elneos® five

experience the touch

Contents

Manufacturer

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This sign guarantees that the device has been manufactured according to the requirements of the EU (European Union) with respect to regulations for safety and electromagnetic compatibility.

1. Preface

The new trade name elneos five. 5-finger-multitouch gesture functioning and 5 device groups stand for the name affix five – power control units, digital multimeter, power sensors, function generators and arbitrary generators.

In the control centre of elneos five up to 7 devices can be integrated and 8 additional racks with 4 devices each be connected at the left and right-hand side. Thus, up to 32 devices can be controlled simultaneously.

The open-plan glass front panel of elneos five is completely equipped with capacitive technology. Very solid, scratch-proof and vandal-proof.

The 7“ big multitouch display of elneos five is operated through gestures with up to 5 fingers and ensures an excellent ease of operation.

The visionary capacitive technology together with the combination of devices and the modularity of elneos five are outstanding in the measuring technique.

2. Warnings

- The elneos devices conform to the state of art and are operationally reliable. Nevertheless, dangers emanate from them.
  For this reason each person entrusted with the installation, commissioning, operation, maintenance and repair of these devices must have read and understood the operating instructions.

- The devices conform to VDE 0411 and are designed for operation in laboratories, test facilities and other rooms which are classified into the degree of pollution 2 as per VDE 0110.
  The devices must be protected against condensation and when being cold, must be adapted to room temperature before connecting them to the supply voltage.

- Unauthorised conversions and alterations carried out to the devices as well as operation outside the 19inch racks or outside the portables are strictly prohibited for safety reasons.
  The manufacturer is not liable for damage caused by the use not according to regulations or by improper operation.
  Repairs may only be carried out by electrically qualified persons. Considerable danger may emanate to the user from improperly made repairs.

- If, for the operation of the devices, there are special stipulations and regulations to be observed, it is the duty of the user to respect the same.
  The devices conform to protection class I and may only be operated with a properly installed earth conductor.

- To ensure a trouble-free operation the tolerance of the operating voltage of 230 VAC +/-10 % must be observed.

3. Note: Return consignment / packing instructions!

MUST BE STRICTLY ADHERED TO

Prior to returning an elneos five device, the extent of the return consignment must be discussed with **Messrs. erfi**. It may be sufficient to return only the front panel (control centre) or individual plug-in cards so that the power cassette can remain with the customer.
When returning the complete device, the front panel must in any case be disconnected mechanically from the cassette and these items must be transported separately from one another.

Packing instructions:

An ideal mode of packing is to lay the device directly in foam.

If this is not possible, it is imperative to safely pack the front panel and the power cassette to ensure that they will not get damaged in any way during transport. For this purpose, soft foamed material and air bubble film must be used. In any case, the front panel must be packed and cushioned separately from the power cassette. The modules may not get out of place. When positioning them in a cardboard box, care must be taken that the front panel will not be exposed to shocks or any hard items. The front panel is made of hard glass, however, it can get destroyed through strikes.

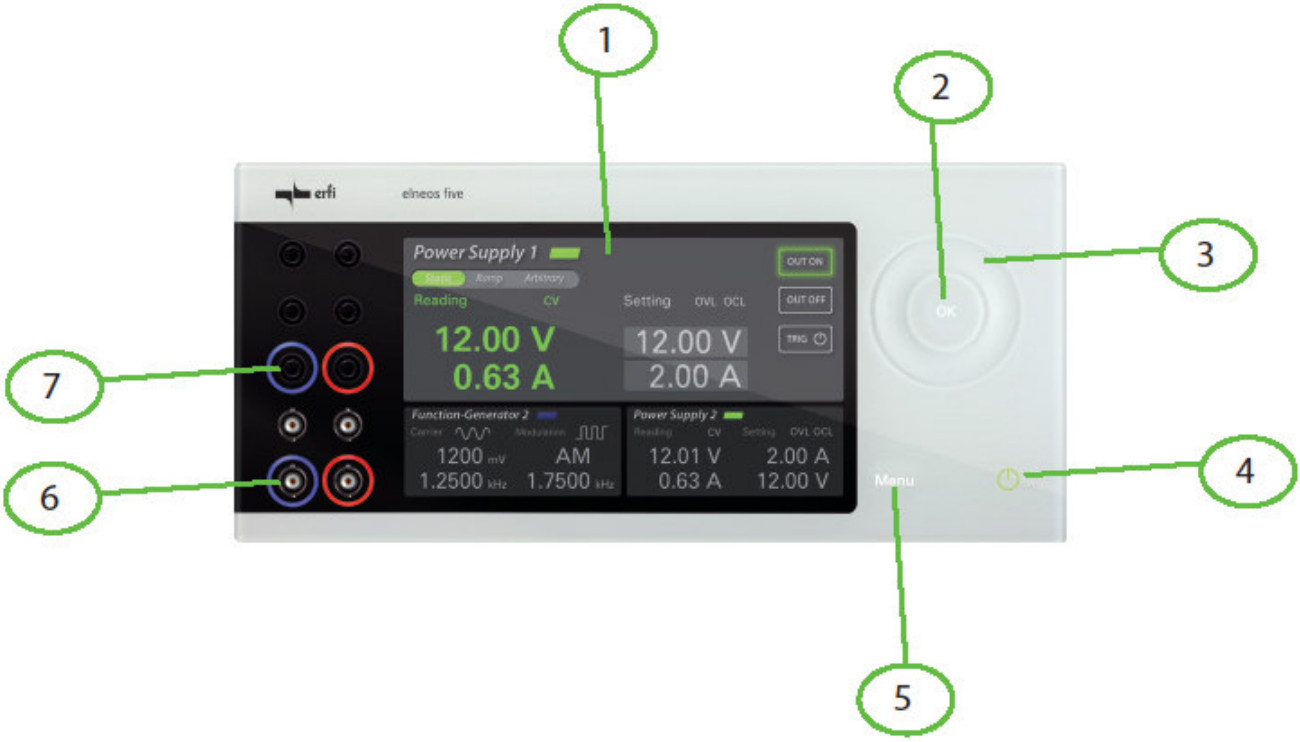
Messrs. erfi do not accept any liability for any kind of transport damage.

Waste disposal:

Electric and electronic appliances may not be removed with the residual waste. The same can be handed over free of charge to the local collection point, e.g. collection station.

4. Description of the front panel

4.1. Front control panel



Legend

1	7“ display	Capacitive touch display for displaying and performing main functions
2	OK	Capacitive push-button for acknowledging the input request
3	3D wheel	Capacitive 3D wheel for fine adjustment of output values
4	On/Off	Capacitive On/Off push-button for switching on/off the control centre
5	Menu	Capacitive push-button for calling up submenus and device groups
6	BNC sockets	Outputs for function generators
7	Si sockets	Outputs for multimeters and power control units

4.2. Design display menu

1 Subdivision of the display:
The screen is subdivided in 3 areas, a brighter primary area and two darker secondary areas.
The primary area allows the active access to the device.
For changing over to the primary area, see page 8.

2 Device designation:
The device designation of the three actually displayed devices is in the top left-hand corner.

3 Measured values:
Each device display has a defined area for displaying the measured values.

4 Selection areas:
Up to 8 push-buttons serve for the device-specific selection of possible adjustments.

5 Colour indication:
Each device group is indexed by a colour bar next to the device designation. Power control units, digital multimeters, power and energy sensors, function and arbitrary generators are thus different in colour.

5. General Operation

5.1. Change primary area

In order to get active access to a device, the same must be in the primary area. To shift devices from the secondary area in the primary area, there are 2 options.

1. Tap onto the capacitive area „menu“ for displaying the available device groups.
   On the display a strip with symbols of the available devices appears.
   Tap on the requested device and it will be displayed in the primary area.
   The device which was before in the primary area will then automatically be shifted into the secondary area.

2. By a wiping gesture the devices which are visible in the secondary area, can be shifted to the primary area.

   Please proceed as follows:
   Place the index finger on the requested device in the secondary area.
   (The finger should be positioned rather in the middle within the frame of the secondary area.)
   Pull the finger vertically upwards into the primary area.
   Now the requested device is in the primary area for active treatment.
   The device which was in the primary area before is now automatically shifted into the secondary area.

5.2. Connecting sockets with RGB ring lighting

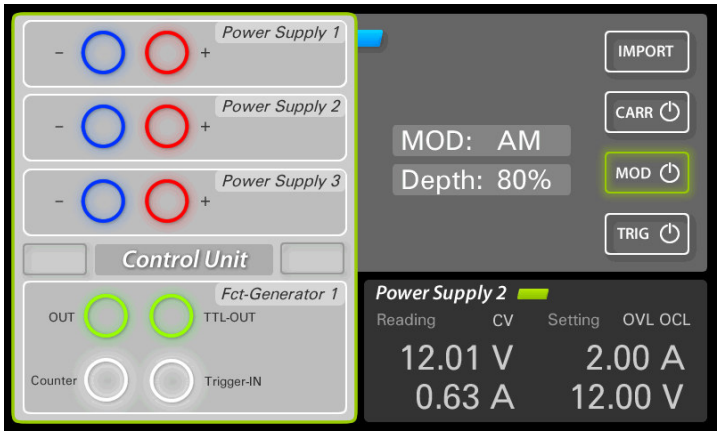
Ring-lighted safety laboratory and BNC sockets for optimal user guidance and very easy contacting. The RGB LED´s light up in different colours depending on their function.

Through the coloured coding of the sockets they are unerringly guided to the connection.
The sockets are permanently illuminated if the output is activated.
When the device pertaining to the socket is not activated, the ring lighting is not visible any more due to a disappearing effect in the surface.

5.3. Assignment of sockets

The elneos control center offers a menu which indicates the assignment of the relevant devices to the respective output sockets. This menu can be shown on the display by making a wiping gesture.

1. Position the index finger on the left-hand edge of the display and pull the finger horizontally towards the middle of the display.
   The menu opens and is shown on the display.



   To let the menu disappear again, it must be deactivated by a wiping gesture.
   Position the index finger on the right-hand edge of the adjacent field of the menu and pull the index finger towards the left-hand edge of the display.

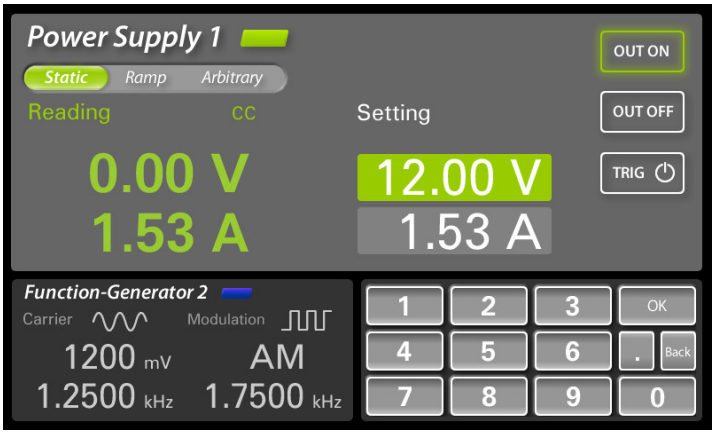
6. Operation power control unit

If a power control unit is in the primary area, the following operations are possible.

6.1. Statical operation

1. In statical operation the power control unit can be used as constant power source or constant tension source.

2. Tap on the parameter to be changed in the primary area underneath the heading „Setting“.



3. A virtual keyboard operating field opens. It is now possible to adjust or to directly type in the desired set-point by means of the 3D wheel.

6.2. Output ON/OFF

As long as the frame of the „OUT ON“ surface is not green, the output is not active.
In this mode the required nominal voltage and the maximum current can at first be adjusted and later on the output can be activated by pressing the surface „OUT ON“.
The advantage is that there is no need any more to disconnect the consumer for de-energising its. As soon as the output is activated, the ring socket lighting is activated as well.

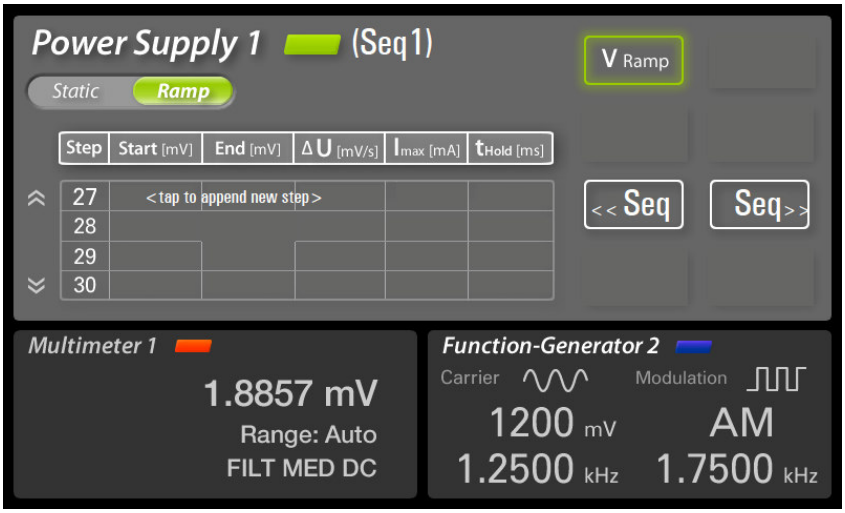
When the output state changes during operation from constant power source to constant tension source or vice versa, this is signalised by flashing of the ring lighting of the respective connection.

When the power control unit is in voltage regulation, „CV“ is displayed. As soon as the control card is in current regulation, the display changes to “CC”.

„CV“ – Constant Voltage
„CC“ – Constant Current

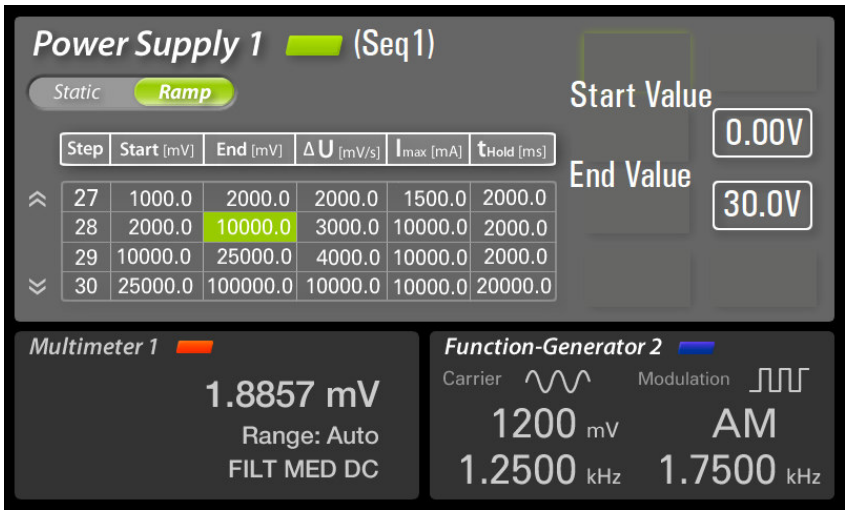
6.3. Ramp operation

In ramp mode the power control unit can pass through the current and tension ramps.
For this, tap on the register ramp in the primary area.



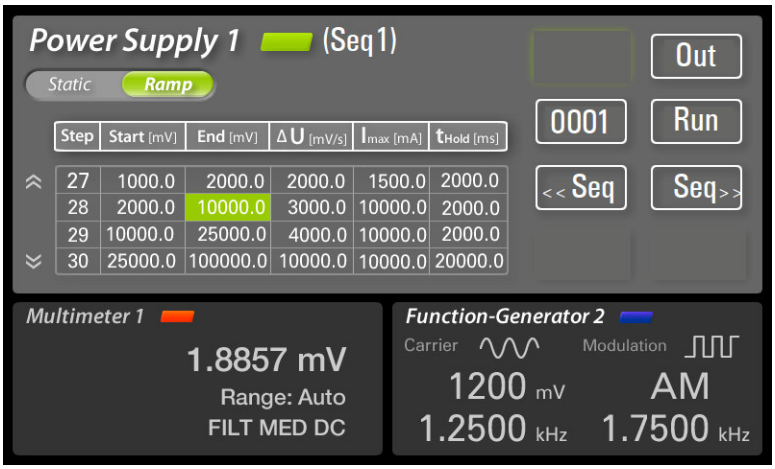
Choose between a tension ramp or a current ramp. The change takes place by tapping with the index finger on VRamp /ARamp.

Tap on a column in order to edit the same.



- Segment Time: Here the ramp response / decay time is entered.
- Segment Limit: Here the maximum current is entered.

- Up to ten sequences can be created.
  They can be used with all power control units.
- At first the sequence must be released globally by tapping on „RUN“ .
- In order to edit the sequence with the requested power control unit, the push-button “Out” must be tapped on.
- The sequence is repeated as often as it has been input.
- A permanent loop is possible by adjusting the counter to „Inf“.



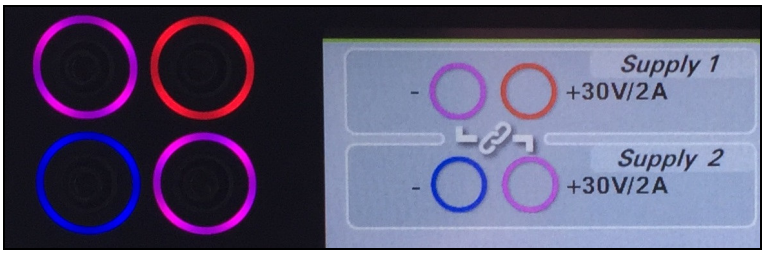
6.4. Power arbitrary generator

elneos five is equipped with a powerful arbitrary generator which combines the advantages of a precision power control unit with the advantages of a function generator. The power arbitrary generator allows to reproduce any shapes of curves and standard signal shapes such as sinus, rectangle, triangle, saw tooth. The arbitrary generator disposes in addition of the same technical data and functions as the control unit. It is a precision control unit with a universal measuring element and an additionally integrated arbitrary generator.

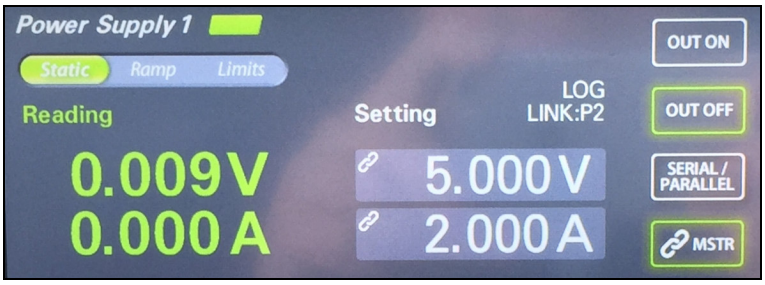
1. Select the power supply Tab Arbitrary
2. Number of the different signal shapes
3. With the field Type the requested signal shape can be selected.
   (Direct voltage / sinus / rectangle / triangle)
4. In this input field the parameters for the requested signal shape are input. Through the virtual keypad 7 the arbitrary parameters are displayed in this column. By selecting the corresponding line, the valued can be input.
5. Input for the duration of each individual step.
6. Input current limiting
7. With this keypad it is possible to change between the DC parameters and the arbitrary parameters.
8. The power arbitrary generator can store up to 10 different sequences. With the help of the arrow push-buttons the sequences can be changed.
9. Keypad for the number of how often the sequence is to be performed.
10. The output is released and „RUN“ appears on the keypad. Then the sequence can be started. When operating the keypad „RUN“ again, the arbitrary parameters are switched off and the DC parameter remains on the place where it stood during the time flow.
    (Example: A ramp of 0 to 10V is performed with a time duration of 2s. After one second the RUN button stops the sequence. Then there is a voltage of 5V at the output).
    Only through keypad 10 (switching symbols) the output is completely switched off.
11. The total sequence can be deleted with the Delete button.

6.5. Comfort-Package for 2 regulating power supplies

Assignment menu:

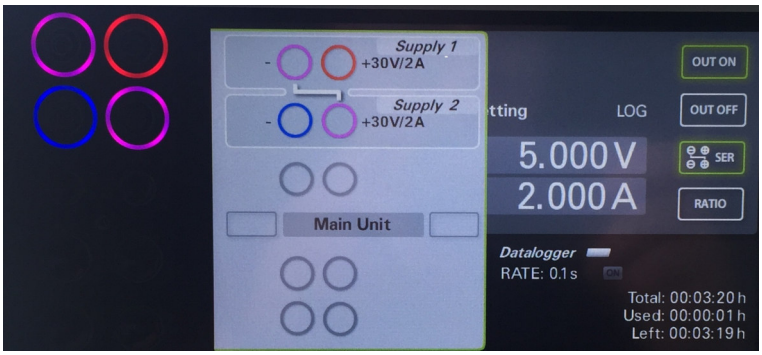


Master-/Slave-Function
Optional coupling of two regulating power supplies. (Current- and voltage-coupling)
The slave regulating power supply is following the master regulating power supply.

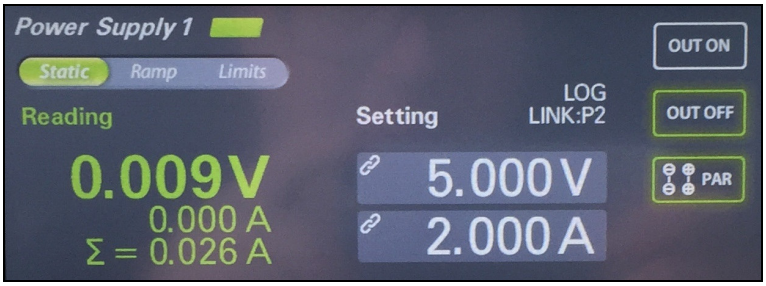


Serial-/Parallel-Function
(Coloured coding of the sockets)
The outputs of the two regulating power supplies are interconnected per relays (serial or parallel).
In this way you can get at the output the double voltage or the double current without an external electrical wiring.

Serial: (Assignment menu)



Parallel:



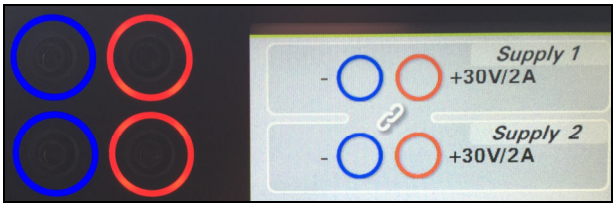
Ratio-Function

The two voltage outputs are linked at the ratio function.
The voltage value of the first power supply depends percentual of the second power supply and vice versa (ratio).

Example:
Power supply 1: + 10 V adjust up to 20 V
Power supply 2: + 1 V follows automatically up to 2V
Ratio: 10/1 = 10

Power supply 1: + 20 V
Power supply 2: + 2 V
Ratio: 20/2 = 10

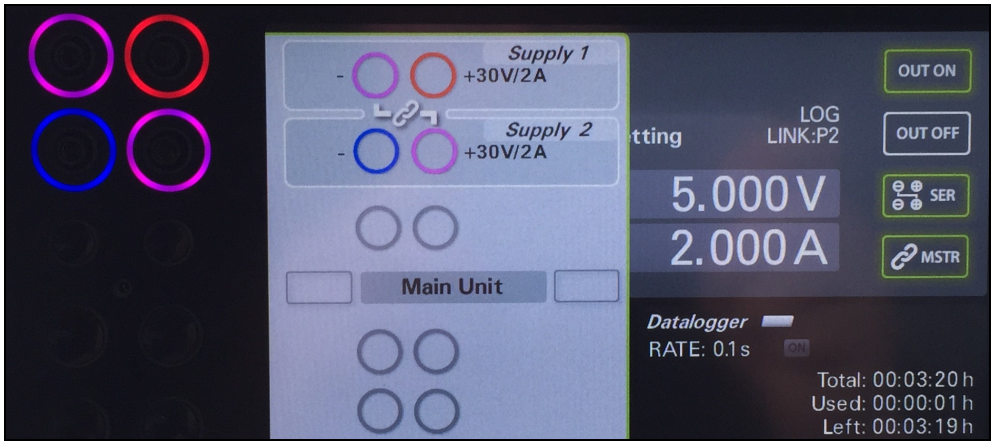
Assignment menu:



Symmetrical /Unsymmetrical Tracking-Function

You can get with the tracking-function a negative and a positive Voltage simultaneously at the outputs. For this function must be activated the “serial” and the “ratio” button.

Example Symmetrical:
Power supply 1: +5 V
Power supply 2: -5 V



The ratio function allows also unsymmetrical settings.

Example Unsymmetrical:
Power supply 1: +10 V
Power supply 2: - 1 V

7. Limits

The limits are treated separately for each device.

With the help of this function there are two ways for signalising whether for example one measured value or one edited voltage is within a defined limit.

Signalling mode:

- Beep — Acoustic signal
- Digital Out — Output 1 to 8 / high or low signal (open drain)

It can be signalised whether a measured value is above [**Above**], below [**Below**] or within [**Inside**] a pre-set limit.

8. Data logger

The data logger is treated like an additional device. With the menu button or by a wiping gesture it can be shown in the primary area of the display.

The data logger allows to record up to four channels which all of them have the same time basis. Thus the recorded data can be well compared with one another and can be evaluated.

From channel 1 (CH1) to channel 4 (CH4) the respective device and the requested measurement can be adjusted.
Example:

CH1	M1[VDC]	|Multimeter 1	-> direct voltage
CH2	P1[A]	|control unit 1	-> output current
CH3	[none]		
CH4	[none]		

Log rate: Input of time at which intervals a measured value is to be recorded.

Length: Points stands for samples, as measuring points. Per adjusted sampling period such a point is recorded. Length stands for buffer length which means the number of samples in the buffer.

Linear: The recording is started once only and ends with the time which is indicated under „Total“ . (Depending on the log rate and length)

Circular: Recording is re-started as soon as the „total“ time has been reached. Infinite loop.

Trigger: The data logger can be started trough a signal at input 1 to 8. It must be selected whether it should start recording with a falling or an ascending flank.

Recording of the measured values is started with the recording symbol at the top edge of the display.

Measured values
In order to look at the graphical presentation of the data, change over to the second page of the data logger by touching keypad „Graph“ .

At the top edge of the display the adjusted channels are listed which have been recorded. The measurement as well as the resolution per division are indicated in brackets.

Below the diagram window a time bar is displayed.

With keypad „Set-up“ you get back again to the adjustments of the data logger.

Data logger Set-up:

Data logger Graph:

Zoom in / Zoom out

With the two-finger gesture the display of the time basis can be changed.
On the one hand the total curve linearity can be displayed and on the other hand the striking parts of the signal sequence can be looked at more precisely.
Furthermore, the graph can be shifted to the left and right-hand side.

- Zoom in: spreading the fingers
- Zoom out: contracting the fingers

The functions are displayed at the top right of the recording window.

9. Digital multimeter

When the digital multimeter is displayed in the primary area, various adjustments can be made.

Enter through the virtual keypad which physical value is to be measured.

- Voltage V_{DC} / V_{AC}
- Current A_{DC} / A_{AC}
- Resistance / continuity tester Ω / Ω
- Diode test / temperature V / °C
- Capacity C
- Frequency / cycle duration f / T

Two measuring functions each are assigned to the virtual keypads. By tapping once more onto the selected keypad, the device changes over to the second measuring function. Zum Example from V_{DC} to V_{AC}.

Should a measuring area be exceeded, the display of the digital multimeter indicates „Overflow“.

When you are in the Auto-Range mode, the digital multimeter changes automatically the measuring area.

The assignment of the sockets can be displayed by making a wiping gesture. (The chapter „Assignment of sockets“ describes how the information window can be displayed).
The RGB ring lighting of the safety laboratory sockets indicates which socket must be used for the selected measuring.

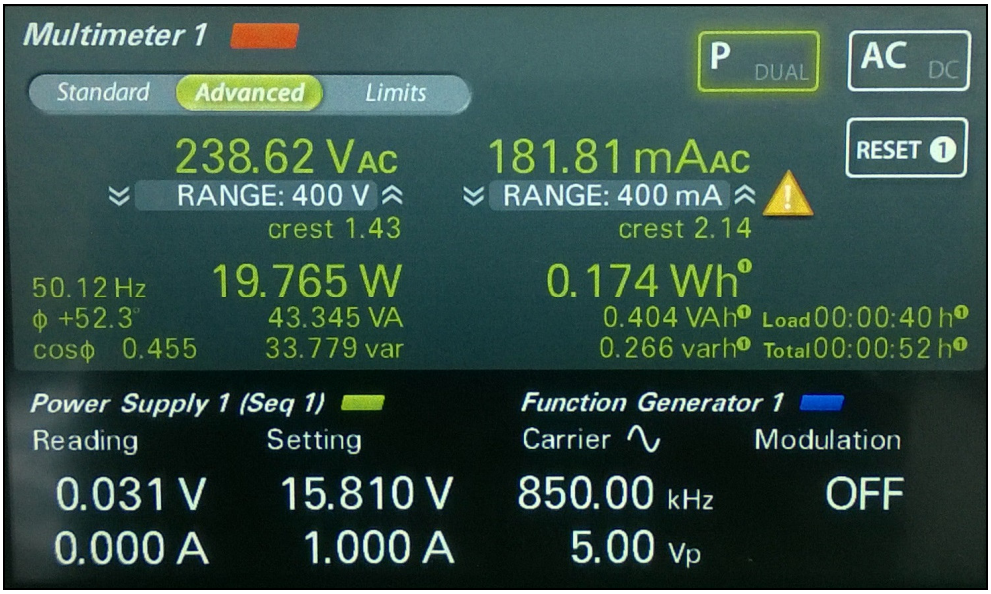
Power sensor

DUAL:

The measured values of current and voltage can simultaneously be recorded and displayed.
A selection between AC and DC can be made.

Power sensor **:** **[P]**

The power can only be measured in AC.
With the RESET button all displayed values which are marked with a small 1 can be set to zero.



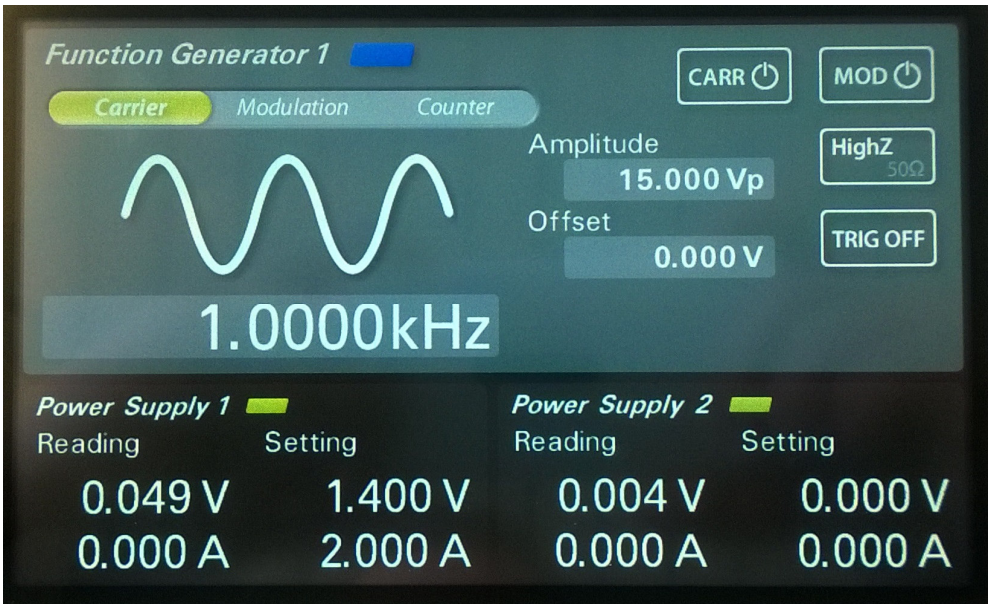
Signal frequency:		**Hz**
Real power:		**W**
Apparent power:		**VA**
Idle power:		**var**
Phase difference angle:	**φ**	
cos φ		**Efficiency factor = real power / apparent power**
Crest factor		**Peak value / effective value**
		e.g.. **Û= 325V / Ueff=230V crest= 1,414**

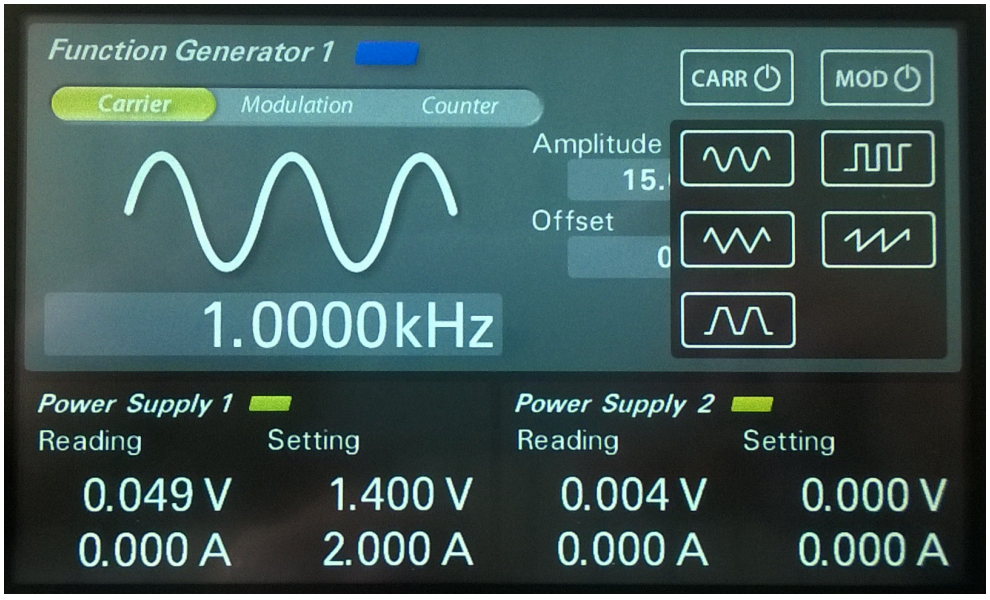
10. Function generator

elneos five offers a particular functionality as regards modulation. The carrier signal and the wanted signals (modulation signal) can be parameterised completely independently and separately of one another due to the two function generators. The modulated signal is obtained at the output.
All parameters of the carrier signals and the wanted signals (modulation signal) such as signal forms (sinus, rectangle, triangle etc.) , amplitude, frequency, pulse-duty factor are stored separately and are recorded modulated at the output.
The depth of the modulation can be adjusted from 0 -50 %.

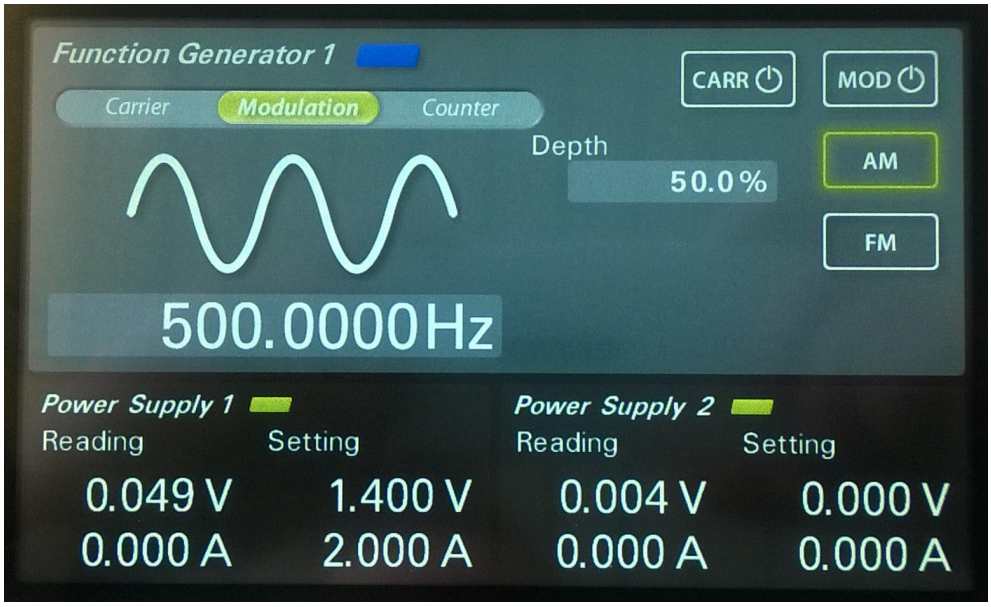
The device consists of two completely integrated function generators.

- **Carrier (carrier signal)**





- **Modulation (wanted signal)**



Adjustment of the signal form:
Tap on the currently displayed signal form.
Six keypads appear on the right-hand edge of the display. Now the desired signal form can be selected.

- Sinus / rectangle / triangle / saw tooth / trapezium

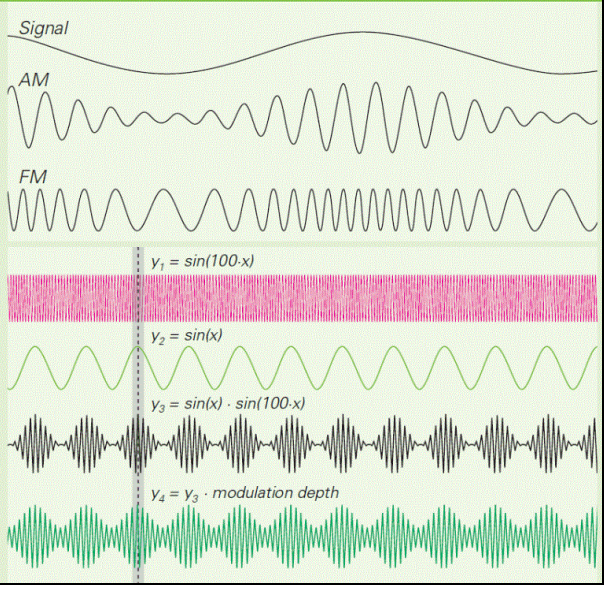
Adjustment of frequency:
Tap on the currently adjusted frequency.
This opens the keypad. Input the desired frequency and acknowledge with OK. In addition, the frequency can be changed by the 3D wheel.

Amplitude and frequency modulation

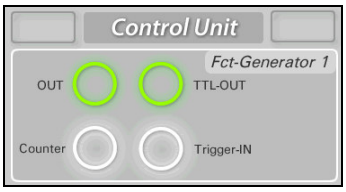
Amplitude modulation (AM)
With the amplitude modulation, the amplitude of a high-frequency carrier is modulated depending on the low-frequency wanted signal which is to be transferred.

Frequency modulation (FM)
With the frequency modulation, the frequency of a high-frequency carrier is modulated depending on the low-frequency wanted signal.

Example of an amplitude modulation with a modulation depth of 50 %
- Carrier signal (high-frequency)
- Wanted signal (modulating)
- Modulated signal with a modulation depth of 100 %
- Modulated signal with a modulation depth of 50 %



Assignment of BNC sockets



OUT: Carrier: Adjustment of frequency, amplitude and Offset
The output impedance can optionally be switched to 50Ω or „HighZ“ (high impedance).

Modulation: Adjustment of frequency, amplitude and modulation depth.
Modulation type – frequency or amplitude modulation
This signal is modulated onto the carrier signal (carrier).

TTL: The TTL output is always connected in parallel with the carrier output.
The TTL signal is edited with the adjusted frequency.

External trigger:
With this function the output of the function generator can be switched on or off from an external device.
When the external trigger is in position „OFF“, this function is deactivated.

External trigger:
„TRIG ⎍“: The output of the frequency generator is active when adjusting at the trigger input

+5V DC (high signal). With 0V (low signal) the output is inactive.

„TRIG ⎏“: The output of the frequency generator is active when adjusting at the trigger input

0V DC (low signal). With +5V (high signal) the output is inactive.

Counter: The counter allows to display the frequency and the cycle duration of various signal forms.

With an amplitude of less than 300mV it must be changed over to DC. Thereby when carrying out the level adjustment 50 % of the measured amplitude must be adjusted. This concerns signals of a low ramp response (e.g. sinus / triangle).

11. Signal arbitrary generator

This device represents the up-to-date technique in the field of arbitrary technology and at the same time incorporates all functions of the function generator and the counter.

Any signal forms are transferable by telecontrol to the internal memory. Signal forms recorded with an oscilloscope can be transferred to the software *highlink elneos* and after transformation from there directly to the arbitrary generator.

The desired signal form with maximum 4000 voltage values / period can be loaded in the device. The frequency can be input either manually on the display or by telecontrol command. Up to 10 signal form can be stored in the buffer of the device.
Signal form 1 is stored non-volatile which means that it remains stored even when switching off the device.

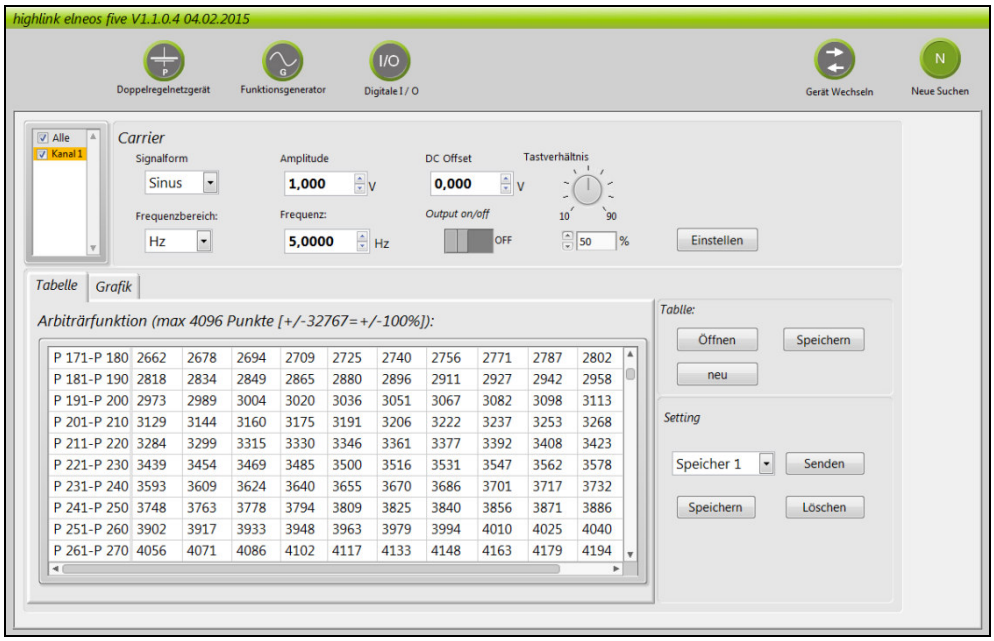
With the help of highlink elneos signal forms can be loaded in the memory of the elneos five device.

- ➔ Start of *highlink elneos*
- ➔ Devices are automatically searched
- ➔ Select device
- ➔ Call function generator
- ➔ Create a new chart / open existing chart
- ➔ Below Tab Graph the input signal form is displayed

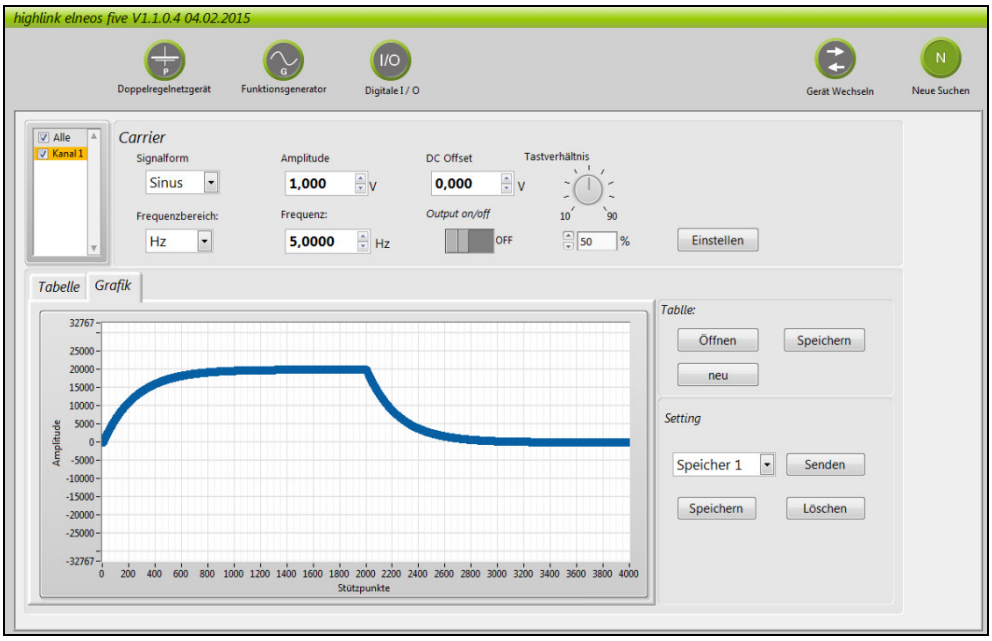
Settings:

- ➔ Select memory (memory 1 … memory 10)
- ➔ Delete memory
- ➔ Send off data
- ➔ Store signal form in the elneos five device

Chart:

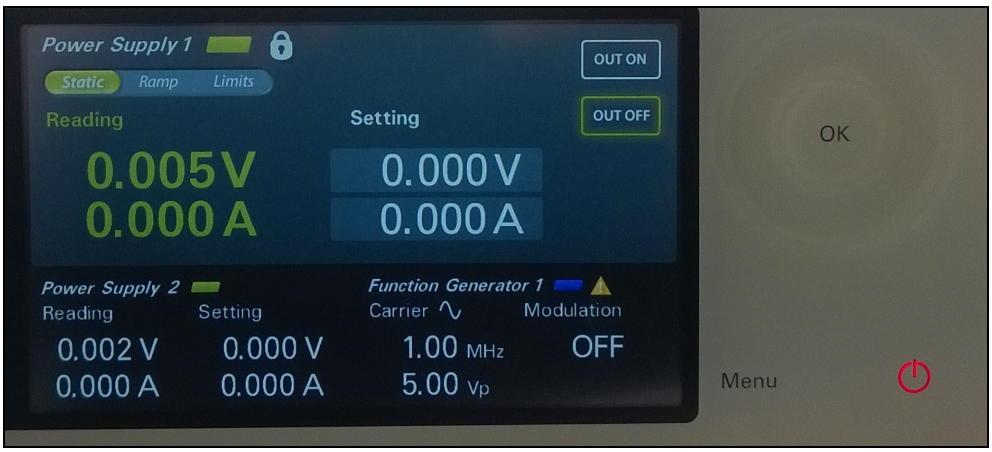

highlink elneos five V1.1.0.4 04.02.2015
Doppelregelnetzgerät
Funktionsgenerator
Digitale I / O
Gerät Wechseln
Neue Suchen
Alle
Kanal 1
Carrier
Signalform
Sinus
Amplitude
1,000
V
DC Offset
0,000
V
Tastverhältnis
Frequenzbereich:
Hz
Frequenz:
5,0000
Hz
Output on/off
OFF
50
%
Einstellen
Tabelle
Grafik
Arbiträrfunktion (max 4096 Punkte [+/-32767=+/-100%]):
P 171-P 180 2662 2678 2694 2709 2725 2740 2756 2771 2787 2802
P 181-P 190 2818 2834 2849 2865 2880 2896 2911 2927 2942 2958
P 191-P 200 2973 2989 3004 3020 3036 3051 3067 3082 3098 3113
P 201-P 210 3129 3144 3160 3175 3191 3206 3222 3237 3253 3268
P 211-P 220 3284 3299 3315 3330 3346 3361 3377 3392 3408 3423
P 221-P 230 3439 3454 3469 3485 3500 3516 3531 3547 3562 3578
P 231-P 240 3593 3609 3624 3640 3655 3670 3686 3701 3717 3732
P 241-P 250 3748 3763 3778 3794 3809 3825 3840 3856 3871 3886
P 251-P 260 3902 3917 3933 3948 3963 3979 3994 4010 4025 4040
P 261-P 270 4056 4071 4086 4102 4117 4133 4148 4163 4179 4194
Tablle:
Öffnen
Speichern
neu
Setting
Speicher 1
Senden
Speichern
Löschen

Graph:


highlink elneos five V1.1.0.4 04.02.2015
Doppelregelnetzgerät
Funktionsgenerator
Digitale I / O
Gerät Wechseln
Neue Suchen
Alle
Kanal 1
Carrier
Signalform
Sinus
Amplitude
1,000
V
DC Offset
0,000
V
Tastverhältnis
Frequenzbereich:
Hz
Frequenz:
5,0000
Hz
Output on/off
OFF
50
%
Einstellen
Tabelle
Grafik
32767
25000
20000
15000
10000
5000
0
-5000
-10000
-15000
-20000
-25000
-32767
Amplitude
0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 3600 3800 4000
Stützpunkte
Tablle:
Öffnen
Speichern
neu
Setting
Speicher 1
Senden
Speichern
Löschen

12. Safeguard function

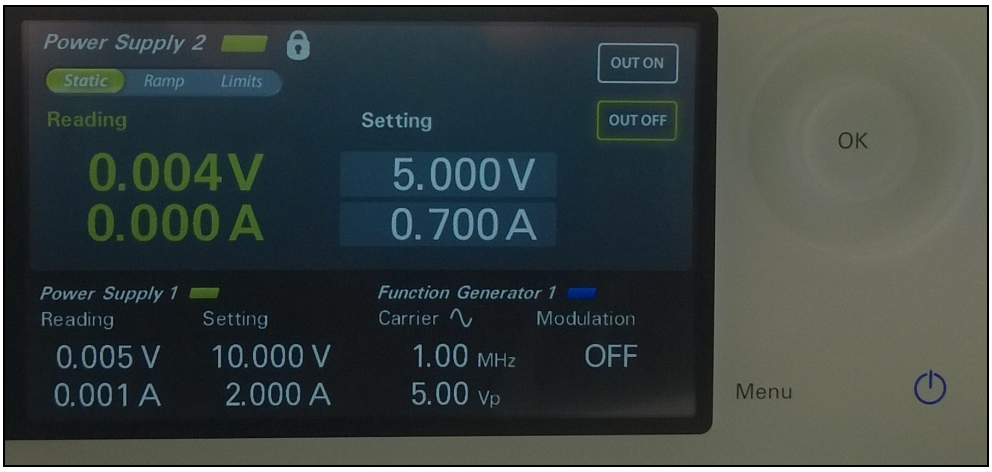
When placing three fingers on the display, the safeguard function is activated.
On the display a lock appears and the ON / OFF button vibrates red.
The elneos five device switches all integrated devices to default state. All output voltages and frequencies are immediately reset.



Deactivation of the locking function:
Pressing the „OK“ button for 5 seconds switches off the locking.

13. Locking function

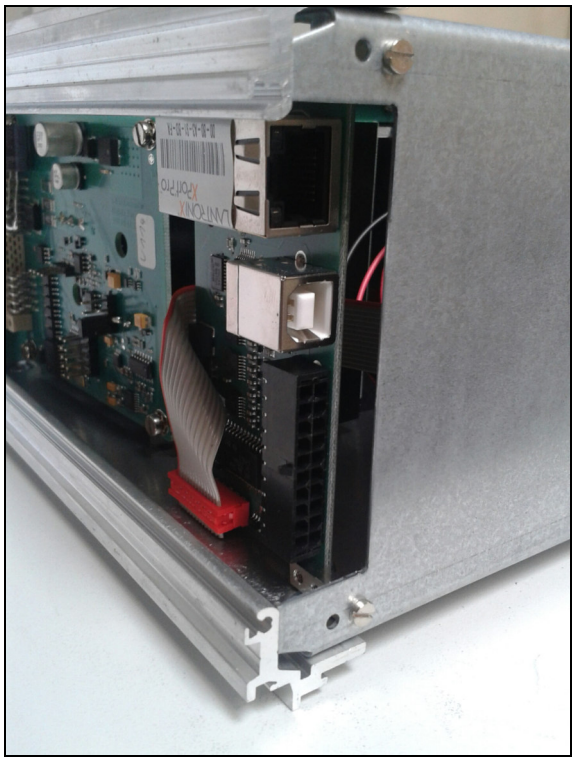
When placing all five fingers onto the display, the locking function is activated.
On the display a lock appears and the ON / OFF button vibrates blue.
Output states and adjustments are conserved.



Deactivation of the locking function:
Pressing the “OK” button for 5 seconds switches off the locking.

14. Telecontrol

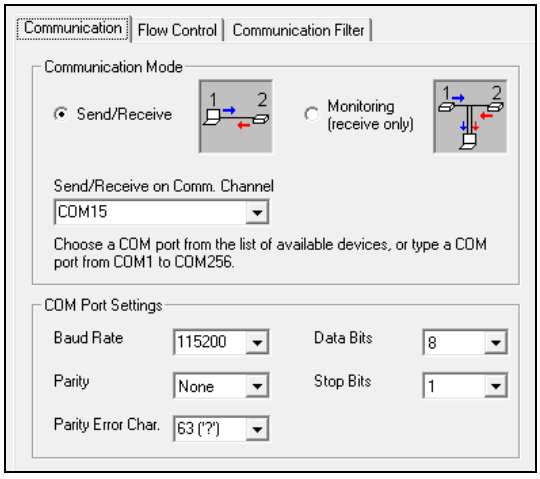
In supplied condition the control center of elneos five is equipped with an Ethernet and an USB interface.

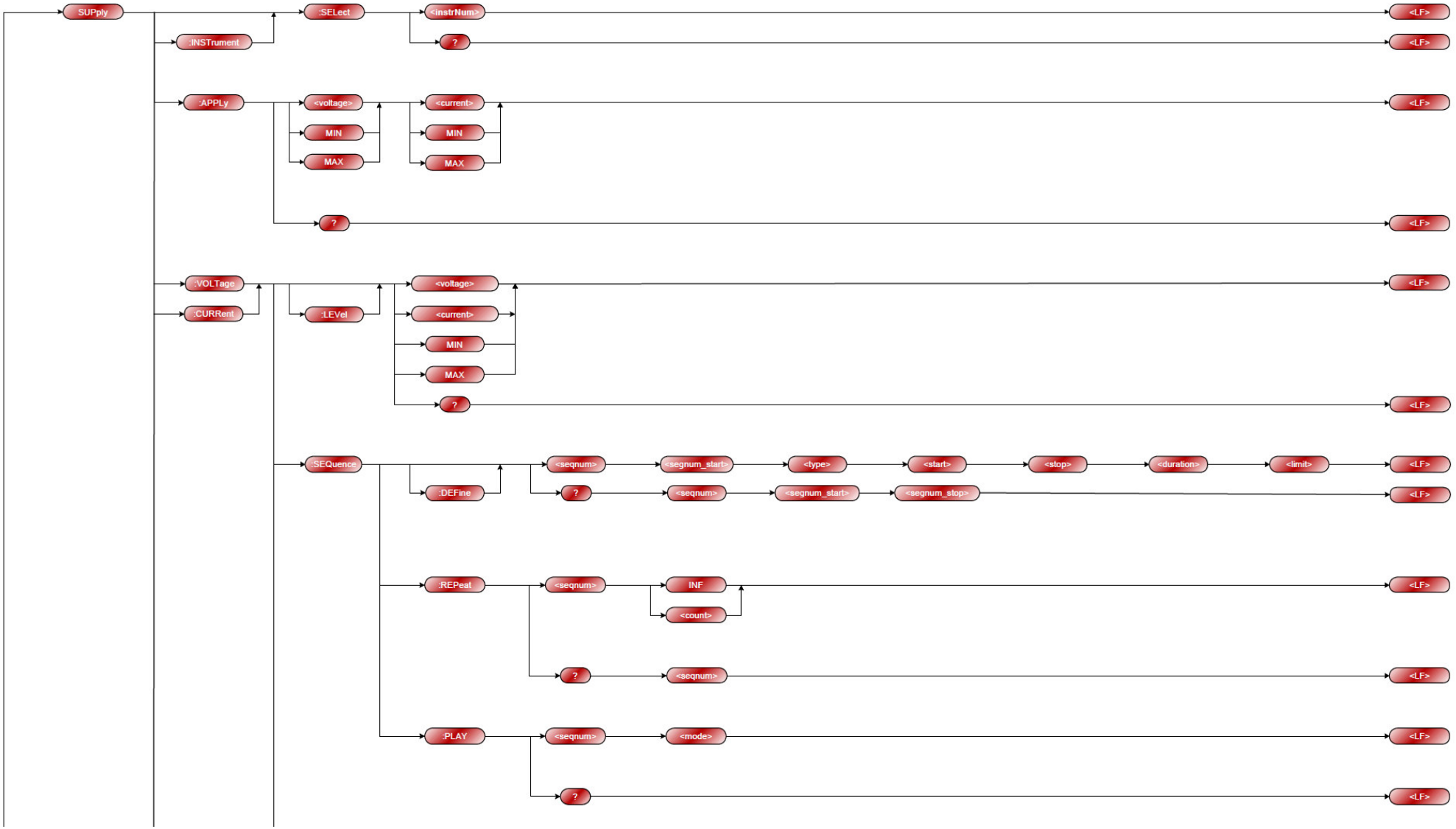


The USB inteface is activated by the manufacturer. Press the “menu” button for 10 seconds in order to select another interface.

15. Telecontrol commands

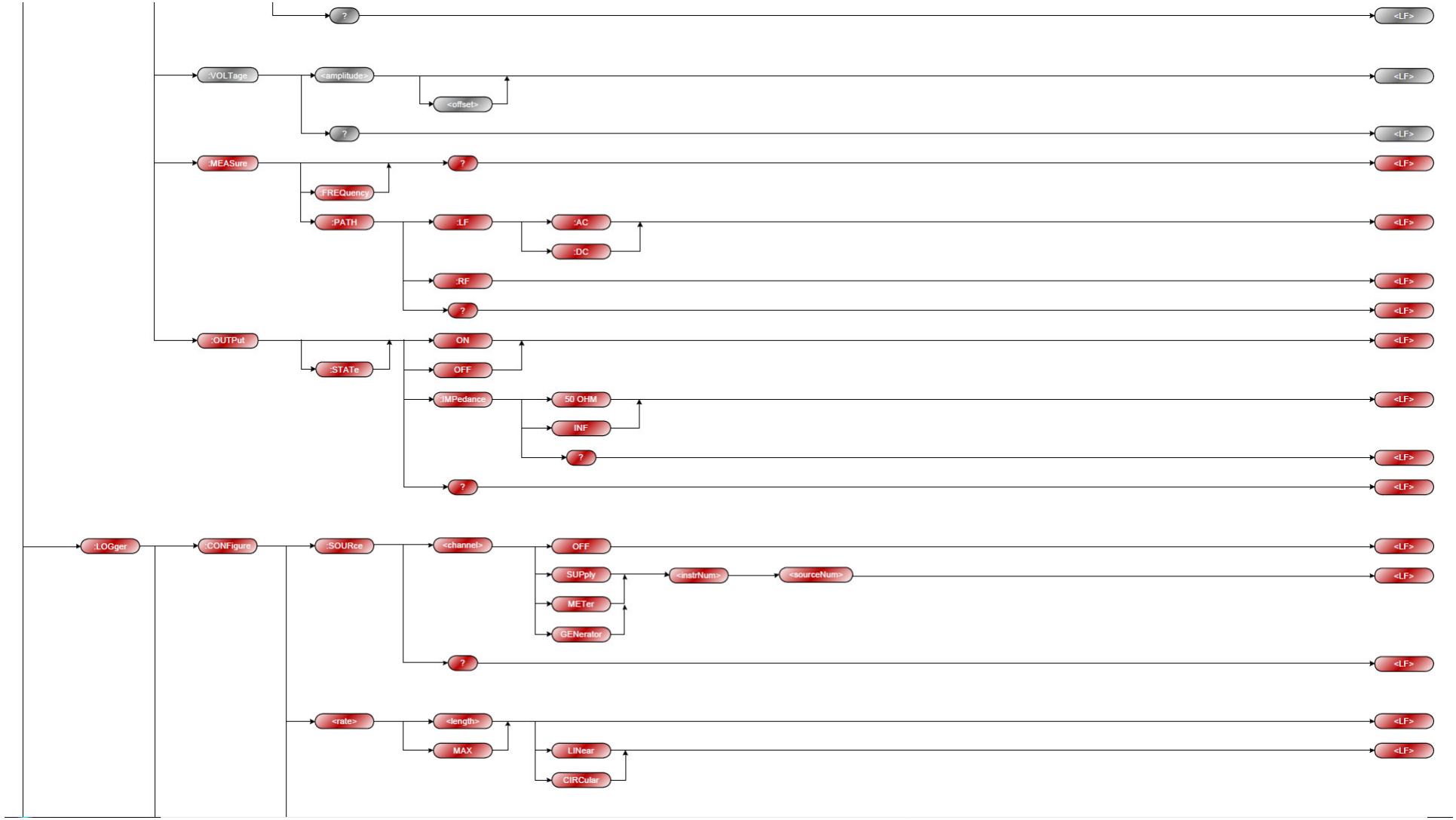
Adjustments of the interface USB port:

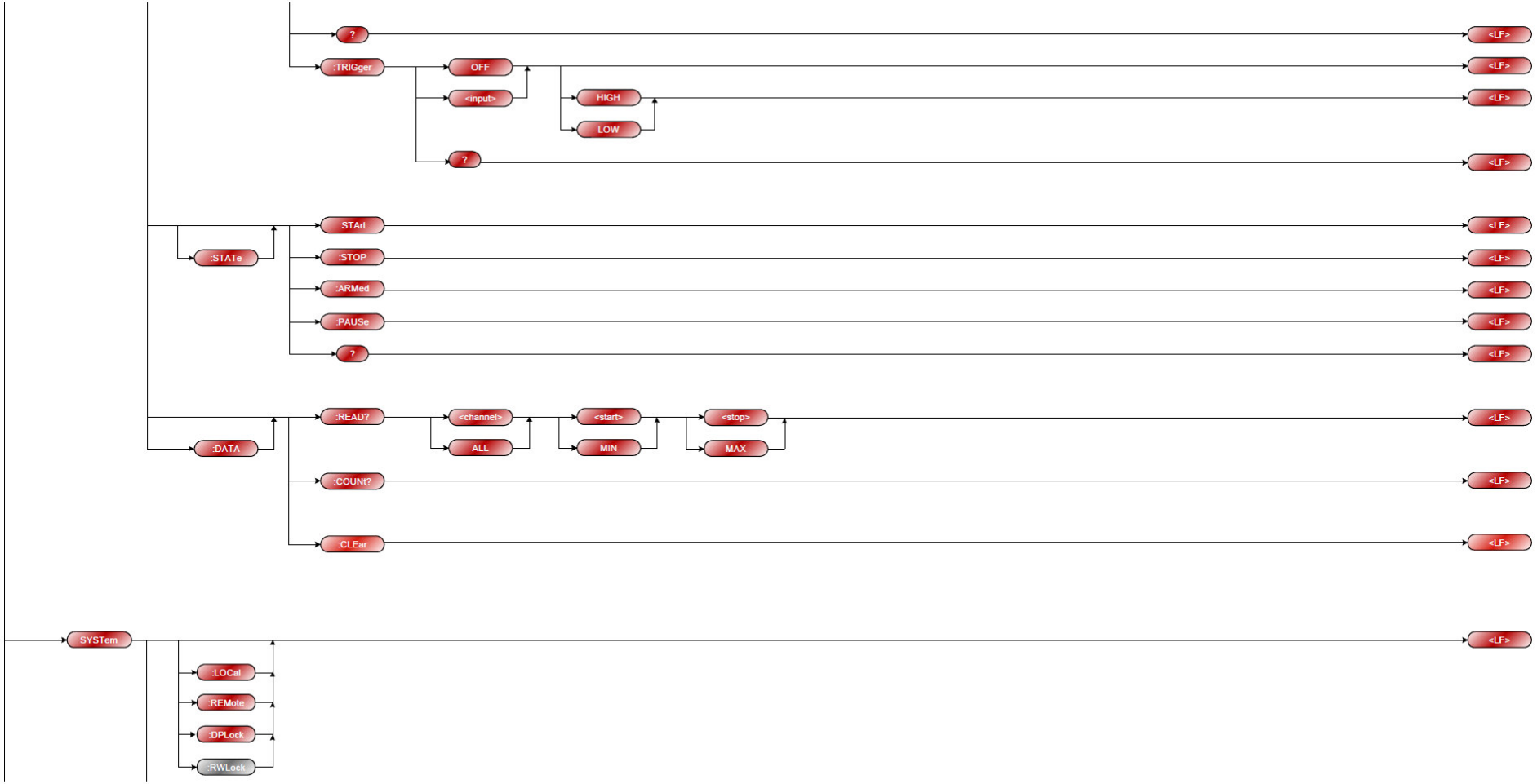



SUPply
:SELect
<instrNum>
?
<LF>
:INSTrument
:APPLy
<voltage>
MIN
MAX
<current>
:VOLTage
:CURRent
:LEVel
:SEQuence
:DEFine
<seqnum>
<segnum_start>
<type>
<start>
<stop>
<duration>
<limit>
<segnum_stop>
:REPeat
INF
<count>
:PLAY
<mode>


:PROTection
:LEVel
<voltage>
<current>
MIN
MAX
?
<LF>
:MEASure
:CURRent
:VOLTage
:OUTPut
:STATe
ON
OFF
METer
:INSTrument
:SELect
<instrNum>
:MEASure?
:CONFigure
:RESistance
:CAPacitance
:INDuctance
:FREQuency
:PERiod
:DC
:AC
<range>
:SLOW
:MEDium
:FAST
:DEFault
:AUTO


:CONTinuity
:DIODe
:TEMPerature
?
<LF>
:GENerator
:INSTrument
:SELect
<instrNum>
?
<LF>
<LF>
:APPLy
:SINusoid
:TRIangle
:SAWtooth
:ISAWtooth
:SQUare
:TRApeze
<frequency>
<amplitude>
<offset>
<symmetry>
<LF>
:PULSe
:PERIOD
:WIDTH
:DCYCLe
:SYMmetry
:COUNT
<period>
<width>
<symmetry>
<count>
INF
<LF>
?
:FUNCTion
:SINusoid
:TRIangle
:SAWtooth
:ISAWtooth
:SQUare
:TRApeze
:SYMmetry
:DCYCle
<symmetry>
?
<LF>


?
<LF>
:VOLTage
<amplitude>
<offset>
?
<LF>
<LF>
:MEASure
?
<LF>
:FREQuency
:PATH
:LF
:AC
:DC
<LF>
:RF
<LF>
?
<LF>
:OUTPut
ON
<LF>
:STATe
OFF
:IMPedance
50 OHM
INF
?
<LF>
<LF>
?
:LOGger
:CONFigure
:SOURce
<channel>
OFF
<LF>
SUPply
<instrNum>
<sourceNum>
<LF>
METer
GENerator
?
<LF>
<rate>
<length>
<LF>
MAX
LINear
CIRCular
<LF>


?
:TRIGger
OFF
<input>
HIGH
LOW
?
<LF>
:STATe
:STArt
:STOP
:ARMed
:PAUSe
?
:DATA
:READ?
<channel>
ALL
<start>
MIN
<stop>
MAX
:COUNt?
:CLEar
SYSTem
:LOCal
:REMote
:DPLock
:RWLock


:INput?
:OUTput
<output>
<mask>
?
:ERRor
?
:NEXT
:COUNt?
:TOPOlogy?
*SAV
1
2
3
4
5
*RCL
1
2
3
4
5
POWer
ON
OFF
<LF>
<LF>
<LF>
<LF>
<LF>
<LF>
<LF>
<LF>


FACTory
:OPTions
<code>
<options>
?
<code>
:CALibration
<code>
ON
OFF
<LF>
*OPT?
*IDN?
*RST
*TST?
*CLS
*ESE
<enable value>

Version 3.1

16. Web server

Preliminary version: V1.00 Beta
Connect device through RJ45

Browser: Mozilla Firefox

- ➔ Input of IP address of the device
- ➔ Acknowledge access and authorisation messages
- ➔ User: *admin* password: *"defined in the config-screen"*
- ➔ Select *Connect* for connection with elneos five

17. General regarding SCPI syntax

SCPI commands consist of
1. a part of the command which may have several levels which are separated by colons
2. (optional) parameters which are separated by commas.
One or several interlinked commands are completed by a line feed
3. (optional) or a sequence of individual commands which are separated by a semicolon ";". .

The part of the command can be input in long form and in a short form.
In the SCPI own presentation the short form is marked with capital letters, the long form with small letters.
However, this is only a kind of presentation.
The command name as such is not case sensitive.

It is possible to write:
VOLT or VOLTAGE or volt or vOLTaGe
Invalid would be for example VOLTA or vol.
A multi-level command could for example be
SUP:INST:SEL 3
or SUPPLY:SELECT 3
Long and short forms can be mingled at will, also within a command.

There are command which contain optional parameters.
Some of these optional parameters are non-effective and still admissible for historical reasons.
Thus, the following two commands are equivalent:
SUP:VOLTAGE:LEVEL 6
SUP:VOLTAGE 6

A command can send or read data.
When the command reads data, there is a question mark (without space) straight behind the command
Valid would be: SUP:VOLTAGE?
Invalid would be: SUP:VOLTAGE ?

The parameters of a command can be pure numerical values with a fixed point or floating points (floating point notation) and as an option, can contain one unit.
Equivalent examples: 5, 5.0, 5e0, 500.0E-2, 5V, 5.00 V, 5000.000mV

If the command requires several data, the same are separated by a comma.
This can look like as follows:
SUP:APPLY 6.02 V, 300 mA
or SUP:APPLY 6.02000 V, 0.3 A
The unit can be omitted when no confusion of the parameters can happen.
Gültig (und gleichbedeutend) sind auch
VOLT 6
VOLT 6.00
VOLT 6 V
VOLT 6V
VOLT 6000 mV

Except „numerical“ values some parameters can be provided with „special“ values.
(for instance MIN, MAX, ON, OFF, ...)

The admissible values result from the adjacent detailed presentation of the various commands.

There is no feedback from commands which are not put in the interrogative form (OK or error). Errors must be read out by means of the SYSTEM:ERROR commands.

Definition of curves and ramps

There are 10 sequences with an own curve memory of a 100 segments. Any power supply unit can be “applied” on the sequencer by switching on the output in the selected power supply unit and by giving the play command.
Each sequencer is defined by the first segment as voltage or current sequence whereby all further segments must have the appropriate unit. A reallocation of a sequence is only possible when at first the first segment is deactivated (type = 0) analogical to the procedure at the graphical control panel. After that, the sequencer can be defined again as voltage or current sequencer. If this entails a reallocation, the intermediately stored values are rejected.

The definition and execution of curves and ramps (at SCPI level there is no differentiation between these two) take place in three steps:

1. Determination of the curve form
Each curve consists of a number of segments (max. 100).
Each segment consists of 5 parameters:
1.1 Segment type
1.2 Initial value
1.3 Final value
1.4 Duration
1.5 Limiting value
For the time being, the segment type is "1", namely ramp.
In case of a voltage curve the initial and stop values are voltages while the limiting value is a current.
In case of a current ramp it is the reverse.
A simple voltage ramp of 3 V to 5 V within 2 seconds and back to 0 V within 5 seconds is put down in memory 2 and this with a current limitation of 800 mA and is indicated in SCPI as follows:
VOLT:SEQ:DEF 2, 1, 3 V, 5 V, 2 sec, 800 mA, 5 V, 0 V, 5 sec, 800 mA
The command contains the number of the first segment to which the following definition refers.

Thereby it is possible to divide the definition of a complex ramp into several SCPI commands.

2. Determination of the replicate number
As an option a ramp can be repeated namely once or endlessly.
A six times repetition of the above mentioned ramp reads as follows:
SUP:VOLT:SEQ:REP 2, 6
If an infinite repetition is to be defined, this reads as follows:
SUP:VOLT:SEQ:REP 2, INF

3. Execution of a curve
Now the curve is defined but it is not yet “replayed”.
For this, there is a PLAY command which gets the number of the sequence and a "Play Mode" transferred.
With
SUP:VOLT:SEQ:PLAY 2, 1
a sequence is started.
The Play Modes
2 - STOP
3 - RESUME
4 - PAUSE
allow to stop a sequence (interrupt), to pause and to restart.

APPLICATION OF THE LOGGER
Since there is only one logger, there is no need for selecting a module number.

Configurations:
LOG:CONF:SOUR 1,SUP,1,1 → Selection of the voltage channel of supply 1 for the first logger channel.
LOG:CONF:SOUR 2,SUP,1,2 → Selection of the current channel of supply 1 for the second logger channel.
LOG:CONF:SOUR 3,MET,1,1 → Selection of the primary measuring path of meter 1 (adjusted measuring mode) for the third logger channel.
LOG:CONF:SOUR 4,OFF → Deactivation of the fourth logger channel.
LOG:CONF:SOUR? → The current configuration is edited.

Result:
1, SUPply, 1, 1, 2, SUPply, 1, 2, 3, METer, 1, 1, 4, OFF → Output of the above mentioned configuration. (Logger channel, type, number, measuring channel).
LOG:CONF 0.3 s,500 → The next smaller or the smallest possible logger rate is selected (0.2 s).
LOG:CONF 0.3 s,500,CIRC → As above. In addition the mode is changed over to "circular"
LOG:CONF:TRIG 2 → The trigger is switched on for the digital input 2. The slope adjustment is not changed.
LOG:CONF:TRIG 2,LOW → As above. The slope adjustment is changed to "low-active".
LOG:CONF:TRIG OFF → The trigger is switched off.
LOG:START → The logger is started. The status must be "paused" or if the logger is stopped, the buffer must be empty.
LOG?

Possible results:
"STOPPED"
"ARMED"
"STARTED"
"PAUSED"

Reading of the buffer:
The emitting buffer is limited to 1024 symbols. Big data volumes must be subdivided, if need be.
LOG:READ? 1,MIN,4 → The values of logger channel 1 are edited if 5 values are available.

Result:
0 S, 0.000 V, 1 S, 0.000 V, 2 S, 0.000 V, 3 S, 0.000 V → Output of the first 5 values with time stamp starting from logger start.
LOG:READ? 1,5,8 → Output of further values.

Result:
4 S, 0.000 V, 5 S, 0.000 V, 6 S, 0.000 V, 7 S, 0.000 V
LOG:READ? 1,MIN,MAX → Output of all values from logger channel 1.

Result:
0 S, 0.000 V, 1 S, 0.000 V, 2 S, 0.000 V, 3 S, 0.000 V, 4 S, 0.000 V, 5 S, 0.000 V, 6 S, 0.000 V, 7 S, 0.000 V
LOG:READ? ALL,MIN,3 → Output of the data points 1-3 of all channels.

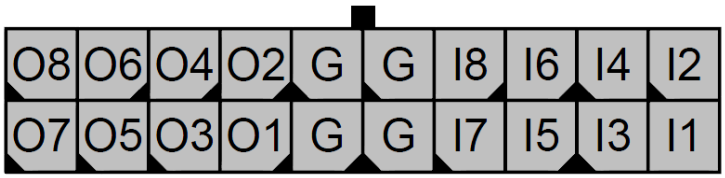
Result:
0 S, 2.000 V, 1.000 A, 0.02 OHM, OFF, 1 S, 2.000 V, 1.000 A, 0.02 OHM, OFF, 2 S, 2.000 V, 1.000 A, 0.02 OHM, OFF
LOG:COUN?→ Output of the number of edited values.

Result:
8
LOG:CLE → Deletion of the logger buffer. An ongoing logger is stopped.

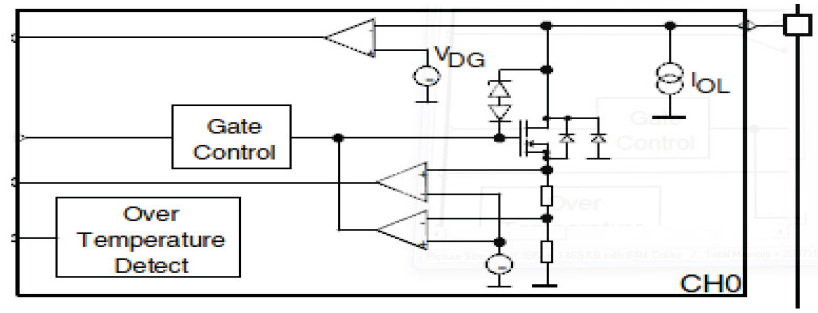
18. Digital inputs and outputs

On the circuit board of the telecontrol there are 8 freely programmable digital inputs and outputs each (low side). They can be set and read through the telecontrol commands.

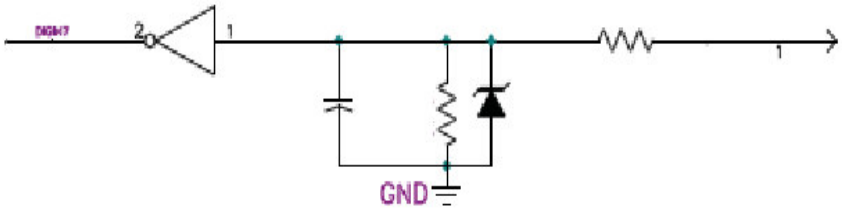
Pin assignment: WR-MPC3 - 20pol (view from the front)



Mating connector: Messrs. Würth Elektronik WR-MPC3 - 20pol



OUT 1-8
Low Side
5…24V
protected
GND-ref



IN 1-8
5…24V
protected
GND-ref

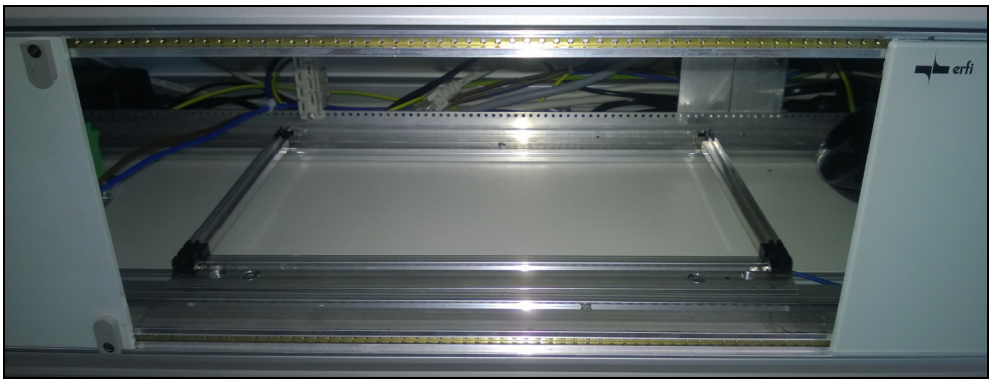
19. Installation / Removal of elneos five device

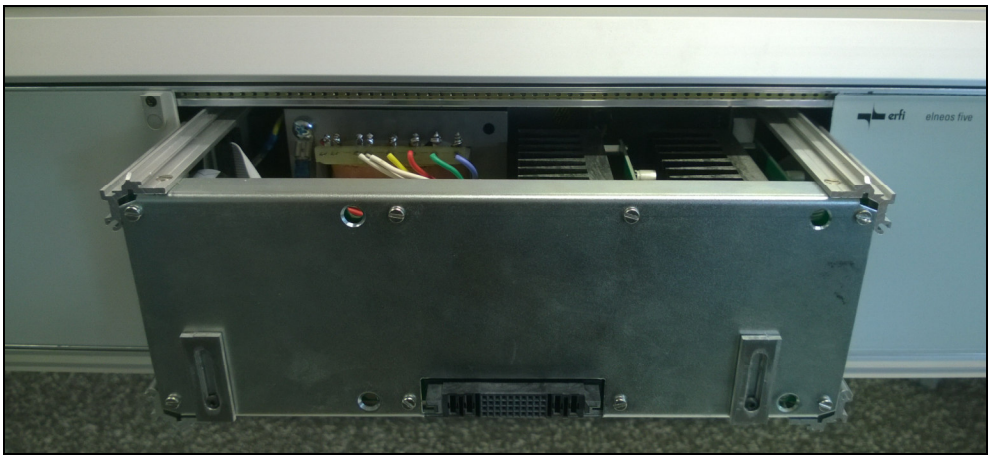
! Prior to the installation or the removal of a device the laboratory table must be de-energised!

19.1. Standard device

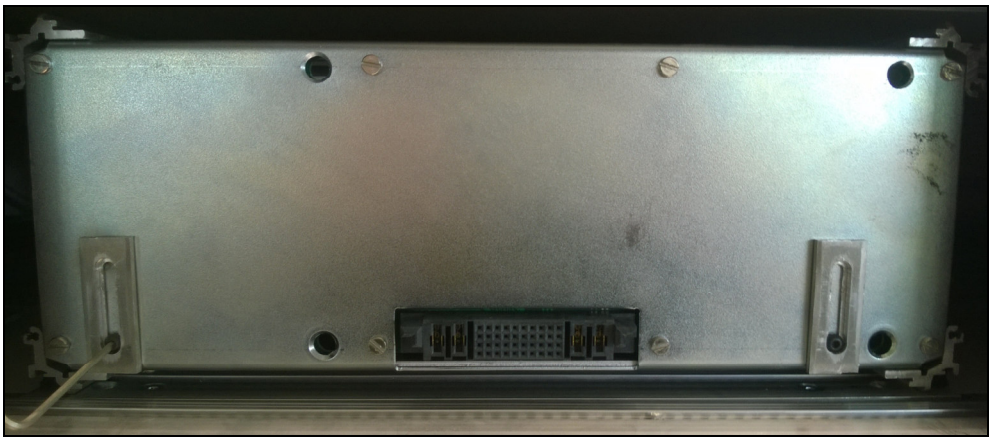
Installation:

1.) Introduce the cassette (without control centre) into the place of the laboratory table which is provided for this purpose. The sliding rails and the connector plugs must be prepared for it.

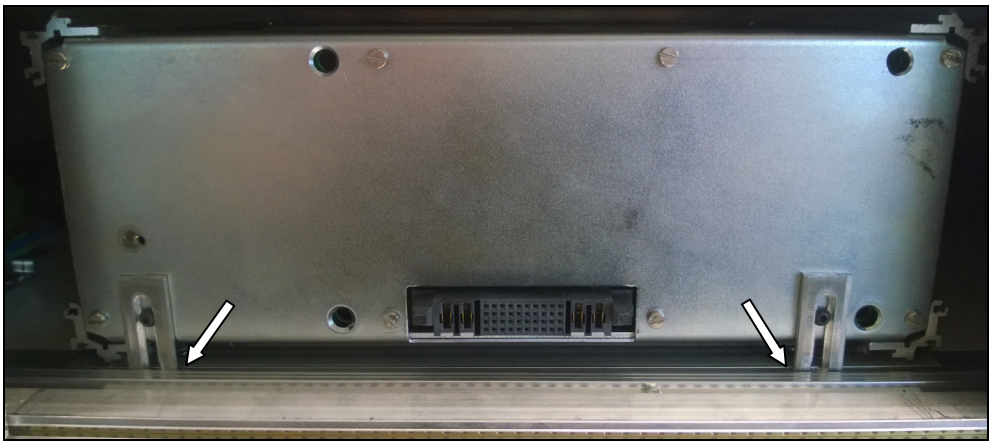




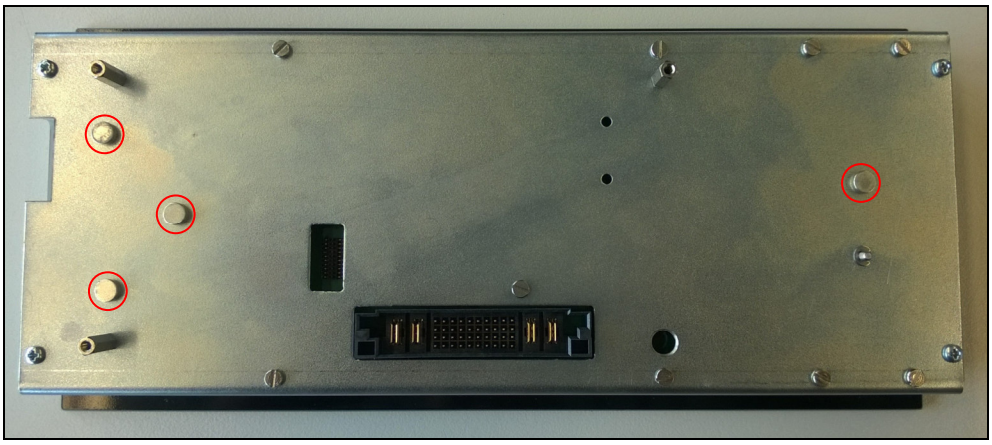
2.) Insert the cassette up to the stop and then release its protection at the left and right-hand side.



3.) Push the cassette protection downwards into the gap provided for this purpose between the two profile rails one behind the other. When the protections are correctly put in place, the screws (socket wrench 2 mm) can be tightened.



4.) Then the control centre can be installed.
Take care that at least two magnets are fixed at the left-hand side of the control centre. At the right-hand side one magnet must be fixed above the fastening screw.



5.) Now position the control centre at the cassette. The control centre must be inserted so far until the glass panel is flush mounted with the adjoining devices / front panel. When it is correctly put in place, the control centre must be secured with the safety screw between the sockets.

Caution:
Tighten the safety screw only slightly!
Use solely appropriate tools from Messrs. erfi.

6.) Once the elneos five device is completely installed, the laboratory table can be switched on again and the device can be taken into operation.

Removal:

! Prior to the installation or the removal of a device the laboratory table must be de-energised!

Put two vacuum cups diagonally onto the glass front panel. Unscrew the safety screws between the pairs of sockets (hexagon socket screw key 2 mm) and with the help of the vacuum cups remove the control centre.

The following steps are carried out in reverse order to the installation.

- Release the cassette protection, push it upwards, fix it
- Remove the cassette

19.2. Device with function generator

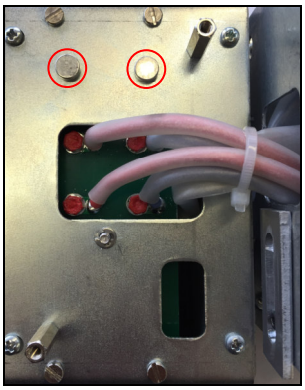
As regards elneos five devices equipped with function generator please bear in mind that the control centre cannot be removed completely. The same fixed permanently with the cassette through the signal lines.
For installation and removal of a elneos five device with function generator, two persons are required.
Avoid in any case that the control centre with the signal lines is pending in the air.

Furthermore care has to be taken that the signal lines must be placed as shown on the picture. The silicon hose in which the signal lines are guided, may not criss-cross or else the control centre cannot be put in place correctly.

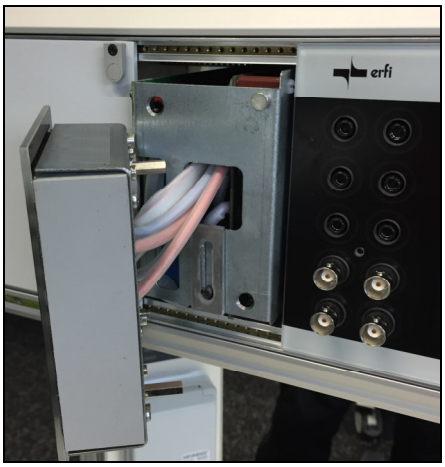
The steps for installation and removal are exactly the same for the standard device.

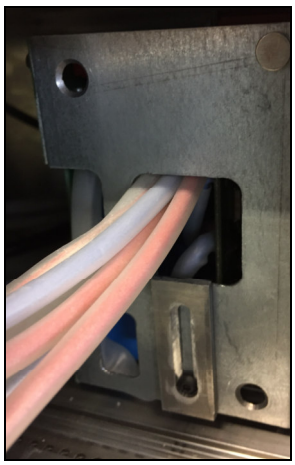
19.3. Additional rack „14TE“

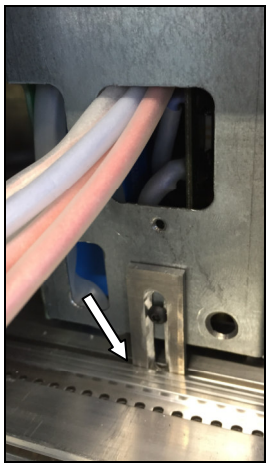
When installing it take care that the two magnets are correctly positioned.
They should be fixed in the top area (see picture).



Insert the additional rack in the table attachment at the place provided for this purpose. The cassette protection must be in top position.







Then unscrew the cassette protection and let it slide downwards in the gap provided for this purpose between the two profile rails placed one behind the other. When the protections are correctly positioned, tighten the screws (hexagon socket screw key 2 mm).

After that the front module can be put in place. The glass front panel must be flush mounted to the adjacent devices.

When the front module is correctly positioned, it must be protected by the safety screws between the sockets to avoid that it might be withdrawn accidentally (hexagon socket screw key 2 mm).

Caution:
Tighten the safety screws only slightly!
Appropriate tools from Messrs. erfi may solely be used.

20. Cleaning of front panel

No special maintenance is required for cleaning.
For cleaning the surface use a soft cloth which is slightly wetted with glass cleaner.
If the glass is to be cleaned with the device being switched on, the locking function should be activated in order to avoid a faulty insertion (see locking function).

21. Technical data

21.1. Elneos control card

Technical controlling data	
Setting resolution	
Setting accuracy	14Bit D/A converter (up to 1mV/1mA)
Measuring accuracy	16Bit D/A converter (up to 1mV/1mA)
Output data	
Voltage :	0 - 100V
Current :	0 - 50A
Control deviation I at regular station point	
Control deviation 1	Voltage 300µV/A, Current: 150µA/V (with load change)
Control deviation II at regular station point	
Control deviation 2	Voltage and current < 0,01% (with network change -6% / +10%)
Indication error / measuring accuracy	
Voltage :	+-(0,05% v.MB +/- 1 Digit)
Current :	+-(0,3% v.MB +/- 1 Digit)
Others	
Temperature coefficiency	Voltage: 0,002%/K, Current: 0,008%/K (40min. warm up time)
Stepwise pre-setting	Software-controlled winding change with a minimum of heat development
Periodic and random deviation	Voltage: 100µVeff. Current: 200µVeff
Transient time	12µs step change in load 0-100% / 500µs step change in load 100 - 0%
Working temperature	0 - 40°C with unobstructed air exchange
Cooling	Natural convection
Zero voltage:	0,3% v.MB

21.2. EL5.D Digital multimeter

Overview technical data Multimeter	
Voltage measurement DC:	up to 1000V; ± 0.08%
Voltage measurement AC:	up to 750V (peak 1060); ± 0.3%
Current measurement DC:	up to 32A continuos current (temporarily up to 40A); 100nA; ± 0.2%
Current measurement AC:	up to 32A continuos current (temporarily up to 40A); 100nA; ± 0.8%
Resistance measurement:	up to 40MΩ; ± 0.8%
Capacity measurement:	up to 400nF/4/40/400/4000µF; ± 1.5%
Temperature measurement:	-200°C up to 600°C; 0,1°C, ± 3% + 2° (Pt-100/100 sensor with 100Ω/1000Ω nominal restitance with 20°C)
Frequency measurement:	up to 100kHz, 1Hz; ± 0.1% + 5dgt;
True-RMS function:	real effective value measurement;
Crest factor:	5 with non-sinusoidal signals; New TRMS converter with improved linearity and band width.
• Diode test:	
• Continuity test:	
Limit values:	Limits of all measured values are programmable.
Digital output:	When exceeding or falling below the measured values, a digital output is triggered.
Digital input:	Start of measurement by trigger pulse of the input (flank control).
Data logger:	Storing of 2000 measured values by time stamp. values graphivally available (X-Y graph/tabular form) or read-out through interface.
Measured value representation:	X-Y graph available and scaleable by 2-finger. ideal for the quick acquisition of changes (long-term measurements).
Measuring range & accuracy	
Voltage measurement DC :	1000 / 400 / 40 / 4 V ± 0,08 % v.MW + 0,01% v.MBE
	400 mV 0,1 % v.MW + 0,01% v.MBE
Voltage measurement AC :	750 / 400 / 40 / 4 V ± 0,3 % v.MW + 0,15% v.MBE
	400 mV 0,3 % v.MW + 0,5% v.MBE
Current measurement DC:	400µ / 4m / 40m / 400m / 4 / 40 A ± 0,15% v.MW + 0,01% v.MBE
Current measurement DC:	4m - 24mA ± 0,07%v.MW + 10dgt.
Current measurement AC:	400µ / 4m / 40m / 400m / 4 / 40 A ± 0,5% v.MW + 0,01% v.MBE
Resistance measurement:	40M / 4M / 400k / 40k / 4k / 400 Ohm ± 0,4 % v.MW + 0,1% v.MBE
Capacity measurement:	400 / 40 / 4 / 0,4µF ± 1,5% v.MW + 0,1%v.MBE, C < 100nF –> 1%v.MBE
Frequency measurement:	1Hz - 100kHz 0,1% v.MW +10dgt
Temperature measurement:	PT100: -200 - 600 °C PT1000: -100 - 600°C
Measuring frequency:	Slow: 1Hz Medium: 5Hz Fast: 10Hz

21.3. EL5.P Power and energy measurement

Technical features	
Real power:	- 24 kW to + 24 kW with 750 V AC
	- 7.5 kW to + 7.5 kW with 230 V AC, (temporarily 9.2 kW)
	precision: ± 0.2 % + 10 dgt
Apparent power:	0 to 24 kVA with 750 kV AC
	-7.5 kVA to + 7.5 kVA with 230 V AC, (temporarily 9.2 VA)
	precision: ± 0.4 % + 10 dgt
Idle power:	- 24 kvar to + 24 kvar with 750 V AC
	-7.5 kvar to + 7.5 kvar with 230 V AC, (temporarily 9.2 kvar)
	precision: ± 0.2 % + 10 dgt
Active energy:	- 24 kWh to + 24 kWh with 750 V AC
	- 7.5 kWh to + 7.5 kWh with 230 V AC, (temporarily 9.2 kWh)
	precision: ± 0.2 % + 10 dgt
Apparent energy:	0 to 24 kVAh with 750 V AC
	0 to 7.5 kVAh with 230 V AC, (temporarily 9.2 VAh)
	precision: ± 0.4 % + 10 dgt
Reactive energy:	- 24 kvarh to + 24 kvarh with 750 V
	- 7.5 kvarh to + 7.5 kvarh with 230 V AC, (temporarily 9.2 kvarh)
	precision: ± 0.2 % + 10 dgt
Power factor:	cos phi from 0 to 1
Max. current (AC/DC):	32 A, temporarily 40 A
Max. voltage (AC):	750 V
Max. voltage (DC):	1000 V

21.4. EL5.F Function generator

Übersicht Technische Daten Funktionsgenerator und Zähler

Frequency sources

2 function generators which are programmable independently of one another;
the technical data apply to each function generator.

Frequency characteristics

Sine wave: 100 mHz bis 40 MHz! Saw tooth: 100 mHz bis 5 MHz
Rectangle: 100 mHz bis 5 MHz Trapeze: 100 mHz bis 5 MHz
Triangle: 100 mHz bis 5 MHz Ramp: 100 mHz bis 5 MHz

Amplitude

Amplitude resolution for all signal shapes: 14 Bit (16.384)
Output amplitude: 30 Vss an 50 Ω von 0 bis 20 MHz, 1,8 mV resolution
Output amplitude: 20 Vss an 50 Ω von 0 bis 40 MHz, 1,8 mV resolution

Pulses

Single pulse: 200 ns bis 999 s / multiple pulse: 200 ns bis 999 s
Burst operation programmable at will through parameters:
Pulse and pause times: 200ns to 999s
Number of repetitions: 1 bis ∞

Trigger pulse

Externally through BNC connector;
Internally through menu for defined signal start;

Outputs

BNC laboratory connectors with innovative ring lighting inclusive disappearing effect;
- Output: up to 30Vss at 50 Ω
- Output: 5 V TTL-compatibel

Inputs

BNC laboratory connectors with innovative ring lighting inclusive disappearing effect;
- Input: Counter input for external unput signals up to 150MHz;
- Input: Trigger input for defined signal start;

Input sensitivity: 100mVeff

Setting range

Frequenzy 100.000 mHz - 40.000 MHz! lowest resolution 1 µHz
Amplitude 0.010 Vp - 15.000 Vp ± 0,5dB +1mV of Setting
Duty cycle rectangle: 0 - 100% in 0,1% steps
Offset: 0.000 up to ±15.000 V

Maximalamplitude	Frequenz	50R	Hi-Z	Frequenz	50R	Hi-Z
	0,00E+000	25	30	2,00E+007	15	15
	3,00E+006	25	30	3,00E+007	6	6
	6,00E+006	25	25	4,00E+007	3	3
	1,50E+007	20	20			

Counter

Inputvoltage: 100mV - 5Veff
Frequenzy up tp 150MHz, optional up to 1,5GHZ

Klirrafktor

Sinus: 0 bis 1MHz <1%
Sinus: 1 bis 20 MHz < 5%
Sinus: 20 bis 40 MHz < 6%

21.5. Signal arbitrary generator

Technical data fast signal arbitrary generator incl. 2 function generators and counter
2 Function generators
All technical parameters as per the previous function generator inclusive counter;
Frequency sources
2 Function generators which are programmable independently of one another;
Memory depth: 524.288 scanning points (512 kwords) / memory cells: 2 pcs. for 2 curves
Frequency characteristics
Sine wave: 1 µHz to 40 MHz, all other shapes: 1 µHz to 5 MHz (arbitrary signals)
Rectangle: 1 µHz to 5 MHz, saw tooth: 1 µHz to 5 MHz, triangle: 1 µHz to 5 MHz,
Trapeze: 1 µHz to 5 MHz, ramp: 1 µHz to 5 MHz;
Amplitude
Amplitude resolution for all signal shapes: 14 Bit (16.384)
Output amplitude: 30 Vss with 50 Ω from 0 to 20 MHz, 1.8 mV resolution
Output amplitude: 20 Vss with 50 Ω from 0 to 40 MHz, 1.8 mV resolution
Pulses
Single pulse: 200 ns to 999 s / multiple pulse: 200 ns to 999 s
Burst operation programmable at will by parameters:
Pulse and pause times: 200 ns to 999 s
Number of repetitions: 1 to ∞
Trigger pulse
Externally by BNC connectors / Internally by menu for defined signal start;
Outputs
BNC laboratory connectors with innovative ring lighting inclusive disappearing effect;
Output: up to 30 Vss with 50 Ω
Output: 5 V TTL compatible
Inputs
BNC laboratory connectors with innovative ring lighting inclusive disappearing effect;
Input: Counter input for external input signals up to 150 MHz;
Input: Trigger input for defined signal start;
Input sensitivity: 100 mVeff
Duty factor: 0.1 to 99.9 %
Frequency counter
Measuring range: 1 µHz to 150 MHz
Input voltage: 100 mVeff to 5 Veff

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