



VS2010A Precision Voltage Source

User's Guide

Notices

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

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A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

| | |
|--|---|
|  Direct current (DC) |  Alternating current (AC) |
|  WARNING, RISK OF ELECTRIC SHOCK. |  Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product. |
|  Indicates the field wiring terminal that must be connected to earth ground before operating the equipment — protects against electrical shock in case of fault. |  Frame or chassis ground terminal—typically connects to the equipment's metal frame. |

Safety Considerations

WARNING

Read the information below before using this instrument.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards for design, manufacture, and intended use of the instrument. wekomm assumes no liability for the customer's failure to comply with these requirements.

- **Ground the equipment:** For Safety Class 1 equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.
- **DO NOT** operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.
- For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. **DO NOT** use repaired fuses or short-circuited fuse holders.
- **Keep away from live circuits:** Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, **DO NOT** perform procedures involving cover or shield removal unless you are qualified to do so.
- **DO NOT** operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, **REMOVE POWER** and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to wekomm for service and repair to ensure that safety features are maintained.
-

WARNING

- **DO NOT** service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- **DO NOT substitute parts or modify equipment:** Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to wekomm for service and repair to ensure that safety features are maintained.
- **High voltages are always hazardous:** When placing the sensors or working on and installing sensors of this instrument always keep the appropriate distance to high voltage sources.
- **Permanent wiring of hazardous voltage** or sources capable of delivering greater than 150 VA should be labeled, fused, or in some other way protected against accidental bridging or equipment failure.
- **DO NOT** try to connect other devices than wekomm sensors to the according inputs of the instrument. Doing so might lead to a permanent damage of the instrument and or electrical shock.
- **DO NOT** try to connect the sensors to other devices than the wekomm environment monitor. Doing so might lead to a permanent damage of the sensor and or electrical shock.
- **DO NOT** connect any voltages or currents exceeding the given limits to the optional rear contacts. Doing so might lead to a permanent damage of the instrument and or electrical shock.
- To prevent electrical shock, disconnect the instrument from AC mains power and disconnect all test leads before cleaning. Clean outside of the instrument using a soft, lint-free, cloth slightly dampened with water. DO NOT use detergent or solvents. DO NOT attempt to clean internally. If needed, contact wekomm to arrange for a proper cleaning to ensure that safety features and performance are maintained.

CAUTION

This is a sensitive measurement apparatus by design and may have some performance loss when exposed to ambient continuous electromagnetic phenomenon.

Environmental Conditions

The EM5010A is designed for indoor use and in an area with low condensation. The table below shows the general environmental requirements for this instrument.

| Environmental condition | Requirement |
|-------------------------|---|
| Temperature | Storing condition: -10°C to +70°C Operating condition: 5°C to 40°C |
| Humidity | Operation condition: up to 95% RH (non condensing) |
| Altitude | Up to 2500m |
| Installation category | II |
| Over voltage protection | II |

WARNING

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE OR WET ENVIRONMENTS

Do not operate the instrument around flammable gases or fumes or vapor. Risk of fire or explosion. If you have the need of operating the instrument in such conditions please contact wekomm for a special version of the instrument

Do not operate the instrument in wet environments. Risk of short circuit or fire.

WEEE

Waste Electrical and Electronic Equipment (WEEE) Directive

This instrument complies with the WEEE Directive marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a "Monitoring and Control Instrument" product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this instrument for recycling, contact wekomm for instructions how to return this instrument or visit www.wekomm.de

Sales and Support

To contact wekomm for sales and technical support, refer to the support links on the wekomm website or contact us via phone or email.

We will be happy to assist you in answering your questions or help choosing the appropriate accessories and or instruments for your application.

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Installation and Maintenance



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Introduction

This chapter contains information on initial inspection, installation, and maintenance. It also contains lists of the instrument's available options and accessories.

It's a good idea to read this chapter before making any electrical connections to the instrument.

Initial Inspection

WARNING

If any of the following symptoms exist, or are expected, remove the instrument from service:

- Visible damage.
- Severe transport stress.
- Prolonged storage under adverse conditions.
- Failure to perform intended measurements or functions.

Do not use instrument until safe operation can be verified by service trained personnel.

The instrument was carefully inspected before it left the factory. It should be undamaged and in proper working order upon receipt. If the shipping container or cushioning material is damaged, keep it, until the contents of the shipment have been checked and the multimeter has been inspected. When you unpack the instrument, verify that the following items are included:

- Line Power Cord (Qty. 1)
- Replacement line power fuses: 500 mA T (Qty 1 for 220/240 operation), 1.0 A NTD (Qty 1 for 100/120 operation)

If the instrument is damaged or the contents are incomplete, promptly notify wekomm. We will then discuss the next steps with you.

WARNING

Check, that the instrument is set to the proper voltage.

Operating an instrument set for 115V with 240V will damage the instrument and or might cause fire or serious injuries. The proper voltage setting must be done inside the instrument and should only be done at certified repair facilities.

Operating the instrument



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Introduction

This chapter is intended for the novice user of the VS2010 user.

It shows you how to use the instrument's front panel, setting parameters and configurations. We will also discuss how to retrieve data from the instrument.

Since front panel operation is discussed first, it covers important topics such as the power-on state, operations and how to change specific settings.

For this reason, you should read the entire chapter even if you intend to use the instrument primarily from remote.

Instrument overview

This picture illustrates the main components of the VoltageSource:

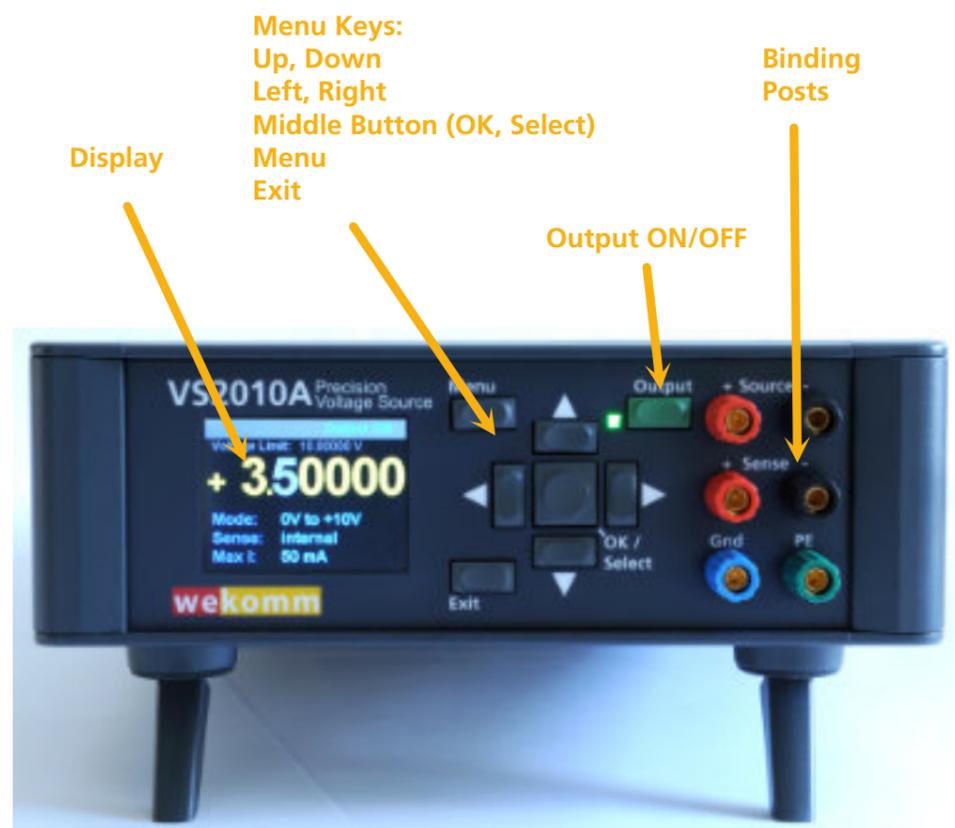


Figure 1 Instrument Overview

Before Applying Power

- Make sure the line voltage matches to the instrument's rear panel given limits
- Make sure the proper line fuse is installed.
- If you have any questions concerning installation or power requirements, refer to [Chapter 1](#).

Applying Power

To apply power, just connect the instrument with the power supply (line or external DC, Option). You might see a short flash on the screen. Following this, the Voltage Source shows a boot screen until the instrument has fully started up.

If anything other than this happens, disconnect the instrument from power and re-power it after 30 seconds. If it won't start up then, disconnect the instrument and contact wekomm for service.

When the instrument is being started for the first time, it should come up with the following screen, no matter which sensors are connected:

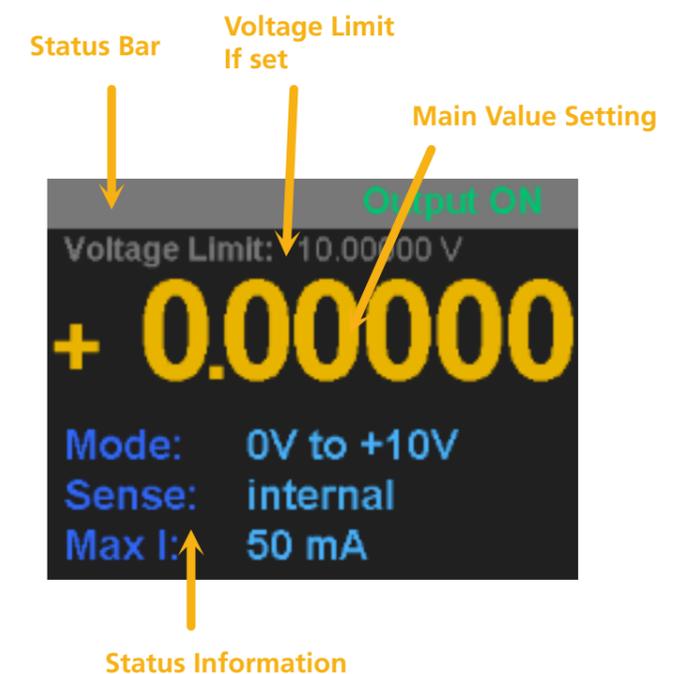


Figure 2 Instrument Screen

Using the instrument - getting started

The main display is very simple to use. The only setting you can make is changing the Voltage value (setting the output voltage of the instrument) and switching output on and off. The output status will be represented by a LED and the status bar respectively.

To change the Output voltage you use the Menu Keys in the following way.

Starting from the main screen

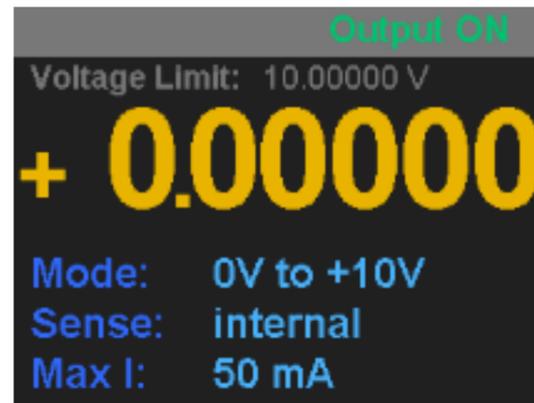


Figure 3 Instrument Screen

You press the "Right" key, so select the first digit:

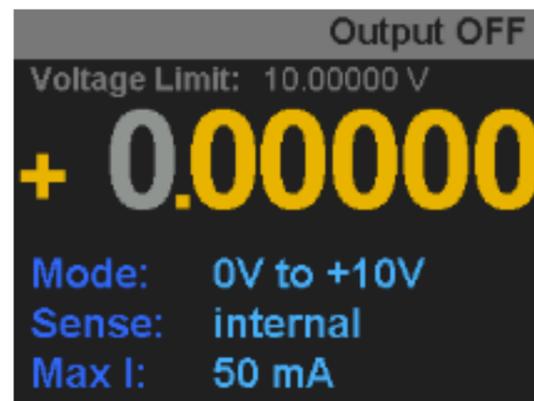


Figure 4 Instrument Screen

The selected digit turns grey.

You are now able to increase or decrease the digit value with the "Up" and "Down" Keys.

Be aware, that the maximum value you may set is limited to 10V as this is the maximum voltage, the instrument can operate with.

The smallest voltage you can set the instrument to is 0.00000V

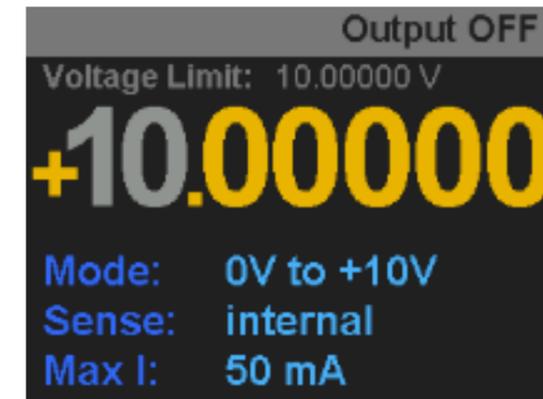


Figure 5 Instrument set to maximum voltage

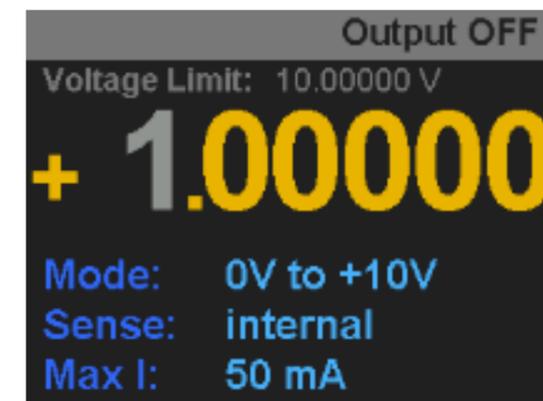


Figure 6 First digit modified

If you need to change other digits, select them with the "Right" and "Left" keys Then use the "Up" and "Down" Keys to select the desired digit value.

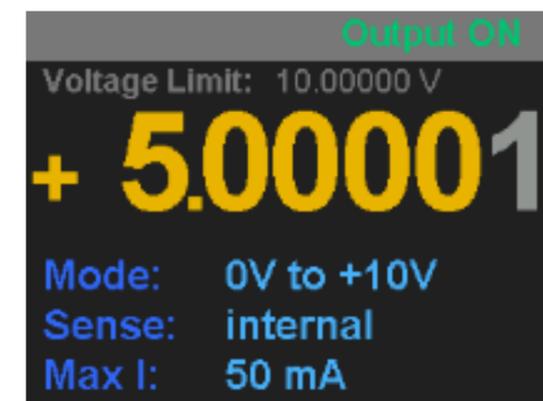


Figure 7 First digit modified

Be aware that the instrument features a rollover. So if you have a setting at 5V for example as shown in the picture below

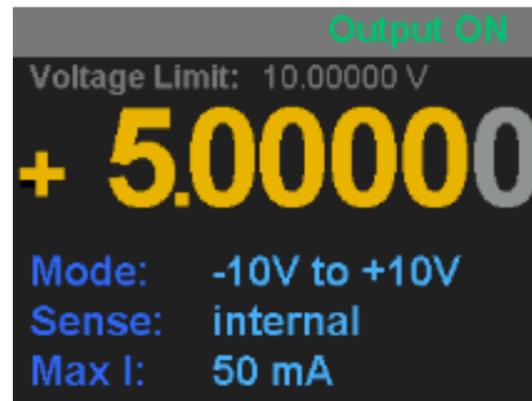


Figure 8 Instrument set to 5V

When you press the "Down" key now, the instrument does a rollover, will say, it is set to 4.99999V afterwards:

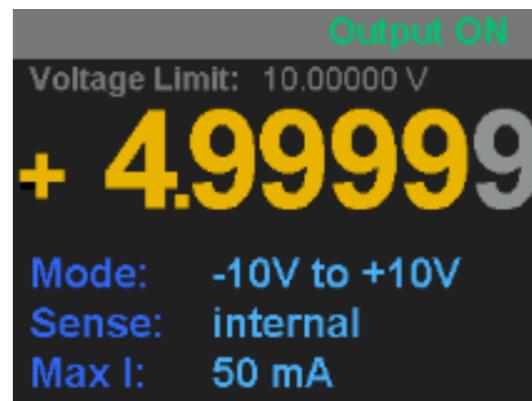


Figure 9 Instrument set to 4.99999 V

This feature helps you move smoothly through the voltage range of the instrument.

When the instrument is set to ranges -10V to +10V or -1V to +1V, you still cannot go below 0.0000V. Instead you need to change the polarity of the output and increase the value then. This is done by selecting the plus sign (+) or minus sign (-) respectively and change it with the "Up" or "Down" key.

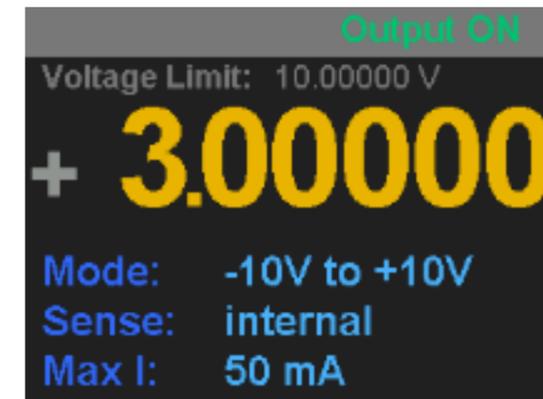


Figure 10 Instrument set to + 3.00000V

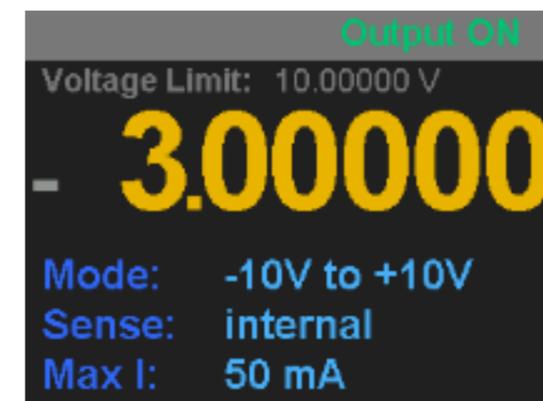


Figure 11 Instrument set to - 3.00000V

Using the instrument - The menu

When changing settings of the instrument, you need to use the menu. Two keys have special functions for the menu.

First, the "Menu" key itself. Pressing this key will always bring you to the top menu page, no matter whether your instrument displays its main screen or some menu screens.

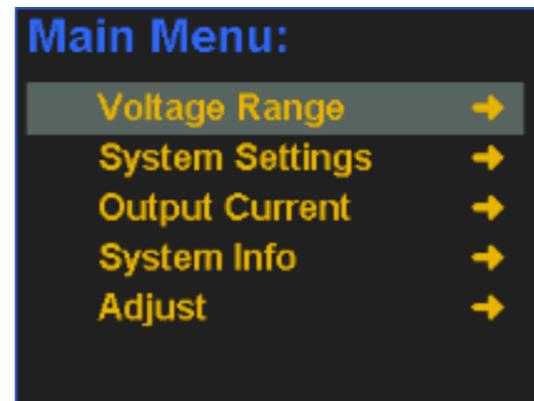


Figure 12 The main menu display

The second important key is the "Exit" key. Operation this key will you bring up a menu level or if you are already in the top menu level, leave the menu and display the main screen.

Using the menu is simple. You can move the scroll bar up and down with the "Up" and "Down" keys. With the "OK/Select" key you can either enter a Sub Menu (represented by an arrow following the menu entry) or select the actual setting (circle in front of the menu line).

In this picture, pressing the "OK/Select" key would call the sub menu to set the voltage range.

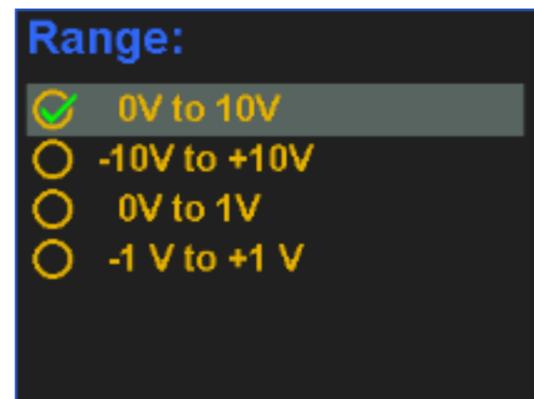


Figure 13 The voltage range menu

Now move the scrollbar over the desired entry with the "Up" and "Down" keys



Figure 14 The voltage range menu

And press the "OK/Select" key to activate the setting



Figure 15 The voltage range menu - now different range selected

When you are done with your selection you may use the "Exit" key to return to the main screen.

Alternatively you may press the "Menu" key to return back to the main menu screen to continue working in the menu.

A combination of a menu which contains submenus and selectable entries is shown in the next screen

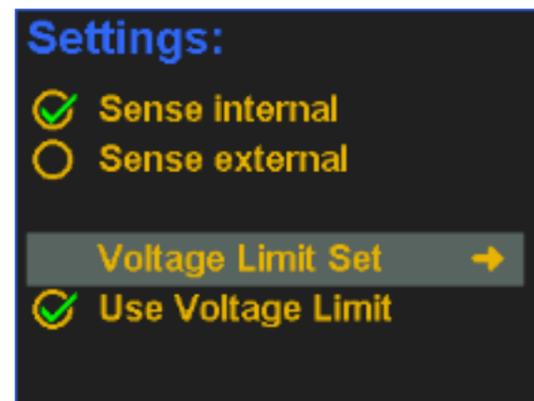


Figure 16 The settings menu

Selecting this submenu offers you a possibility to enter a maximum voltage which the Voltage source will generate at its outputs.

This feature is implemented to protect your circuits from accidentally apply voltages which the electronics is not capable of handling.

In addition you can switch between internal and external sense operation. If you are using currents higher than a few mA, it is strongly recommended to use external Sense to provide the precision of the instrument even in these cases. Both, high and low path of the output are actively driven to compensate for losses in the connections wires.

Note

When selecting external Sense, make sure that the sense inputs are properly connected. Internal protection circuits will make sure that the instrument is not damaged in any way but the generated output voltage might be way off the specification.

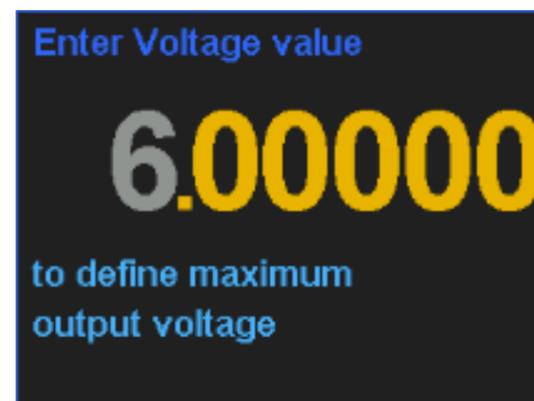


Figure 19 Setting the maximum output voltage

You may dial in the desired voltage using the "Up", "Down", "Left" and "Right" keys. When the desired voltage is displayed, you may select the value, pressing the "OK/Select" key for about half a second. Success will be indicated when the display returns back to the Settings menu.

Two items in the menu are rather self explanatory.

First you may define the maximum output current, the instrument is able to provide. This setting is not a precise definition of current. It is meant for protection of your connected electronics only. So if you select 50 mA for example, it might well be, that the instrument delivers 55 mA in a short circuit case.

On the other hand, the instrument is short circuit protected by this way and you may protect your valuable electronics.

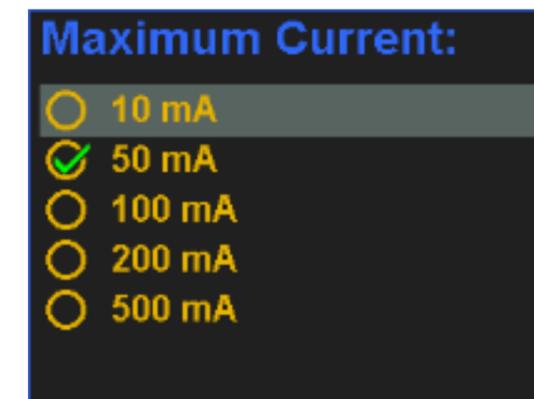


Figure 17 The Maximum Current Menu

The next menu item to discuss is the System Info Menu. This menu displays a single page, giving you some information about the instrument itself. Most important should be the serial number.

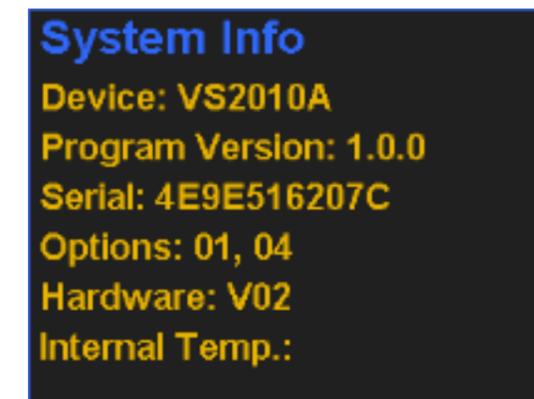


Figure 18 The System Info Menu

Adjusting the instrument

To provide the precision of the instrument itself, the output voltage needs to be adjusted according to some reference. Wekomm recommends using a metrology grade multimeter like the Keysight 3458A or equivalent to perform this task.

Note

Before starting the adjustment procedure, make sure, that both instruments, the reference voltmeter and the Voltage Source, have enough time to settle and warm up properly.

It is recommended, that the Keysight 3458A is allowed to warm up for at least 24 hours and a full auto-cal cycle was applied before the instrument is used for adjustment. The VS2010A should be given at least six hours to fully warm up before the adjustment procedure is initiated.

Once these prerequisites are fulfilled, the adjustment procedure can be initiated. To do so, select the Adjust menu in the menu structure.

When done, the instrument asks for a PIN code to get access to the Adjust menu:

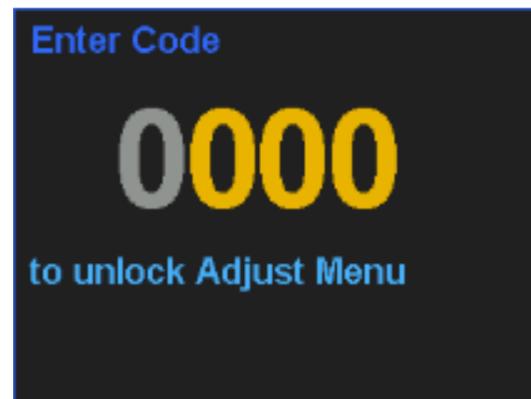


Figure 20 Entering the unlock code

With the actual firmware revision this code is fixed and has the value

2010

Further firmware revisions might offer a possibility to change this code.

When the correct code is entered, pressing the "OK/Select" key will then open the actual Adjust Menu.



Figure 21 Adjust Menu

Now connect the voltmeter to the output terminals of the VS2010A.

The VS2010A offers four adjustments, which need to be performed in sequential order to provide the maximal precision the instrument is capable providing.

The first adjustment is the zero level. This defines the 0.00000V level of the output. The instrument is designed in a way, that the D/A converter is able to output a very small negative voltage. So the first step will be to enter an offset value to bring the output exactly to 0.00000V.

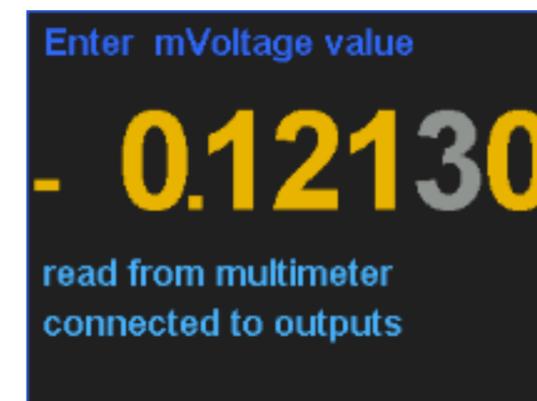


Figure 22 Adjusting the zero level

In this step you need to enter the negative value displayed on the multimeter. This value should be around -0.1mV, the minus sign is already set accordingly. Make sure that you have a stable reading on the multimeter and that you enter the correct value.

Once you have done this, pressing the "OK/Select" key for about 0.5 seconds will store this value and display the next window. When watching the multimeter, you will see that the output value should be very close to 0V as the instrument is applying the calculated offset to its DAC converter.

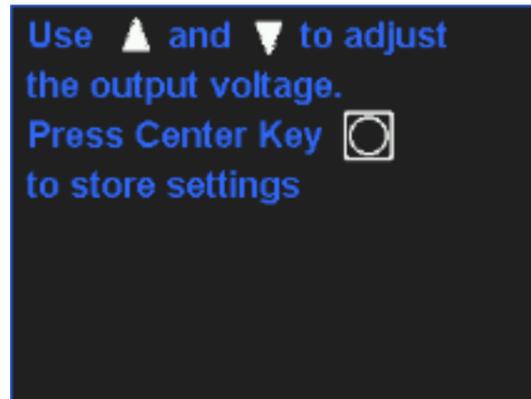


Figure 23 Adjusting the zero level

Using the “Up” and “Down” keys you are able to modify the calculated offset in the most tiny steps possible. Every keypress should lead to a very tiny change on the multimeter, make sure that you select the closest value towards 0V as possible. When happy with the settings, press the “OK/Select” or Center Key to store the value and return to the adjust menu.

Now select the Adjust 10V entry to continue. A very similar menu is displayed:

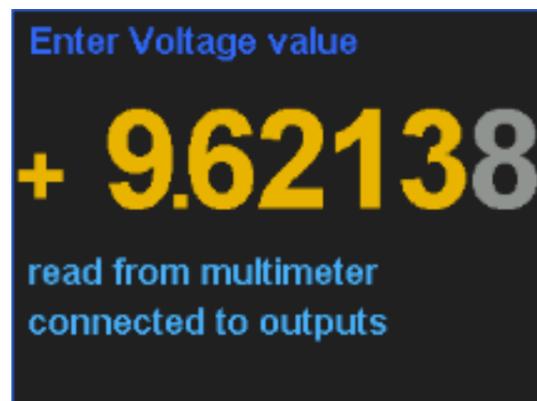


Figure 25 Adjusting the 10V level

The connected multimeter should display a value at around 9.6V, which you need to enter digit by digit into the instrument. Again pressing the “OK/Select” key for about 0.5 seconds will store this value and apply the scaling factor to the ADC. A value of exactly 9.00000V should be displayed at the multimeter. The Voltage Source selects the next screen, where you can fine adjust the scaling factor.

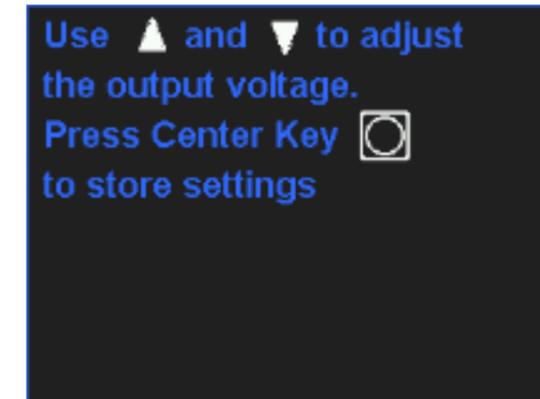


Figure 24 Fine tune the 10 V level

Again, using the “Up” and “Down” keys you are able to modify the calculated scale value in the most tiny steps possible. Every keypress should lead to a very tiny change on the multimeter, make sure that you select the closest value towards 9.00000V as possible.

When the multimeter readings are stable and entered properly, a correction with the fine tuning menus usually should not be necessary.

When happy with the settings, press the “OK/Select” or Center Key to store the value and return to the adjust menu.

Repeat the steps for the 1V range accordingly and follow the steps, advised on the display.

When done, leave the menu - your instrument is properly adjusted.

The SCPI Interface

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Remote control of the instrument

The Voltage Source VS2010A provides a USB-B connector at the back of the instrument for remote controlling the major functions of the device.

For most operating systems the required driver should be already installed with the operation system (valid for Windows 10, Windows 11, OS-X 13.x and greater). This driver announces the instrument as a serial port, talking SCPI.

All SCPI commands must be terminated by a carriage return sign (CR13) for the instrument to interpret the command.

Once the instrument receives a valid command, it locks out the keys on the front panel and displays a "Remote" sign on the display.

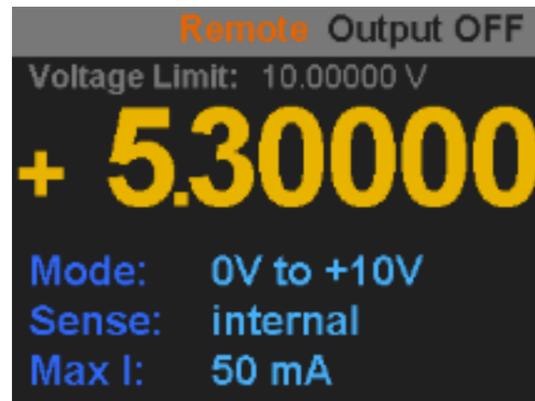


Figure 26 Instrument under remote control

To return to the front panel mode, you must press the "Exit" button on the front panel, which will remove the "Remote" label and return back to local operation.

SCPI command reference

In the following section you will find the reference of all used SCPI commands. The instrument is capable of handling all SCPI99 conformant commands, only those which will cause some action of the instrument are listed below.

Identify

Command

*IDN?

Parameter

–

Response

Device identification

Example:

```
wekomm engineering GmbH, VS2010A, S/N 4E9E516207C,  
Rev 1.0.0  
VS2010A>
```

Use Voltage Limit Settings

Command

STATus:OPERation:USEVlimit

Parameter

YES → activate

1 → activate

NO → deactivate

0 → deactivate

Response

–

Get Voltage Limit Settings

Command

STATus:OPERation:USEVlimit?

Parameter

–

Response

YES / NO

Example:

```
YES  
VS2010A>
```

Set Voltage Limit Value

Command
STATus:OPERation:VLIMit

Parameter
Float Value 10 >= x >= 0

Example:
STAT:OPER:VLIM 5.23

Response
-

Get Voltage Limit Value

Command
STATus:OPERation:VLIMit?

Parameter
-

Response
Limit Value

Example:
5.23000 V
VS2010A>

Set Maximum Current Value

Command
STATus:OPERation:MAXI

Parameter
10mA

50mA

100mA

200mA

500mA

Example:
STAT:OPER:MAXI 200mV

Response
-

Get Maximum Current Value

Command
STATus:OPERation:MAXI?

Parameter
-

Response
Value of current limit

Example
200mA
VS2010A>

Set Output Status

Command
STATus:OPERation:ENABLE

Parameter

ON → activate

1 → activate

OFF → deactivate

0 → deactivate

Example:
STAT:OPER:ENAB OFF

Response

-

Befehl
STATus:OPERation

Parameter

ON → activate

1 → activate

OFF → deactivate

0 → deactivate

Example:
STAT:OPER ON

Response

-

Get Output Status

Command

STATus:OPERation?

Parameter

—

Response

Output ON / Output OFF

Example

Output ON
VS2010A>

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Get Output Voltage Value

Command

PARAMeter:VOLTage?

Parameter

—

Response

Value of Output Voltage

Example

1.23456 V
VS2010A>

Set Output Voltage Value

Command

PARAMeter:VOLTage

Parameter

Value of output voltage, valid for the chosen operating range. Invalid parameters are ignored.

Example:

PARA:VOLT 1.23456

Response

—

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EU-KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY



Hersteller/
Manufacturer wekomm engineering GmbH

Anschrift/
Address Helmut-A.-Müller-Str. 7
D-82152 Planegg

Produktbezeichnung/
Product Name Präzisions-Spannungsquelle
Precision Voltage Source

Typ / Type VS2010A

Artikel-Nr. / Article No. VS2010A

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein,
nachgewiesen durch die vollständige Einhaltung folgender Normen:

*The above mentioned product has been manufactured according to the regulations on the following
European directives proven through complete compliance with the following standards:*

| Nr. / No | Richtlinie | Directive |
|------------|---|--|
| 2014/53/EU | Bereitstellung von Funkanlagen - RED Richtlinie – Anbringung der CE-Kennzeichnung: 2024 | Making available of radio equipment - RED Directive – Attachment of CE mark : 2024 |

Anforderungen an die Sicherheit gemäß 2014/35/EU
Safety requirements according to 2014/35/EU

| <u>EN/Norm/Standard</u> | <u>IEC/DeutscheNorm</u> | <u>VDE-Klassifikation/Classification</u> |
|-------------------------|-------------------------|--|
| EN61010-1 : 2010 | IEC 61010-1 : 2011 | VDE 0411-1 : 2011 |

Anforderungen an die elektromagnetische Verträglichkeit gemäß 2014/30/EU
Requirements for electromagnetic compatibility according to 2014/30/EU

Grundnorm / Generic Standard
EN 61326-1 : 2013

Planegg, den 01.06.2024

Ort, Datum / Place, Date

Geschäftsführung / Managing director

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien,
beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise
der mitgelieferten Produktdokumentation sind zu beachten.

This declaration certifies compliance with the above mentioned directives but does not
include a property assurance. The safety notes given in the product documentations,
which are part of the supply, must be observed

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