter *3.1 Front panel*.

F3, F4: T 16 A / 250 V / (32 × 6,3) mm / 1500 A: protection against over-currents through mains test socket.
For position of fuses refer to chapter *3.1 Front panel*.

Warnings!

- Switch off the instrument and disconnect all test accessories and mains cord before replacing the fuses or opening the instrument.
- Replace blown fuses only with the same types defined in this document.

6.2 Cleaning

Use a soft, slightly moistened cloth with soap water or alcohol to clean the surface of C.A 6165 instrument. Leave the instrument to dry totally before using it.

Notes:

- Do not use liquids based on petrol or hydrocarbons!
- Do not spill cleaning liquid over the instrument!

7 Warranty

Except as otherwise stated, our warranty is valid for **24 months** starting from the date on which the equipment was sold. The extract from our General Conditions of Sale is available on our website.

www.chauvin-arnoux.com/en/general-terms-of-sale

The warranty does not apply in the following cases:

- Inappropriate use of the equipment or use with incompatible equipment;
- Modifications made to the equipment without the explicit permission of the manufacturer's technical staff;
- Work done on the device by a person not approved by the manufacturer;
- Adaptation to a particular application not anticipated in the definition of the equipment or not indicated in the user's manual;
- Damage caused by shocks, falls, or floods.

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