

6040 Panel Meter Calibrator

user manual



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1. Introduction

6040 Panel Meter Calibrator is ruggedized and water-tight, high compliance multifunction calibrator, designed for calibrations of high consumption meters like panel meters or analog meters. Calibrator functions include DC and AC Voltage, DC and AC Current, DC and AC Electric Power and Phase Shift/Synchroscope. The calibrator can be controlled via front panel keyboard, Handheld Remote Control Unit with 3-meter cable or remotely through USB, GPIB or Ethernet interface.

Meatest 6040 has been designed as direct replacement of Arbiter Systems 1040C Panel Meter Calibrator, adding new functionality, user convenience, improving ranges and accuracies to match modern-day panel meter workload.

1.1. Front panel overview - Bottom section

Main control segments of the calibrator are:



Figure 1 Front panel - bottom section

1. Output cable connectors
2. Display
3. Numeric entry keys
4. OPER and STBY keys
5. Function keys
6. Ground terminal and Hand-held Remote Control Unit cable connector
7. Softkeys (sky blue) and menu keys (grey)
8. Rotary knob
9. Navigation keys

1.1.1. Connectors in detail

All output connectors and RCU connector are located on bottom left side of the front panel. Label in output connector area shows maximum voltage allowed between Voltage and Current Neutral terminals (Voltage RED, Current YELLOW) and ground potential (GND). Connectors are as follows:

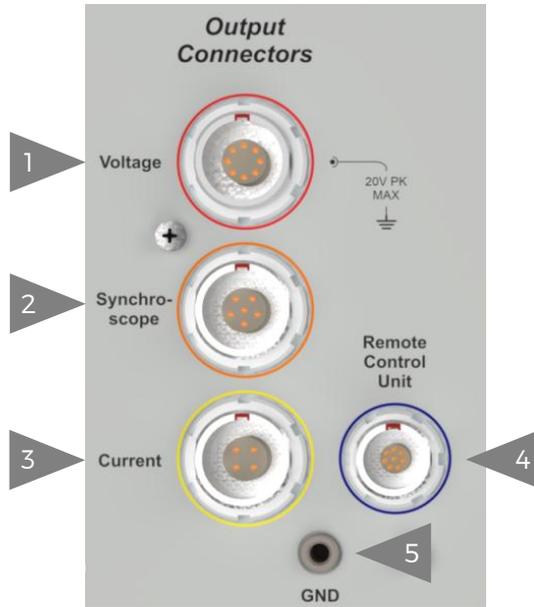


Figure 2 Input/output terminals

1. Voltage output cable connector. Used in VOLTAGE, FREQUENCY and POWER functions.
2. Synchroscope output cable connector.
3. Current output cable connector. Used in CURRENT and POWER functions.
4. Hand-held Remote Control Unit cable connector.
5. Ground potential, galvanically connected to mains PE wire.

Output cables

Each output cable has LEMO connector on one end that connects into the calibrator and two 4mm banana plugs on the other end to connect to Device Under Test (DUT). Each LEMO connector is unique, preventing connection mistakes on the calibrator side. Output cables use the following color scheme:

1. Voltage Output cable (red LEMO connector) with RED live wire and BLACK neutral wire
2. Synchroscope Output cable (orange LEMO connector) with RED live wire and BLACK neutral wire.
Note: Synchroscope output is galvanically connected to Voltage output at all times. The connection is either direct (V-live to Sync-live) in “normal” setting or inverted (V-live to Sync-neutral) in “inverse” setting. As a result, high voltage may appear on both Synchroscope output cables, depending on output setup.
Warning: Do not connect any Synchroscope output wire to ground potential or external voltage sources.
3. Current Output cable (yellow LEMO connector) with YELLOW live wire and BLUE neutral wire

Additional BLUE LEMO connector is used to connect the Handheld RCU unit.

1.1.2. Display in detail

Display is divided into several sections with following meaning:

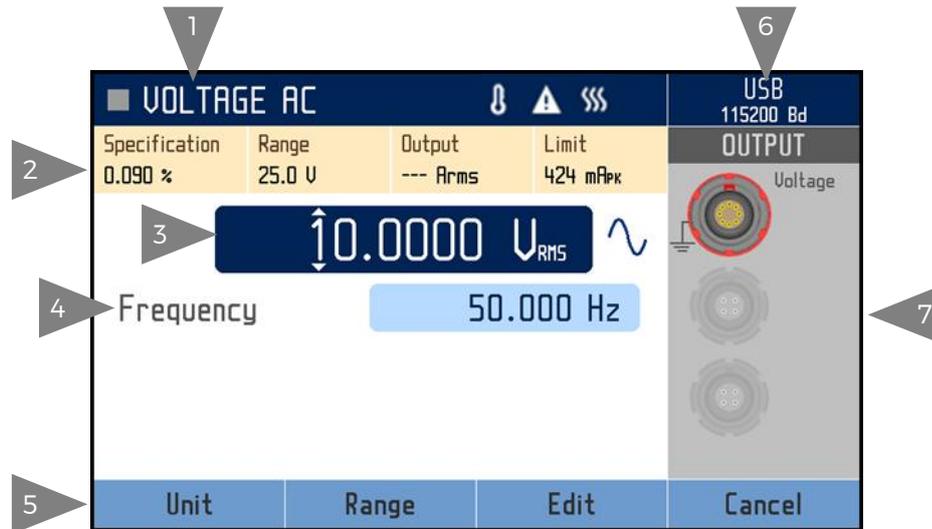


Figure 3 Main unit display

4. Selected function. Symbol on the left indicates system status (■ standby, ◡ settling in, ▶ running). There may be additional Warning symbols on the right:
 - a. Warm-up in progress. Calibrator is fully operational but it may be outside specifications.
 - b. Overheated. Output terminals cannot be switched on until temperature falls below safe limit. Select Voltage DC function and wait a few minutes until the symbol disappears.
 - c. Remote control unit. Remote control unit is connected.
 - d. Other error. Some functions may not be operational and/or outside specifications. Go to “MENU/Information/Device status” to get detailed information.
5. Tooltip. Shows additional information about selected parameter or main value. Information may include uncertainty, range, description, limits (burden current, compliance voltage), etc. Tooltip is hidden when no parameter is selected.
6. Main function parameter. Can be edited via numerical input, cursor keys or rotary knob. Symbol on the right represents signal shape.
7. Auxiliary function parameters. Can be selected via softkeys and then edited in the same way as the main parameter. Each function has different set of auxiliary parameters.
8. Softkey labels. Softkeys below the display change their function dynamically based on current workspace, these labels describe Softkey functions at any given time.
9. Remote control. Shows active interface and its main parameter.
10. Output status. Indicates active connectors, their output state (grey means OFF, green means ON) and grounding state.

1.1.3. Keys in detail

There are 3 button groups on the front panel. Softkeys and menu keys under the display, function keys on the right and numeric entry keys with rotary knob and cursor keys in between.

Softkeys and Menu buttons

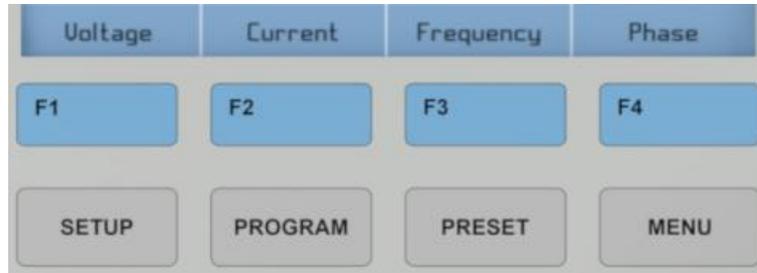
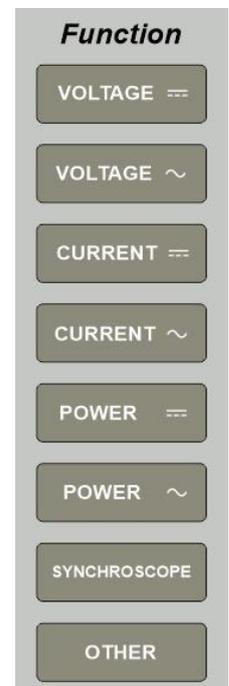


Figure 4 Softkeys and menu buttons

1. SETUP key. Enters/exits device menu. Device menu contains additional function parameters, see chapter 3.2 or SETUP subchapters in chapter 4 for more details.
2. PROGRAM key. Currently has no function.
3. PRESET key. Enters/exits preset menu. Preset feature allows the operator to save and recall one of up to 100 predefined calibrator configurations. This includes startup (reset) configuration.
4. MENU key. Enters/exits main menu. Main menu contains all device-related settings, see menu structure in chapter 3.
5. Softkeys F1 – F4. Buttons with context-specific functions. Current meaning of each softkey is shown above on display.

Function buttons

1. Individual function keys. Directly selects a calibrator function.
2. OPER key. Turns output on according to selected function and parameters.
3. STBY key. Turns output off.
4. OTHER function key. Enters/exits function selection menu.



Entry buttons

Numeric and rotation knob have dual function. In menus these buttons are used to list through items (▲ and ▼ buttons, knob rotation), select an item (ENTER button, OK softkey or knob push), enter a value or exit menu item (CANCEL button, EXIT/CLOSE softkey).

Outside menus, numeric and navigation buttons are used to edit values of selected parameters. If no parameter is selected, pressing any numeric or navigation button will select function's main parameter. Values can be edited with cursor keys and rotary knob as well. Use ◀ and ▶ buttons to shift through digits and ▲ and ▼ buttons to increment or decrement that digit. Knob rotation works as either ▲ / ▼ or ◀ / ▶ buttons, knob push toggles between the two modes.

Figure 5 OPER, STBY and Function buttons

1.2. Front panel – Top section

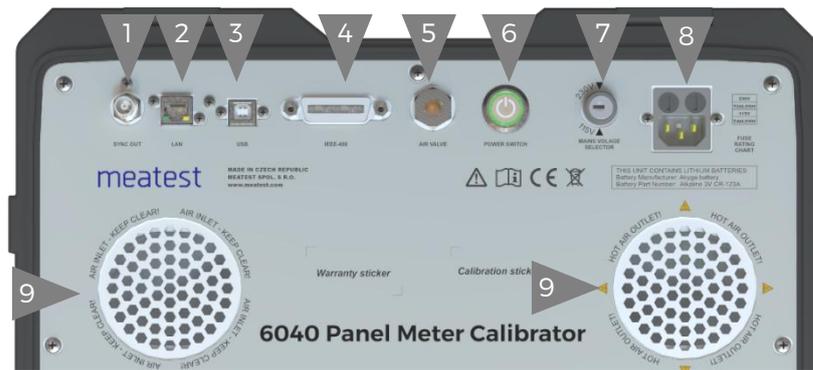


Figure 6 Front panel – top section

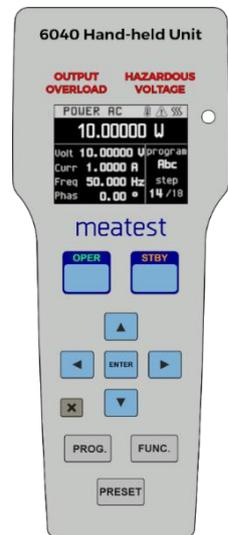
1. Synchronization signal output (used for signal sampling in factory calibration)
2. RJ-45 (Ethernet) connector for remote control
3. USB connector for remote control
4. GPIB IEEE-488 connector for remote control
5. Air pressure release valve
6. Power switch
7. 115/230 V voltage selector (operated by key that comes with each unit)
8. Power cord module with fuse holder
9. Air inlet and outlet covers

1.3. Hand-held Remote Control Unit (RCU)

RCU can be used to operate the main unit from a distance, f.e. when input terminals of the tested meter are far away from its display. RCU enables full control of the calibrator output including function selection and parameter setup. RCU can also load & execute predefined Programs and Presets.

RCU controls

1. Output overload indicator. Lights up upon output overload, clears on each output activation.
2. Hazardous voltage indicator.
3. Display
4. Ambient light sensor.
5. OPER key. Turns output on according to selected function and parameters.
6. STBY key. Turns output off.
7. Cursor keys. Adjust selected value in Normal mode, move through Program steps in Program mode or navigate through menus
8. ENTER key. Scrolls through parameters in Normal mode or confirms item selection in menus
9. X (Cancel) key. Deselects selected parameter in Normal mode, switches to Normal mode when in Program mode or closes current menu (Program, Function, Preset)
10. PROGRAM key. Currently has no function.
11. FUNCTION key. Enters/exits Function menu
12. PRESET key. Enters/exits Preset menu



RCU display in detail

Display is divided into several sections with following meaning:

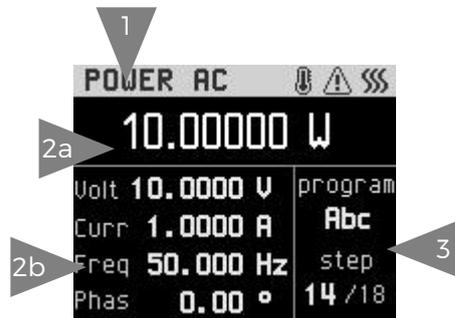


Figure 7 RCU display

1. Selected function. There may be additional Warning symbols on the right:
 - a. Warm-up in progress. Calibrator is fully operational but it may be outside specifications.
 - b. Overheated. Output terminals cannot be switched on until temperature falls below safe limit. Select Voltage DC function and wait a few minutes until the symbol disappears.
 - c. Other error. Some functions may not be operational and/or outside specifications. Go to “MENU/Information/Device status” to get detailed information.
2. Main and auxiliary function parameters. Selected parameter can be edited via cursor keys. Use ◀ and ▶ keys to shift through digits and ▲ and ▼ keys to increment or decrement that digit. Press Enter key to select next parameter. Each function has different set of parameters.
3. Program mode status. Shows ID, step number and step count of currently selected program. “--” indicates program mode is currently inactive.

1.4. Accessories

Every 6040 Panel Meter Calibrator delivery includes following items:

- | | |
|-----------------------------------------------------------|------|
| - USB stick with user manual | 1 pc |
| - Calibration certificate | 1 pc |
| - Power cord (with North American B-type plug by default) | 1 pc |
| - 6040-RCU Hand-held Remote Control Unit with 3m cable | 1 pc |
| - 6040-10 Voltage output cable, 1000V rated, 3 m | 1 pc |
| - 6040-11 Synchroscope output cable, 1000V rated, 3 m | 1 pc |
| - 6040-12 Current output cable, 12A rated, 3 m | 1 pc |

1.5. Remote control

The calibrator can be integrated into automated calibration systems (ATS) and generally controlled from remote computer via following remote control interfaces:

- USB
- GPIB (IEEE488)
- LAN

When controlled remotely, maximum ratings of calibrator's output signals as well as all other specifications are the same as in manual mode.

Meatest software package WinQbase + Caliber is recommended for best automation results. This system is designed for automated and semi-automated calibrations of digital and analogue meters including uncertainty calculation, result evaluation and certificate printing according to ISO 17025 standard.

1.5.1. Connection setup

Only one interface can be used for communication at any given time. Default active interface is RS232, other interfaces can be selected in MENU->Interface->Active bus. To establish connection between the calibrator and computer, set interface settings in your computer accordingly:

USB connection settings

- | | |
|------------------------|----------------------------------------------------------------|
| - COM port | see available COM ports in Windows Device Manager |
| - Baudrate | according to MENU > Interface > USB Baudrate (9600 by default) |
| - Data bits | 8 |
| - Stop bits | 1 |
| - Parity | None |
| - Handshake (XON/XOFF) | Off |

GPIB connection settings

- GPIB Address according to MENU->Interface->GPIB Address (2 by default)

LAN connection settings

DHCP service discovery is active by default and is recommended for easiest connection. If you prefer to use fixed IP address or change any other default settings, go to MENU->Interface->LAN Settings.

LAN communication uses Telnet/TCP/UDP protocol. Default hostname is "6040_SNxxxxxx", where "xxxxxx" stands for serial number. Default ports are 23 for Telnet and 22 for both TCP and UDP protocols.

1.5.2. SCPI commands and protocol

See 6040 SCPI manual for complete SCPI reference, more details on communication setup and troubleshooting.

2. Getting started

Inspect package contents when unboxing the calibrator for the first time. See chapter 1.3 for complete list of accessories.

Place the instrument on a level surface before powering on and let it stabilize for at least one hour if the instrument has been stored outside of reference temperatures beforehand.

2.1. Safety precautions

The instrument has been designed according to IEC 61010-1:2011 + A1. Safety is ensured by design and by use of specific components. The manufacturer is not liable for the damage caused by modification of the construction or replacement of parts with non-original ones.

Safety symbols used on the equipment:



Warning, risk of danger.



Warning - risk of electric shock. Hazardous voltage above 50 V DC or AC might be present.



See User Manual.



Protective earth.



Hot surface.

To prevent possible electrical shock or personal injury:

- Read carefully safety information before you use the Product.
- Do not alter the Product and use only as specified, or the protection supplied by the Product can be compromised.
- Do not use the Product if it is altered or damaged.
- Use this Product indoors only.
- Use power cord approved for local mains voltage and plug configuration and rated for the Product.
- Use original, manufacturer approved test leads only.
- Keep hands away from all Product terminals and exposed metal cable parts during operation. High voltage on those may be cause death or serious injury.

2.2. Power on and warm-up

The calibrator must be powered by 230/115 V – 50/60 Hz mains. Before connecting the instrument to the mains, check the position of the mains voltage selector located on top of the main unit front panel. Set appropriate voltage selector position either 115 V or 230 V.

Plug one end of the power cord into connector on the rear panel and connect the other end of the power cord into a wall outlet. Turn the calibrator on with mains switch right next to it. You should see following splash screen on display.

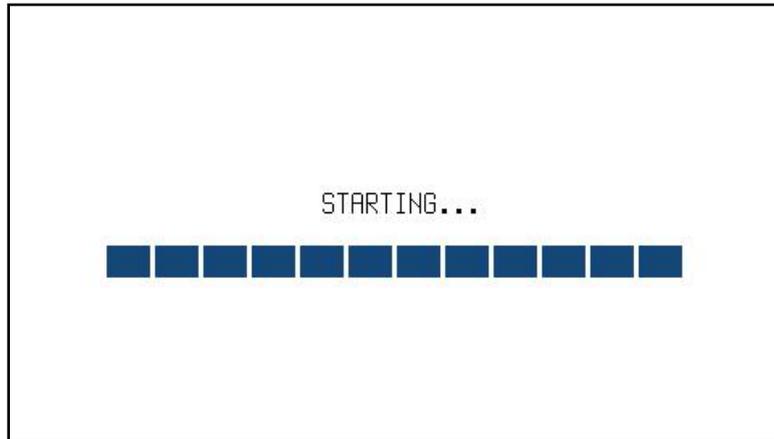


Figure 8 Starting screen

Calibrator then performs internal hardware checks for app. 5 seconds and then starts in Startup state (called Preset). Startup preset can be customized and up to 99 other presets can be defined and recalled later at any time. By default, the Startup preset is set to VDC function, 10 V with output switched off.

Warm-up

Specified parameters are guaranteed 30 minutes after switching the calibrator on and stabilizing it in reference conditions.  symbol indicates warm-up period has not finished yet.

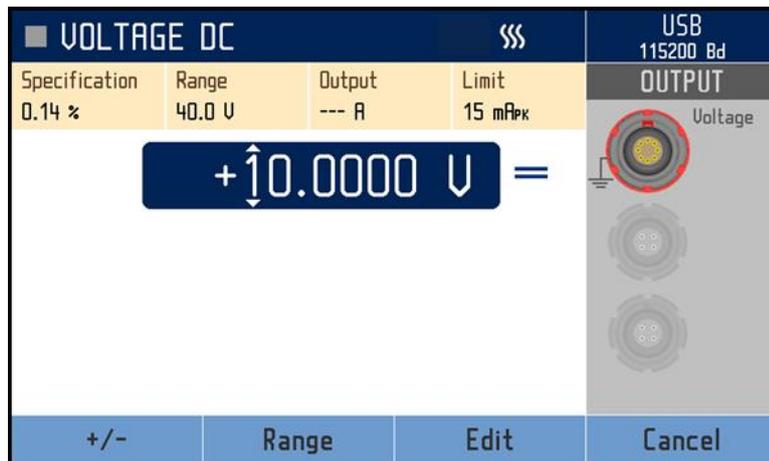


Figure 9 Factory default startup screen with

2.3. Function setup

Calibrator output (source) function can be set using FUNCTION buttons. Push any FUNCTION button to change function or push the button repeatedly to scroll through function modes if available (for example DC and AC in voltage function).

Once a function is selected, you can change the main value as well as auxiliary output parameters like frequency in AC modes or phase shift in AC power function. Function parameters can be edited in three ways:

- Numeric keypad. Write a value directly and confirm either by softkey with appropriate unit or ENTER button to set value in base unit (for example V).
- Cursor keys and rotary button. Push ▲▼ buttons or turn rotary knob to increment/decrement selected digit by one. Move through parameter digits using ◀▶ buttons or push the rotary knob to switch to digit selection mode, rotate to a new digit and confirm with another push.
- Softkeys. Values of most parameters can be also changed by softkeys x10 and :10, which change value by order of magnitude and +/- softkey which switches polarity.



Figure 10 Main and auxiliary parameters

Described methods change the main parameter by default. If there are any other parameters on display, you can switch between them by pushing ENTER key repeatedly. Picture above shows AC voltage function with main value 10 V_{rms} and one auxiliary parameter frequency. Auxiliary parameters have their dedicated softkey for fast access.

Additional settings are available under SETUP button. This button is a shortcut to relevant section of Device menu. See chapter 3.2 or SETUP subchapters in chapter 4 for more details.

2.4. Signal output

Calibrator output can be turned on by pushing OPER button. STBY button turns output off. Output turns off automatically on calibrator startup and function switch. Output state is indicated by LED light in OPER button as well as green rectangle next to Source label on the right side of the display. Diagram below Source label shows which terminals are currently being used.

2.5. What to do in case of failure

If an obvious failure occurs during the operation (e.g. the display is not lit, the fan is not turning), the calibrator must be switched off immediately. First, check the fuse located in the power cord receptacle. Procedure is following:

- Remove the end of power cord from the mains connector at the rear panel.
- Insert the blade of a flat screwdriver into the opening cut in the mains voltage selector and pry out the fuse holder.
- Remove the fuse. Replace it with new fuse of the same rating if the fuse was broken.
- Replace the fuse holder, reconnect the power cord and switch on the calibrator. If the problem persists, contact the manufacturer.

If an obvious fault is evidenced, e.g. a measurement range or an operating mode is not functional, the user cannot correct the fault. Contact the manufacturer.

Hidden faults can cause different symptoms and be caused by different causes. Usually, they cause instability of some parameter. Hidden defects can be caused by unacceptable distortion, degraded insulation etc. In this case contact the manufacturer.

Sometimes it seems that the calibrator has hidden defect, when the rules for correct operation are not adhered to. In this case, the fault is caused by the operator. Most frequent cases of false “hidden defects”:

- mains voltage out of tolerance limits or unstable
- wrong grounding of the measurement circuit (bad connection of the ground terminal of the mains outlet, or several ground connections when grounding loops are formed)
- proximity to sources of intensive influence, whose products are spread through the mains or propagated by the electromagnetic field
- strong electrostatic or electromagnetic field which can cause major instability during calibration using higher impedance.

3. Menu reference

Four buttons on the front panel give access to main menu sections:

- Source. Shortcut to section of Menu > Device related to currently selected source function.
- Meter. Shortcut to Menu > Device > Meter
- Preset. Save or recall predefined calibrator configurations. See chapter 3.6 for more details.
- Menu. Access to main menu.

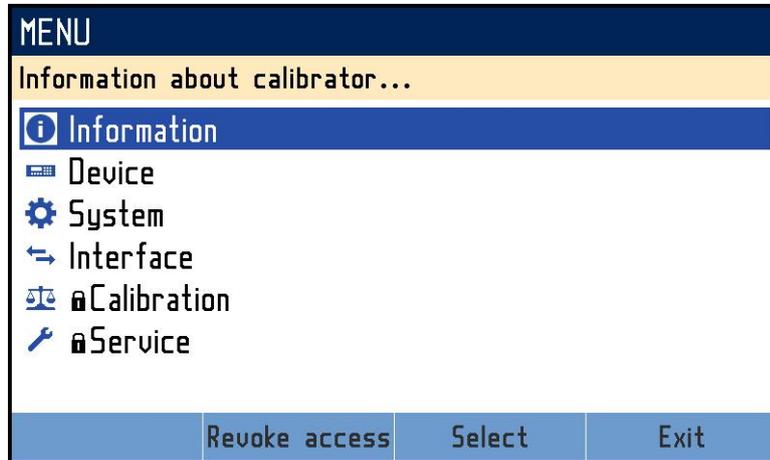


Figure 11 Main menu

Main menu is the most comprehensive setup tool of the calibrator, containing information like serial number, calibration date or display brightness as well as remote control interface setup or calibration constants.

Short tooltip in yellow box shows basic description of selected item. Main menu items are described in detail in chapters 3.1 – 3.5.

3.1. Information menu

Information menu contains general device data which cannot be modified by the user:

<ul style="list-style-type: none"> - Manufacturer - Model - Serial number 	Device identification
<ul style="list-style-type: none"> - Software version - Hardware version - Internal options 	Device configuration
<ul style="list-style-type: none"> - Device status - Calibration validity - Current date 	Device readiness info. Calibration expiration date is equal to last calibration date plus calibration interval, see menu item Calibration for more details.
<ul style="list-style-type: none"> - Ambient temperature - Ambient humidity 	Device temperature and humidity

3.2. Device menu

Device menu is divided according to calibrator functions that gives access to additional function related settings, hazardous voltage protection, master limits, self-test and unlock code function. Unlock code function will allow you to enable, disable or set some calibrator properties after entering a password.

Picture below shows DC power section as an example of device menu.

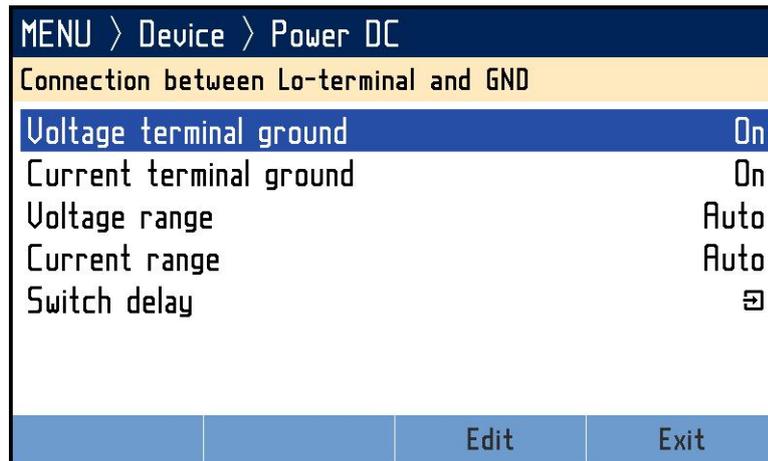


Figure 12 Device/Setup menu

Hazardous voltage protection is protected with calibration password and is used to increase safety of operator by informing him of presence of dangerous voltage (valid also for the power function) with audio signaling and possibly turning off output after transitioning to a dangerous level.

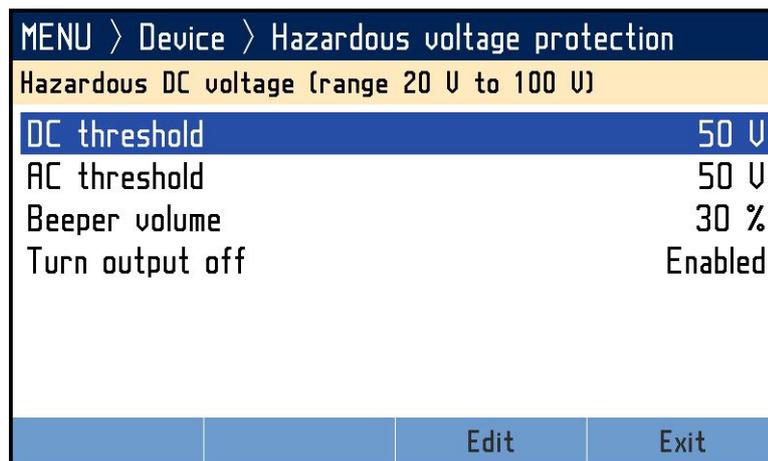


Figure 13 Hazardous voltage protection

Master limits are protected with calibration password and it serves as user limitation of maximum voltage and current values during normal operation of device in manual and remote control to limit user error. It helps protect DUT against user error. Values set here are subsequently taken as the maximum settable values for any calibrator function. User is informed that limitation is from this functionality when trying to exceed them.

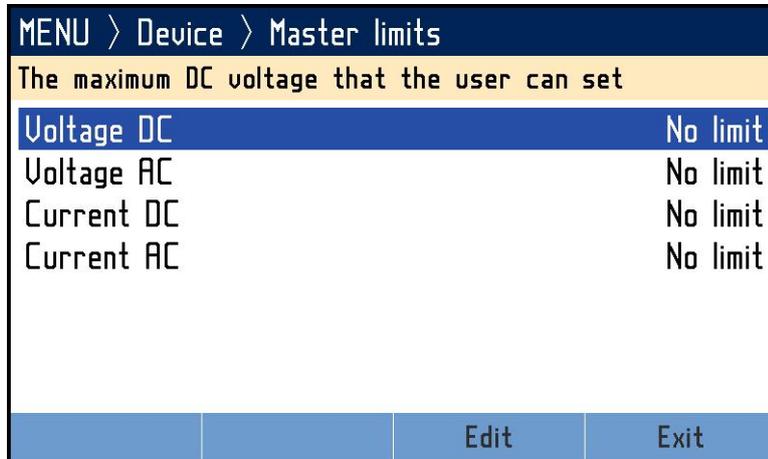


Figure 14 Master limits

The Self-test menu provides access to a diagnostic interface used to verify the functionality of internal electronic modules and components of the device.

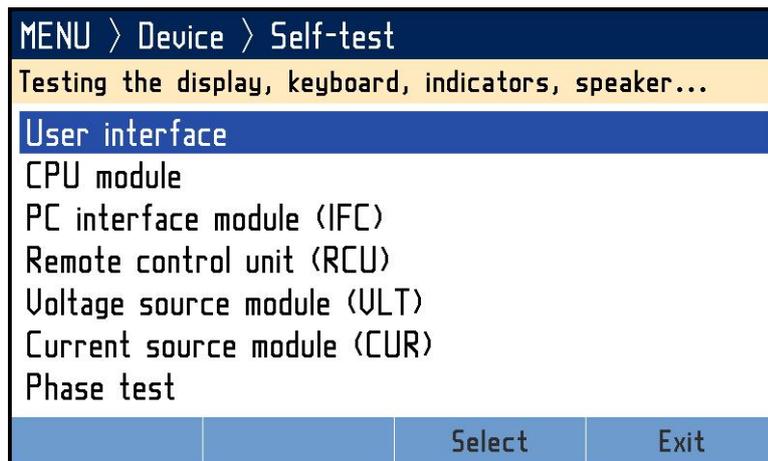


Figure 15 Self-test

3.3. System menu

System menu contains general, user-accessible device settings:

- Language Language version of user interface
- Display backlight [0 – 100 %]
- Button backlight [0 – 100 %]
- Beeper master switch [On/Off]
- Beeper volume [0 – 100 %]
- Keyboard beep [On/Off]
- Show tooltips on display Turns yellow menu tooltip On/Off
- Specification
 - o Show specification on display [On/Off]
 - o Specification format [Auto/Absolute/%/ppm]
- Date & Time Password protected submenu with following items
 - o Time System time in HH:MM:SS format
 - o Date System date in selected format
 - o Format Date format [M/D/Y, M-D-Y, D/M/Y, D.M.Y, D-M-Y, Y/M/D, Y.M.D]
 - o Show date & time on display [On/Off]
- Number format
 - o Decimal point [Period / Comma]
 - o Separator [None / Space / On]
- Remote control unit
 - o Control mode [Panel only, Remote only (if connected), Panel and remote]
 - o Display brightness [0 – 100 %]
 - o Indicator brightness [0 – 100 %]
 - o Beeper volume [0 – 100 %]
 - o Beeper danger volume [0 – 100 %]

3.4. Interface menu

Interface menu contains remote control connection settings:

Menu item	Range / format	Default value
Active bus	GPIB/USB/LAN	RS232
USB Baudrate	1200 – 256000	9600
GPIB Address	0 – 31	2
LAN Settings		
> DHCP	On/Off	On
> IP Address	IPv4 format; locked with DHCP On	192.168.001.100
> Subnet mask	IPv4 format; locked with DHCP On	255.255.255.000
> Default gateway	IPv4 format; locked with DHCP On	255.255.255.255
> Telnet port number	0 – 9999	23
> TCP port number	0 – 9999	22
> UDP port number	0 – 9999	22
> Host name	14 alphanumeric characters; locked with DHCP Off	9010+_SN750011
> Assigned IP address	IPv4 format; current IP address of the device	
>Mac address	MAC address of the device	

3.5. Calibration menu

Calibration menu contains internal calibration constants and other tools for device adjustment and is therefore password protected. See chapter 6 for more details on 9010+ adjustment. Calibration menu has following items:

1. Data. Contains current calibration data. Structure of this menu is described in chapter 6.1.
2. Backup. Calibration data backup. See below for more details.
3. Password. Changes calibration password. Calibration password gives access to Calibration menu and Date/Time settings in Information menu.
4. Calibration date. Calibration date is updated automatically upon calibration data adjustment or just by manual confirmation (if calibration doesn't require adjustment).
5. Calibration interval. Recommended interval is 12 months.

Backup function allows you to save and recall entire sets of calibration data. Calibration data are also saved automatically when any calibration value gets changed, creating a record with "Auto" storage (or overwriting an existing one if the last change occurred within last 90 days). Use softkeys to save and recall previously stored calibration data sets:

1. Back up. Saves currently used calibration data, overwriting existing record on selected Location. Only empty records and records with Calibration access and Manual storage can be overwritten.
2. Try. Loads selected record temporarily, original calibration data will be restored on next calibrator startup.
3. Load. Loads selected record permanently.
4. Delete. Deletes record. Only records with Calibration access and Manual storage can be deleted.

3.6. Preset menu

Preset feature allows you to save and recall one of up to 100 calibrator configurations so that you can get to work quickly instead of setting up the calibrator every single time. Push PRESET button to show list of saved presets:

PRESETS			
Location	Preset	Function	Date
00	Startup	Voltage DC	01/01/2000
01	---	---	---
02	---	---	---
03	---	---	---
04	---	---	---
05	---	---	---
06	---	---	---
07	---	---	---
▼			
Save	Load	Clear	Close

Figure 16 Preset function

To recall a predefined configuration, select its preset from the list and push Load softkey. Configuration will be loaded with output turned off for safety reasons.

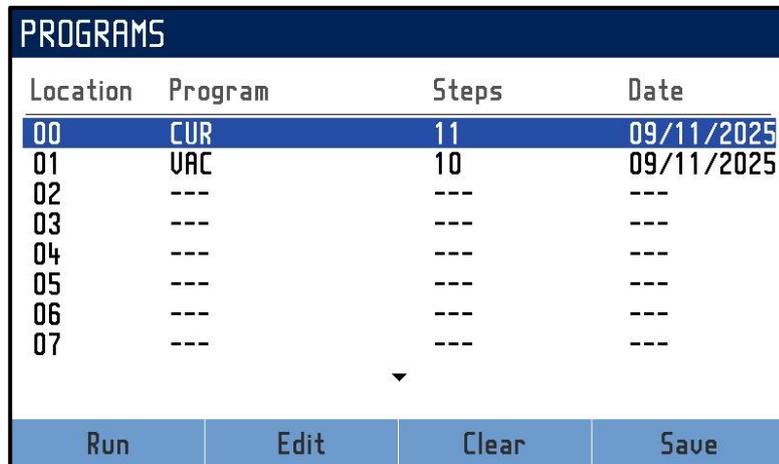
Similarly, you can save a configuration by choosing Location 0 – 99 from the list and pushing Save softkey. Preset includes configuration of:

- Function and mode (for example AC Power)
- Main value (for example 10 VA)
- Auxiliary parameters (for example 50 Hz, 10 V, 1 A, 0 °)
- Additional Device/Setup menu parameters of current Source and Meter function

While editing functions, parameters are stored in temporary RAM until another preset is selected or the device is restarted.

3.7. Program menu

Program feature allows you to create and run one of up to 100 pre-programmed procedures. Unlike Presets, Programs don't include settings from menus Device and General (f.e. grounding settings). Push PROGRAM button to show Program list.



Location	Program	Steps	Date
00	CUR	11	09/11/2025
01	UAC	10	09/11/2025
02	---	---	---
03	---	---	---
04	---	---	---
05	---	---	---
06	---	---	---
07	---	---	---

Run Edit Clear Save

Figure 17 Program list

To run a configuration, select a program from the list and push Run softkey.



POWER AC

USB 9600 Bd

Program CUR* Step 1 / 32

OUTPUT

10.000 0 W ~

Voltage 10.000 0 V

Current 1.000 00 A

Frequency 50.000 Hz

Phase 0.00 °

13:50 09/11/2025

Steps

Figure 18 Program Execution mode

Edit or make new program by choosing Location 0 – 99 from the list and pushing Edit softkey. Program includes configuration of:

- Function (Power AC)
- Main value and auxiliary parameters (10 W, 10 V, 1 A, 50 Hz, 0 °)
- Output status (ON/OFF)

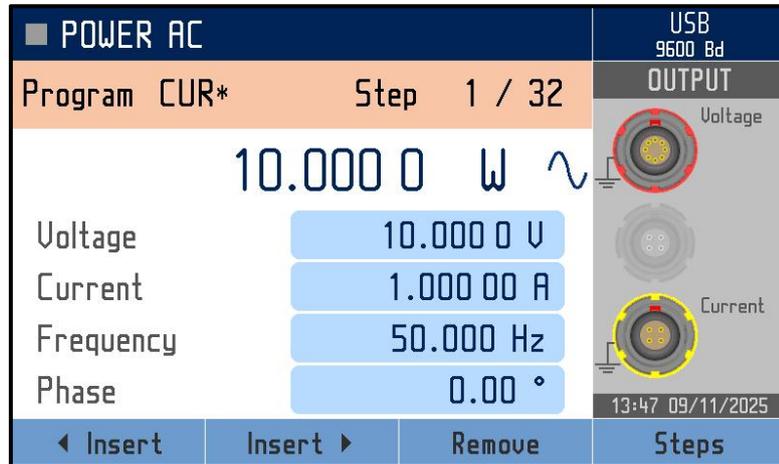


Figure 19 Program Edit mode

Press either Insert softkey to add a copy of current step before or after the current step, press remove to remove current step from the sequence or press step to view list of all steps in selected program. Maximum number of steps in a program is 100.

Once you're done editing a program, push PROGRAM button to get into Program list and then push either Save softkey to save edited program into selected memory slot or push CANCEL button to exit Program mode and return to Normal mode.

Output status

Programs can be set to automatically activate/deactivate output when going from one step to another. By default, output will always turn off upon step change. This behaviour can be changed in MENU > Device > Program > Output state in program Run mode.

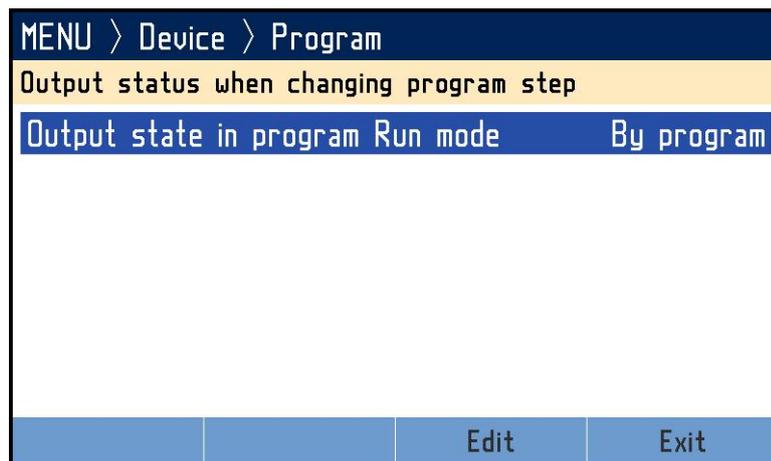


Figure 20 Program menu

Selecting item “By program” will cause the program to activate/deactivate the output individually for each program step.

Program steps					
Step	Func	Voltage	Current	Frequency	Outp
1	VDC	+1,000.00 U			●
2	VDC	+2,000.00 U			●
3	VDC	+3,000.00 U			●
4	VDC	+4,000.00 U			●
5	VDC	+5,000.00 U			●
6	VDC	+06,000.0 U			●
7	VDC	+07,000.0 U			●
8	VDC	+08,000.0 U			●
9	VDC	+09,000.0 U			●

▼

Output ON
Output OFF
Select
Cancel

Figure 21 Program Edit mode - list of steps

This setting can be modified in list of program steps where green dot in “Outp” column indicates output will be turned ON as soon as selected step is loaded in Program Execution mode while red dot indicates the opposite. For safety reasons, the first step of each program is always loaded with output turned off.

4. Calibration examples

4.1. AC/DC Voltage

1. Connect the voltmeter to the calibrator as shown on the figure below.
2. Select appropriate function and range on the voltmeter.
3. Push VOLTAGE DC or AC function key on the calibrator.

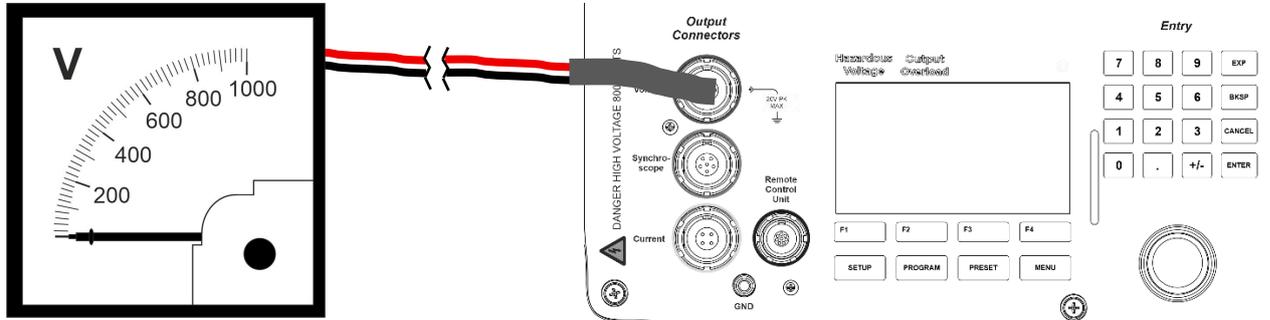


Figure 22 Voltmeter calibration

4. In AC mode set output frequency using soft key beneath the display or switch active field on the display for direct value entry using ENTER key repeatedly.
5. Set output voltage value using cursor keys, rotary button or numerical keyboard.
6. Switch output terminals on by pushing key OPER. Green OPER key backlight, green “play” symbol and green OUTPUT rectangle on the screen indicate an active output
7. Push STBY key to switch output off.

4.1.1. Voltage SETUP

Voltage function SETUP can be activated using SETUP SOURCE key. Following screen will appear:

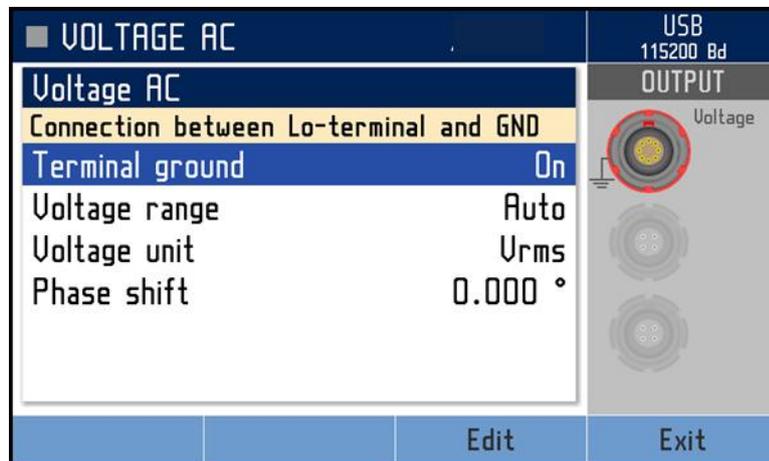


Figure 23 Voltage SETUP screen

SETUP offers additional voltage function settings. Use ▲▼ keys and EDIT soft key to change following items:

Terminal ground	On/Off	Voltage LO output terminal grounded/floating
[DC] Voltage range	Auto/105mV/1.5V/5V/40V/200V/800V	
[AC] Voltage range	Auto/75mV/1.5V/3V/25V/162V/750V	
[AC only] Voltage unit	Root Mean Square/Peak/Peak-Peak/Average	
[AC only] Phase shift	x.xxx Degrees (°)	phase shift between voltage output and synchronization signal

4.2. AC/DC Current

1. Connect the ammeter to the calibrator as shown on the figure below.
2. Select appropriate function and range on the ammeter (multimeter)
3. Push CURRENT DC or AC function key on the calibrator.

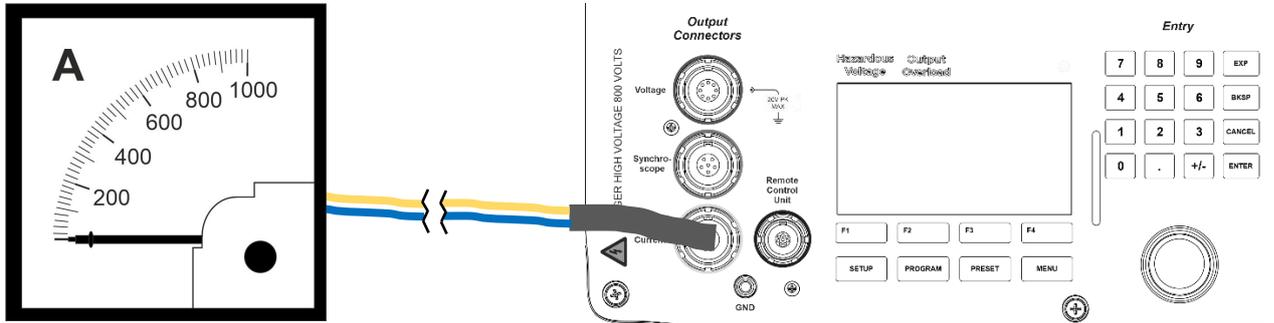


Figure 24 Ammeter calibration

4. In AC mode set output frequency using soft key beneath the display or switch active field on the display for direct value entry using ENTER key repeatedly.
5. Set output current value using cursor keys, rotary button or numerical keyboard.
6. Switch output terminals on by pushing key OPER. Green OPER key backlight, green “play” symbol and green OUTPUT rectangle on the screen indicate an active output
7. Push STBY key to switch output off.

4.2.1. Current SETUP

Current function SETUP can be activated using SETUP key. Following screen will appear:

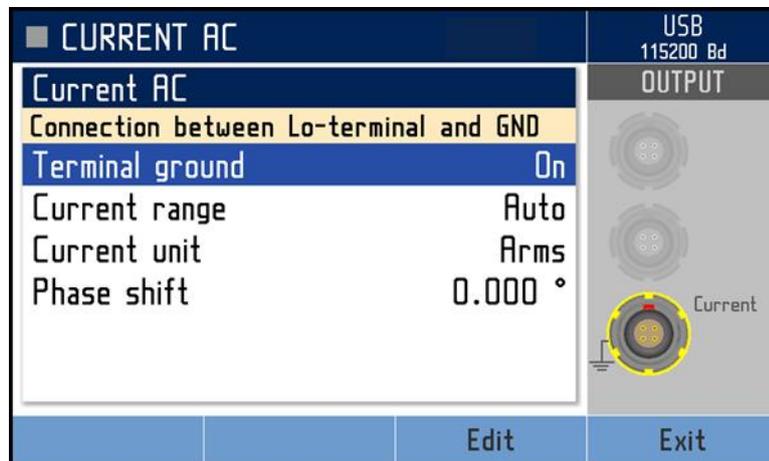


Figure 25 Current SETUP screen

SETUP offers additional current function settings. Use ▲▼ keys and EDIT key to change the following:

Terminal ground	On/Off	Current output terminal grounded/floating
[DC] Current range	Auto/1mA/10mA/100mA/500mA/1.5A/5A/10A	
[AC] Current range	Auto/700µA/7mA/70mA/320mA/1A/3.2A/7A	
Current unit	Root Mean Square/Peak/Peak-Peak/Average	
[AC only] Phase shift	x.xxx Degrees (°)	phase shift between current output and synchronization signal

4.3. Electric power meters, analyzers and energy meters

Calibrator can supply output voltage and current at the same time. The function is designed for calibration of electric power meters and power analyzers.

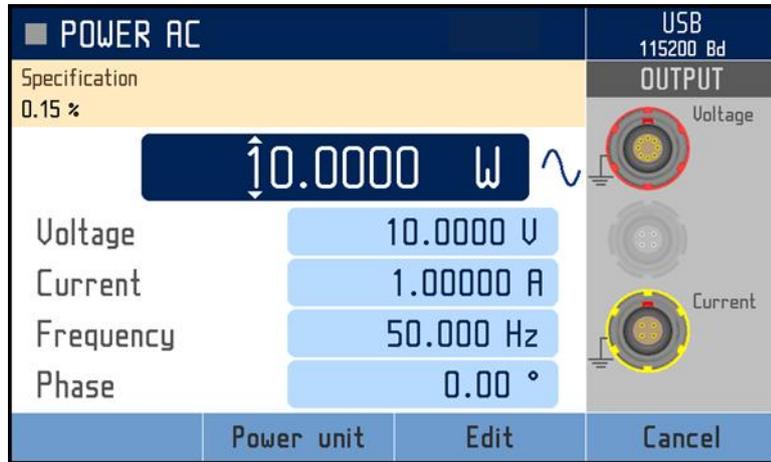


Figure 26 AC Power screen

1. Connect power meter to the calibrator as shown on the figure below.
2. Push POWER DC or AC function key on the calibrator.
3. Set output voltage, current, frequency and phase shift using soft keys beneath the display or switch active field on the display for direct value entry using ENTER key repeatedly.
4. Switch output terminals on by pushing key OPER. Green OPER key backlight, green “play” symbol and green OUTPUT rectangle on the screen indicate an active output.
5. Push STBY key to switch output off.

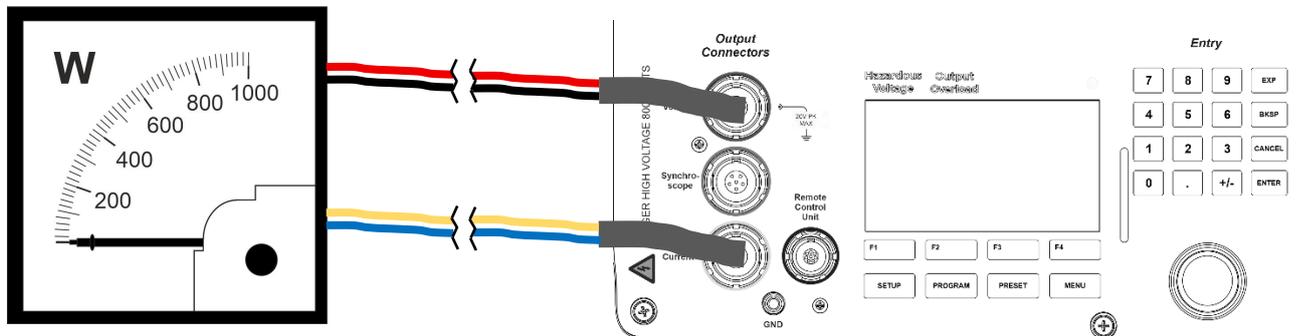


Figure 27 Power meter calibration

4.3.1. Power parameters

Push SETUP key to call out menu with parameter setting.

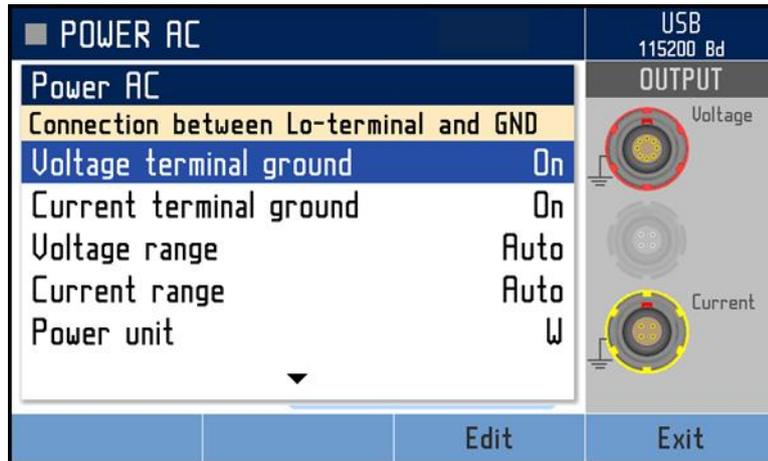


Figure 28 Power SETUP screen

Following items can be modified:

Voltage terminal ground	On/Off	Voltage output terminal grounded/floating
Current terminal ground	On/Off	Current output terminal grounded/floating
[DC] Voltage range	Auto/105mV/1.5V/5V/40V/200V/800V	
[DC] Current range	Auto/1mA/10mA/100mA/500mA/1.5A/5A/10A	
[AC] Voltage range	Auto/75mV/1.5V/3.5V/25V/162V/750V	
[AC] Current range	Auto/700μA/7mA/70mA/320mA/1A/3.2A/7A	
[AC only] Power Unit	W/VA/VAr	
[AC only] Phase Unit	Degrees (°) or Cos (Lead, Lag).	Switch between Defrees and Cos
[AC only] Phase shift	x.xxx Degrees (°)	Phase shift between voltage output and synchronization signal
[AC only] Phase polarity	Positive/Negative	Change polarity of phase angle rotation.
Switch delay	Switch-on delay	Delayed switch-on of the current channel after voltage connection, range 0 to 60 s. This "extra" delay is indicated by a symbol on the main panel when switching the terminals on and off. ⌚
	Switch-off delay	Delayed switch-off of the current channel after voltage connection, range 0 to 60 s.

4.4. Synchroscope

Select SYNCHROSCOPE function using SYNCHROSCOPE key, following screen will appear:

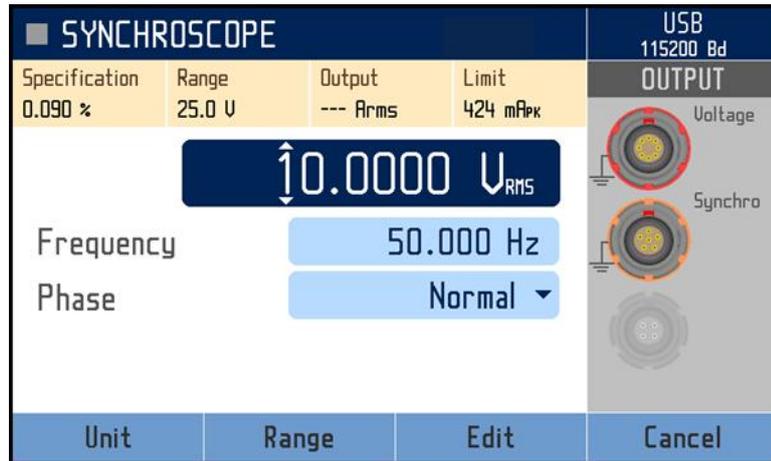


Figure 29 Synchroscope screen

1. Connect the synchroscope to the calibrator as shown on the figure below.
2. Push SYNCHROSCOPE function key on the calibrator.

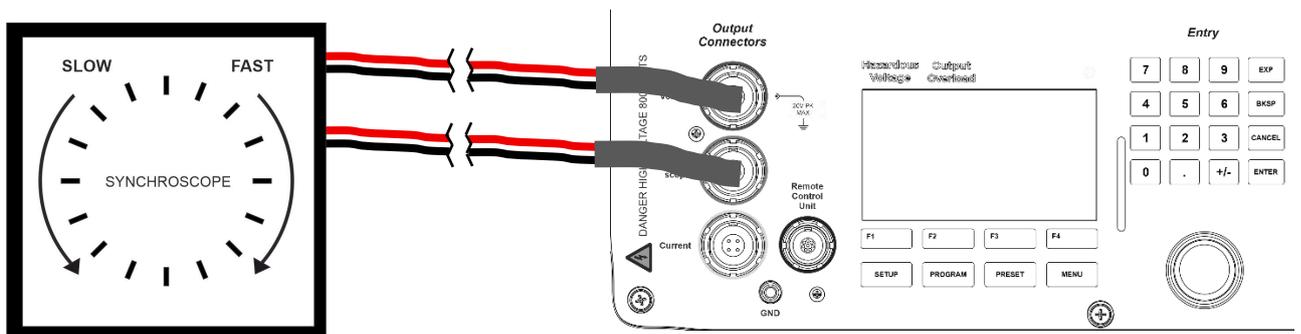


Figure 30 Synchroscope calibration

3. Set output voltage, frequency and phase shift using soft keys beneath the display or switch active field on the display for direct value entry using ENTER key repeatedly.
4. Set output voltage value using cursor keys, rotary button or numerical keyboard.
5. Switch output terminals on by pushing key OPER. Green OPER key backlight, green “play” symbol and green OUTPUT rectangle on the screen indicate an active output.
6. Push STBY key to switch output off.

4.4.1. Synchroscope parameters

Push SETUP key to call out menu with parameter setting. Following items can be modified:

Terminal ground	On/Off	Synchroscope output terminal grounded/floating
Voltage range	Auto/75mV/1.5V/3V/25V/162V/750V	
Voltage unit	Root Mean Square/Peak/Peak-Peak/Average	

5. Performance verification

Specifications of this calibrator are defined for 1 year period so it should be periodically tested (and adjusted if necessary) within the same period of time. If you don't have the necessary equipment or can't do the calibration on your own, please ask local Meatest representative to help you calibrate this device.

5.1. Required equipment

Following instruments are required for performance verification test:

- 8½ digit multimeter like Keysight 3458A, Fluke 8588A or similar with DC voltage uncertainty 20 ppm or better and AC voltage uncertainty 350 ppm or better.
- 10A current shunt like Ohm-Labs CS-10-1 or similar with measurement uncertainty 0.02 % or better.
- LF Power Meter / Power Analyzer like Applied Precision RS 3330S, Radian Research RX-23 or similar with AC power measurement uncertainty 0.04 % or better. Alternative: Phase angle meter like Clarke-Hess 6000A or similar with phase angle measurement accuracy 0.05 ° or better.

5.2. Verification procedure

1. Place the calibrator in reference conditions and leave it switched on for at least 30 minutes.
2. Set Terminal ground item in 6040's SETUP menu to ON in order to suppress mains noise during measurement.
3. Connect output terminals of the calibrator to the input voltage terminals of the standard device. Set parameters which enables the most accurate measurement in standard device.
4. Use table in chapter 5.3 to verify all recommended test points. Measured deviation should not exceed the limits in tables.
 - a. DC voltage test
 - b. AC voltage test
 - c. DC current test
 - d. AC current test
 - e. AC power test (or phase shift test as an alternative)
 - f. Synchroscope test

5.3. Test points

Function	Range	Nominal	Min value	Max value	Unit	Standard unit	Test parameters
DC Voltage	105	-105	-105.149	-104.851	mV	8½ digit DMM	DC
		-52.5	-52.5755	-52.4245	mV		
		-10.5	-10.5167	-10.4833	mV		
		10.5	10.4833	10.5167	mV		
		52.5	52.4245	52.5755	mV		
		105	104.851	105.149	mV		
	1.5	-1.5	-1.50422	-1.49578	V		
		-0.75	-0.75212	-0.74788	V		
		-0.1	-0.1003	-0.0997	V		
		0.1	0.0997	0.1003	V		
		0.75	0.74788	0.75212	V		
		1.5	1.49578	1.50422	V		
	5	-5	-5.00357	-4.99643	V		
		-2.5	-2.50182	-2.49818	V		
		-0.5	-0.50042	-0.49958	V		
		0.5	0.49958	0.50042	V		
		2.5	2.49818	2.50182	V		
		5	4.99643	5.00357	V		
	40	-40	-40.0565	-39.9435	V		
		-35	-35.0495	-34.9505	V		
		-30	-30.0425	-29.9575	V		
		-25	-25.0355	-24.9645	V		
		-20	-20.0285	-19.9715	V		
		-15	-15.0215	-14.9785	V		
		-10	-10.0145	-9.9855	V		
		-5	-5.0075	-4.9925	V		
		5	4.9925	5.0075	V		
		10	9.9855	10.0145	V		
		15	14.9785	15.0215	V		
		20	19.9715	20.0285	V		
		25	24.9645	25.0355	V		
		30	29.9575	30.0425	V		
	200	-190	-190.538	-189.462	V		
		-100	-100.295	-99.705	V		
		-20	-20.079	-19.921	V		
		20	19.921	20.079	V		
100		99.705	100.295	V			
190		189.462	190.538	V			

Function	Range	Nominal	Min value	Max value	Unit	Standard unit	Test parameters
DC Voltage	800	-800	-802.29	-797.71	V	8½ digit DMM	DC
		-400	-401.17	-398.83	V		
		-100	-100.33	-99.67	V		
		100	99.67	100.33	V		
		400	398.83	401.17	V		
		800	797.71	802.29	V		
AC Voltage	1.5	1	0.9991	1.0009	V		45 Hz and 500 Hz
		1.5	1.49865	1.50135	V		
	3.5	1.5	1.49865	1.50135	V		
		3.5	3.49685	3.50315	V		
	25	5	4.9955	5.0045	V		
		7.5	7.49325	7.50675	V		
		10	9.991	10.009	V		
		12.5	12.48875	12.51125	V		
		15	14.9865	15.0135	V		
		17.5	17.48425	17.51575	V		
		20	19.982	20.018	V		
		22.5	22.47975	22.52025	V		
	162	25	24.9775	25.0225	V		
		81	80.9271	81.0729	V		
		162	161.8542	162.1458	V		
	750	162	161.8542	162.1458	V		
		375	374.6625	375.3375	V		
		750	749.325	750.675	V		
DC Current	1	-1	-1.0012	-0.9988	mA	DC	
		-0.5	-0.5007	-0.4993	mA		
		-0.1	-0.1003	-0.0997	mA		
		0.1	0.0997	0.1003	mA		
		0.5	0.4993	0.5007	mA		
		1	0.9988	1.0012	mA		
	10	-10	-10.012	-9.988	mA		
		-5	-5.007	-4.993	mA		
		-1	-1.003	-0.997	mA		
		1	0.997	1.003	mA		
		5	4.993	5.007	mA		
		10	9.988	10.012	mA		
	100	-100	-100.102	-99.898	mA		
		-50	-50.052	-49.948	mA		
		-10	-10.012	-9.988	mA		
		10	9.988	10.012	mA		
		50	49.948	50.052	mA		
		100	99.898	100.102	mA		

Function	Range	Nominal	Min value	Max value	Unit	Standard unit	Test parameters	
DC Current	0.5	-0.5	-0.5006	-0.4994	A	8½ digit DMM, 10A current shunt	DC	
		-0.25	-0.25035	-0.24965	A			
		-0.05	-0.05015	-0.04985	A	8½ digit DMM		
		0.05	0.04985	0.05015	A			
		0.25	0.24965	0.25035	A	8½ digit DMM, 10A current shunt		
		0.5	0.4994	0.5006	A			
	1.5	-1.5	-1.5017	-1.4983	A	8½ digit DMM (use 10A current shunt where nominal exceeds DMM's current range)		
		-0.75	-0.75095	-0.74905	A			
		-0.15	-0.15035	-0.14965	A			
		0.15	0.14965	0.15035	A			
		0.75	0.74905	0.75095	A			
		1.5	1.4983	1.5017	A			
	5	-5	-5.009	-4.991	A			
		-2.5	-2.505	-2.495	A			
		-0.5	-0.5018	-0.4982	A			
		0.5	0.4982	0.5018	A			
		2.5	2.495	2.505	A			
		5	4.991	5.009	A			
	10.5	-10	-10.018	-9.982	A			
		-5	-5.01	-4.99	A			
		-1	-1.0036	-0.9964	A			
1		0.9964	1.0036	A				
5		4.99	5.01	A				
10		9.982	10.018	A				
AC Current	320	70	69.893	70.107	mA		8½ digit DMM, 10A current shunt	45 Hz and 500 Hz
		160	159.794	160.206	mA			
		320	319.618	320.382	mA			
	1	0.1	0.09979	0.10021	A			
		0.5	0.49935	0.50065	A			
		1	0.9988	1.0012	A			
	3.2	0.32	0.319348	0.320652	A			
		1.6	1.59794	1.60206	A			
		3.2	3.19618	3.20382	A			
	7	0.7	0.69623	0.70377	A			
		3.5	3.49315	3.50685	A			
		7	6.9893	7.0107	A			

Table 1 List of main test points

5.3.1. AC Power & Phase shift test points

Function	Range	Nominal	Min value	Max value	Unit	Standard unit	Test parameters
AC Power	25	25	24.9584	25.0416	W	Power meter	25V/1A/55Hz/PF=1
	162	150	149.750	150.250	W		150V/1A/55Hz/PF=1
	5250	3500	3493.27	3506.73	W		700V/5A/55Hz/PF=1
	25	12.5	12.3957	12.6043	W		25V/1A/55Hz/PF=0.5
	162	75	74.3744	75.6256	W		150V/1A/55Hz/PF=0.5
	5250	1750	1735.31	1764.69	W		700V/5A/55Hz/PF=0.5

Table 2 List of AC Power test points

Performance of AC Power function can be alternatively verified through calibration of AC Power components, i.e. AC Voltage, AC Current and Phase shift. AC Voltage and Current test points are listed among the main test points above, recommended phase shift test points are listed in table below. Only one of the two tests (AC Power or phase shift) is required to verify AC Power function.

Function	Range	Nominal	Min value	Max value	Unit	Standard unit	Test parameters
Phase shift	360	0	-0.27	0.27	°	Phase meter	25V/1A/55Hz/PF=1
		0			°		150V/1A/55Hz/PF=1
		0			°		700V ¹ /5A/55Hz/PF=1
		60	59.73	60.27	°		25V/1A/55Hz/PF=0.5
		60			°		150V/1A/55Hz/PF=0.5
		60			°		700V ¹ /5A/55Hz/PF=0.5

1. Verification can be performed at ≥ 400 Vrms if the standard phase doesn't allow testing at 700 V.

Table 3 List of phase shift test points

5.3.2. Synchroscope test points

Function	Range	Nominal	Min value	Max value	Unit	Standard unit	Test parameters
Synchroscope	180	0	-1	1	°	Phase meter	12.5 V, 81 V and 325 V
		180	179	181	°		

Table 4 List of Synchroscope test points

6. Adjustment

Adjustment is done through MENU > Calibration > Data. This menu item is password protected, default factory set calibration code is “6040”.

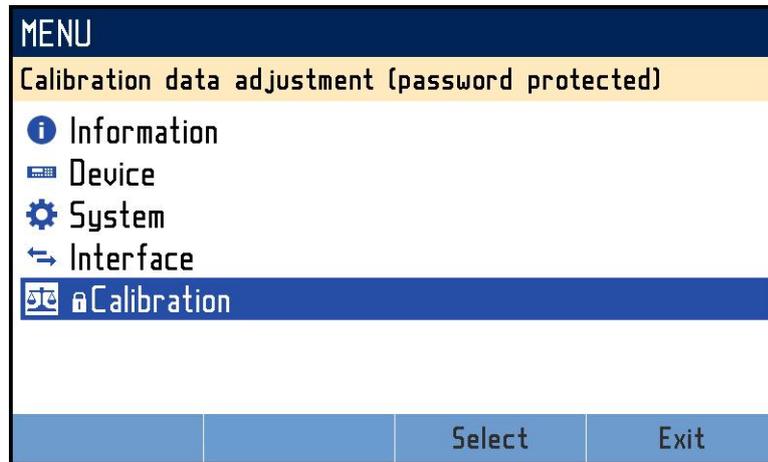


Figure 31 Password entry

6.1. Calibration menu structure

Calibration data are sorted in a tree structure with following hierarchy:

1. Function groups (source and advanced)
2. Functions (f.e. Voltage DC)
3. Ranges (f.e. 10 V)
4. Calibration points (f.e. zero offset)

As with any other menu you can navigate through the tree structure using cursor buttons, rotary knob or softkeys:

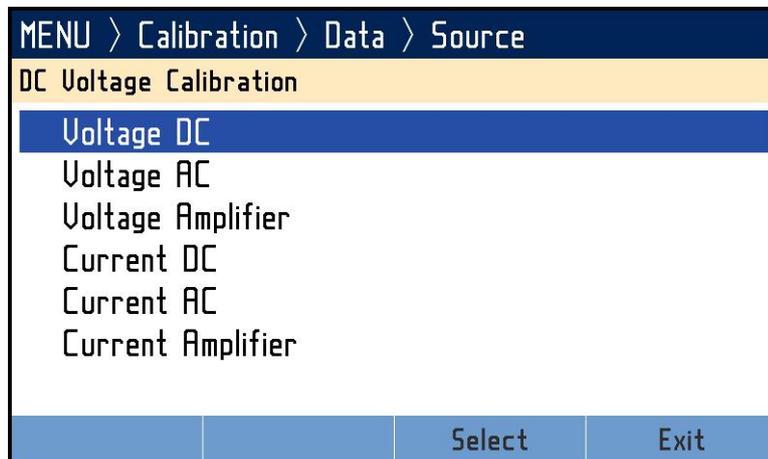


Figure 32 Calibration menu

Once range level of the tree structure is reached, calibration points are displayed in following format:

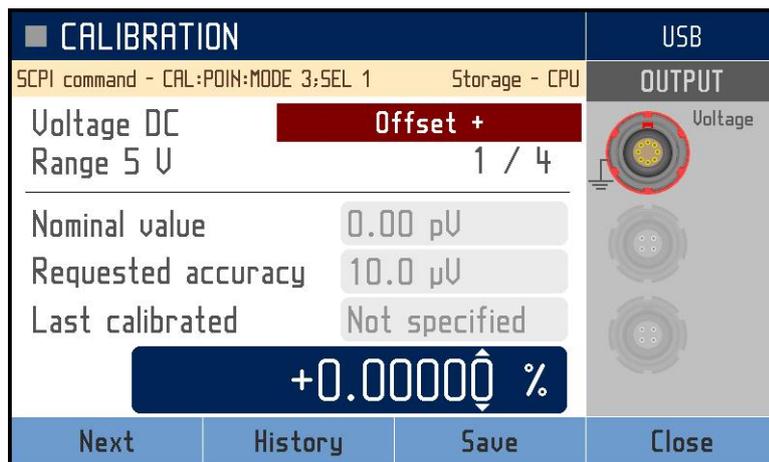


Figure 33 Calibration point adjustment

Upper part shows selected function and range on the left, selected calibration point on the right and remote control command used to access this specific point in tooltip bar on top. Lower part of the display shows:

- Nominal value
- Requested accuracy of used calibration standard
- Last calibration date of this point
- Calibration value (only this can be modified)

History of each calibration point can be recalled using History softkey. History shows all previously saved values in a table, including date and relative drift from the first value ever recorded.

6.2. Calibration point adjustment

Values denoted in % or without any unit (used in source functions with continuous ranges like V_{dc} function in fig. above) show relative position within selected range. Such points can be adjusted by changing the value so that the standard readout gets as close to nominal value as possible.

In both cases the procedure starts by connecting required standard to relevant terminals as shown on the right side of display. Meter functions measure all the time, source functions have to be switched on first using OPER key. Then adjust the main value accordingly and confirm with SAVE softkey.

HISTORY softkey allows you to check all previous values of this specific calibration point, PREVIOUS and NEXT softkeys navigate through other calibration points in selected range.

It is strongly recommended to periodically adjust all calibration points at once and in order as described in chapter 6.3 in order to maintain instrument specifications. That said, the instrument can be also adjusted partially, i.e. in particular functions or ranges only. If adjustment of next calibration point is not possible (f.e. when required standard is not available), the point can be skipped and old calibration data can be confirmed. However, specification can no longer be guaranteed in that range or function.

6.3. List of calibration points

Process of adjustment mostly involves changing offsets and slopes of individual ranges and other factors like amplitude linearity or frequency flatness coefficients of SCO option functions.

6.3.1. Voltage and current DC functions

Function	Range	Nominal value			
		Offset +	Offset -	Full range +	Full range -
Voltage DC	105 mV	0.000 mV	N/A	105.000 mV	-105.000 mV
	1.5 V	0.0000 V	N/A	1.5000 V	-1.5000 V
	5 V	0.00000 V	N/A	5.00000 V	-5.00000 V
	40 V	0.0000 V	N/A	40.0000 V	-40.0000 V
	200 V	0.000 V	N/A	200.000 V	-200.000 V
	800 V	200.000 V	-200.000 V	800.000 V	-800.000 V
Current DC	1 mA	0.00000 mA	N/A	1.00000 mA	-1.00000 mA
	10 mA	0.0000 mA	N/A	10.0000 mA	-10.0000 mA
	100 mA	0.000 mA	N/A	100.000 mA	-100.000 mA
	500 mA	0.00 mA	N/A	500.00 mA	-500.00 mA
	1.5 A	0.0000 A	N/A	1.5000 A	-1.5000 A
	5 A	0.0000 A	N/A	5.0000 A	-5.0000 A
	10.5 A	0.0000 A	N/A	10.5000 A	-10.5000 A

Table 5 Calibration points – DC voltage and current

6.3.2. Voltage and current amplifier

Function	Range	Nominal value	
		Offset 55 Hz	Full range 55 Hz
Voltage AC	75 mV	7.500 mV	75.000 mV
	1.5 V	150.000 mV	1.50000 V
	3.5 V	350.00 mV	3.5000 V
	25 V	2.5000 V	25.0000 V
	162 V	16.2000 V	162.0000 V
	750 V	75.000 V	750.000 V
Current AC	700 μ A	70.000 μ A	700 μ A
	7 mA	700.000 μ A	7.000 0 mA
	70 mA	7.000 mA	70.000 mA
	320 mA	32.000 mA	320.000 mA
	1 A	100.000 mA	1.0000 A
	3.2 A	0.3200 A	3.2000 A
	7 A	0.7000 A	7.0000 A

Table 6 Calibration points – Voltage and current amplifier

6.3.3. Voltage and current AC functions

Function	Range	Nominal value	
		Offset 120 Hz	Full range 120 Hz
Voltage AC	75 mV	10.000 mV	75.000 mV
	1.5 V	75.000 mV	1.50000 V
	3.5 V	1.5000 V	3.5000 V
	25 V	3.5000 V	25.0000 V
	162 V	25.0000 V	162.0000 V
	750 V	162.000 V	750.000 V
Current AC	700 μ A	70.000 μ A	700 μ A
	7 mA	700.000 μ A	7.000 0 mA
	70 mA	7.000 mA	70.000 mA
	320 mA	70.000 mA	320.000 mA
	1 A	320.000 mA	1.0000 A
	3.2 A	1.0000 A	3.2000 A
	7 A	3.2000 A	7.0000 A

Table 7 Calibration points – AC voltage and current

7. Maintenance

This chapter explains how to perform the routine maintenance to keep your device in optimal operating conditions.

7.1. Fuse replacement

Warning: The fuse must be changed according to the selected voltage!

6040 calibrator has user-replaceable mains fuse located in top right corner of the front panel. The fuse replacement procedure is as follows:

1. Switch the calibrator off and disconnect power cord from it
2. Insert flat screwdriver into fuse holder slot (right slot holds active) next to power cord connector and turn counterclockwise to release the fuse holder.
3. Remove the fuse, check if it's blown and replace it with new fuse according to fuse rating chart on the right if needed.
4. Put the fuse holder back and secure it in place with flat screwdriver (push and turn clockwise).



7.2. Firmware update

Internal firmware can be updated by user. It is recommended check for firmware updates every 6 months or so to get the latest UI improvements, new features and bug fixes. To do this:

1. Go to www.meatest.com/drivers-updates and find firmware update file (.upl) for your device. If your device is not listed, contact Meatest support and ask for firmware update file for your device.
2. Check if the update file version is greater than yours, installed FW version can be found in MENU > Information > Software version. If the installed version is the same, stop the update process.
3. Download Uploader program from the same website and install it if you haven't already.

Connect the instrument to your PC using USB cable and use Uploader to update your instrument's firmware. The calibrator will be restarted once the update is finished.

7.3. Error messages

The following table lists an overview of error codes that you might come across when operating the calibrator manually. Complete list of errors is available in SCPI manual.

Error code groups	Description and most notable error codes
1000-5999	Internal errors are detected by internal processors. Try updating internal firmware to the latest version as described in chapter 7.2 and if the error persists, please report this error to the Service Center.
6000-6999	User interface errors prevent the user from entering incorrect values from keyboard and accessing unavailable features.
	<u>6032</u> : Device is locked in remote control mode. Press "Go to Local" softkey to exit.
	<u>6044</u> : RCU control is enforced. Disconnect the RCU to enable main unit keyboard. <u>6045</u> : RCU control is disabled. Enable RCU control in Device menu.
7000-7099	Errors caused by missing or damaged hardware. Restart the instrument and if the error persists, please report this error to the Service Center.
	<u>7021</u> : Source function is unavailable. Ask Meatest for possible upgrades.
	<u>7040, 7041, 7042</u> : Please connect ABC cable. Relevant cable might need to be replaced if the error keeps coming back even with the cable connected.
7100-7999	Protective element has been triggered and output/input has been shut off in order to prevent calibrator damage. Check for excessive load and/or external voltage at terminals. If the error persists, please report this error to the Service Center.
	<u>7100-7102</u> : Passive Voltage/Synchroscope output overload. Decrease load to specified limits.
	<u>7103-7105</u> : Passive Current output overload. Decrease load to specified limits.
	<u>7106, 7107</u> : Active Current output overload. Disconnect external source of excessive voltage from current output terminals. <u>7108, 7109</u> : Active Voltage/Synchroscope output overload. Disconnect external source of excessive voltage from voltage and/or synchroscope output terminals.
8000-8999	Calibration data errors can occur when working with calibration data. They also diagnose calibration backup errors.
9000-10999	Preset errors usually come up when trying to create, modify or delete a device or harmonic setup preset in a way which would corrupt preset data like reusing existing names, deleting actively used presets or exceeding memory capacity. See chapter 3.6 for more details.
11000-11999	Exceeding the limits of internal meters: The instrument contains a number of internal meters that monitor voltage and current limits at the terminals, the temperatures of certain parts of the device, and other meters. Errors below will disconnect the output terminals.
	<u>11010, 11028</u> : Ground current limit exceeded. Limit external current between GND and Neutral terminal (Voltage RED, Synchroscope RED & BLACK or Current YELLOW).
	<u>11011, 11029</u> : Ground voltage limit exceeded. Limit external voltage between GND and Neutral terminal (Voltage RED, Synchroscope RED & BLACK or Current YELLOW). <u>11026, 11027</u> : Compliance limit exceeded. Decrease load to specified limits.
12001-12999	Handheld RCU communication errors. Try updating internal firmware to the latest version as described in chapter 7.2 and if the error persists, please report this error to the Service Center.

Table 8 Error code overview

8. Specifications

All absolute uncertainty specifications in this document are defined at a confidence interval of 95%, extension coefficient $k = 2$. Uncertainties include 12 months long-term stability, temperature coefficient, linearity, load and line regulation and the traceability of factory and National calibration standards. Recommended recalibration interval is 1 year.

Temperature and humidity stabilization and additional 30-minute warm-up in reference conditions are required in order to reach these specifications.

Ambient conditions

Reference temperature:	+13 – +33 °C
Operating temperature:	+0 – +50 °C
Storage conditions:	-40 – +71 °C, 0 – 100 % rel. humidity, max. altitude 12 km; storage requires the case lid to be closed and locked
Temperature coefficient:	10 % of specifications per °C outside T_{ref}
Max relative humidity:	0 – 30 °C: 85 %, non-condensing 30 – 40 °C: 80 %, non-condensing 40 – 50 °C: 50 %

General

Warm-up time:	30 minutes
Power supply:	115 V/230 V \pm 10 %, 45 – 65 Hz
EMC compliance:	Safety class I according to IEC 61010 ed. 2 ESD class I according to EN 61326 Overvoltage CAT II
Interfaces:	USB, IEEE 488.2, LAN
Dimensions (L x W x D):	42.8 x 35.8 x 23.5 cm (16.87 x 14.10 x 9.27 in)
Weight:	15.8 kg (35 lbs)

8.1. Voltage

DCV range summary:	0.000 mV – 800.000 V
ACV range summary:	1.00000 V _{rms} – 750.000 V _{rms}
Voltage ranges:	auto or fixed
AC range minimums:	1 V _{rms} or 5 % of range, whichever is higher
Available AC units:	RMS, peak, peak-peak, average
Frequency uncertainty:	10 ppm
THD & noise	max. 0.1 % below 500 Hz, 0.2 % otherwise (in bandwidth up to 80 kHz)

DCV Absolute Uncertainty [% of set value + floor]

Range	1 year	10 minutes ±1 °C	Burden current
0.000 – 105.000 mV	0.14 % + 2 µV	0.02 % + 2 µV	15 mA
0.10501 – 1.50000 V	0.28 % + 20 µV	0.028 % + 5 µV	15 mA
1.50001 – 5.00000 V	0.07 % + 70 µV	0.007 % + 15 µV	15 mA
5.0001 – 40.0000 V	0.14 % + 500 µV	0.014 % + 100 µV	15 mA
40.001 – 200.000 V	0.27 % + 2.5 mV	0.027 % + 0.5 mV	15 mA
200.001 – 800.000 V	0.27 % + 50 mV	0.027 % + 10 mV	15 mA

ACV Absolute Uncertainty [% of set value + floor]

Range	45 Hz – 500 Hz	500 Hz – 1 kHz	Burden current
	1 year	1 year	
1.00000 – 1.50000 V	0.09 %	0.15 % + 500 µV	300 mA _{rms}
1.50001 – 3.50000 V	0.09 %	0.15 % + 1 mV	300 mA _{rms}
3.5001 – 25.0000 V	0.09 %	0.15 % + 4 mV	300 mA _{rms}
25.001 – 162.0000 V	0.09 %	0.15 % + 40 mV	300 mA _{rms}
162.001 – 750.000 V	0.09 %	-	65 to 15 mA _{rms} ²

2. Max. burden current in 750V range is calculated as (77.5 - set voltage / 12) mA.

8.2. Synchroscope output

Provides secondary voltage output with the same voltage and frequency as main voltage output. Synchroscope output and main voltage output are galvanically connected to one another and share burden current limit defined in chapter 8.1 Voltage.

ACV range summary:	same as Voltage output
Frequency range:	same as Voltage output
Selectable phase shift:	0° or 180° against Voltage output

8.3. Current

DCI range summary:	0.00 μ A – 10.5000 A
ACI range summary:	70.000 mA _{rms} – 7.0000 A _{rms}
Current ranges:	auto or fixed
AC range minimums:	70 mA _{rms} or 5 % of range, whichever is higher
Available AC units:	RMS, peak, peak-peak, average
Frequency range:	45.000 Hz – 1000.00 Hz
Frequency uncertainty:	10 ppm
THD & noise	max. 0.2 % below 500 Hz, 0.3 % otherwise (in bandwidth up to 80 kHz)

DC Current Absolute Uncertainty [% of set value + floor]

Range	1 year	Compliance Voltage
0.00000 – 1.00000 mA	0.10 % + 200 nA	12 V
1.0001 – 10.0000 mA	0.10 % + 2 μ A	12 V
10.001 – 100.000 mA	0.10 % + 20 μ A	12 V
0.10001 – 0.50000 A	0.10 % + 100 μ A	3 V
0.50001 – 1.50000 A	0.10 % + 200 μ A	3 V
1.5001 – 5.0000 A	0.16 % + 1 mA	3 V
5.0001 – 10.5000 A	0.16 % + 2 mA	3 V

AC Current Absolute Uncertainty [% of set value + floor]

Range	45 Hz – 500 Hz	500 Hz – 1 kHz	Compliance Voltage	Max. inductive load
	1 year	1 year		
70.000 – 320.000 mA	0.11 % + 30 μ A	0.22 % + 60 μ A	6 V _{pk} (>4 V _{rms})	50 μ H
0.32001 – 1.00000 A	0.11 % + 100 μ A	0.22 % + 200 μ A	4 V _{pk} (>2.5 V _{rms})	30 μ H
1.00001 – 3.20000 A	0.11 % + 300 μ A	0.22 % + 600 μ A	4 V _{pk} (>2.5 V _{rms})	20 μ H
3.2001 – 7.0000 A	0.11 % + 3 mA	0.22 % + 6 mA	4 V _{pk} (>2.5 V _{rms})	10 μ H

8.4. Electric Power

8.4.1. DC power

Voltage range summary:	10.0000 V – 800.000 V
Current range summary:	10.0000 mA – 10.5000 A
Electric power range:	0.10000 W – 8.0000 kW

Uncertainty of DC power is determined by formula $dP = \sqrt{(dU^2 + dI^2)}$, where:

- dP is uncertainty of output power in %
- dU is uncertainty of set voltage in %, as per DCV specifications
- dI is uncertainty of set current in %, as per DCI specifications

8.4.2. AC power

Voltage range summary:	10.0000 V – 750.000 V
Current range summary:	70.000 mA – 7.0000 A
Electric power range:	0.70000 W – 5.2500 kW
Frequency range:	45.000 Hz – 1000.00 Hz
Phase shift range:	0.00° – 359.99°
Phase shift uncertainty:	0.27° at 500 Hz and below 0.50° above 500 Hz

Uncertainty of AC power is determined by formula $dP = \sqrt{(dU^2 + dI^2 + dPF^2)}$, where:

- dP is uncertainty of output power in %
- dU is uncertainty of set voltage in %, as per ACV specifications
- dI is uncertainty of set current in %, as per ACI specifications
- dPF is uncertainty of power factor in %

dPF is based on type of power units used, calculated by following formulas:

- $dPF = [1 - \cos(\varphi + d\varphi) / \cos(\varphi)] \cdot 100$ for active power
- $dPF = [1 - \sin(\varphi + d\varphi) / \sin(\varphi)] \cdot 100$ for reactive power
- $dPF = 0$ for apparent power

where:

- φ is set phase shift between voltage and current
- $d\varphi$ is uncertainty of set phase shift

Standalone Power Factor (PF) specifications

Range: -1.0000 – +1.0000

Uncertainty is determined by formula $dPF = \text{abs}[\cos(\varphi + d\varphi) / \cos(\varphi)]$, where:

- φ is set phase shift between voltage and current
- $d\varphi$ is uncertainty of set phase shift

9. Revisions

9.1. Change 1 (12. 01. 2026)

- Added Phase polarity menu item in chapter 4.3.1.
- Merged Offset+ and Offset- adjustment points in chapter 6.3.1.

9.2. Change 1 (13.04. 2026)

- Max. DC current increased to 10.5 A

CE Declaration of conformity

According to EN ISO/IEC 17050-1:2010 standard as well as European Parliament and European Council directives 2011/65/EU + amendment 2015/863, 2012/19/EU, 2014/30/EU and 2014/35/EU, MEATEST, spol. s r. o., manufacturer of 6040 Panel Meter Calibrator, based in Železná 3, 619 00 Brno, Czech Republic, declares that its product conforms to following specifications:

LVD

- EN 61010-1 ed. 2:2010 + A1:2016 + COR1:2019-03

EMC

- EN 61000 part 3-2 ed. 5:2019
- EN 61000 part 3-3 ed. 3:2014
- EN 61000 part 4-2 ed. 2:2009
- EN 61000 part 4-3 ed. 3:2006 + A1:2008 + A2:2011 + Z1:2010
- EN 61000 part 4-4 ed. 3:2013
- EN 61000 part 4-5 ed. 3:2015 + A1:2018
- EN 61000 part 4-6 ed. 4:2014
- EN 61000 part 4-11 ed. 2:2005
- EN 61326-1 ed. 3:2020
- EN 55011 ed. 4:2015 + A1:2016 + A11:2020

RoHS

- EN IEC 63000:2018

WEEE

- EN 50419:2022

Brno

August 20th, 2025



Place

Date

Signature