EPS/ACS POWER SOURCE

User's Manual

Introduction

Thank you for purchasing one of the high reliable products from EPS Stromversorgung GmbH. The EPS/ACS POWER SOURCE is a programmable AC and DC Source of high efficiency. The µP controlled sine wave oscillator generates accurate and stable voltages and frequencies. The design of the linear power booster guarantees a safe feeding of any load. This Manual contains the description of the programmable EPS/ACS POWER SOURCE with all technical data and important notes for the correct usage. Software status 3.20 (July 2017).

Features

- Easy operating via front panel
- Remote control by RS232, USB, LAN or GPIB (as option)
- AC, DC and mixed operation
- energy recovery capable, standard 20% of nominal power
- constant voltage and constant current mode
- V, I, IP, P, VA, PF, CF measurement
- programmable limits for V,C, P
- 20 storable device states
- 20 storable sequences (option)
- 3 phase operation (Option)
- 1 and 3 phase WAVE function (option)
- OPP; OVP; OCP and OTP
- temperature controlled cooling

Safety instructions

Only qualified staff is allowed to debug and to operate this equipment or to work close to this. This device can only implement its functions reliably, when it is transported and installed in a proper way and be operated and maintained according to the recommendations.
The qualified personnel are specified as those personnel who carry out commissioning, grounding and apply volume identification to the circuits, equipment and systems according to the available safety practices and standards. Please ensure the environment i.e. temperature, humidity, etc.

Before powering up the device make sure, that the selected voltage is the same as environment power voltage!
Connect the power cable with a 3 pole grounded plug to main power! To avoid damages please replace fuse only by the same type.

Do not remove any covers or parts while equipment is working! There is a high risk of injuries touching life components!
The EPS/ACS POWER SOURCE can supply up to 1000 V at the output connectors.
A low capacitive leakage current occurs depending in the output frequency.

Before switching off the EPS/ACS POWER SOURCE completely cut the load via "OUTPUT/LOAD" pushbutton, or via interface command.
The EPS/ACS POWER SOURCE can be powered off by main switch now!

Operating the Power Source by front plate and by interface simultaneously can cause electrical malfunction.

Front

Labels (top to bottom, left and right):

- Rotary knob
- MEASURE button
- GRAPHIC display
- MEASURE-button
- SD card slots

- MAINSWITCH
- MORE button
- ENTER button
- OUTPUT/ LOAD button
- FUNCTION keys
- MENU button
- ESCAPE button
- DISPLAY button

Display content:

F=50.0Hz
P=995.0VA
SET UAC 100 Volt
UAC   UDC   IRMS

J=230.0V
I=1.002A
FREQ
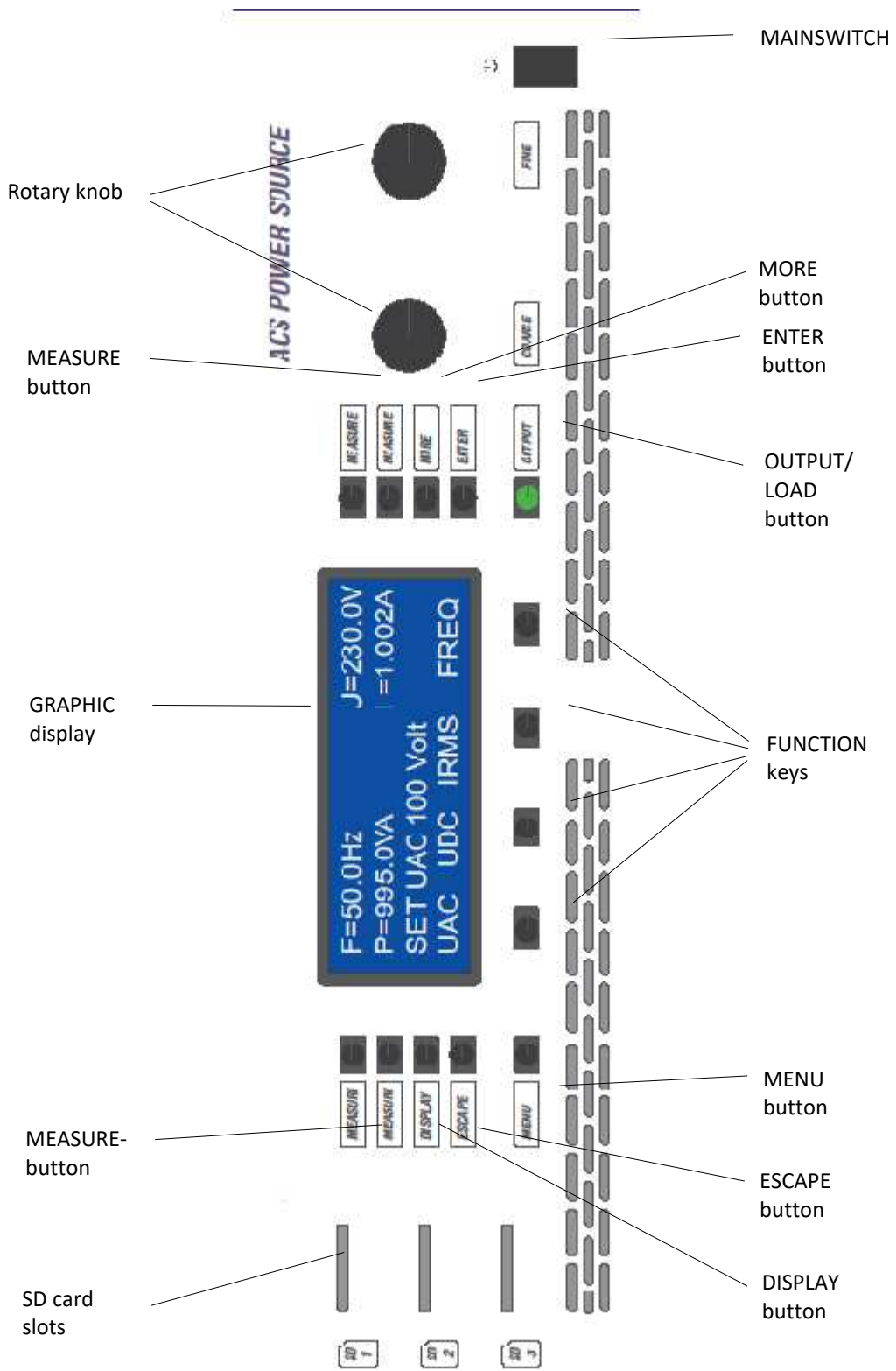
Device description

Frontpanel

The drawing (pg 8) is showing the front panel with its elements.
These elements are: display, keys, rotary knobs, output connectors, main switch. and the SD Slots.

Display

To show the input- and measured values there is a 4*20 chrs Vacuum Fluorescence Display used which is organized in: menu line, status line and measure value table

OUTPUT/LOAD key

Connects / disconnects op power to the load.

Function keys

Action selection via four buttons

MENU key

Change between several main menus.

ESCAPE key

Return to main from submenu

ENTER key

Input confirmation

DISPLAY key

Special functions, presently not assigned

MORE key

Activating auxiliary menus

MEASURE keys

Indicate value selection

Rotary knobs

Input value change by turning

SD card slot

SD card for WAVE data up to 4 GB.
To avoid malfunction or data loss do not remove SD card during operation

Main switch

Device On / Off

Rear panel

Output connector

Power output connection to load. Pin assignment attached

First steps

Graphic display

The display surface is divided into the sections menu line, status line and measured value table
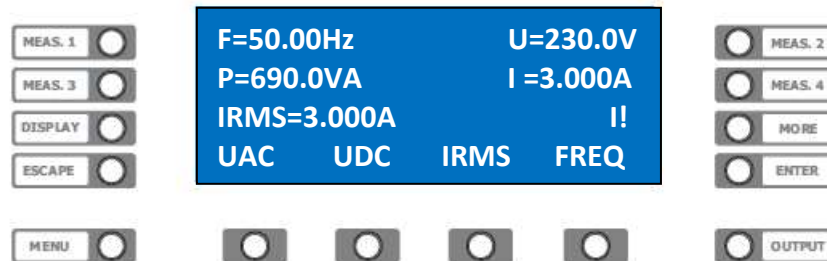
Measure table

Sample data:

MEASURE 1. - Measurement frequency
MEASURE 2. - Measurement voltage
MEASURE 3. - Measurement power
MEASURE 4. - Measurement current

Status line

Drill down of input values, error signals and indicators.
„I!" appears on the right edge of the display when CC mode is active

Menu line

Functional allocation of the buttons below

Manual operation 1 phase system

Input mode
The EPS/ACS POWER SOURCE supports two input alternatives:

Continual
Continual acceptance of rotary knob input (direct effect to op)

Single
Acceptance of rotary knob input not before confirmed by >**ENTER**< button

Change of Mode
Shift to the Main menu by pressing **>MENU<** key. Press the key **>MORE<** then the function button below the displayed characters **>UAC<.** The display changes, the input value appears in the status line.

MEAS. 1	F=50.00Hz U=000.0V	MEAS. 2
MEAS. 3	P=000.0VA I =0.000A	MEAS. 4
DISPLAY	U=220V	MORE
ESCAPE	Pre1 Mem Cont Lioff	ENTER
MENU	⦿ ⦿ ⦿ ⦿	OUTPUT
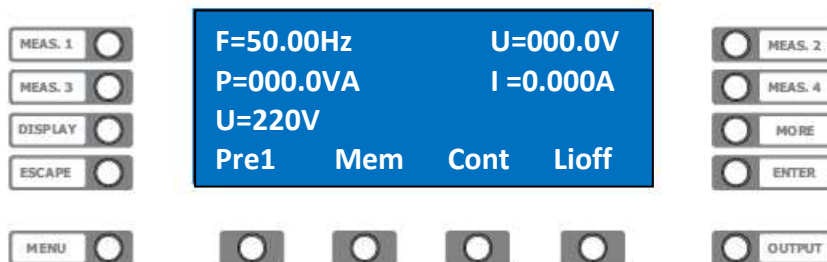
Press the function key below the word **>cont<.** The mode changes from continual to the single mode, the string**>sing<** and vice versa.

Voltage setting
After powering up the display appears as below.

MEAS. 1	F=50.00Hz U=230.0V	MEAS. 2
MEAS. 3	P=690.0VA I =3.000A	MEAS. 4
DISPLAY	UAC=230.0V	MORE
ESCAPE	UAC UDC IRMS FREQ	ENTER
MENU	⦿ ⦿ ⦿ ⦿	OUTPUT
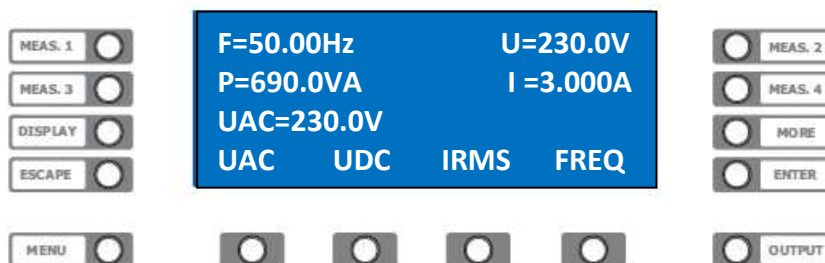
Press function key below **>UAC<.** The status line returns the actual preset value. Adjust required voltage by turning the rotary knobs. After 10 seconds without input the rotary knobs become inactive for safety reasons, these can be reactivated by the function keys.

Frequency setting

After powering up the display appears as below.

MEAS. 1		F=50.00Hz			U=000.0V			MEAS. 2

Display panel:
```
F=50.00Hz              U=000.0V
P=000.0VA              I =0.000A
F=50.0Hz
UAC      UDC      IRMS     FREQ
```

Side keys: MEAS. 1, MEAS. 3, DISPLAY, ESCAPE, MENU (left); MEAS. 2, MEAS. 4, MORE, ENTER, OUTPUT (right)
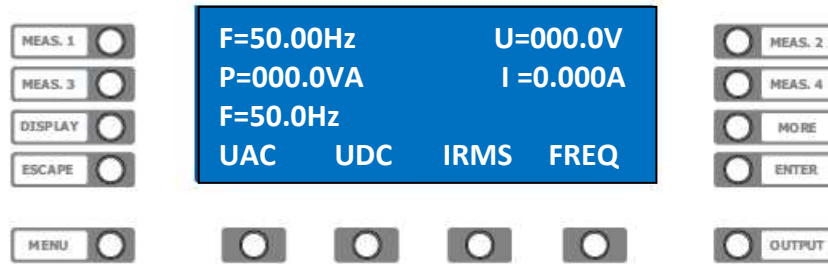
Press function key below **>Freq<.** The status line returns the actual preset value. Adjust required frequency by turning the rotary knobs. After 10 seconds without input the rotary knobs become inactive for safety reasons, these can be reactivated by the function keys

Enable output

By pressing the >**Output**< key the op voltage is connected to the op terminal, the pushbutton >**Output**< is illuminated green. Press >**Output**< key again to disable.

Measure selection

The EPS/ACS POWER SOURCE indicates four measures on the display, these can be selected by pressing the **>MEASURE<** keys.

Measure change

Press the **>MEASURE 2<** key top right beside the display. Measure changes with every pressing the key beside. One value after each other for F, V, C, VA, P, PF, CrF, CP is displayed.

Limit

To protect the probes from e.g. high voltage, the input value can be limited, i.e. the voltage can only be adjusted to a defined value.

Enable limit

Shift to main menu with **>MENU<** key.

Display panel:
```
F=50.00Hz              U=000.0V
P=000.0VA              I =0.000A
U=220V
Pre1      Mem      Cont      Lioff
```

Side keys: MEAS. 1, MEAS. 3, DISPLAY, ESCAPE, MENU (left); MEAS. 2, MEAS. 4, MORE, ENTER, OUTPUT (right)
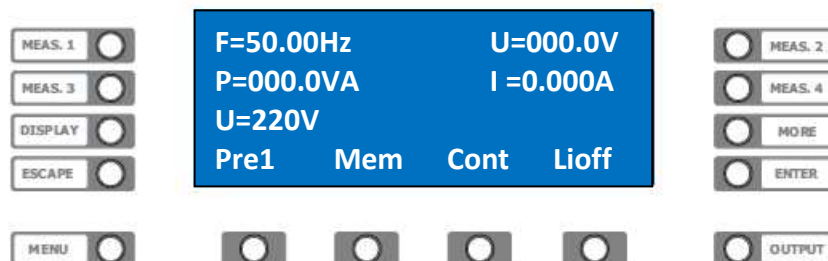
Press **>MORE<** and then the function key below **>UAC<.**
The content of the display changes (see above), the input value appears in the status line. Adjust now the required voltage by turning the rotary knobs.
Press **>function<** key below **>LiOff<**. The current AC voltage value will be accepted as input limit, display changes to **>LiOn<**. Vice versa.

Device states

The EPS/ACS-Power Source can save 20 complete unit states (state 1 to 20) for later use.
The state **No. 0** contains the manufacturer parameters and cannot be changed.
A list of stored parameters is attached as appendix.
To load and save states shift to main menu by pressing **>MENU<** key.


```
MEAS. 1          F=50.00Hz          U=000.0V          MEAS. 2
MEAS. 3          P=000.0VA          I =0.000A         MEAS. 4
DISPLAY          SAV-Nr.01                            MORE
ESCAPE           Pwr      Seq      Stat     Opt       ENTER

MENU                                                  OUTPUT
```
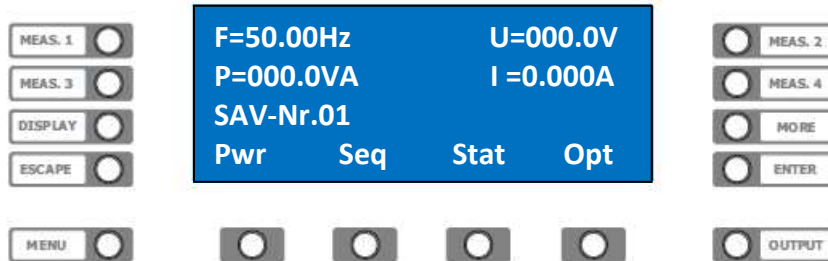
Enter the state menu by pressing the function key below **>Stat<**


```
MEAS. 1          F=50.00Hz          U=000.0V          MEAS. 2
MEAS. 3          P=000.0VA          I =0.000A         MEAS. 4
DISPLAY          SAV-Nr.01                            MORE
ESCAPE           Rcl      Save     P-On               ENTER

MENU                                                  OUTPUT
```
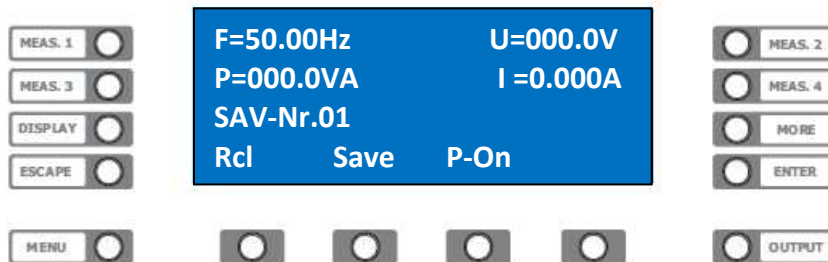
Save state

To save a set of settings in state (n) press the function key below **>Save<***.* The proposed memory location appears in the status line. Select required state number by turning the rotary knobs.
Press **>ENTER<** to save the state.

Load state

To recall the settings from state memory (n) press the function key below **>Rcl<***.* The input value appears in the status line. Select required state number by turning the rotary knobs.
Press **>ENTER<** to load the state
Warning! Loading and executing a saved state may effect high voltages at the output of the EPS/ACS POWER SOURCE!

State Power On

The different states 0 – 20 can be determined as „power on" with preset values.
To load the preset state from the state memory (n) at the next start up, press the function key below
>P-On<*.* The input value appears in the status line. Select required state number by turning the rotary knobs. Press **>ENTER<** to save the state.

Current regulation

Constant current

Shift to main menu with **>MENU<** key.

MEAS. 1				MEAS. 2
MEAS. 3	F=50.00Hz U=000.0V			MEAS. 4
DISPLAY	P=000.0VA I =0.000A			MORE
ESCAPE	I=0.500A			ENTER
	UAC UDC IRMS FREQ			
MENU				OUTPUT
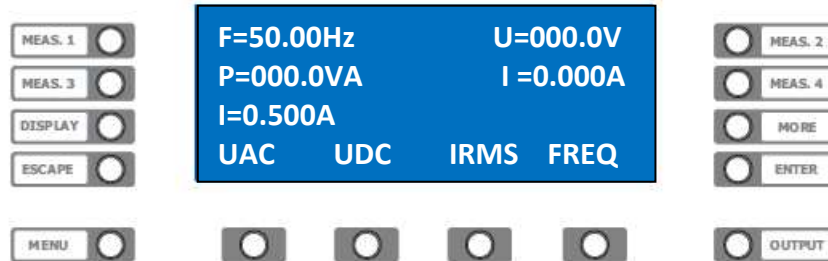
Press function key below **>Irms<.** The input value appears in the status line. Select required current by turning the rotary knobs. The EPS/ACS Power Source announces the activated current regulation by showing „I!" at the right edge of the status line.

Peak current

The EPS/ACS POWER SOURCE allows the measurement of the peak current, the periodic current and the inrush current as well.

Inrush current

Select the required parameters for voltage, current frequency etc.
Set one of the measurement indications to peak current **>IP<**. (Please refer measure selection).
Shift to „extended current menu" by pressing **>MORE<** and **>Irms<** .
Reach the second level of the extended current menu by pressing the **>Menu<** key.

MEAS. 1				MEAS. 2
MEAS. 3	F=50.00Hz U=000.0V			MEAS. 4
DISPLAY	P=000.0VA I =0.000A			MORE
ESCAPE	Max Time Pclr			ENTER
MENU				OUTPUT
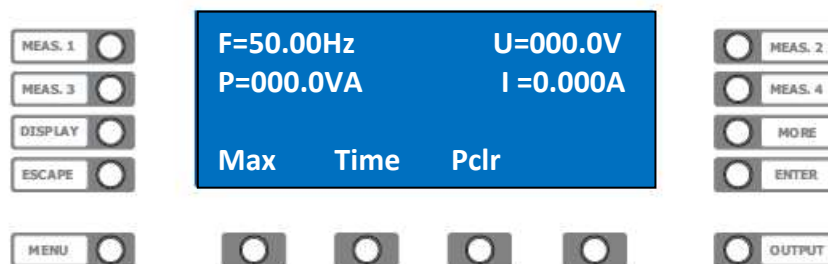
Press the function key below **>PClr<** to clear the peak current memory.
Engage the load with **>LOAD<**; **>Output<**. The inrush current IP=X.XXXA is displayed now.

Periodic peak current

Arrange everything for measurement as described under topic „inrush current"
Clear the peak current memory by pressing **>PClr<** at enabled load. The peak current IP=X.XXXA appears on the display.

Current cut off

The EPS/ACS Power Source can disable the load automatically exceeding the preset current limit, the exceding time can be fixed. Higher currents until tripping are possible, because this function is not designed as a current limitation. Shift with **>MORE<** and **>Irms<** in the extended current menu.
Get the second level pressing **>Menü<**.

MEAS. 1	F=50.00Hz U=000.0V	MEAS. 2
MEAS. 3	P=000.0VA I =0.000A	MEAS. 4
DISPLAY	IMAX=0.200A	MORE
ESCAPE	Max Time Pclr	ENTER
MENU		OUTPUT
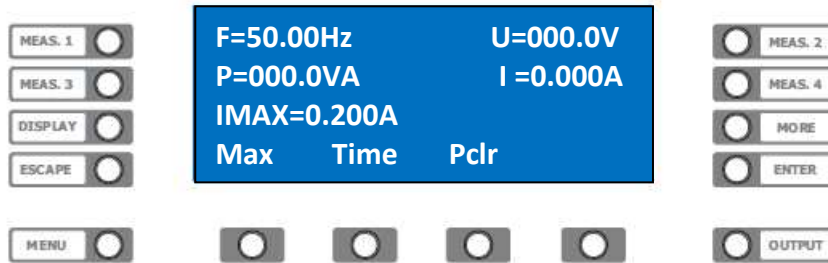
Pres the function key below **>Max<** to set the current limit. Select the required parameter and confirm by pressing **>ENTER<**.
To set the time press the function key below **>Time<,** select the required parameter and confirm by pressing **>ENTER<**.

Power cut off

The EPS/ACS Power Source can disable the load automatically exceeding the preset power limit.
Shift to main menu by pressing **>MENU<**

MEAS. 1	F=50.00Hz U=000.0V	MEAS. 2
MEAS. 3	P=000.0VA I =0.000A	MEAS. 4
DISPLAY	PMAX=400VA	MORE
ESCAPE	Pwr Stat Opt	ENTER
MENU		OUTPUT
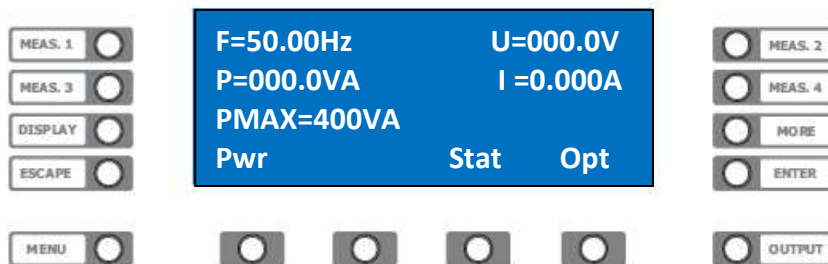
Press the **>function<** key below **>Pwr<** to define the power limit. Select the required parameter and confirm by pressing **>ENTER<**.

Phase angle

The EPS/ACS Power Source can power on the AC voltage at predefined phase angle. In 3 phase operation the phase angles can be shifted to each other.

Power on phase angle

Select the needed parameter for voltage, current, frequency, etc.
Shift with **>Menü<** key to the main menu phase.

MEAS. 1	F=50.00Hz U=000.0V	MEAS. 2
MEAS. 3	P=000.0VA I =0.000A	MEAS. 4
DISPLAY	PHAS=90.0°	MORE
ESCAPE	Pha1 P.On	ENTER
MENU		OUTPUT
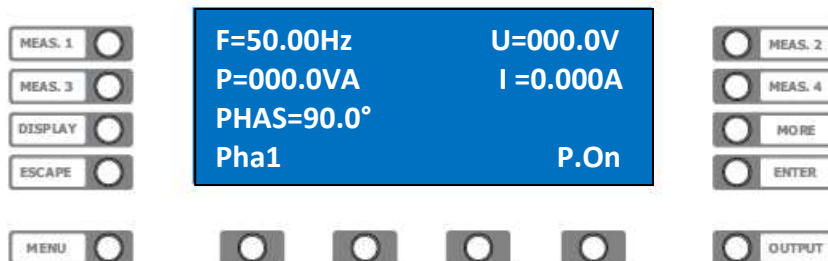
Press the key below **>P.On<** the indication changes to **>P.Off<.**
Press the key below **>Pha1<.** Select the required parameter for the phase angle. Enable the power output with **>LOAD<**; **>Output<** . The op is enabled, the AC voltage is off.
Press the key below **>P.Off<** indication changes to **>P.On<**
the AC voltage is engaged at the defined phase angle.

External signal input

The EPS/ACS POWER SOURCE can be fed with an external signal and works as a real power booster in this mode.

Please pay attention to max. frequency at this input!

Standard   max. 500Hz
Option F1   max. 1KHz
Option F2   max. 2KHz

Enabling of external signal input

Press >MENU< and shift to main menu phase.

```
  MEAS. 1   ○     ┌─────────────────────────────┐     ○   MEAS. 2
                  │  F=50.00Hz        U=000.0V  │
  MEAS. 3   ○     │  P=000.0VA        I =0.000A │     ○   MEAS. 4
                  │                             │
  DISPLAY   ○     │                             │     ○   MORE
                  │  Pwr     Seq     Stat    Opt│
  ESCAPE    ○     └─────────────────────────────┘     ○   ENTER

  MENU    ○       ○     ○     ○     ○                 ○   OUTPUT
```

Press key below **>Opt<** to get the options.

```
  MEAS. 1   ○     ┌─────────────────────────────┐     ○   MEAS. 2
                  │  F=50.00Hz        U=000.0V  │
  MEAS. 3   ○     │  P=000.0VA        I =0.000A │     ○   MEAS. 4
                  │                             │
  DISPLAY   ○     │                             │     ○   MORE
                  │  Exon           Baud        │
  ESCAPE    ○     └─────────────────────────────┘     ○   ENTER

  MENU    ○       ○     ○     ○     ○                 ○   OUTPUT
```
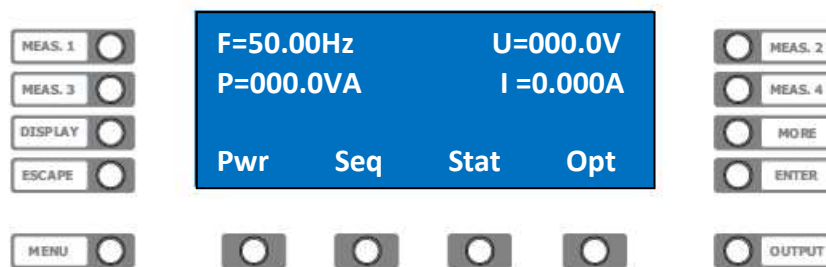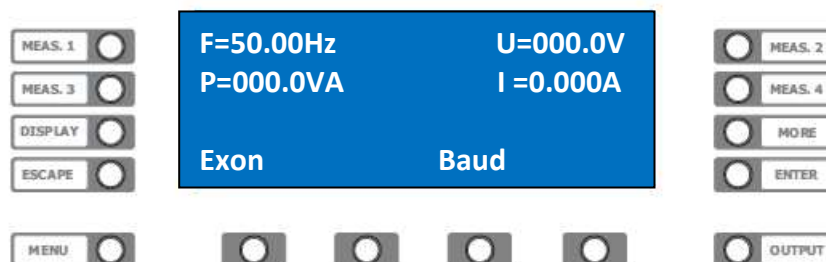
Press key below **>Ex.On<** indication changes to **>Ex.Off<** and the signal is fed by external input.
Pressing the key again, the EPS/ACS Power Source returns to the internal signal generator.

Baudrate

The EPS/ACS POWER SOURCE provides a transfer rate via RS232 interface from 9600, 19200, 38400up to 57600 Baud by free choice.

Baudrate selection

Shift with **>Menü<** key to this main menu.

MEAS. 1		F=50.00Hz	U=000.0V		MEAS. 2
MEAS. 3		P=000.0VA	I =0.000A		MEAS. 4
DISPLAY					MORE
ESCAPE		Pwr Seq Stat Opt			ENTER
MENU					OUTPUT

Press key below **>Opt<** to get the options.

MEAS. 1		F=50.00Hz	U=000.0V		MEAS. 2
MEAS. 3		P=000.0VA	I =0.000A		MEAS. 4
DISPLAY					MORE
ESCAPE		Exoff Baud			ENTER
MENU					OUTPUT
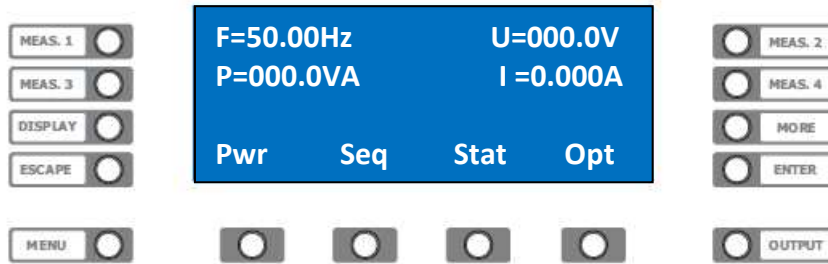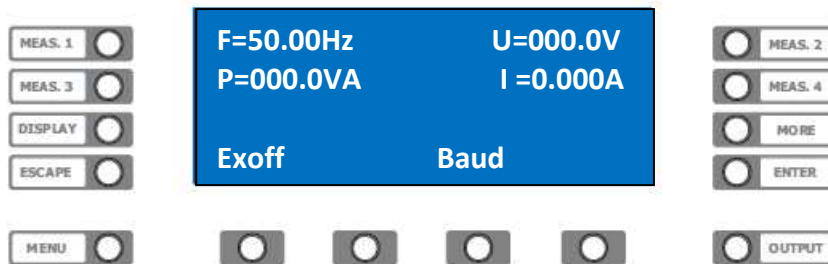
Press the key below **>Baud<.** Select the required Baudrate for the RS232 Interface by turning the rotary knobs. This setting takes effect after the next restart.

Sequences

The EPS/ACS POWER SOURCE provides operation of automatic command sets (sequences).
One can store up to 20 sequences with 50 commands each for later recall. This function can be used i.a. to generate voltage drops or voltage surges.
The minimum time between several commands is 10 ms at 10ms length of steps.
For faster processes the option WAVE is recommended. The input and the transfer of sequences can be done with the software tool EPS/ACS Control or by simple remote commands via interface.

Sequence load / save / run

Shift with **>Menü<** key to this main menu.

```
MEAS. 1      F=50.00Hz          U=000.0V      MEAS. 2
MEAS. 3      P=000.0VA          I =0.000A     MEAS. 4
DISPLAY                                       MORE
ESCAPE       Pwr     Seq     Stat     Opt     ENTER
MENU                                          OUTPUT
```
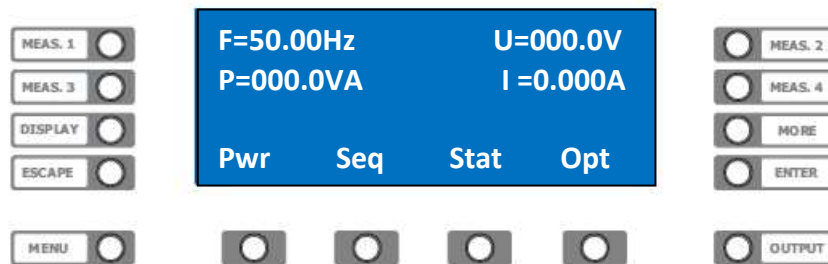
Press function key below **>Seq.<** to enter the sequence menu

```
MEAS. 1      F=50.00Hz          U=000.0V      MEAS. 2
MEAS. 3      P=000.0VA          I =0.000A     MEAS. 4
DISPLAY                                       MORE
ESCAPE       Go      Stop    Rcl     Save     ENTER
MENU                                          OUTPUT
```
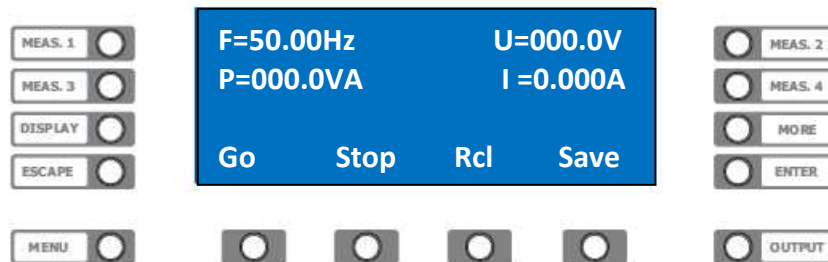
Sequence loading

To load a sequence Number (n) from memory (NV-RAM) in the execution-memory (RAM) press the function key below **>Rcl<.** The input value is displayed in the status line.
Select now the required memory number by turning the rotary knob.
By pressing the **>Enter<** key the sequence is loaded into the execution-memory (RAM).

Sequence saving

To save a previous transferred sequence number (n) from execution-memory (RAM) in the memory (NV-RAM) press the function key below **>Save<.** The input value is displayed in the status line. There is no matter if the sequence was transferred by EPS/ACS Control or by terminal programs.
Select now the required memory number by turning the rotary knobs.
By pressing the **>Enter<** key the sequence is saved in the memory (NV-RAM).

Sequence running

To start a previous transferred sequence number (n) from execution-memory (RAM), press the function key below **>Go<.** The input value is displayed in the status line.
Select now the required number of reruns by turning the rotary knobs.
Run the sequence by pressing **>ENTER<**, stop the sequence by pressing the function key below **>Stop<.**

WAVE operation

Intended use
The EPS/ACS Power Source allows to play WAVE files, the system can manage up to 30 files at a length of 25.000 seconds. This function can be a replacement for expensive arbitrary waveform generators. Most frequently application is the simulation of main failures, according to the EN 6100, e.g. voltage lacks, harmonics, variations of frequency and amplitude. To avoid malfunction or data loss do not remove SD card during operation

WAVE file creation
For editing we propose „Goldwave", „Audacity" or „Octave".

Name and extension:
The file name has to begin with 001 up to 030. Starting from version 3.18 long file names are agreed e.g.: „003 Pruefnorm EN61000-0-13 Teil 2". The valid length of file is 150ms up to 6h.

Sample rate:
The recommended sample rate is 40000 samples/s. Sample rates from 8000 - 48000 samples/s are allowed, but lead on to deviation of frequency.

Voltage amplitude:
The function WAVE reads the complete value range of the wave format as -425 Volt up to +425 volts. (HV option as -700 up to +700 volts, XHV option as -1000 up to +1000 volts. The recommended value range of the wave format ranges from -0.8 up to 0.8. The value range from -1 up to 1 is allowed, but increases the distortion.

frequency range:
Standard: DC - 500Hz full amplitude, moreover 20 % up to 3.6kHz.
F1 option, DC - 1kHz full amplitude, moreover 40 % up to 3.6kHz.
F2 option, DC - 2kHz full amplitude, moreover 80 % up to 3.6kHz
Higher frequencies only after consulting the factory.

Menu
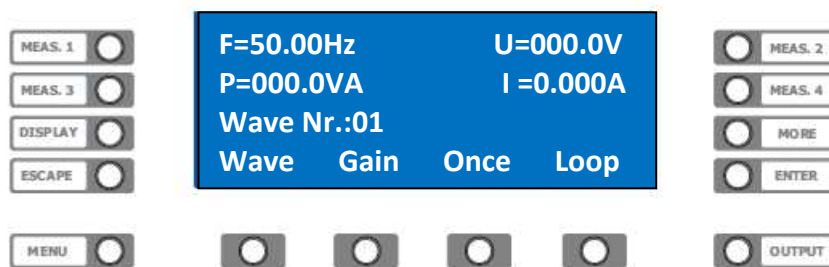
WAVE file playing

1. **>WAVE<**   select file 1 - 30 with the rotary knob

2. **>GAIN<**   Select amplification 0 - 100% with rotary knob.
                       The selected amplification (Gain) will be obtained at change of file.
                       Check the gain before playing the file.

3. **>ONCE<**   Playing the wave file one time.
   >STOP<   Immediate stop of the file.

4. **>LOOP<**   Endless playing of the wave file.
   >STOP<   Immediate stop of the file.

3 phase system – operation by hand

MENU
The graphic display shows the VAC main menu below. Enter the annex for detailed structure.

MEAS. 1	U=230.1V U=230.2V	MEAS. 2
MEAS. 3	U=230.3V	MEAS. 4
DISPLAY	UAC=230.0V	MORE
ESCAPE	UAC1 UAC2 UAC3 ALL	ENTER
MENU		OUTPUT
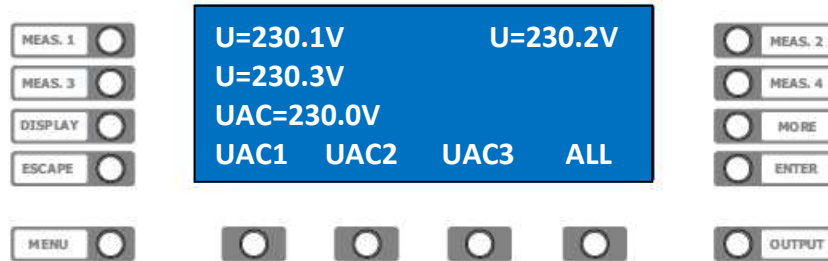
Press function key below **>All<.** The input value is displayed in the status line. Select required voltage by turning the rotary knobs for **all phases**.
Change the value by pressing the key below **>UAC1< for phase 1**.

Key assignment:
function key **>UAC1<** voltage **Phase 1**
function key **>UAC2<** voltage **Phase 2**
function key **>UAC3<** voltage **Phase 3**

Further menus, which are available via **>MORE<** affect the function keys of the selected phase.
Refer the specific chapter for more information.
When inputting DC voltage, current, frequency and phase, the procedure is the same.

see: menu structure.

Measurement selection
The EPS/ACS POWER SOURCE shows in 3 measurements on the display. Mode „3 Phasen"
shows a table of 3 identic measurements.

e.g.:
MEASURE 1. – AC voltage phase 1
MEASURE 2. – AC voltage phase 2
MEASURE 3. – AC voltage phase 3

Single measurements can be selected by pressing **>MEASURE<** key.

Change measurement
Press key **>MEASURE *1*<**, **>MEASURE *2,* >MEASURE *3<* or >MEASURE *4<*** beside
the graphic display. Every pressing changes the measurement.
The values for F, V, C, VA, P, PF, CF, CP are displayed one after each other.

Remote control

General

The EPS/ACS POWER SOURCE can be controlled via RS232 or as an option IEEE488-, USB-, and LAN-interface.

All settings and measurements can be done with these interfaces, the resolution is 12 Bit. All commands and returns are transferred as ASCII characters. Between the specific commands there **must** be a pause length of 50 ms!

Settings

The settings of the interface operation parameters are defined by the 8-way DIP switch on the rear of the Power Source.

The DIP switch is only called up at Power-On. Due to this a restart of the EPS/ACS Power Source is necessary having changed the settings of the DIP switch.

Switch No.

1. IEEE488 address Value 1
2. IEEE488 address Value 2
3. IEEE488 address Value 4
4. IEEE488 address Value 8
5. IEEE488 address Value 16
6. RS232 / IEEE488
7. not used
8. 19200 Baud / 9600 Baud

Switch 6.   =OFF RS232 operation
                  =ON IEEE488 operation

For IEEE488 operation the Baudrate **is to be set** on DIP-Switch **and** on the front panel to 19200 Baud.

Switch 8.   =OFF 19200 Baud   *IEEE488
                  =ON   9600 Baud

Switch 1. up to 5. specifies the IEEE488 device address, its range is between 1 and 30. The setting follows binary according to the assigned value.

To define the IEEE address 5 switch 1 and 3 have to be locked in ON position.

   Switch 1.   = 1
 + Switch 3.   = 4
                  = 5

Please refer appendix „address table"

USB interface

Please refer external documentation

LAN interface

Please refer external documentation

REMOTE-STATE
The EPS/ACS-Power Source supports 3 modes of remote control
Local
Unit can be operated manually or remote controlled

Remote
In this mode the device can be remote controlled. Operating manually is only possible after pressing
>MENU< key**,** which works as „Local key".

Remote with Lockout
Device only allows remote control. An operation by hand is only possible after having sent the command
„Local" or after restart the EPS/ACS-Power Source.

RS232 interface
The data transfer rate of the RS232 interface is possible with 9600, 19200, 38400 or 57600 Baud,
8 data bits, no parity and 1 Stop bit. The connection tot he control PC is realized by a „Null Modem"
assignment, the signals RXD and TXD find a use. To enable the RS 232 interface all the DIP switches of
the optional interfaces have be locked in RS 232 mode.

IEEE488 interface
The IEEE 488 interface was realized by using the GPIB Controller CB 7210.2 (Computer Boards). It pro-
vides an IEEE 488.2 conformal interface.

Command syntax
A command consists of keyword, delimiter, value and end character. Commands
can also consist of several keywords, these have to be separated by colon <:>.
The keyword represents the name of the command for identifying.
As delimiter between command and value a comma <,> is agreed.
The end character terminates the command. RS232 mode allows <CR> or
<LF> as end character; IEEE488 mode recognizes <LF> or the BUS message
<EOI> as end character.
If the device is sending signals to the BUS (Talker) these will be terminated with <LF>
and <EOI> simultaneously.

Command input
Keyword input in capitals, lower cases or in mixed way is agreed.
-e.g. command.: sour:voltac,220
SOUR:VOLTAC,220
Sour:VoltAc,220
Numeric values can be sent as "integer" or "real" separated by <.> as a comma.
-e.g. INTEGER: SOUR:VOLTAC,1
SOUR:VOLTAC,10
-e.g. REAL : SOUR:VOLTAC,220.0
SOUR:VOLTAC,200.
SOUR:VOLTAC,0.4
SOUR:VOLTAC,.3
SOUR:VOLTAC,230.100

Command overview

Please refer the submenus for detailed command information

*ACS?	reads the actual ACS status byte.
*ACSB?	reads the ACS status byte
*CLS	deletes status byte and event status register
*ESE	sets event status enable register
*ESE?	reads event status enable register
*ESR?	reads event status register
*IDN?	returns the device ID string.
*OPC	sets operation complete bit in the ESR register
*OPC?	writes ASCII "1" in the out buffer.
*OPT?	returns the ID oft he active options
*RCL	recall device state X
*RST	device default setting
*SAV	saves state X
*SRE	sets the service request enable register
*SRE?	reads the service request enable register
*STB?	reads the ACS status byte register

MEAS[n]	
:CURR?	Measurement of RMS current at the op
:CURRP?	Measurement of PEAK current at the op
:CFACT?	Measurement of crest factor at the op
:PFACT?	Measurement of power factor at the op
:VA?	Measurement of power at the op
:VOLT?	Measurement of RMS voltage at the op
:POW?	Measurement of true power at the op
:PRP?	Measurement of electrical recovery power at the op

OUTP,X	sets op active
	For reasons of compatibility command exists twice. Refer <STAT>.
OUTP	
:AUX	toggles the external signal input
:AUX?	returns the status of the external signal input
:OT1	1* controls op option 1
:OT1?	1* returns the status of op option 1
:PHASON	engages voltage power on phase
:PHASON?	returns the status of voltage power on phase
:PON	sets the device power on state
:PON?	returns the setting of device power on state
:STAT	sets the op relay 0 or 1
:STAT?	returns the status of the device output

SEQ	1* Option
:CNT	sets the number of repetitions of a sequence
:GO	starts execution of a sequence
:LOAD	loads a sequence from NV-RAM into RAM
:NEW	transfers the sequence data to sequence table
:SET	transfers the sequence data to sequence table
:STOP	stops sequence running
:STORE	stores a sequence from RAM into NV-RAM
:TIME	sets the time for a sequence command
:VAL1	sets value 1 for the sequence command
:VAL2	sets value 2 for the sequence command
:VAL3	sets value 3 for the sequence command

```
SOUR[n]
:CURR           sets the current for constant current mode (CC).
:CURRCLR        clears peak current memory (IP measurement)
:CURRMAX        sets current limit (cut off)
:CURRTIME       sets the time delay for current cut off
:CURRRNG        *2 activates second range of current measurement
:FREQ           *1 sets frequency AC voltage
:PHAS           *1 sets voltage power up phase angle
:POWMAX         sets the value for power cut off
:VOLTAC*        1 sets AC voltage value
:VOLTDC         *1 sets DC voltage value
:CURR?          *1 returns the preset of constant current mode (CC).
:CURRMAX?       returns the setting of the current cut off
:CURRTIME?      returns the setting of the time delay for current cut off
:CURRRNG?       *2 returns the status of second range of current measurement
:FREQ?          *1 returns the value of the frequency setting of the AC voltage
:PHAS?          *1 returns the value oft he phase setting
:POWMAX?        returns the preset value of the power cut off
:VOLTAC?        *1 returns the preset value of the AC voltage
:VOLTDC?        *1 returns the preset value of the DC voltage

                *1 3 phase command (e.g. SOUR1:VOLTAC,100)
                *2 option


SYST
:LOC            shifts device to local mode
:REM            shifts device to remote mode
:RWL            shifts device to local lockout mode


WAVE
:ONCE,X         X: number of the wave file
:LOOP,X         X: number of the wave file
:STOP           stops running
:GAIN,XXX.X     XXX.X : amplification, specification in steps of 0.1% (0 - 100).
:GAIN1,XXX.X    phase 1 of a 3 phase unit
:GAIN2,XXX.X    phase 2 of a 3 phase unit
:GAIN3,XXX.X    phase 3 of a 3 phase unit
:GAIN?          returns the preset amplification value
:GAIN1?         phase 1 of a 3 phase unit
:GAIN2?         phase 2 of a 3 phase unit
:GAIN3?         phase 3 of a 3 phase unit
:STAT?          plays the state oft he wave file
:ACTIVE,X       not in use at this time
```

Programming examples

*idn?	returns device ID string
	right after this first command the device falls in remote state during IEEE operation
*rcl,0	reads the factory settings
SOUR:VOLTAC,230	sets AC voltage to 230 AC
OUTP,1	activates op relay
gtl	IEEE488 command back in local operation
	In RS232 operation the command <SYST:LOC> shifts the device in local mode. (only when remote state is activated).

Setup of voltage to 115 AC/60Hz at a current (regulation) of 0.5A.

SOUR:VOLTAC,115	voltage 115 AC
SOUR:CURR,0.5	current 0.5A
SOUR:FREQ,60	frequency 60Hz
OUTP,1	output relay ON

Setup of voltage to 24 DC at a current (regulation) of 1A.

SOUR:VOLTDC,24	voltage 24 DC
SOUR:CURR,1	current 1A
OUTP,1	output relay ON

Setup of voltage to 230 AC/50Hz, with activating the voltage at a phase angle of 90°

SOUR:VOLTAC,230	voltage 230 AC
SOUR:FREQ,50	frequency 50Hz
OUTP:PHASON,0	phase (voltage) OFF
SOUR:PHAS,90	phase angle 90 degs
OUTP,1	output relay ON
OUTP:PHASON,1	phase (voltage) active at 90°

3 phase operation:
setup of voltage to 115 AC/60Hz and 160 AC/60Hz on phase 1.

SOUR:FREQ,60	frequency 60Hz
SOUR:VOLTAC,115	voltage 115V AC (all phases)
SOUR1:VOLTAC,160	voltage 160 AC (phase 1)
OUTP,1	output relay ON

COMMON commands

*ACS?	reads the actual ACS status byte
*ACSB?	reads the ACS status byte
*CLS	deletes the ACS status byte and the event status register
*ESE	sets the event status enable register
*ESE?	reads the event status enable register
*ESR?	reads the event status register
*IDN?	returns the device ID string
*OPC	sets the operation complete bit in the ESR register
*OPC?	writes an ASCII „1" in the out buffer
*OPT?	returns the ID of installed options
*RCL	recall device state X
*RST	brings the device into default settings
*SAV	saves device state X.
*SRE	sets the service request enable register
*SRE?	reads the service request enable register
*STB?	reads status byte register

*ACS?	reads the actual ACS status register
	response: 0 - 255
	Bit definition – refer chapter status register
*ACSB?	reads the ACS status register
	this register keeps the data content until read out and will be deleted then
	response: 0 - 255
	Bit definition – refer chapter status register
*CLS	deletes the status byte and the event status register
	enable register will not be deleted
*ESE,X	sets bits in the event status enable register. This register acts as release mask
	for the event status register
	X= 0 - 255
	Bit definition, see chapter status register
*ESE?	reads the event status enable register
	response: 0 - 255
	Bit definition, see chapter status register
*ESR?	reads the event status register.
	Answer: 0 - 255
	Bit definition, see chapter status register
*IDN?	returns the device ID string
	Answer:
	EPS Electronic,
	ACS-xxx,
*OPC	sets the operation complete bit in ESR register.
	Bit definition, see chapter status register
*OPC?	writes ASCII "1" in the Out buffer.
	Answer: 1
*OPT?	returns the ID of installed options
	Answer: HV,F1 , if installed

possible options:

NONE	keine Option
HV:	expanded voltage range 1
XHV:	expanded voltage range 2
F1:	expanded frequency range 1
F2:	expanded frequency range 2
SEQ:	option sequence
CR2:	current measurement range 2
OT1:	Output option 1
3P:	3 phase option

*RST   brings the device into default settings
see appendix STATE 0 - default settings.

*RCL,X   WARNING! The recall of a saved state may effect high voltages
at the output of the EPS/ACS Power Source!
Recall device state X.
X= 0 - 20

*SAV,X   save device state X.
X= 1 - 20

*SRE,X   sets bits in the event status enable register. This register acts as release mask
for the event status register.
X= 0 - 255
Bit definition, see chapter status register

*SRE?   reads event status enable register.
Answer: 0 - 255
Bit definition, see chapter status register

*STB?   reads event status register.
Answer: 0 - 255
Bit definition, see chapter status register

MEASURE commands

MEAS[n]   n = 1, 2 or 3 for phase 1, 2 or 3
                    standard (e.g. MEAS:VOLT? for 1 phase deviece)
                    n = 0 not available

:CURR?	measurement of RMS current at the OP.
:CURRP?	measurement of peak current at the OP.
:CFACT?	measurement of crest factor at the OP.
:PFACT?	measurement of power factor at the OP.
:VA?	measurement of power at the OP.
:VOLT?	measurement of RMS voltage at the OP.
:POW?	measurement of true power at the OP.
:PRW?	measurement of reverse power at the OP.

Beispiel

MEAS:CURR?	measurement of RMS current at the OP. Answer: C (A)
MEAS:CURRP?	measurement of peak current at the OP. Answer: C (A)
MEAS:CFACT?	measurement of crest factor at the OP. Answer: factor n
MEAS:PFACT?	measurement of power factor at the OP. Answer: factor n
MEAS:POW?	measurement of true power at the OP. Answer: P (W)
MEAS:VOLT?	measurement of RMS voltage at the OP. Answer: V (V)
MEAS:VA?	measurement of power at the OP Answer: P (VA)

OUTPUT commands

OUTP,X	activates the OP relay
	X=1 ON
	X=0 OFF
	This function is existing twice for compatibility, see <STAT>.
OUTP	
:AUX	activates the external signal input
:AUX?	returns the state of the external signal input
:OT1	1* activates op 1 function
:OT1?	1* returns the value of the op 1 function
:PHASON	activates the voltage power on phase
:PHASON?	returns the state of voltage power on phase
:PON	sets the power on device state
:PON?	returns the preset oft he power on state
:STAT	activates the OP relay
:STAT?	returns the state of OP
	1* option

:AUX,X	activates the external signal input
	X=1 external signal input ON
	X=0 external signal input OFF

Please observe the limits of this input!

Standard	max.	500Hz
option F1	max.	1KHz
option F2	max.	2KHz

:OT1,X	activates op option 1
	X=1 op option 1 ON
	X=0 op option 1 OFF

:PHASON,X	sets phase (voltage)
	X=1 phase (voltage) ON
	X=0 phase (voltage) OFF

:STAT,X	sets op relay
	X=1 op relay ON
	X=0 op relay OFF

:AUX?	returns the state of the external oscillator
	Response: 0 | 1
	1 external oscillator ON
	0 external oscillator OFF

:OT1?	returns the state of op option 1
	Response: 0 | 1
	1 op option 1 ON
	0 op option 1 OFF

:PHASON?	returns the value of the power on state
	Response: 0 | 1
	X=1 phase (voltage) ON
	X=0 phase (voltage) OFF.

:PON,X   defines the power on device state
                X=0 - 20

:PON?   returns the preset value of power on state
                Response: device power on state No.

:STAT?   returns the state oft he output
                Response: 0 | 1
                1 – op relay activated
                0 – op relay off

SOURCE commands

SOUR[n]	n = 1, 2 or 3 for phase 1, 2 or 3
	standard (e.g. SOUR:VOLTAC,100) for 1 phase source and to set all 3 Phases at once
	n = 0 not available
:CURR 1*	sets the current for constant current mode (CC)
:CURRCLR	clears the Peak-current memory(IP-Measure)
:CURRMAX	sets the current limit set point
:CURRTIME	sets the time delay for current cut off
:CURRRNG	*2 activate the current-measure-range 2
:FREQ	1* sets the frequency of the AC voltage
:PHAS	1* sets the phase of the voltage
:POWMAX	sets the value for power cut off
:VOLTAC	1* sets the value of the AC voltage
:VOLTDC	1* sets the value of the DC voltage
:CURR?	1* returns the preset value for constant current mode (CC)
:CURRMAX?	returns the preset value for current cut off
:CURRTIME?	returns the preset value for the time delay for current cut off
:CURRRNG?	*2 returns the State of the current-measure-range 2
:FREQ?	1* returns the preset value of the frequency of the AC voltage
:PHAS?	1* returns the preset value of the power on phase of the AC voltage.
:POWMAX?	returns the preset value for power cut off.
:VOLTAC?	1* returns the preset value for AC voltage
:VOLTDC?	1* returns the preset value for DC voltage

*1   3-Phase-command (e.g. SOUR1:VOLTAC,100)
*2 Option

:CURR,X	sets the current constant mode CC	
	X (A)	
:CURRCLR	clears peak current memory (IP measure)	
:CURRMAX,X	sets value for current cut off.	
	X (A)	
:CURRTIME,X	sets time delay for current cut off	
	X (sec)	
:CURRRNG,X	activates second current measure range	
	X=1 current measure range 2 ON	
	X=0 current measure range 2 OFF	
:FREQ,X	sets the frequency of the AC voltage	
	X (Hz)	
:PHAS,X	sets phase angle AC	
	X (deg)	
:POWMAX,X	sets value of power cut off	
	X (VA)	
:VOLTAC,X	sets the value of AC voltage	
	X (V)	

:VOLTDC,X	sets the value of DC voltage X (V)
:CURR?	returns the value of constant current mode (CC) Response: C (A)
:CURRMAX?	returns the preset value for current cut off Response: C (A)
:CURRTIME?	returns preset value for delayed current cut off Response: T (sec)
:CURRRNG?	returns the state of current measure range 2 Response: 0 | 1 1 current measure range 2 ON 0 current measure range 2 OFF
:FREQ?	returns the preset for frequency AC voltage Response: F (Hz)
:PHAS?	returns the preset value of power on phase AC voltage Response: phase angle (deg)
:POWMAX?	returns the value for power cut off Response: P (VA)
:VOLTAC?	returns preset value AC voltage Response: V (V)
:VOLTDC?	returns preset value DC voltage Response: V (V)

SYSTEM commands

SYST :LOC	shift device to local state (RS232 mode)
:REM	shifts device to remote state (RS232 mode) operation by hand only after having pressed **>MENU<** (works like „local button")
:RWL	shifts device to local lock out state (RS232 mode, no manual operation) operation by hand can be activated by command <SYST:LOC> or powering off and on

SEQUENCE commands

SEQ
:CNT   sets the number of reruns of the sequence
:GO   starts the execution of a sequence
:LOAD   loads a sequence from NV-RAM into RAM
:NEW   transfers the sequence data in the sequence table
:SET   transfers the sequence data in the sequence table
:STOP   stops the execution of a sequence
:STORE   stores a sequence from RAM into NV-RAM
:TIME   sets the time of the sequence-command
:VAL1   sets the value 1 for the sequence-command
:VAL2   sets the value 2 for the sequence-command
:VAL3   sets the value 3 for the sequence-command

:CNT,X   sets the number of reruns
                       X = number of reruns 0 - 60000
                       X = 0 endless

:GO,X   starts sequence with X reruns
                       X = number of reruns 0 - 60000
                       X = 0 endless
                       without parameter = running with saved number of reruns

:LOAD,X   loads a sequence from NV-RAM into RAM
                       X = sequence number 1 - 20

:NEW,X   writes the sequence parameter into the sequence table
                       Use only for the first item of a sequence
                       the preset data VAL1, VAL2, VAL3, TIME and CNT will be applied by sequence table
                       X = command 1 - 255
                       command UAC = decimal 4
                       for detailed information see table „sequence commands"

:SET,X   transfers the sequence parameter into the sequence table
                       the preset data VAL1, VAL2, VAL3, TIME and CNT will be applied by sequence table
                       X = Sequenzbefehl 1 - 255
                       command UAC = decimal 4
                       for detailed information see table „sequence commands"

:STOP   stops running the sequence

:STORE,X   stores a sequence from RAM into NV-RAM
                       X = sequence number 1 - 20

:TIME,X   sets the time(command length) of the sequence-command X in HH.MM.SS.MSMSMS
                       10 ms at minimum in steps of 10 ms
                       SEQ:TIME,00.00.00.010 command length 10 ms

:VAL1,X   sets the value 1 for the sequence-command
                       X as decimal
                       e.g. command UAC (decimal 4)
                       SEQ:VAL1,100   AC voltage 100 Volts

:VAL2,X   sets the value 2 for the sequence-command
                 X as decimal
                 e.g. command UAC (decimal 4)
                 SEQ:VAL2,100   not used for command UAC

:VAL3,X   sets the value 3 for the sequence-command
                 X as decimal
                 e.g. command UAC (decimal 4)
                 SEQ:VAL3,50   frequency 50 Hertz

SEQUENCE COMMANDS

For faster execution in the CPU handles the commands as decimal values

Command	Decimal value	Action
UAC	4	sets the value of the AC voltage for all phases
UAC1	10	sets the value of the AC voltage-Phase 1
UAC2	11	sets the value of the AC voltage-Phase 2
UAC3	12	sets the value of the AC voltage-Phase 3
UDC	3	sets the value of the DC voltage for all phases
UDC1	6	sets the value of the DC voltage-Phase 1
UDC2	17	sets the value of the DC voltage-Phase 2
UDC3	18	sets the value of the DC voltage-Phase 3
PHAS1	30	phase angle Phase 1
PHAS2	31	phase angle Phase 2
PHAS3	32	phase angle Phase 3
FREQ	1	sets the value of the frequency for all phases
FREQ1	22	sets the value of the frequency Phase 1
FREQ2	23	sets the value of the frequency Phase 2
FREQ3	24	sets the value of the frequency Phase 3
RUAC	5	Ramp AC voltage
RUAC1	13	Ramp AC voltage-Phase 1
RUAC2	14	Ramp AC voltage-Phase 2
RUAC3	15	Ramp AC voltage-Phase 3
RUDC	6	Ramp DC voltage
RUDC1	19	Ramp DC voltage-Phase 1
RUDC2	20	Ramp DC voltage-Phase 2
RUDC3	21	Ramp DC voltage-Phase 3
RPHAS1	33	Ramp Phase angle Phase 1
RPHAS2	34	Ramp Phase angle Phase 2
RPHAS3	35	Ramp Phase angle Phase 3

UAC
UAC1
UAC2
UAC3
        VAL1 AC voltage (V)
        VAL2 not used
        VAL3 frequency (Hz)
UDC
UDC1
UDC2
UDC3
        VAL1 DC-voltage (V)
        VAL2 not used
        VAL3 not used
PHAS1
PHAS2
PHAS3
        VAL1 phase angle (deg)
        VAL2 not used
        VAL3 not used
FREQ
FREQ1
FREQ2
FREQ3
        VAL1 not used
        VAL2 not used
        VAL3 frequency (Hz)
RUAC
RUAC1
RUAC2
RUAC3
        linear voltage ramp in steps of 10 ms
        VAL1 ramp start point (ACV)
        VAL2 ramp stop point (ACV)
        VAL3 Frequency (Hz)
RUDC
RUDC1
RUDC2
RUDC3
        linear voltage ramp in steps of 10 ms
        VAL1 ramp start point (DCV)
        VAL2 ramp stop point (DCV)
        VAL3 not used
RPHAS1
RPHAS2
RPHAS3
        linear phase angle ramp in steps of 10 ms
        VAL1 ramp start point (deg)
        VAL2 ramp stop point (deg)
        VAL3 not used

SEQUENZ programming example

Generation of a sequence 10ms/100VAC, 10ms/130VAC, 20ms/100VAC with 2 reruns
The sequence commands are handed over as decimal values

SEQ:TIME,00.00.00.010	command length 10 ms
SEQ:VAL1,100	command value 1 (voltage 100VAC at UAC command)
SEQ:VAL2,0	command value 2 (not used at UAC command)
SEQ:VAL3,500	command value 3 (frequency 500 Hz at UAC command)
SEQ:NEW,4	sequence command UAC, acceptance in sequence table
	SEQ:NEW only at the beginning of sequence table
SEQ:TIME,00.00.00.010	command length 10 ms
SEQ:VAL1,130	command value 1 (voltage 130VAC at UAC command)
SEQ:VAL2,0	command value 2 (not used at UAC command)
SEQ:VAL3,500	command value 3 (frequency 500 Hz at UAC command)
SEQ:SET,4	sequence command UAC, acceptance in sequence table
	SEQ:SET for further listing
SEQ:TIME,00.00.00.020	command length 20 ms
SEQ:VAL1,100	command value 1 (voltage 100VAC at UAC command)
SEQ:VAL2,0	command value 2 (not used at UAC command)
SEQ:VAL3,500	command value 3 (frequency 500 Hz at UAC command)
SEQ:SET,4	sequence command UAC, acceptance in sequence table
	SEQ:SET for further listing
SEQ:TIME,00.00.00.010	command length 10 ms
SEQ:VAL1,100	command value 1 (voltage 100VAC at UAC command)
SEQ:VAL2,0	command value 2 (not used at UAC command)
SEQ:VAL3,500	command value 3 (frequency 500 Hz at UAC command)
SEQ:SET,255	sequence command END, acceptance in sequence table
	SEQ:SET for further listing
SEQ:CNT,2	number of commands for reruns
SEQ:STORE,1	Storage of sequence in memory space No.1
SEQ:GO,2	start with 2 reruns

10ms	10ms	20ms	10ms	10ms	20ms
Befehl1	Befehl 2	Befehl 3	Befehl 1	Befehl 2	Befehl 3

Sequenz
Wiederholung 1

Sequenz
Wiederholung 2
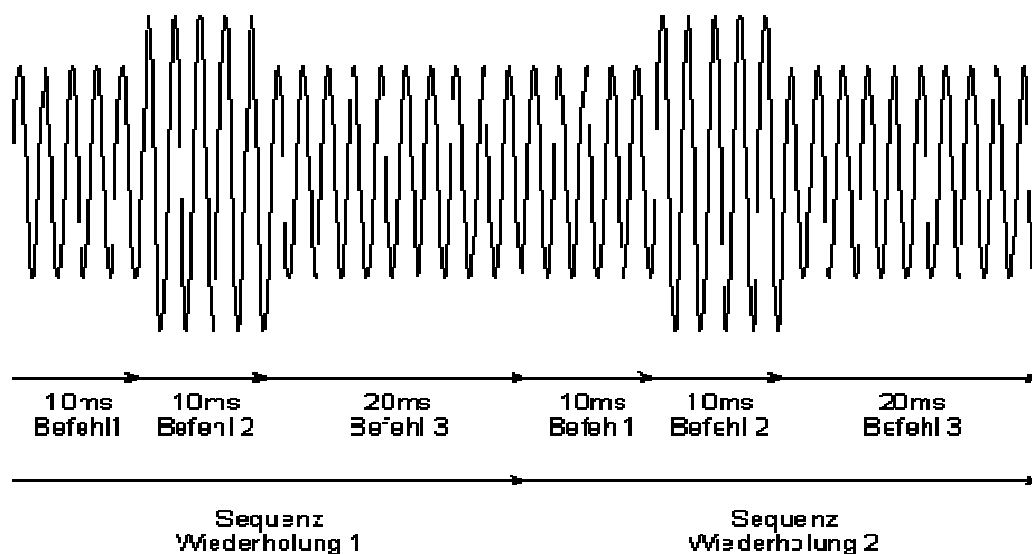
WAVE player commands

Please see the safety instructions (front panel) before operating the wave player
To avoid malfunction or data loss do not remove SD card during operation

WAVE

:ONCE,X   X: number of wave file
      0: wave signal relay deactivated
      one-time playing of selected file

      Tip:
      select „0" after playing the file to avoid any noise on the generated signal
      This will happen automatically when operating by hand

:LOOP,X   X: number of wave file
      0: wave signal relay deactivated
      endless playing of selected file

      Tip:
      select „0" after playing the file to avoid any noise on the generated signal
      This will happen automatically when operating by hand

:STOP   Stops playing the file

:GAIN,XXX.X XXX.X : in 0.1% steps (0 - 100).
      amplification of the wave amplitude
      indication: the power on condition is „0"

:GAIN1,XXX.X amplification of the wave amplitude phase 1 .
:GAIN2,XXX.X amplification of the wave amplitude phase 2.
:GAIN3,XXX.X amplification of the wave amplitude phase 3.

:GAIN?   returns the preset value amplification of the wave amplitude
      in 0,1 % steps (0 - 100).

:GAIN1?   readout of amplification of the wave amplitude phase 1
:GAIN2?   readout of amplification of the wave amplitude phase 2
:GAIN3?   readout of amplification of the wave amplitude phase 3

:STAT?   playing status of the wave player:
      0: not in use
      1: actually in operation

:ACTIVE,X   (X: enables / disables the wave relay)
      0 relay OFF
      1 relay ON
      indication: not available at this time

Status register

Status BYTE

command *STB? returns the status byte register

Bit	Dec	Hex		
0	1	01		Not used
1	2	02		Not used
2	4	04	EAV	Error available
3	8	08	QSB	Not used
4	16	10	MAV	Message available
5	32	20	ESB	Event Status Bit
6	64	40	RQS	Service Request
7	128	80	OSB	Not used

Bit 2, EAV
is set in case of error

Bit 4, MAV
message in the GPIB output buffer. This bit will be deleted after readout the op buffer

Bit 5, ESB
summary bit for ESR. Is set if one of the ESR bit is set. Will be deleted after readout the ESR

Bit 6, RQS
This bit marks a service request approved by *SRE command

EVENT status register

command *ESR?

Bit	Dec	Hex		
0	1	01	OPC	Operation Complete
1	2	02		Not used
2	4	04	QYE	Query Error
3	8	08	DDE	
4	16	10	EXE	
5	32	20	CME	Command Error
6	64	40	URQ	User Request
7	128	80	PON	Power On

Bit 0, OPC
is set after execution of the last command (*OPC)

Bit 2, QYE
query error (query interrupted, no message)

Bit 6, URQ
is set if Local button is pushed

Bit 7, PON
is set by powering on the device. ESR summary bit is not set

EPS/ACS STATUS BYTE

EPS/ACS Status Byte Register can be read by command *ACS?

Bit	Dec	Hex		
0	1	01	OL1	Overload bit phase 1
1	2	02	OL2	Overload bit phase 2
2	4	04	OL3	Overload bit phase 3
3	8	08	CC1	Constant current bit phase 1
4	16	10	CC2	Constant current bit phase 2
5	32	20	CC3	Constant current bit phase 3
6	64	40		Not used
7	128	80	SEQ	Sequence is running

Bit 0, OL1
is set in case of over power, over temperature or der over current of phase 1

Bit 1, OL2
is set in case of over power, over temperature or der over current of phase 2
Bit 2, OL3
is set in case of over power, over temperature or der over current of phase 3

Bit 3, CC1
constant current mode phase 1

Bit 4, CC2
constant current mode phase 2

Bit 5, CC3
constant current mode phase 3

Bit 7, SEQ
is set while a sequence is running

Appendix:

IEEE488 address table

Device ADR.	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5		Listener ADR.
1	ON	OFF	OFF	OFF	OFF	!	A
2	OFF	ON	OFF	OFF	OFF	„	B
3	ON	ON	OFF	OFF	OFF	#	C
4	OFF	OFF	ON	OFF	OFF	$	D
5	ON	OFF	ON	OFF	OFF	%	E
6	OFF	ON	ON	OFF	OFF	&	F
7	ON	ON	ON	OFF	OFF	'	G
8	OFF	OFF	OFF	ON	OFF	(	H
9	ON	OFF	OFF	ON	OFF	)	I
10	OFF	ON	OFF	ON	OFF	*	J
11	ON	ON	OFF	ON	OFF	+	K
12	OFF	OFF	ON	ON	OFF	,	L
13	ON	OFF	ON	ON	OFF	-	M
14	OFF	ON	ON	ON	OFF	.	N
15	ON	ON	ON	ON	OFF	/	O
16	OFF	OFF	OFF	OFF	ON	0	P
17	ON	OFF	OFF	OFF	ON	1	Q
18	OFF	ON	OFF	OFF	ON	2	R
19	ON	ON	OFF	OFF	ON	3	S
20	OFF	OFF	ON	OFF	ON	4	T
21	ON	OFF	ON	OFF	ON	5	U
22	OFF	ON	ON	OFF	ON	6	V
23	ON	ON	ON	OFF	ON	7	W
24	OFF	OFF	OFF	ON	ON	8	X
25	ON	OFF	OFF	ON	ON	9	Y
26	OFF	ON	OFF	ON	ON	:	Z
27	ON	ON	OFF	ON	ON	;	[
28	OFF	OFF	ON	ON	ON	<	
29	ON	OFF	ON	ON	ON	=	]
30	OFF	ON	ON	ON	ON	>	^

IEEE488 assignment

Pin	Name	Signal
1	DIO1	Data Input/Output
2	DIO2	Data Input/Output
3	DIO3	Data Input/Output
4	DIO4	Data Input/Output
5	EOI	End or Identfiy
6	DAV	Data Valid
7	NRFD	Not Ready for Data
8	NDAC	No Data Accepted
9	IFC	Interface Clear
10	SRQ	Service Request
11	ATN	Attention
12	GND	Shield Ground
13	DIO5	Data Input/Output
14	DIO6	Data Input/Output
15	DIO7	Data Input/Output
16	DIO8	Data Input/Output
17	REN	Remote Enable
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Logic Ground

RS232 assignment

Pin	Name	Signal
1	DCD	Data Channel Received
2	RXD	Receive Data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Ready for Sending
9	RI	Ring Indicator

POWER OUT Assignment
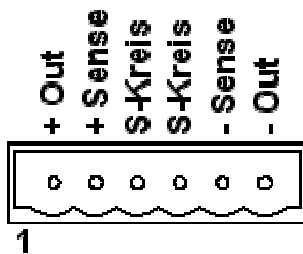
Indication Sense:
Using the sense lines pay attention to correct polarity! Using external op switches or contactors the sense lines have to be switched also. Max current over the sense lines: 100 mA (maybe connection of suitable fuses)

Indication Safety Circuit:
In factory sate pin 3 and pin 4 are bridged by wire. An external safety switch or contact must be free of potential!
Using different AC sources, e.g. a 3 phase system, the safety circuit must be free of potential among each other.

Pin	Name	Signal
1	+ Out	+ AC/DC OP
2	+ Sense	+ Sense IP
3	S-Kreis / S-CON	Safety Circuit
4	S-Kreis / S-CON	Safety Circuit
5	- Out	- Sense IP
6	-Out	- AC/DC OP

3-Phasen OP
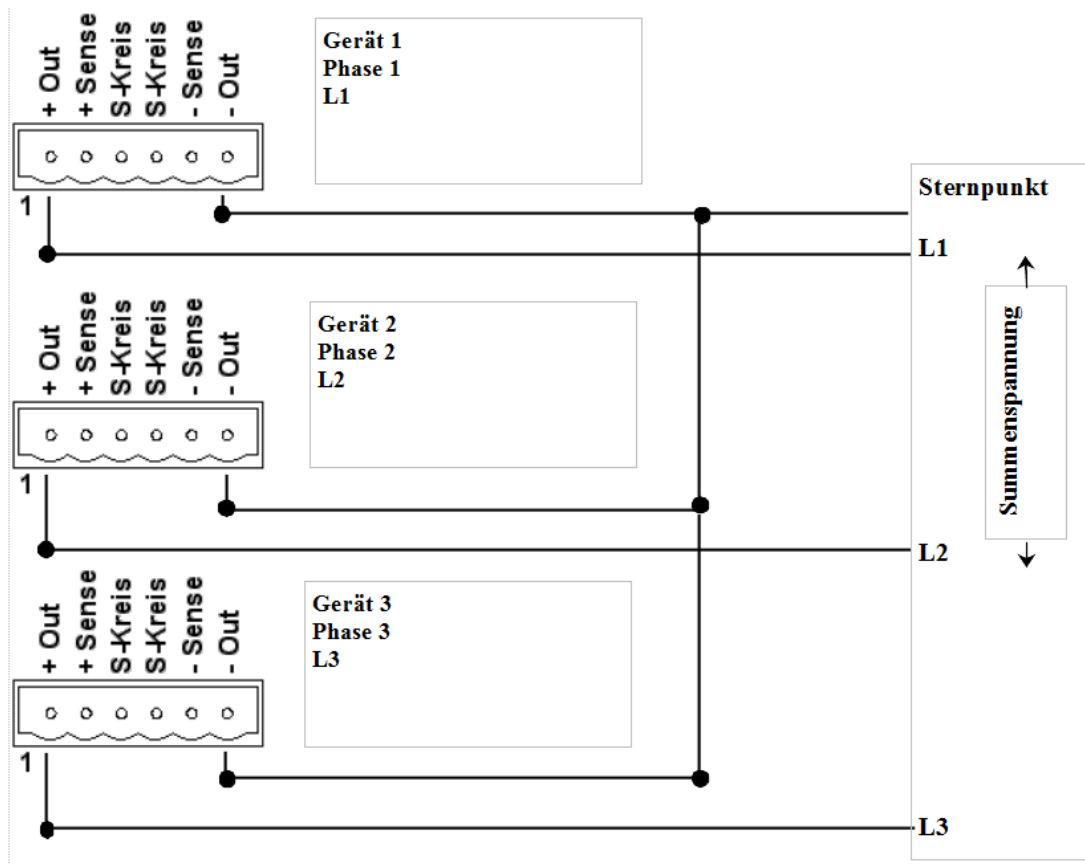
Indication:
The safety circuit connectors (bridge pin 3 and pin 4) are of different potential in a 3 phase system. Never connect these combined to each other.

Special Case: To generate a high OP voltage on one phase, the phase angle of phase 1 must be 0°, the angle of phase 2 must be 180°.
A total voltage occures between L1 and L2, e.g. 230 VAC phase 1, 230 VAC phase 2 = 460 VAC in total.

Menu Structure

Main Menu 1

UAC	UDC	Irms	Freq ***1**

UAC

		cont	LiOff ***2**

UDC

		cont	LiOff ***2**

Irms

		cont	LiOff *2

Max	Time	PClr	***3**

Freq

		cont	LiOff ***2**

Main Menu 2

Pha1		P.On ***1**

Pha1

		cont	LiOff ***2**

Main Menu 3

Pwr	Seq	Stat	Opt. ***1**

Seq

Go	Stop	Rcl	Save ***2**

Stat

Rcl	Save	P-On	***2**

Opt.

ExOf		Baud	***2**

Main Menu 4

WAVE	GAIN	ONCE	LOOP ***1**

*1 toggle of main menues by pressing key **>MENU<.**
*2 Shifting to submenu by **>MORE<** and e.g. **>UAC<.**
   Return to main menu via **>ESC<.**
*3 Shifting to other menus by pressing key **>MENU<.** Return by >ESC<.

Menu Structure 3 phase system
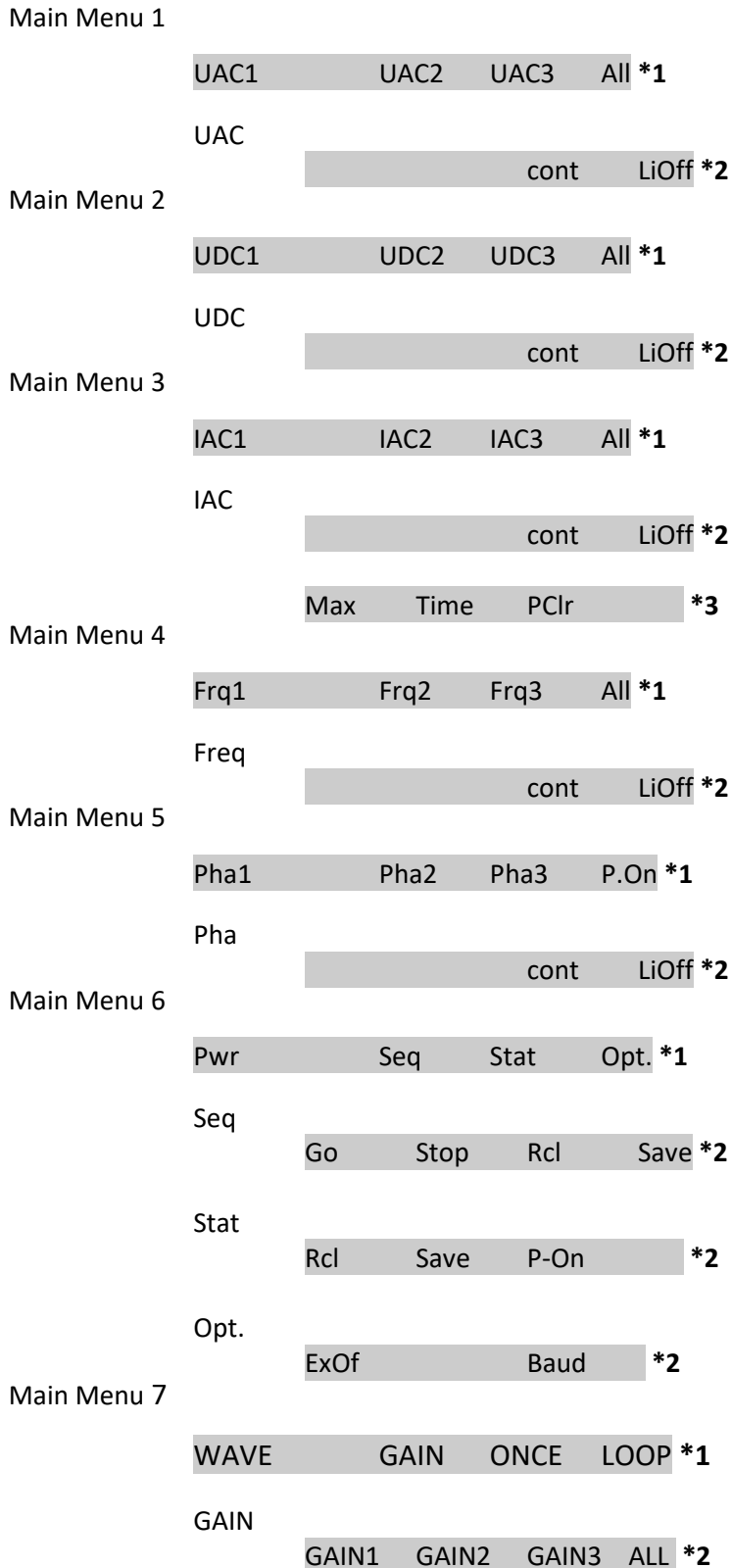
Main Menu 1

| UAC1 | UAC2 | UAC3 | All | *1 |

UAC

| | | cont | LiOff | *2 |

Main Menu 2

| UDC1 | UDC2 | UDC3 | All | *1 |

UDC

| | | cont | LiOff | *2 |

Main Menu 3

| IAC1 | IAC2 | IAC3 | All | *1 |

IAC

| | | cont | LiOff | *2 |

| Max | Time | PClr | | *3 |

Main Menu 4

| Frq1 | Frq2 | Frq3 | All | *1 |

Freq

| | | cont | LiOff | *2 |

Main Menu 5

| Pha1 | Pha2 | Pha3 | P.On | *1 |

Pha

| | | cont | LiOff | *2 |

Main Menu 6

| Pwr | Seq | Stat | Opt. | *1 |

Seq

| Go | Stop | Rcl | Save | *2 |

Stat

| Rcl | Save | P-On | | *2 |

Opt.

| ExOf | | Baud | | *2 |

Main Menu 7

| WAVE | GAIN | ONCE | LOOP | *1 |

GAIN

| GAIN1 | GAIN2 | GAIN3 | ALL | *2 |

***1** toggle of main menues by pressing key **>MENU<.**
***2** Shifting to submenu by **>MORE<** and e.g. **>UAC<.**
   Return to main menu via **>ESC<.**
***3** Shifting to other menus by pressing key **>MENU<.** Return by >ESC<.

STATE 0 - Default Settings

voltage AC	0 Volts
voltage DC	0 Volts
current rms	I-Max
frequency	50 Hertz
Phase 1	0 deg
Phase 2	120 deg
Phase 3	240 deg
voltage limit AC	OFF
voltage limit DC	OFF
current limit	OFF
frequency limit	OFF
phase limit	OFF
power cut off	P-Max
Stromabschaltung	I-Max
current cut off delay	2,00 Sekunden.
external signal input	OFF
phase (voltage)	ON
LOAD (OP)	OFF
measure 1	Frequenz
measure 2	Spannung
measure 3	Leistung (VA)
measure 4	Strom

option 3 phase

measure 1	voltage phase 1
measure 2	voltage phase 2
measure 3	voltage phase 3
measure 4	not used

Specification

tolerance relation: full scale FS

Type	EPS/ACS-0400-PS	EPS/ACS-0800-PS	EPS/ACS-1600-PS
Power(VA) at cos phi > 0,7	400 / 500* * extended for 1 minute	800 / 1000* * extended for 1 minute	1600 / 2000* * extended for 1 minute
Output Voltage Range Standard	0-300VAC 0-425VDC	0-300VAC 0-425VDC	0-300VAC 0-425VDC
Output Voltage Range (Option HV)	0-500VAC 0-700VDC	0-500VAC 0-700VDC	0-500VAC 0-700VDC
Output Voltage Range (Option XHV)	0-700VAC 0-1000VDC	0-700VAC 0-1000VDC	0-700VAC 0-1000VDC
Max. current rms (Option HV) (Option XHV)	3A 1,8A 1,5A	6A 3,6A 3A	12A 7,2A 6A
Max. current DC (Option HV) (Option XHV)	3A 1,8A 1,5A	6A 3,6A 3A	12A 7,2A 6A
Max. periodic peak current (Option HV) (Option XHV)	8A 4,8A 4A	20A 12A 10A	40A 24A 20A
Crest factor	2,6	3,3	3,3
Line regulation	0,1%	0,1%	0,1%
Load regulation @ Pnom	0,1%	0,1%	0,1%
Distortion factor @ Pnom	0,2%	0,2%	0,2%
Programming accuracy ACV	0,1% DC (10-400Hz)	0,1% DC (10-400Hz)	0,1% DC (10-400Hz)
Programming accuracy DCV	0,1%	0,1%	0,1%
Programming accuracy CCrms	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
Programming accuracy frequency	0,1Hz	0,1Hz	0,1Hz
Programming accuracy Power on phase	0,1 Grad	0,1 Grad	0,1 Grad
Frequency standard Frequency (Option F1) Frequency (Option F2)	500Hz 1 kHz 2 kHz	500Hz 1 kHz 2 kHz	500Hz 1 kHz 2 kHz
External signal input Frequency standard Frequency (Option F1) Frequency (Option F2)	20Vss DC-500 Hz DC-1 kHz DC-2 kHz	20Vss DC-500 Hz DC-1 kHz DC-2 kHz	20Vss DC-500 Hz DC-1 kHz DC-2 kHz
Measurement voltage rms	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
Measurement current rms	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
Measurement peak current	0,8%	0,8%	0,8%
Measurement power	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
external signal input (Option T) with galvanic isolation	Option	Option	Option
Interface with galvanic isolation IEEE488,USB,LAN	Option RS232 Standard	Option RS232 Standard	Option RS232 Standard
Case 19"	19" 3U, Depth 590mm, weight17Kg	19" 3U, Depth 590mm,weight 19Kg	19" 6U, Depth 590mm, weight 32Kg

Specification

tolerance relation: full scale FS

Type	EPS/ACS-2200-PS	EPS/ACS-3000-PS	EPS/ACS-4600-PS	EPS/ACS-6000-PS
Power(VA) at cos phi > 0,7	2200 / 2750* * extended for 1 minute	3000 / 3750* * extended for 1 minute	4600 / 5750* * extended for 1 minute	6000 / 7500* * extended for 1 minute
Output Voltage Range Standard	0-300VAC 0-425VDC	0-300VAC 0-425VDC	0-300VAC 0-425VDC	0-300VAC 0-425VDC
Output Voltage Range (Option HV)	0-500VAC 0-700VDC	0-500VAC 0-700VDC	0-500VAC 0-700VDC	0-500VAC 0-700VDC
Output Voltage Range (Option XHV)	0-700VAC 0-1000VDC	0-700VAC 0-1000VDC	0-700VAC 0-1000VDC	0-700VAC 0-1000VDC
Max. current rms (Option HV) (Option XHV)	16A 9,6A 8A	20A 12A 10A	30A 18A 15A	40A 24A 20A
Max. current DC (Option HV) (Option XHV)	16A 9,6A 8A	20A 12A 10A	30A 18A 15A	40A 24A 20A
Max. periodic peak current (Option HV) (Option XHV)	60A 36A 30A	80A 48A 40A	100A 60A 50A	120A 72A 60A
Crest factor	3,75	4	3,3	3
Line regulation	0,1%	0,1%	0,1%	0,1%
Load regulation @ Pnom	0,1%	0,1%	0,1%	0,1%
Distortion factor @ Pnom	0,2%	0,2%	0,2%	0,2%
Programming accuracy ACV	0,1% DC (10-400Hz)	0,1% DC (10-400Hz)	0,1% DC (10-400Hz)	0,1% DC (10-400Hz)
Programming accuracy DCV	0,1%	0,1%	0,1%	0,1%
Programming accuracy CCrms	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
Programming accuracy frequency	0,1Hz	0,1Hz	0,1Hz	0,1Hz
Programming accuracy Power on phase	0,1 Grad	0,1 Grad	0,1 Grad	0,1 Grad
Frequency standard Frequency (Option F1) Frequency (Option F2)	500Hz 1 kHz 2 kHz	500Hz 1 kHz 2 kHz	500Hz 1 kHz 2 kHz	500Hz 1 kHz 2 kHz
External signal input Frequency standard Frequency (Option F1) Frequency (Option F2)	20Vss DC-500 Hz DC-1 kHz DC-2 kHz	20Vss DC-500 Hz DC-1 kHz DC-2 kHz	20Vss DC-500 Hz DC-1 kHz DC-2 kHz	20Vss DC-500 Hz DC-1 kHz DC-2 kHz
Measurement voltage rms	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
Measurement current rms	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
Measurement peak current	0,8%	0,8%	0,8%	0,8%
Measurement power	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)	0,2% DC (40-400Hz)
external signal input (Option T) with galvanic isolation	Option	Option	Option	Option
Interface with galvanic isolation IEEE488,USB,LAN	Option RS232 Standard	Option RS232 Standard´	Option RS232 Standard	Option RS232 Standard
Case 19"	19" 6U, Depth 590mm, weight 34Kg	19" 6U, Depth 590mm,weight 38Kg	19" 12U, Depth 590mm, weight 64Kg	19" 12U, Depth 590mm, weight 70Kg

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