

ENGLISH

User manual



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1. PRECAUTIONS AND SAFETY MEASURES

The instrument has been designed in compliance with directive IEC/EN61010-1 relevant to electronic measuring instruments. For your safety and in order to prevent damaging the instrument, please carefully follow the procedures described in this manual and read all notes preceded by the symbol  with the utmost attention.

Before and after carrying out the measurements, carefully observe the following instructions:

- Do not carry out any measurement in humid environments.
- Do not carry out any measurements in case gas, explosive materials or flammables are present, or in dusty environments.
- Avoid any contact with the circuit being measured if no measurements are being carried out.
- Avoid contact with exposed metal parts, with unused measuring probes, etc.
- Do not carry out any measurement in case you find anomalies in the instrument such as deformation, substance leaks, absence of display on the screen, etc.
- **Never apply a voltage exceeding 30V** between any pair of inputs or between an input and the grounding in order to prevent possible electrical shocks and any damage to the instrument.

In this manual, and on the instrument, the following symbols are used:



CAUTION: observe the instructions given in this manual; improper use could damage the instrument or its components.



Double-insulated meter.



Connection to earth

1.1. PRELIMINARY INSTRUCTIONS

- This instrument has been designed for use in environments of pollution degree 2.
- It can be used to measure **DC VOLTAGE** and **DC CURRENT**.
- We recommend following the normal safety rules devised to protect the user against dangerous currents and the instrument against incorrect use.
- Only the leads and the accessories supplied with the instrument guarantee compliance with the safety standards. They must be in good conditions and replaced with identical models, when necessary.
- Do not test circuits exceeding the specified voltage limits.
- Do not perform any test under environmental conditions exceeding the limits indicated in § 6.2.1.
- Check that the battery is correctly inserted.
- Before connecting the leads to the circuit being measured, check that the instrument has been correctly set in order to prevent any damage to the instrument.

1.2. DURING USE

Please carefully read the following recommendations and instructions:



CAUTION

Failure to comply with the caution notes and/or instructions may damage the instrument and/or its components or be a source of danger for the operator.

- Before selecting a measuring function, disconnect the test leads from the circuit under test.
- When the instrument is connected to the circuit under test, do not touch any unused terminal.
- When connecting the cables, always connect the “**COM**” terminal first, then the “**Positive**” terminal. When disconnecting the cables, always disconnect the “**Positive**” terminal first, then the “**COM**” terminal.
- **Do not apply a voltage exceeding 30V between the inputs of the instrument** in order to prevent possible damage to the instrument.

1.3. AFTER USE

- When measurement is complete, press the  key to switch off the instrument.
- If you expect not to use the instrument for a long period, remove the battery.

1.4. DEFINITION OF MEASUREMENT (OVERVOLTAGE) CATEGORY

Standard “IEC/EN61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements” defines what measurement category, commonly called overvoltage category, is. § 6.7.4: Measured circuits, reads:

(OMISSIS)

Circuits are divided into the following measurement categories:

- **Measurement category IV** is for measurements performed at the source of the low-voltage installation.
Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.
- **Measurement category III** is for measurements performed on installations inside buildings.
Examples are measurements on distribution boards, circuit breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to fixed installation.
- **Measurement category II** is for measurements performed on circuits directly connected to the low-voltage installation
Examples are measurements on household appliances, portable tools and similar equipment.
- **Measurement category I** is for measurements performed on circuits not directly connected to MAINS.
Examples are measurements on circuits not derived from MAINS, and specially protected (internal) MAINS-derived circuits. In the latter case, transient stresses are variable; for that reason, the standard requires that the transient withstand capability of the equipment is made known to the user.

2. GENERAL DESCRIPTION

The instrument HT8051 carries out the following measurements:

- Voltage measurement up to 10V DC
- Current measurement up to 24mA DC
- Voltage generation with amplitude up to 100mV DC and 10V DC
- Current generation with amplitude up to 24mA DC with display in mA and %
- Current and voltage generation with selectable ramp outputs
- Measuring output current of transducers (Loop)
- Simulation of an external transducer

On the front part of the instrument there are some function keys (see § 4.2) for selecting the type of operation. The selected quantity appears on the display with indication of the measuring unit and the enabled functions.

3. PREPARATION FOR USE

3.1. INITIAL CHECKS

Before shipping, the instrument has been checked from an electric as well as mechanical point of view. All possible precautions have been taken so that the instrument is delivered undamaged.

However, we recommend generally checking the instrument in order to detect possible damage suffered during transport. In case anomalies are found, immediately contact the forwarding agent.

We also recommend checking that the packaging contains all components indicated in § 6.4. In case of discrepancy, please contact the Dealer.

In case the instrument should be returned, please follow the instructions given in § 7.

3.2. INSTRUMENT POWER SUPPLY

The instrument is powered by a single 1x7.4V rechargeable Li-ION battery included in the package. The “” symbol appears on the display when the battery is flat. To recharge the battery using the supplied battery charger, please refer to § 5.2.

3.3. CALIBRATION

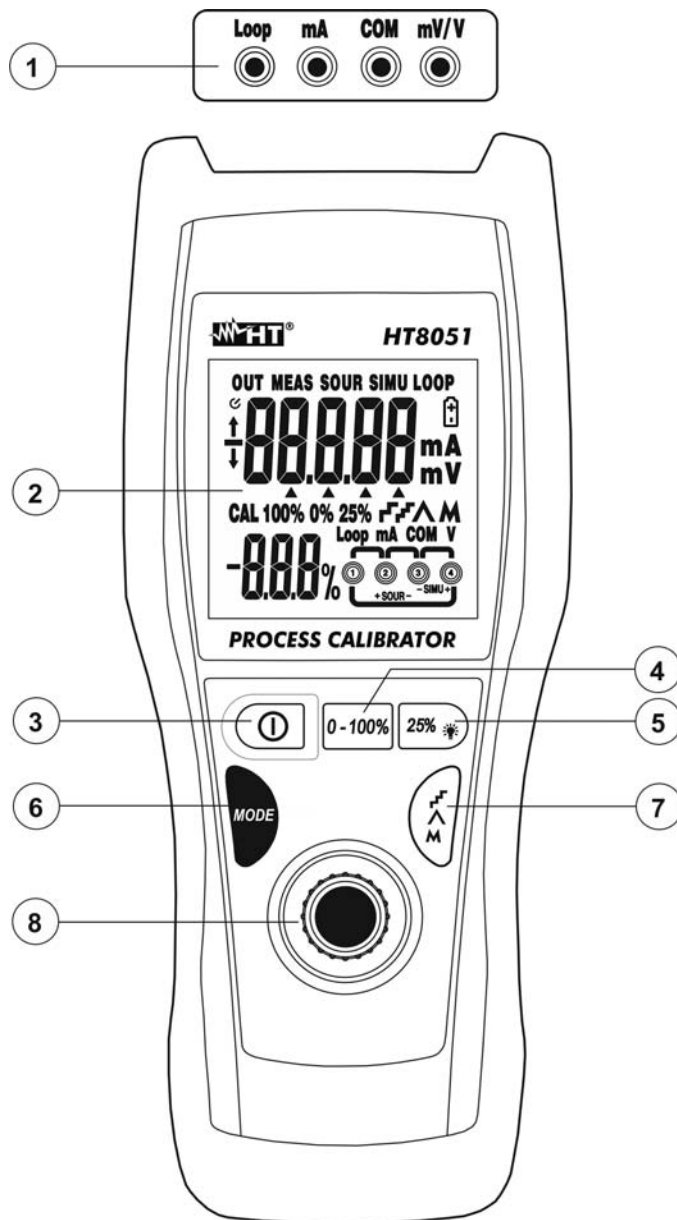
The instrument has the technical specifications described in this manual. The instrument's performance is guaranteed for 12 months.

3.4. STORAGE

In order to guarantee precise measurement, after a long storage time under extreme environmental conditions, wait for the instrument to come back to normal conditions (see § 6.2.1).

4. OPERATING INSTRUCTIONS

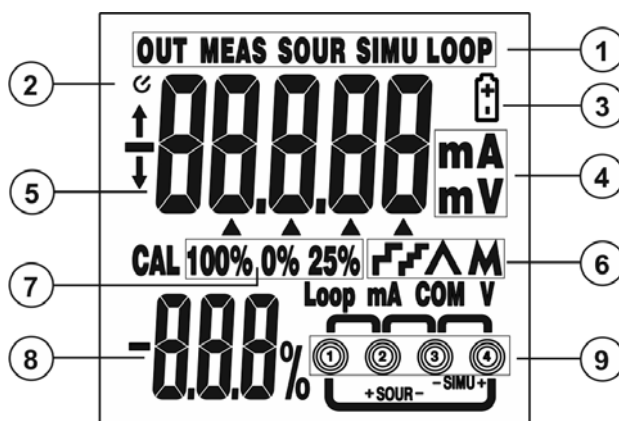
4.1. INSTRUMENT DESCRIPTION



CAPTION:

1. Input terminals **Loop**, **mA**, **COM**, **mV/V**
2. LCD display
3. Key ①
4. **0-100%** key
5. **25%** key
6. **MODE** key
7. Ramp function key
8. Adjuster knob

Fig. 1: Instrument description



CAPTION:

1. Operating mode indicators
2. Auto Power OFF symbol
3. Low battery indication
4. Measuring unit indications
5. Main display
6. Ramp function indicators
7. Signal level indicators
8. Secondary display
9. Used inputs' indicators

Fig. 2: Display description

4.2. DESCRIPTION OF FUNCTION KEYS AND INITIAL SETTINGS

4.2.1. ① key

Pressing this key turns on and off the instrument. The last selected function is indicated on the display.

4.2.2. 0-100% key

In operating modes **SOUR mA** (see § 4.3.4), **SIMU mA** (see § 4.3.6), **OUT V** and **OUT mV** (see § 4.3.2) pressing this key allows quickly setting the initial (**0mA** or **4mA**) and final (**20mA**) values of the output generated current, the initial (**0.00mV**) and final (**100.00mV**) values and the initial (**0.000V**) and final (**10.000V**) values of the output generated voltage. The percentage values “0.0%” and “100%” appear on the secondary display. The displayed value can always be modified by using the adjuster (see § 4.2.6). The “0%” and “100%” indication are shown at display.



CAUTION

The instrument **CANNOT** be used for managing measurements (**MEASURE**) and signal generation (**SOURCE**) at the same time.

4.2.3. 25%/☀ key

In operating modes **SOUR mA** (see § 4.3.4) and **SIMU mA** (see § 4.3.6), **OUT V** and **OUT mV** (see § 4.3.2), pressing this key allows quickly increasing/decreasing the value of the generated output current/voltage in steps of **25%** (0%, 25%, 50%, 75%, 100%) in the selected measuring range. In particular, the following values are available:

- Range 0 ÷ 20mA → 0.000mA, 5.000mA, 10.000mA, 15.000mA, 20.000mA
- Range 4 ÷ 20mA → 4.000mA, 8.000mA, 12.000mA, 16.000mA, 20.000mA
- Range 0 ÷ 10V → 0.000V, 2.500V, 5.000V, 7.500V, 10.000V
- Range 0 ÷ 100mV → 0.00mV, 25.00mV, 50.00mV, 75.00mV, 100.00mV

The percentage values are shown on the secondary display and the displayed value can always be modified by using the adjuster knob (see § 4.3.6). The “25%” indication is shown at display.

Press and hold the **25%/☀** key for a 3 seconds to activate display backlighting. The function deactivates automatically after approx. 20 seconds.

4.2.4. MODE key

Repeatedly pressing this key allows selecting the operating modes available in the instrument. In particular, following options are available:

- **OUT SOUR mA** → generation of output current up to 24mA (see § 4.3.4).
- **OUT SIMU mA** → simulation of a transducer in a current loop with auxiliary power supply (see § 4.3.6)
- **OUT V** → generation of output voltage up to 10V (see § 4.3.2)
- **OUT mV** → generation of output voltage up to 100mV (see § 4.3.2)
- **MEAS V** → measurement of DC voltage (max 10V) (see § 4.3.1)
- **MEAS mV** → measurement of DC voltage (max 100mV) (see § 4.3.1)
- **MEAS mA** → measurement of DC current (max 24mA) (see § 4.3.3).
- **MEAS LOOP mA** → measurement of output DC current from external transducers (see § 4.3.5).

4.2.5. key

In operating modes **SOUR mA**, **SIMU mA**, **OUT V** and **OUT mV** pressing this key allows setting the output current/voltage with automatic ramp, with reference to measuring ranges $0 \div 20\text{mA}$ or $4 \div 20\text{mA}$ for the current and $0 \div 100\text{mV}$ or $0 \div 10\text{V}$ for the voltage. Below shows the available ramps.

Ramp type	Description	Action
	Slow linear ramp	Passage from 0% → 100% → 0% in 40s
	Quick linear ramp	Passage from 0% → 100% → 0% in 15s
	Step ramp	Passage from 0% → 100% → 0% in steps of 25% with ramps of 5s

Table 1: List of available ramps for output current/voltage

Press any key or turn off and then on again the instrument to exit the function.

4.2.6. Adjuster knob

In operating modes **SOUR mA**, **SIMU mA**, **OUT V** and **OUT mV** the adjuster knob (see Fig. 1 – Position 8) allows programming the output current/voltage generated with resolution **1μA (0.001V/0.01mV) / 10μA (0.01V/0.1mV) / 100μA (0.1V/1mV)**. Proceed as follows:

1. Select operating modes **SOUR mA**, **SIMU mA**, **OUT V** or **OUT mV**.
2. In case of current generation, select one of the measuring ranges $0 \div 20\text{mA}$ or $4 \div 20\text{mA}$ (see § 4.2.7).
3. Press the adjuster knob and set the desired resolution. The arrow symbol “▲” moves to the desired position of the digits on the main display following the decimal point. Default resolution is **1μA (0.001V/0.01mV)**.
4. Turn the adjuster knob and set the desired value of output current/voltage. The corresponding percentage value is indicated on the secondary display.

4.2.7. Setting measuring ranges for output current

In operating modes **SOUR mA** and **SIMU mA** it is possible to set the output range of generated current. Proceed as follows:

1. Switch off the instrument by press the  key
2. With **0-100%** key pressed switch on the instrument by press the  key
3. The value “0.000mA” or “4.000mA” is shown at display for approx. 3 seconds and then the instrument back to the normal visualization

4.2.8. Adjusting and disabling the Auto Power OFF function

The instrument has an Auto Power OFF function which activates after a certain period of idleness in order to preserve the instrument’s internal battery. The symbol “” appears on the display with enabled function and the default value is 20 minutes. To set a different time or deactivate this function, proceed as follows:

1. Press the “” key to switch on the instrument and, at the same time, keep the **MODE** key pressed. The message “PS – XX” appears on the display for 5s. “XX” stands for the time indicated in minutes.
2. Turn the adjuster to set the time value in the range **5 ÷ 30 minutes** or select “**OFF**” to disable the function.
3. Wait 5s until the instrument automatically quits the function.

4.3. DESCRIPTION OF MEASURING FUNCTIONS

4.3.1. DC Voltage measurement



CAUTION

The maximum DC which can be applied to inputs is 30V DC. Do not measure voltages exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

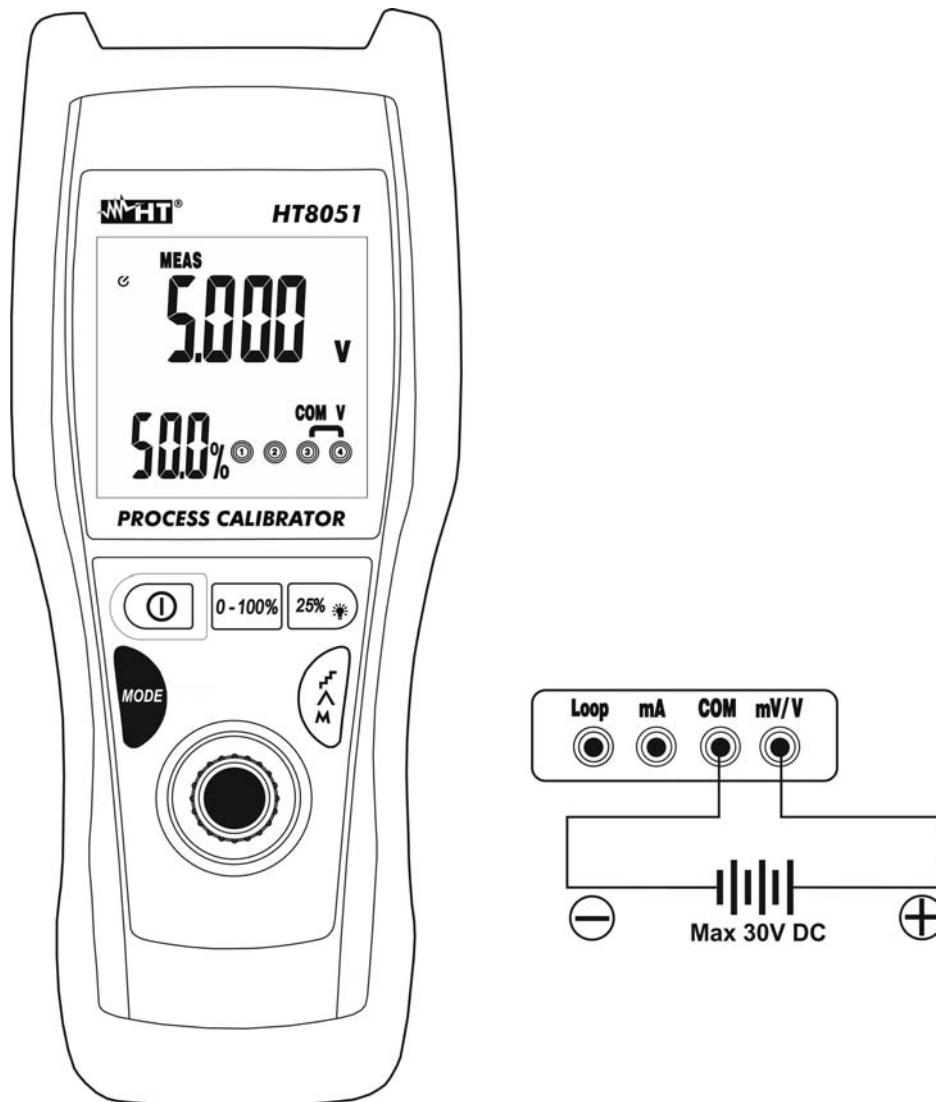


Fig. 3: DC voltage measurement

1. Press the **MODE** key and select the measuring modes **MEAS V** or **MEAS mV**. The message "MEAS" is shown on the display
2. Insert the green cable into input lead **mV/V** and the black cable into input lead **COM**
3. Position the green lead and the black lead respectively in the points with positive and negative potential of the circuit to be measured (see Fig. 3). The value of voltage is shown on the main display and the percentage value with respect to the full scale on the secondary display
4. The message "**-OL-**" indicates that the voltage being measured exceeds the maximum value measurable by the instrument. The instrument do not perform voltage measurements with opposite polarity respect to the connection in Fig. 3. The value "0.000" is shown at display

4.3.2. DC Voltage generation

CAUTION



The maximum DC which can be applied to inputs is 30V DC. Do not measure voltages exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

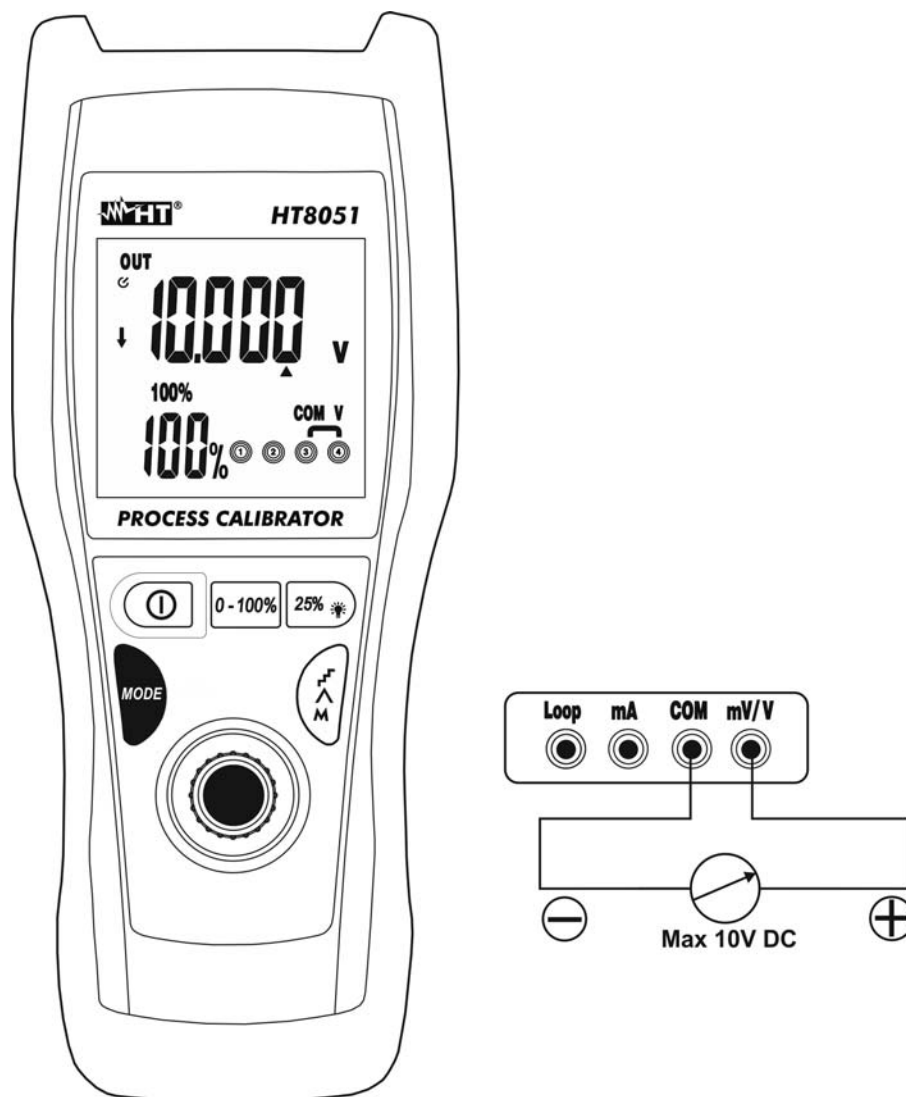


Fig. 4: DC voltage generation

1. Press the **MODE** key and select modes **OUT V** or **OUT mV**. The symbol "OUT" is shown on the display.
2. Use the adjuster knob (see § 4.2.6), the **0-100%** key (see § 4.2.2) or the **25%** key (see § 4.2.3) to set the desired value of output voltage. The maximum values available are 100mV (OUT mV) and 10V (OUT V). The display shows the value of voltage
3. Insert the green cable into input lead mV/V and the black cable into input lead COM.
4. Position the green lead and the black lead respectively in the points with positive and negative potential of the external device (see Fig. 4)
5. To generate a negative voltage value, turn the measuring leads in the opposite direction with respect to the connection in Fig. 4

4.3.3. DC Current measurement



CAUTION

The maximum input DC current is 24mA. Do not measure currents exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

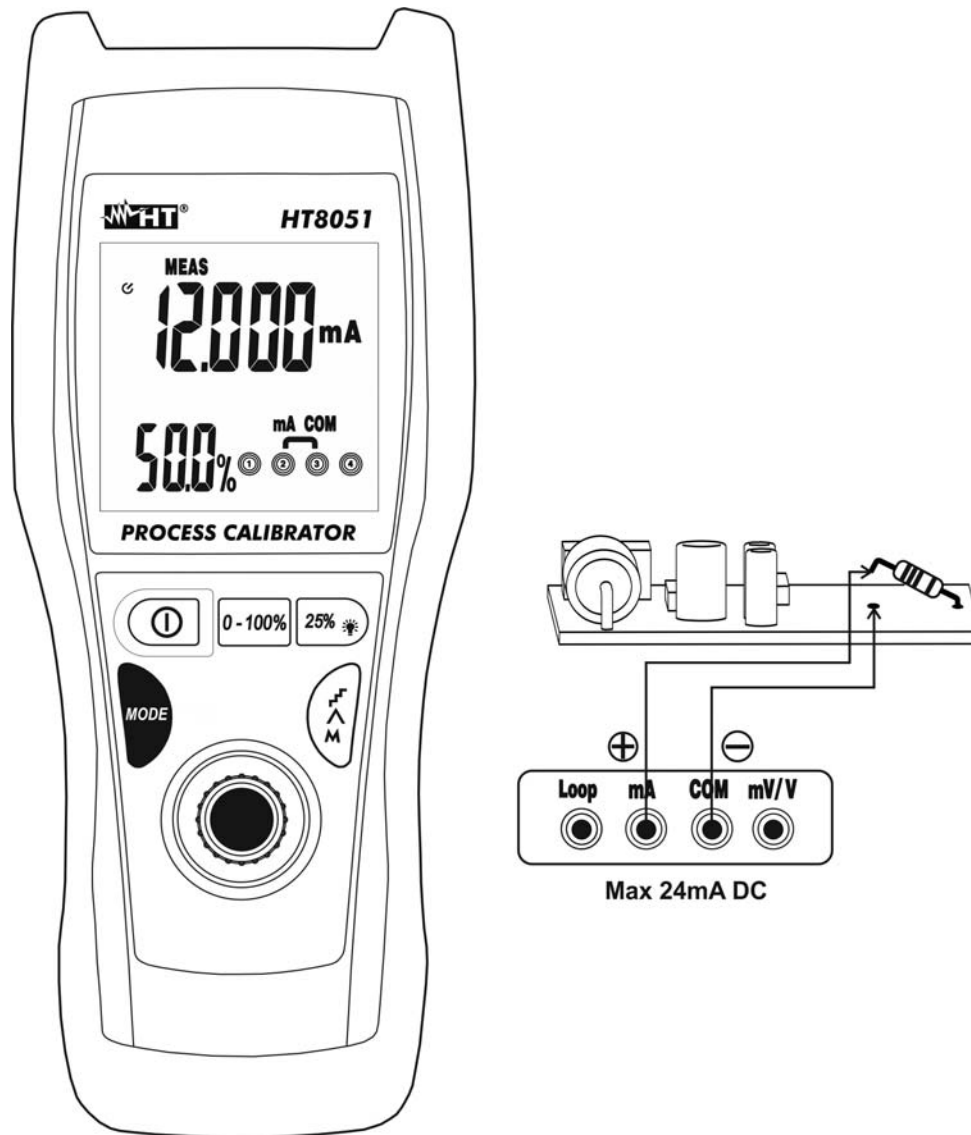


Fig. 5: DC current measurement

1. Cut off power supply from the circuit to be measured
2. Press the **MODE** key and select the measuring mode **MEAS mA**. The symbol "MEAS" is shown on the display
3. Insert the green cable into the input terminal **mA** and the black cable into the input terminal **COM**
4. Connect the green lead and the black lead in series to the circuit whose current you want to measure, respecting polarity and current direction (see Fig. 5)
5. Supply the circuit to be measured. The value of current is shown on the main display and the percentage value with respect to the full scale on the secondary display.
6. The message "**-OL-**" indicates that the current being measured exceeds the maximum value measurable by the instrument. The instrument do not perform current measurements with opposite polarity respect to the connection in Fig. 5. The value "0.000" is shown at display

4.3.4. DC Current generation



CAUTION

- The maximum output DC current generated on passive circuits is 24mA
- With set value $\geq 0.004\text{mA}$ the display blink intermittently to indicate no signal generation when the instrument is not connected to external device

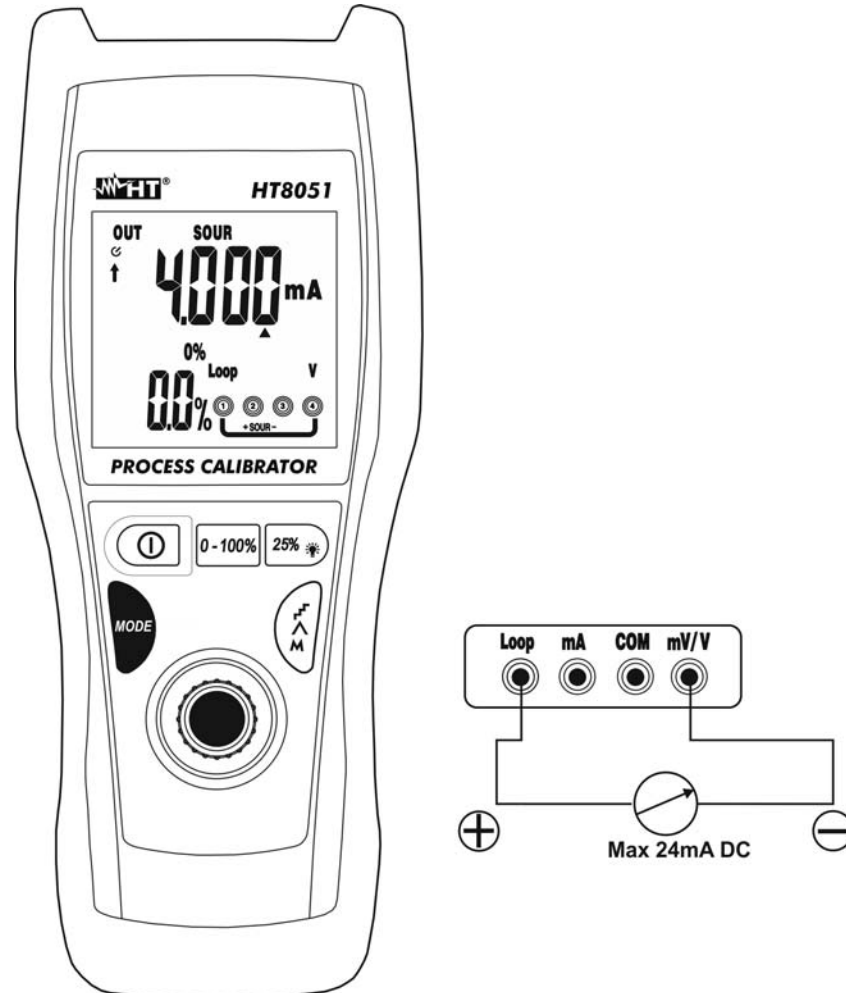


Fig. 6: DC current generation

1. Press the **MODE** key and select the measuring mode **SOUR mA**. The symbol "SOUR" is shown on the display
2. Define a measuring range between 0-20mA and 4-20mA (see § 4.2.7).
3. Use the adjuster knob (see § 4.2.6), the **0-100%** key (see § 4.2.2) or the **25%** key (see § 4.2.3) to set the desired value of output current. The maximum value available is 24mA. Please consider that -25% = 0mA, 0% = 4mA, 100% = 20mA and 125% = 24mA. The display shows the value of current. If necessary, use the **RAM** key (see § 4.2.5) to generate DC current with automatic ramp.
4. Insert the green cable into the input terminal **Loop** and the black cable into the input terminal **mV/V**
5. Position the green lead and the black lead respectively in the points with positive and negative potential of the external device which must be supplied (see Fig. 6)
6. To generate a negative current value, turn the measuring leads in the opposite direction with respect to the connection in Fig. 6

4.3.5. Measuring output DC current from external transducers (Loop)

CAUTION



- In this mode, the instrument provides a fixed output voltage of 25VDC $\pm$ 10% capable of supplying an external transducer and allowing measuring current at the same time.
- The maximum output DC current is 24mA. Do not measure currents exceeding the limits given in this manual. Exceeding these limits could result in electrical shocks to the user and damage to the instrument.

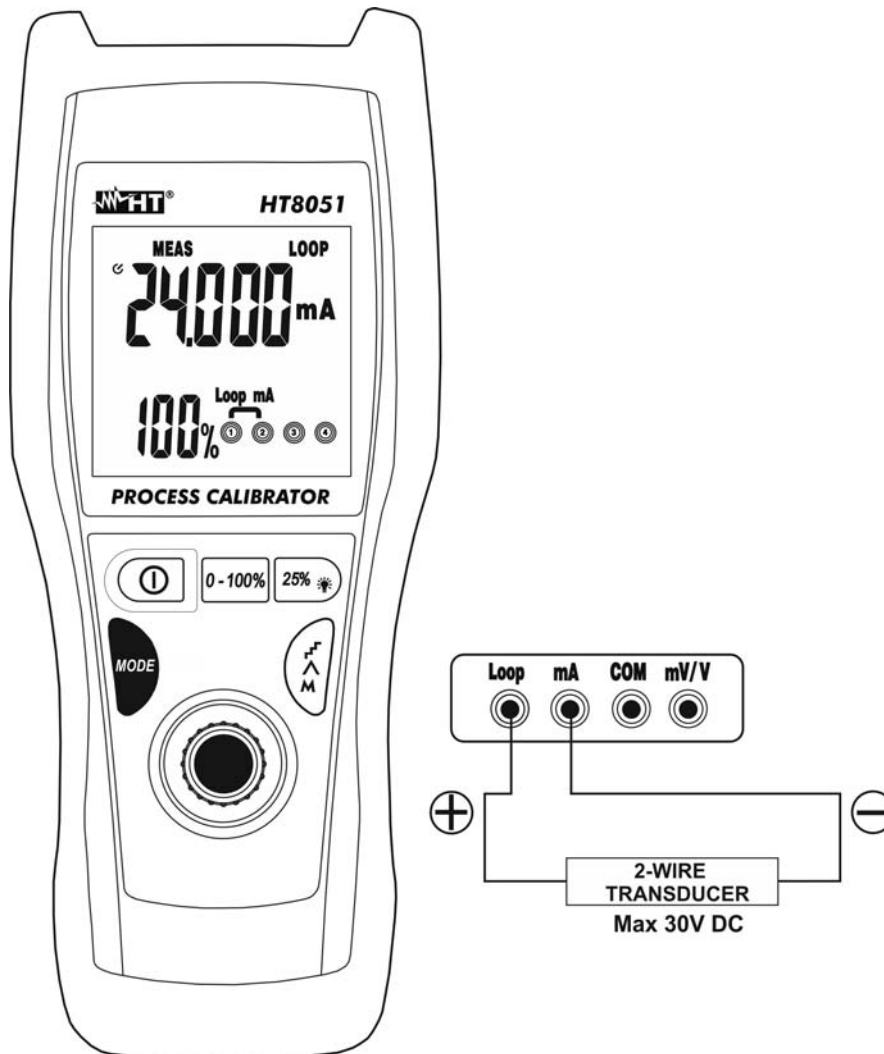


Fig. 7: Measuring output DC current from external transducers (Loop)

1. Cut off power supply from the circuit to be measured
2. Press the **MODE** key and select the measuring mode **MEAS LOOP mA**. Symbols "MEAS" and "LOOP" appear on the display.
3. Insert the green cable into the input terminal **Loop** and the black cable into the input terminal **mA**
4. Connect the green lead and the black lead to the external transducer, respecting current polarity and direction (see Fig. 7).
5. Supply the circuit to be measured. The display shows the value of current.
6. The message "**-OL-**" indicates that the current being measured exceeds the maximum value measurable by the instrument. To generate a negative voltage value, turn the measuring leads in the opposite direction with respect to the connection in Fig. 7

4.3.6. Simulation of a transducer



CAUTION

- In this mode, the instrument provides an adjustable output current up to 24mA DC. It is necessary to provide an external power supply with **voltage between 12V and 28V** in order to adjust current
- With set value $\geq 0.004\text{mA}$ the display blink intermittently to indicate no signal generation when the instrument is not connected to external device

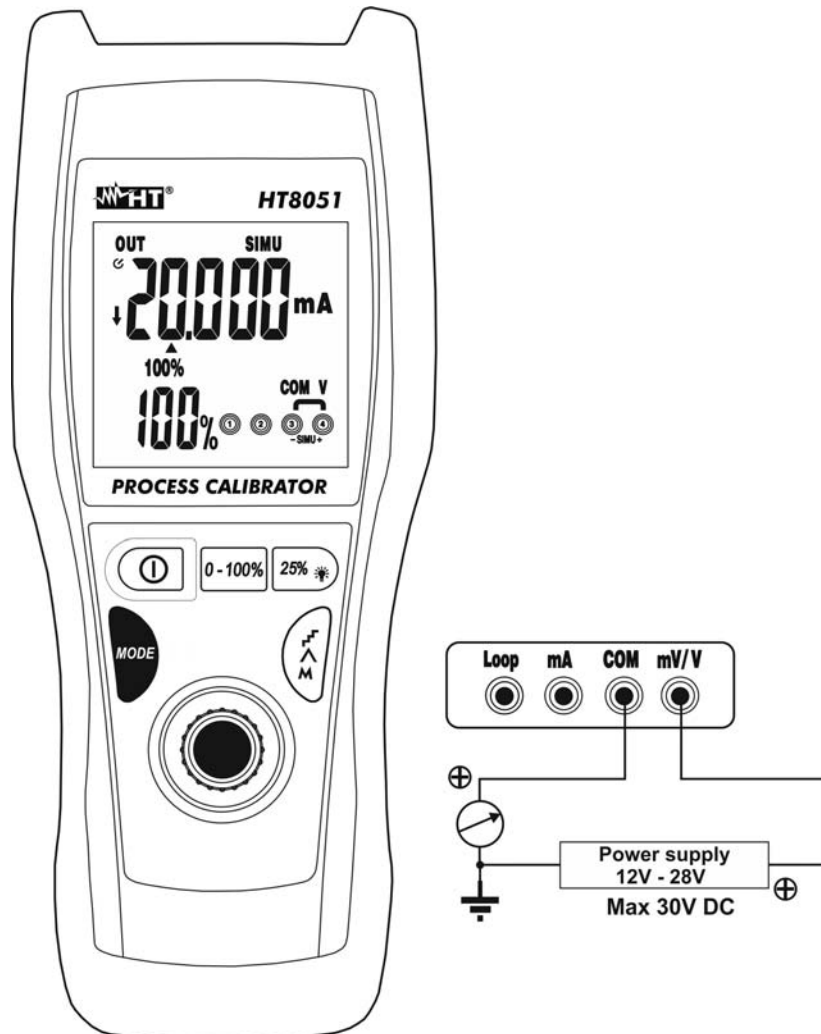


Fig. 8: Simulation of a transducer

1. Press the **MODE** key and select the measuring mode **SIMU mA**. Symbols “OUT” and “SOUR” appear on the display.
2. Define a measuring range of current between 0-20mA and 4-20mA (see § 4.2.7).
3. Use the adjuster knob (see § 4.2.6), the **0-100%** key (see § 4.2.2) or the **25%/** key (see § 4.2.3) to set the desired value of output current. The maximum value available is 24mA. Please consider that -25% = 0mA, 0% = 4mA, 100% = 20mA and 125% = 24mA. The display shows the value of current. If necessary, use the **↕** key (see § 4.2.5) to generate DC current with automatic ramp.
4. Insert the green cable into input lead **mV/V** and the black cable into input lead **COM**.
5. Position the green lead and the black lead respectively in the points with positive potential of the external source and positive potential of the external measuring device (e.g.: multimeter – see Fig. 8)
6. To generate a negative current value, turn the measuring leads in the opposite direction with respect to the connection in Fig. 8

5. MAINTENANCE

5.1. GENERAL INFORMATION

1. The instrument you purchased is a precision instrument. While using and storing the instrument, carefully observe the recommendations listed in this manual in order to prevent possible damage or danger during use.
2. Do not use the instrument in environments with high humidity levels or high temperatures. Do not expose to direct sunlight.
3. Always switch off the instrument after use. In case the instrument is not to be used for a long time, remove the batteries to avoid liquid leaks that could damage the instrument's internal circuits.

5.2. RECHARGING THE INTERNAL BATTERY

When the LCD displays the symbol "⚡", it is necessary to recharge the internal battery.



CAUTION

Only expert and trained technicians should perform maintenance operations.

1. Switch off the instrument using the ① key
2. Connect the battery charger to the 230V/50Hz electric mains.
3. Insert the red cable of the charger into terminal **Loop** and the black cable into terminal **COM**. The instrument switch on the backlight in fixed mode and the charging process start
4. The charging process is finished when the backlight is blinking at display. This operation have a duration time of approx. 4 hours
5. Disconnect the battery charger at the end of the operation.



CAUTION

- The Li-ION battery must always be recharged whenever the instrument is used, in order not to shorten its duration. The instrument may also operate with a 1x9V alkaline battery type NEDA1604 006P IEC6F22. **Do not connect the battery charger to the instrument when it is supplied by an alkaline battery.**
- Immediately disconnect the cable from the electrical mains in case of overheating of instrument parts during battery recharge
- If the battery voltage is too low (<5V), the backlight may not switch on. Still continue the process in the same way

5.3. CLEANING THE INSTRUMENT

Use a soft and dry cloth to clean the instrument. Never use wet cloths, solvents, water, etc.

5.4. END OF LIFE



CAUTION: this symbol found on the instrument indicates that the appliance, its accessories and the battery must be collected separately and correctly disposed of.

6. TECHNICAL SPECIFICATIONS

6.1. TECHNICAL CHARACTERISTICS

Accuracy is calculated as [%reading + (no. of digits) * resolution] at 18°C ÷ 28°C, <75%RH

Measured DC voltage

Range	Resolution	Accuracy	Input impedance	Protection against overcharge
0.01÷100.00mV	0.01mV	±(0.02%rdg +4digits)	1MΩ	30VDC
0.001÷10.000V	0.001V			

Generated DC voltage

Range	Resolution	Accuracy	Protection against overcharge
0.01÷100.00mV	0.01mV	±(0.02%rdg +4digits)	30VDC
0.001÷10.000V	0.001V		

Measured DC current

Range	Resolution	Accuracy	Protection against overcharge
0.001÷24.000mA	0.001mA	±(0.02%rdg + 4digits)	max 50mADC with 100mA integrated fuse

Sampling resistance: 10Ω

Measured DC current with Loop function

Range	Resolution	Accuracy	Protection against overcharge
0.001÷24.000mA	0.001mA	±(0.02%rdg + 4digits)	max 30mADC

Sampling resistance: 10Ω

Generated DC current (SOUR and SIMU functions)

Range	Resolution	Accuracy	Percentage values	Protection against overcharge
0.001÷24.000mA	0.001mA	±(0.02%rdg + 4digits)	0% = 4mA 100% = 20mA 125% = 24mA	max 24mADC
-25.00 ÷ 125.00%	0.01%			

SOUR mA mode → maximum allowed load :1kΩ @ 20mA

SIMU mA mode → loop voltage: 24V rated, 28V maximum, 12V minimum

SIMU Mode → reference parameters

Loop voltage	Generated current	Load resistance
12V	11mA	0.8kΩ
14V	13mA	
16V	15mA	
18V	17mA	
20V	19mA	
22V	21mA	
24V	23mA	
25V	24mA	

Loop mode (loop current)

Range	Resolution	Protection against overcharge
25VDC ±10%	Not specified	30VDC

6.2. GENERAL CHARACTERISTICS

6.2.1. Reference standards

Safety:	IEC/EN 61010-1
Insulation:	double insulation
Pollution level:	2
Measurement category:	CAT I 30V
Max operating altitude:	2000m

6.2.2. General characteristics

Mechanical characteristics

Size (L x W x H):	195 x 92 x 55mm
Weight (battery included):	400g

Display

Characteristics:	5 LCD, decimal sign and point
Over range indication:	the display shows message “-OL-”

Power supply

Rechargeable battery	1x7.4/8.4V 700mAh Li-ION
Alkaline battery:	1x9V type NEDA1604 006P IEC6F22
External adapter:	230VAC/50Hz – 12VDC/1A
Battery life:	SOUR mode: approx. 8 hours (@ 12mA, 500Ω) MEAS/SIMU mode: approx. 15 hours
Low battery indication:	the display shows symbol 
Auto power off:	after 20 minutes (adjustable) of non-operation

6.3. ENVIRONMENT

6.3.1. Environmental conditions for use

Reference temperature:	18°C ÷ 28°C
Operating temperature:	-10 ÷ 40°C
Allowable relative humidity:	<95%RH up to 30°C, <75%RH up to 40°C <45%RH up to 50°C, <35%RH up to 55°C
Storage temperature:	-20 ÷ 60°C

This instrument satisfies the requirements of Low Voltage Directive 2006/95/EC (LVD) and of EMC Directive 2004/108/EC

6.4. ACCESSORIES

6.4.1. Accessories provided

- Pair of test leads
- Pair of alligator clips
- Protection shell
- Rechargeable battery (not inserted)
- External battery charger
- User manual
- Hard carrying case

7. SERVICE

7.1. WARRANTY CONDITIONS

This instrument is warranted against any material or manufacturing defect, in compliance with the general sales conditions. During the warranty period, defective parts may be replaced. However, the manufacturer reserves the right to repair or replace the product.

Should the instrument be returned to the After-sales Service or to a Dealer, transport will be at the Customer's charge. However, shipment will be agreed in advance.

A report will always be enclosed to a shipment, stating the reasons for the product's return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.

The manufacturer declines any responsibility for injury to people or damage to property.

The warranty shall not apply in the following cases:

- Repair and/or replacement of accessories and battery (not covered by warranty).
- Repairs that may become necessary as a consequence of an incorrect use of the instrument or due to its use together with non-compatible appliances.
- Repairs that may become necessary as a consequence of improper packaging.
- Repairs which may become necessary as a consequence of interventions performed by unauthorized personnel.
- Modifications to the instrument performed without the manufacturer's explicit authorization.
- Use not provided for in the instrument's specifications or in the instruction manual.

The content of this manual cannot be reproduced in any form without the manufacturer's authorization.

Our products are patented and our trademarks are registered. The manufacturer reserves the right to make changes in the specifications and prices if this is due to improvements in technology.

7.2. SERVICE

If the instrument does not operate properly, before contacting the After-sales Service, please check the conditions of battery and cables and replace them, if necessary.

Should the instrument still operate improperly, check that the product is operated according to the instructions given in this manual.

Should the instrument be returned to the After-sales Service or to a Dealer, transport will be at the Customer's charge. However, shipment will be agreed in advance.

A report will always be enclosed to a shipment, stating the reasons for the product's return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.