AC- / DC-Sources | Electronic Loads
Inverter | Power Supplies
Bidirectional DC-Sources

DEVELOPMENT | PRODUCTION | SALES

MADE
IN
GERMANY

must have

ETSYSTEM®

WELCOME TO ET SYSTEM ELECTRONIC!

ET System Electronic is one of the world's leading producers of AC and DC-Sources, electronic loads, power supplies and inverters. Our power instruments are used in research and industry all around the globe. Application areas include the automotive, aerospace and defence sectors along with medical engineering and telecoms. Specialist units are also aimed at the railway, photovoltaic and laser industries.

We develop and manufacture our devices from the company's headquarters in Altlußheim, Germany. This enables us to provide a single source for development, production, distribution and support services.

Our manufacturing flexibility ensures even small quantities are economically viable. All production stages are available in-house from PCB fabrication to transformer winding, metalwork housing and test chambers.

This integrated approach guarantees you the highest quality, quick decisions and short delivery times. Whether individual pieces, bespoke models or modified standards we make it happen!

As an ISO 9001:2008 certified company we not only offer you a wide range of standard products, but also provide customer specific modifications. We are often able to meet unusual requests. Please contact us for an informal discussion of your particular requirements. We hope that you will be delighted and amazed by our flexibility and special models!

Dipl.-Ing. Eric Keim
Managing director ET System electronic GmbH

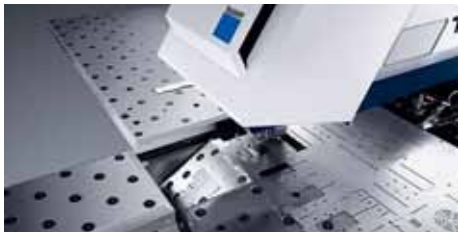
”Our centralised German design and production facility means that we are able to meet individual customer requirement effectively and efficiently.“

TWO ADVANTAGES: **Quality and Innovation**

Whether we are producing a standard unit or creating one of our special models, we strive to maintain our two core German engineering values: Refined quality and practical innovation.

Our devices are carefully equipped with the best electronic components and are checked with painstaking accuracy. This ensures that only products of uncompromising high quality leave our production facility.

We also regard the continued innovation of new and current products as crucial to our future success. This philosophy has always kept us more than the proverbial 'jump ahead' of the competition. We continue to add new and original features to our product lines that you're unlikely to find elsewhere. We also continue to lead the industry in achieving extraordinary power densities ensuring the most compact units possible.



1.200 Volt DC-Sources

Every laboratory, test field and electronic production facility requires high precision DC currents. Adjustable voltage and current limits with high stability are usually required regardless of the actual load. This is particularly important when testing power electronic components such as solar inverters, isolators, power semiconductors and converters with a high quality electric current.

ET System Electronic GmbH's broad range of DC laboratory power supplies provide proven and reliable sources ranging from 120 Watts up to 1.000 Kilowatts. Both switchmode and linear power supplies are provided. Our extensive range of basic models can also be complemented by various options and also modified to meet customer specific requirements. Along with analogue interfaces a variety of computer interfaces such as IEEE 488.2 (GPIB), RS232, RS485, USB and LAN can be used to control the devices remotely.

Single- and Three-Phase Linear AC-Sources

AC powered devices in development and production also require adjustable voltage and current sources. Programmable AC-Sources are used to simulate frequencies, waveforms and phase angles with differing voltage and current levels within single- and three-phase networks. This allows for the effective testing of component performance, power supplies, motors and devices in normal operation or in overvoltage and undervoltage scenarios. Adjustable AC-Sources are essential for ensuring that devices produced for export markets will operate from the local electrical supply. Similarly component testing for certain applications, such as 400 Hz aircraft systems, require specific AC inputs that aren't available from the public grid.

Our single- and three-phase AC-Sources offer excellent ouput control and cover a performance range from 250 VA to 150 kVA. The electronically generated and stabilised voltage is galvanically separated from the input and can be set from zero to maximum voltage. Analogue interfaces as well as IEEE 488.2 (GPIB), RS232/485, USB and LAN are available for remote control. LabView drivers are also available to aid system integration.

As of with all of our product families our AC-Sources are either built as laboratory units or as ATE versions for automated test systems in 19 inch racks.

With their linear circuit concept, our AC-Sources provide many advantages:

- minimum distortion of the output signal
- high output bandwidth
- high crest factors with constant wave form even with differing loads

200 kW Electronic Loads

Electronic loads are often essential for the testing and characterisation of units in production or development. Electronic loads are the practical and flexible alternative to using the actual load. The load can be set to absorb just the right amount of energy in order to simulate real world conditions.

Electronic loads are commonly used for the testing of chargers, battery packs, power supplies and photovoltaic panels. For such applications ET System Electronic GmbH offers a comprehensive catalogue of electronic loads. These cover a wide range of voltage, current and power levels. Our devices provide constant current and constant resistance operation. Additionally the dynamic mode allows constant voltage and constant power operation. A range of different waveforms can be set with adjustable frequency and current rise times to accurately simulate pulsing loads.

Electronic loads are often used as bench top instruments in laboratories and are also available for use in 19 inch rack systems or as euro cassettes. If front panel operation is not required then the device can be operated via an analogue interface. Computer control and integration of the load in to wider test systems can also be achieved via IEEE 488.2, RS232/485, USB or LAN interfaces.

AC-Sources

THE EAC/S SERIES - POWER AND VOLTAGE TO THE FULL EXTENT OF UP TO 36 KVA!

When simulating AC networks, the AC-Sources of ET System electronic are essential. Depending on the model they supply freely adjustable single- or three-phase sine, rectangle or triangle voltages. The manually adjustable frequency range lies between 0 - 2.000 Hz. In addition, often needed frequencies such as 50 Hz, 60 Hz and 400 Hz can be selected at the press of a button. The standard versions offer voltage ranges from 0 V up to 300 V AC/ ±424 V DC at power range of 250 VA up to 45 kVA. The currents reach values of up to 80 A per phase, while the regulated high current versions deliver up to 600 A. Alternatively, voltages up to 500 V AC/ ±700 V DC or up to 700 V AC/ ±1000 V DC are available, while maximum output currents are reduced by 40 % or by 50 %. The entire series has excellent control data, offers a distortion of only 0.1 % and DC voltage programming accuracy of 100 mV - all that at a very high control precision of 0.1 %.

HIGH VARIETY OF FUNCTIONS AND INCLUDED FLICKER SIMULATION

The EAC/S series features an extraordinary variety of functions, offering for example UI control or operation as constant voltage source and constant current source. As a standard, the series is equipped with an adjustable AC voltage output up to 1.000 V DC, which is useful for applications where a DC voltage must be superimposed to an AC voltage.

Moreover, it is possible to simulate ripple control and then superimpose it to a free adjustable AC voltage within three-phase systems (see also page 14). Besides sinusoidal signals many other variants are available.

The integrated flicker simulation omits a certain number of sinusoidal half-waves and therefore helps to simulate short-term mains failures according to EN 61000-4-11. In addition to the nominal voltage, it is possible to adjust the percental amount for the voltage dip and the number of half-waves to be dropped. Since each phase is adjustable with an optional accuracy of 0.1°, mains failure can also be simulated.

OPTIONAL WAVE FORMS

Besides sinusoidal, rectangular and triangular voltages, the EAC/S series also manages to create user-defined wave-forms. All it takes is the creation of a script containing wave file with a PC, which must be uploaded from a SD card into the AC source. The units are able to save up to three different wave forms and to model the curve shapes sequentially. Therefore the simulation of stepped voltage curves of an inverter or the signal shapes of triacs or dimmers is easier than ever. External signals can also be fed in via oscillator input, allowing the user to utilize its own signal generators. Additionally, signal curves according to different standards such as EN and MIL are permanently set and there are ten memory slots available for saving the current configuration.

OPTIONAL WITH TRANSFORMER OR SWITCHING POWER SUPPLY

While AC-Sources of the EAC/S series work with transformers, the EAC/SP model is equipped with switching power supplies, offering more performance at less weight and reduced size. A direct comparison shows the principle-dependent strengths of both models:

EAC/SP:

- power source: switching power supply
- compact design: e. g. 1.500 VA in 3 HE, 35 kg
- voltages up to 1.000 V AC and +/- 1.000 V DC
- output frequency up to 2 kHz
- operation modes: Cv, CC
- parallel switchable as master or slave
- linear output stage
- THD 0.15 %
- Cos φ ≥ 0,7
- standard programs for IEC/EN, aicraft, military

EAC/S:

- power source: transformer
- compact design: e. g. 1.000 VA in 6 HE, 60 kg
- voltages up to 1.000 V AC and +/- 1.000 V DC
- output frequency up to 2 kHz
- operation modes: CV, CC
- parallel switchable as master or slave
- linear output stage
- THD 0.1 %
- Cos φ ≥ 0,7
- standard programs for IEC/EN, aicraft, military
- peak currents of up to three times of the nominal current

While units with switching power supply score with their outstanding efficiency and lightweight construction, units with transformers may be overloaded to a certain extent and deliver very high peak currents.

BRILLIANT COLOR GRAPHICS DISPLAY AND VARIOUS INTERFACES

Units of the EAC/S series measure automatically output voltage, effective current, average and peak current, effective power, idle power, apparent power, as well as power factor and crest factor. All these values simultaneously appear on the largecolor display. This also applies to the three-phase units but not all measured values can be shown at the same time. Instead the unit offers different overview screens, e. g. displaying all powers, all voltages or all values of an output. Therefore the user has a perfect overview at all times and must not connect additional measurement devices for most of the tasks, which supports efficient ways of working.

The EAC/S series is equipped with various interfaces, which provide universal connection options and enable the unit's control. Besides RS232, RS485, USB, IEEE 488 and LAN interface is available, plus, the AC-Sources provide galvanically isolated, self-calibrating 5 V or 10 V analog interfaces.

Remote supervision, remote control and configuration can be made via web interface if the unit is provided with a LAN interface. In connection with the IEEE interface, drivers for the user interface Lab View can be used, too.

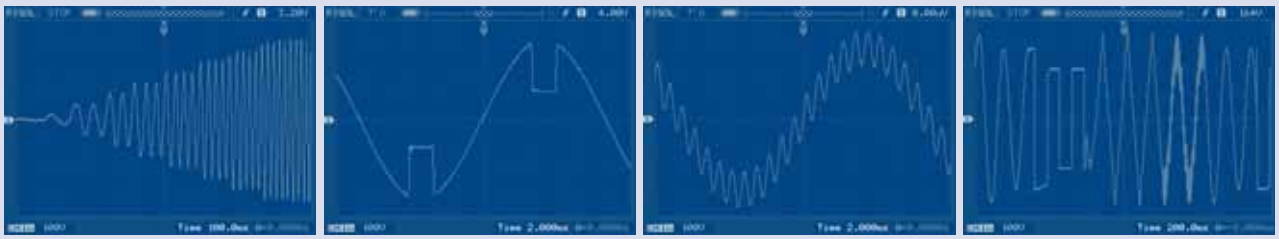
All units meet the requirements according to IEC/EN 61000-4-11, 61000-4-13, -4-14, 61000-4-17, 61000-4-28, 61000-4-29, MIL-STD-704, DO 160 Section 16, as well as the avionic requirements of Airbus (ABD0100) and Boeing.

Electronic AC-Sources 250 VA - 150.000 VA

Single-Phase EAC/S and Three-Phase EAC/3S

OVERVIEW

- Simulation of single- and three-phase networks
- AC and DC operation
- 250 - 30.000 VA power output
- 0 - 700 V AC / 1.000 V DC output voltage per phase
- 1 - 2.000 Hz variable frequency (sine, square, triangle)
- Currents up to 600 A per phase
- Graphical display
- Measuring of: voltage, current, average and peak current, effective power, idle power, apparent power, power factor, crest factor
- Constant voltage and constant current modes
- Free memory space to store user programmed curves via optional SD card slot
- Pre-loaded test procedure according to EN61000-4-11 (adjustable via front panel)
- External oscillator input ±10 V with adjustable time delay up to 70 mS
- Digital interface IEEE, RS232/485, USB, LAN
- Galvanically isolated 0 - 5 V or 0 - 10 V analogue interface
- Script control: process programming and booting from memory card
- Creation of user defined waveforms and programming via memory card or digital interface
- Data logging function: output values can be saved at adjustable time intervals to a memory card
- Script operation in combination with data logging function provides and stand-alone testing
- Sync input synchronizes the device with external sources
- Sync output triggers external measurement instruments or similar
- 'Brown-out' simulation where output voltage drops for a determined amount of half periods
- Output voltage for a determined amount of time
- Special versions available on request



Motor-Controlled AC-Sources 500 VA - 50.000 VA

Single-Phase EAC/MT and Three-Phase EAC/MT3P

OVERVIEW

- Motor controlled
- Potentiometer adjustment
- Benchtop and 19" rackmounting units
- High output power
- Digital voltage and current display
- Analogue interfaces 0 - 5 or 0 - 10 V for control and measurement
- ATE version also available
- Digital interfaces IEEE 488.2 (GPIB), RS232/485, USB
- Special versions available on request

Voltage and Current Source

AC-SOURCES

EAC/SP Single-Phase 250 VA - 12.000 VA

19" x 3 U x 620 mm

PRODUCT EXAMPLES

Type	Power VA	Voltage V AC / V DC	Effective Current A
EAC/SP 250	250	0 - 300 / 0 - 425	0 - 3
EAC/SP 500	500	0 - 300 / 0 - 425	0 - 6
EAC/SP 1500	1.500	0 - 300 / 0 - 425	0 - 10
EAC/SP 2000	2.000	0 - 300 / 0 - 425	0 - 16
EAC/SP 3000	3.000	0 - 300 / 0 - 425	0 - 20
EAC/SP 4500	4.500	0 - 300 / 0 - 425	0 - 30
EAC/SP 5000	5.000	0 - 300 / 0 - 425	0 - 35
EAC/SP 6000	6.000	0 - 300 / 0 - 425	0 - 40
EAC/SP 7500	7.500	0 - 300 / 0 - 425	0 - 50
EAC/SP 8000	8.000	0 - 300 / 0 - 425	0 - 60
EAC/SP 9000	9.000	0 - 300 / 0 - 425	0 - 70
EAC/SP 10500	10.500	0 - 300 / 0 - 425	0 - 80
EAC/SP 12000	12.000	0 - 300 / 0 - 425	0 - 90

OPTIONS

Appendix	Description
../230	Input 230 / 207 - 253 V AC
../400	Input 400 / 360 - 440 V AC
../3P208	Input 3 x 208 / 187 - 229 V AC
../3P400	Input 3 x 400 / 360 - 440 V AC
../3P480	Input 3 x 480 / 432 - 528 V AC
../V500	Extended voltage range 0 - 500 V AC / 0 - 700 V DC -40 % I_{max}
../V700	Extended voltage range 0 - 700 V AC / 0 - 1.000 V DC -50 % I_{max}
../F1000	Extended freqency range 1 - 1.000 Hz
../F2000	Extended freqency range 1 - 2.000 Hz
../LT	Interface IEEE 488
../LTRS485	Interface RS485
../LTRS232	Interface RS232
../LAN	Interface LAN
../USB	Interface USB
../ATI 5	Galvanically isolated analogue interface 0 - 5 V
../ATI 10	Galvanically isolated analogue interface 0 - 10 V
../EXT/OSZ	OSZ external oscillator input
../SD	SD card slot
../SYNC A	Sync output for triggering external measurement devices or similar (optinal)
../SYNC E	Sync input for synchronization with external sources (optional)
../INTLOCK	Interlock input / safety shutdown
../DIP	Disengageable output voltage during a specific number of half periods (digital interface required)
../GATE	Engageable output voltage during a specific amount of time (digital interface required)
../APuls	Adjustable puls sequence (digital interface required)
../LoadR	Load reverse energy recovery
../LoadLR	Load energy recovery / regeneration in development

TECHNICAL DATA

Input Voltage Specification

Input voltage range	230 V AC / 400 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
Input frequency	47 - 63 Hz

Output Specification

Grid regulation	0,10 %
Load control	0,10 %
Distortion P_{max}	0,20 %
Programming accuracy AC voltage	100 mV
Programming accuracy DC voltage	100 mV
Programming accuracy $_{< 10 A}$	1 mA
Effective constant current $_{> =10 A}$	10 mA
Programming accuracy Activation phase	0,1°
Programming accuracy Frequency	0,1 Hz
Frequency standard	0 - 500 Hz
External oscillator input	0 - 10 V / 1 kHz
Resolution, Measurement, Effective voltage, DC voltage, Peak voltage	100 mV
Resolution, Measurement $_{<10 A}$ Effective current, DC current	1 mA
Peak current $_{> =10 A}$	10 mA
Resolution, Measurement $_{< 10 A}$	10 mW
Active power $_{> =10 A}$	100 mW

Programming & Control

Output Control and Monitoring	Front panel and/or optional Analog 0 - +5V/+10V isolated/ Digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions

Cooling	Fans
Operating temperature	0 - 50°C
Storage temperature	-20 - 70°C
Humidity	< 80 %
Operating height	< 2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	< 20 G
Weight	30 - 150 kg

AC-SOURCES

EAC/3SP Three-Phase 750 VA - 36.000 VA

3 x 19" x 3 U x 620 mm

PRODUCT EXAMPLES

Type	Power VA	Voltage V AC / V DC	Effective Current A
EAC/3SP 250	3 x 250	3 x 0 - 300 / 0 - 425	3 x 0 - 3
EAC/3SP 500	3 x 500	3 x 0 - 300 / 0 - 425	3 x 0 - 6
EAC/3SP 1500	3 x 1.500	3 x 0 - 300 / 0 - 425	3 x 0 - 10
EAC/3SP 2000	3 x 2.000	3 x 0 - 300 / 0 - 425	3 x 0 - 16
EAC/3SP 3000	3 x 3.000	3 x 0 - 300 / 0 - 425	3 x 0 - 20
EAC/3SP 4500	3 x 4.500	3 x 0 - 300 / 0 - 425	3 x 0 - 30
EAC/3SP 5000	3 x 5.000	3 x 0 - 300 / 0 - 425	3 x 0 - 35
EAC/3SP 6000	3 x 6.000	3 x 0 - 300 / 0 - 425	3 x 0 - 40
EAC/3SP 7500	3 x 7.500	3 x 0 - 300 / 0 - 425	3 x 0 - 50
EAC/3SP 8000	3 x 8.000	3 x 0 - 300 / 0 - 425	3 x 0 - 60
EAC/3SP 9000	3 x 9.000	3 x 0 - 300 / 0 - 425	3 x 0 - 70
EAC/3SP 10500	3 x 10.500	3 x 0 - 300 / 0 - 425	3 x 0 - 80
EAC/3SP 12000	3 x 12.000	3 x 0 - 300 / 0 - 425	3 x 0 - 90

OPTIONS

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../230	Input 230 / 207 - 253 V AC
../400	Input 400 / 360 - 440 V AC
../3P208	Input 3 x 208 / 187 - 229 V AC
../3P400	Input 3 x 400 / 360 - 440 V AC
../3P480	Input 3 x 480 / 432 - 528 V AC
../V500	Extended voltage range 0 - 500 V AC / 0 - 700 V DC -40 % I_{max}
../V700	Extended voltage range 0 - 700 V AC / 0 - 1.000 V DC -50 % I_{max}
../F1000	Extended freqency range 1 - 1.000 Hz
../F2000	Extended freqency range 1 - 2.000 Hz
../LT	Interface IEEE 488
../LTRS485	Interface RS485
../LTRS232	Interface RS232
../LAN	Interface LAN
../USB	Interface USB
../ATI 5	Galvanically isolated analogue interface 0 - 5 V
../ATI 10	Galvanically isolated analogue interface 0 - 10 V
../EXT/OSZ	OSZ external oscillator input
../SD	SD card slot
../SYNC A	Sync output for triggering external measurement devices or similar (optinal)
../SYNC E	Sync input for synchronization with external sources (optional)
../INTLOCK	Interlock input / safety shutdown
../DIP	Disengageable output voltage during a specific number of half periods (digital interface required)
../GATE	Engageable output voltage during a specific amount of time (digital interface required)
../APuls	Adjustable puls sequence (digital interface required)
../LoadR	Load reverse energy recovery
../LoadLR	Load energy recovery / regeneration in development

TECHNICAL DATA

Input Voltage Specification

Input voltage range	230 V AC / 400 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
Input frequency	47 - 63 Hz

Output Specification

Grid regulation	0,10 %
Load control	0,10 %
Distortion P_{max}	0,10 %
Programming accuracy AC voltage	100 mV
Programming accuracy DC voltage	100 mV
Programming accuracy $_{< 10 A}$	1 mA
Effective constant current $_{> =10 A}$	10 mA
Programming accuracy Activation phase	0,1°
Programming accuracy Frequency	0,1 Hz
Frequency standard	0 - 500 Hz
External oscillator input	0 - 10 V / 1 kHz
Resolution, Measurement, Effective voltage, DC voltage, Peak voltage	100 mV
Resolution , Measurement $_{<10 A}$ Effective current, DC current	1 mA
Peak current $_{> =10 A}$	10 mA
Resolution , Measurement $_{< 10 A}$	10 mW
Active power $_{> =10 A}$	100 mW

Programming & Control

Output Control & Monitoring	Front panel and/or optional Analog 0 - +5V/+10V isolated/ Digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions

Cooling	Fans
Operating temperature	0 - 50°C
Storage temperature	-20 - 70°C
Humidity	< 80 %
Operating height	< 2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	< 20 G
Weight	30 - 400 kg

Voltage and Current Source

AC-SOURCES

EAC/S Single-Phase 250 VA - 10.000 VA

19" x 4 U x 434.5 mm to 19" x 25 U x 780 mm

PRODUCT EXAMPLES

Type	Power VA	Voltage V AC/V DC	Effective Current A
EAC/S 250	250	0 - 300 / 0 - 425	0 - 3
EAC/S 500	500	0 - 300 / 0 - 425	0 - 6
EAC/S 1000	1.000	0 - 300 / 0 - 425	0 - 10
EAC/S 2000	2.000	0 - 300 / 0 - 425	0 - 15
EAC/S 3000	3.000	0 - 300 / 0 - 425	0 - 20
EAC/S 4000	4.000	0 - 300 / 0 - 425	0 - 30
EAC/S 5000	5.000	0 - 300 / 0 - 425	0 - 35
EAC/S 6000	6.000	0 - 300 / 0 - 425	0 - 40
EAC/S 7000	7.000	0 - 300 / 0 - 425	0 - 50
EAC/S 8000	8.000	0 - 300 / 0 - 425	0 - 60
EAC/S 9000	9.000	0 - 300 / 0 - 425	0 - 70
EAC/S 10000	10.000	0 - 300 / 0 - 425	0 - 80

OPTIONS

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../F1000	Extended freqency range 1 - 1.000 Hz
../F2000	Extended freqency range 1 - 2.000 Hz
../LT	Interface IEEE488
../LTRS485	Interface RS485
../LTRS232	Interface RS232
../LAN	Interface LAN
../USB	Interface USB
../ATI 5	Isolated analogue interface 0 - 5 V DC set and monitor
../ATI 10	Isolated analogue interface 0 - 10 V DC set and monitor
../EXT/OSZ	OSZ external oscillator input
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Input voltage range	230 V AC / 400 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
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Output Specification

Grid regulation	0,10 %
Load control	0,10 %
Distortion P_{max}	0,10 %
Programming accuracy AC voltage	100 mV
Programming accuracy DC voltage	100 mV
Programming accuracy $_{< 10 A}$	1 mA
Effective constant current $_{> =10 A}$	10 mA
Programming accuracy Activation phase	0,1°
Programming accuracy Frequency	0,1 Hz
Frequency standard	0 - 500 Hz
External oscillator input	0 - 10 V / 1 kHz
Resolution, Measurement, Effective voltage, DC voltage, Peak voltage	100 mV
Resolution , Measurement $_{<10 A}$ Effective current, DC current	1 mA
Peak current $_{> =10 A}$	10 mA
Resolution , Measurement $_{< 10 A}$	10 mW
Active power $_{> =10 A}$	100 mW

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Output Control & Monitoring	Front panel and/or optional Analog 0 - +5V/+10V isolated/ Digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

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EAC/3S 500	3 x 500	3 x 0 - 300 / 0 - 425	3 x 0 - 6
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EAC/3S 2000	3 x 2.000	3 x 0 - 300 / 0 - 425	3 x 0 - 15
EAC/3S 3000	3 x 3.000	3 x 0 - 300 / 0 - 425	3 x 0 - 20
EAC/3S 4000	3 x 4.000	3 x 0 - 300 / 0 - 425	3 x 0 - 30
EAC/3S 5000	3 x 5.000	3 x 0 - 300 / 0 - 425	3 x 0 - 35
EAC/3S 6000	3 x 6.000	3 x 0 - 300 / 0 - 425	3 x 0 - 40
EAC/3S 7000	3 x 7.000	3 x 0 - 300 / 0 - 425	3 x 0 - 50
EAC/3S 8000	3 x 8.000	3 x 0 - 300 / 0 - 425	3 x 0 - 60
EAC/3S 9000	3 x 9.000	3 x 0 - 300 / 0 - 425	3 x 0 - 70
EAC/3S 10000	3 x 10.000	3 x 0 - 300 / 0 - 425	3 x 0 - 80

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../F2000	Extended freqency range 1 - 2.000 Hz
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Input Frequency	47 - 63 Hz

Output Specification

Grid regulation	0,10 %
Load control	0,10 %
Distortion P_{max}	0,10 %
Programming accuracy AC voltage	100 mV
Programming accuracy DC voltage	100 mV
Programming accuracy < 10 A	1 mA
Effective constant current > =10 A	10 mA
Programming accuracy Activation phase	0,1°
Programming accuracy Frequency	0,1 Hz
Frequency standard	0 - 500 Hz
External oscillator input	0 - 10 V / 1 kHz
Resolution, Measurement, Effective voltage, DC voltage, Peak voltage	100 mV
Resolution , Measurement <10 A Effective current, DC current	1 mA
Peak current > =10 A	10 mA
Resolution , Measurement < 10 A	10 mW
Active power > =10 A	100 mW

Programming & Control

Output Control & Monitoring	Front panel and/or optional Analog 0 - +5V/+10V isolated / Digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions

Cooling	Fans
Operating temperature	0 - 50°C
Storage temperature	-20 - 70°C
Humidity	< 80 %
Operating height	< 2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	< 20 G
Weight	90 - 1200 kg

Voltage and Current Source

AC-SOURCES

EAC/MT Single-Phase 500 VA - 15.000 VA

EAC/MT Three-Phase 750 VA - 50.000 VA

19" x 4 U x 434.5 mm - 19" x 25 U x 780 mm

PRODUCT EXAMPLES

Type	Power VA	Voltage V AC	Current A
EAC/MT 2705	1.350	0 - 270	5
EAC/MT 2706	1.620	0 - 270	6
EAC/MT 2708	2.160	0 - 270	8
EAC/MT 27010	2.700	0 - 270	10
EAC/MT 27012	3.240	0 - 270	12
EAC/MT 27014	3.780	0 - 270	14
EAC/MT 27016	4.320	0 - 270	16
EAC/MT 27018	4.860	0 - 270	18
EAC/MT 27020	5.400	0 - 270	20
EAC/MT 27022	5.940	0 - 270	22
EAC/MT 27025	6.750	0 - 270	25
EAC/MT 27030	8.100	0 - 270	30
EAC/MT 27035	9.450	0 - 270	35
EAC/MT 27040	10.800	0 - 270	40
EAC/MT 27045	12.100	0 - 270	45
EAC/MT 27050	13.500	0 - 270	50

OPTIONS

Appendix	Description
../110	Input: 110 V AC (99 - 121 V AC)
../230	Input: 230 V AC (207- 253 V AC)
../400	Input: 400 V AC (360 - 440 V AC)
../3P208	Input: 3 x 208 V AC (187 - 229 V AC)
../3P400	Input: 3 x 400 V AC (360 - 440 V AC)
../3P480	Input: 3 x 480 V AC (432 - 528 V AC)
../ATE	Without display and control panel
../AI5	Analogue interface 0 - 5 V DC
../AI10	Analogue interface 0 - 10 V DC
../ATI5	Galvanically isolated analogue interface 0 - 5 V DC
../ATI10	Galvanically isolated analogue interface 0 - 10 V DC
../V300	Extended voltage range 0 - 300 V AC
../V380	Extended voltage range 0 - 380 V AC
../V500	Extended voltage range 0 - 500 V AC
../LT	IEEE 488.2 (GPIB) interface
../LTRS485	RS485 interface
../LTRS232	RS232 interface
../USB	USB interface
../H	19" handles
../10POT	Potentiometer with calibration scale

PRODUCT EXAMPLES

Type	Power VA	Voltage V AC	Current A
EAC/MT3P 2705	3 x 1.350	3 x 0 - 270	3 x 5
EAC/MT3P 2706	3 x 1.620	3 x 0 - 270	3 x 6
EAC/MT3P 2708	3 x 2.160	3 x 0 - 270	3 x 8
EAC/MT3P 27010	3 x 2.700	3 x 0 - 270	3 x 10
EAC/MT3P 27012	3 x 3.240	3 x 0 - 270	3 x 12
EAC/MT3P 27014	3 x 3.780	3 x 0 - 270	3 x 14
EAC/MT3P 27016	3 x 4.320	3 x 0 - 270	3 x 16
EAC/MT3P 27018	3 x 4.860	3 x 0 - 270	3 x 18
EAC/MT3P 27020	3 x 5.400	3 x 0 - 270	3 x 20
EAC/MT3P 27022	3 x 5.940	3 x 0 - 270	3 x 22
EAC/MT3P 27025	3 x 6.750	3 x 0 - 270	3 x 25
EAC/MT3P 27030	3 x 8.100	3 x 0 - 270	3 x 30
EAC/MT3P 27035	3 x 9.450	3 x 0 - 270	3 x 35
EAC/MT3P 27040	3 x 10.800	3 x 0 - 270	3 x 40
EAC/MT3P 27045	3 x 12.100	3 x 0 - 270	3 x 45
EAC/MT3P 27050	3 x 13.500	3 x 0 - 270	3 x 50

TECHNICAL DATA

Input Voltage Specification

Input Voltage Range	110 V AC/230 V AC/400 V AC ±10 %
Input Voltage Range	3 x 208 V AC/3 x 400 V AC/3 x 480 V AC ±10 %
Input Frequency	47 - 63 Hz

Output Specification

Isolation	3.750 V AC
Digital Display for Voltage and Current	3 ½ digits
Load Control	< 1,5 %
Time Setup	< 100 V/sek
Protective Devices	Overtemperature, Short-circuit
Display	Voltage and current

Programming & Control

Output Control and Measurement	Control Panel and/or optional Analogue 0 - +5V/+10V standard & isolated /Digital 12 bit: RS232, RS485, IEEE488, USB

Ambient Conditions

Cooling	Air-cooled
Operating Temperature	0 - 50°C
Storage Temperature	-20 - 70°C
Humidity	< 80 %
Operating Altitude	< 2.000 m
Vibration	10 - 55 Hz/1 min/2G XYZ
Shock	< 20 G
Weight	30 - 350 kg (single-phase), 90 - 850 kg (three-phase)

Load management is the process of balancing the supply of electricity on the network with the electrical load by adjusting or controlling the load rather than the power station output. This can be achieved by; direct intervention of the utility in real time, the use of frequency sensitive relays triggering circuit breakers (ripple control), with time clocks or by using special tariffs to influence consumer behaviour. Ripple control is the most common form of load control, and is used in many countries around the world.

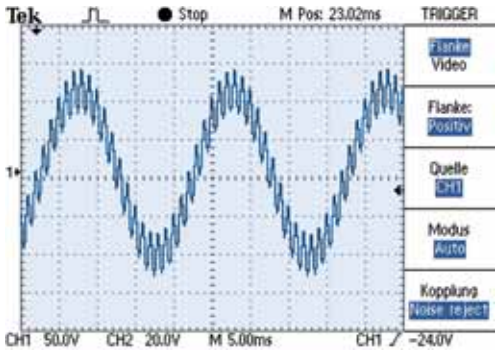
EAC-S simulated ripple control signals

The EAC-S family of AC-Sources from ET System electronic can simulate ripple control signals. Ripple control involves superimposing a higher frequency signal (usually between 100 and 1600 Hz) onto the standard 50 - 60 Hz of the mains power signal. When the receiver device attached to a non-essential residential or industrial load receives this signal, they shut down the load until the signal is disabled or another 'enabling' frequency signal is received.

The EAC-S gives the test and development engineer the capability to simulate the ripple signals used by many public grid authorities. This helps to ensure that ripple control systems in development or used in production units operate as expected.

For example the scope shot below shows an output of 230 VAC at 50 Hz from the EAC-S. A ripple of 1 kHz can be seen on top of the 50 Hz output.

Waveforms can be easily created using freely available software. They can be transferred to the AC Source via the convenient memory card slot.

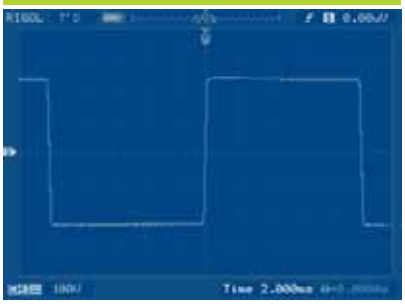


Ripple control waveforms can be implemented from an EAC-S with either a single- or three-phase output. Besides sine signals many other signal variations are possible.

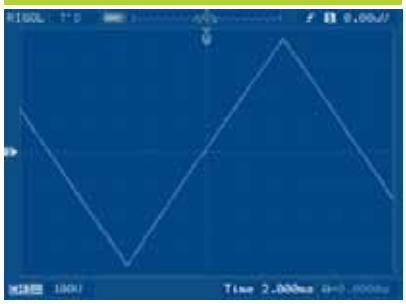
WAVEFORM

Sine

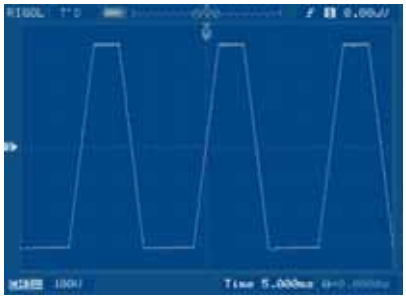
Rectangle



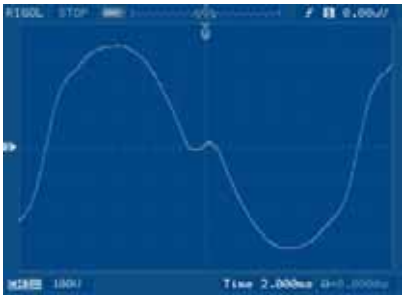
Triangle



Trapeze

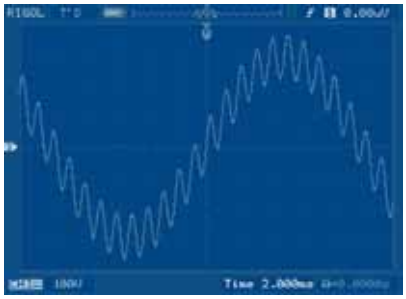


Sine THD straight

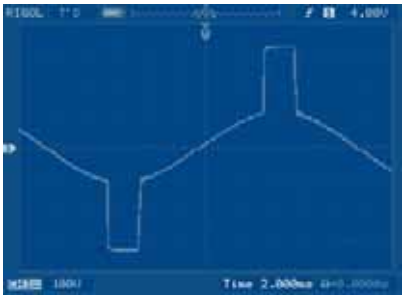


Sine THD unstraight

Ripple control

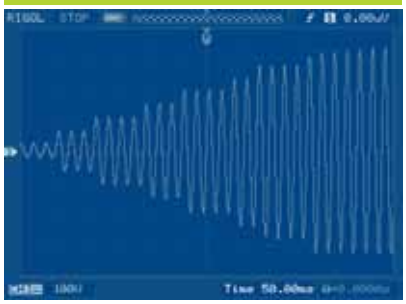


Sine Voltage flip

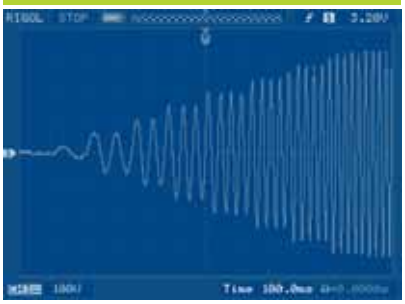


Sine Voltage drop

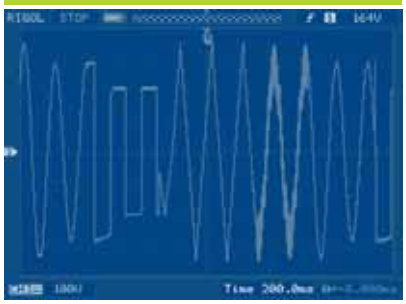
Sine Voltage rise



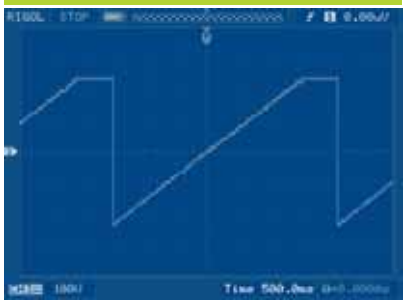
Sine Voltage and Frequency rise



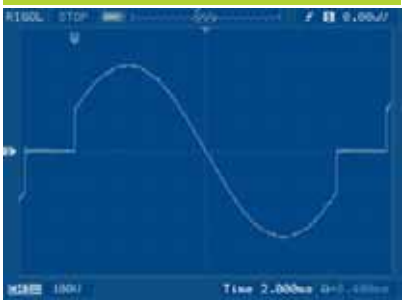
Waveform Mix



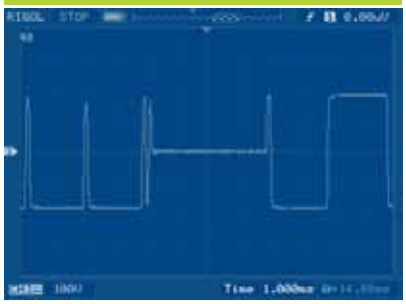
DC Voltageramp



Phasecut



Arbitrary ETS



AC Source 15 kVA - 2.000 kVA

EAC/AFC Serie

TECHNICAL DATA

- **Touch Screen**
  Easy to operate, rich colors, able to simulate change curve, suitable for non-harsh environment such as labaratory and R&D center.

- **High Efficiency**
  Power Efficiency > 90 %, energy saving and eco-friendly
  Programmable output voltage and frequency functionality
  General mode, step mode, gradual change mode

- **General mode:**
  Ten set of output voltage and output frequency

- **Step Mode:**
  up to 24 sets of output voltage and frequency are available for configuration. Each voltage, frequency and running time can be set separately.

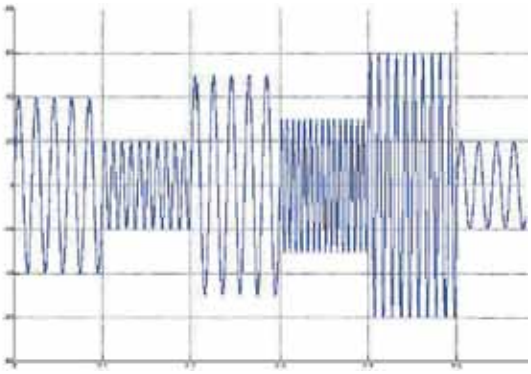
- **Gradual Change Mode:**
  up to 12 sets of output voltage and frequency are available for configuration. Each set includes starting voltage, starting frequency and ending voltage, ending frequency and running time.

APPLICATION AREAS OF AFV SERIES PRODUCTS

Electric Motor | Home Applications | Switched-mode Power Supply | Air Conditioning Compressor | Transformer Test | EMC Test | Product Life Cycle Test | Product Test an R&D

Step Mode

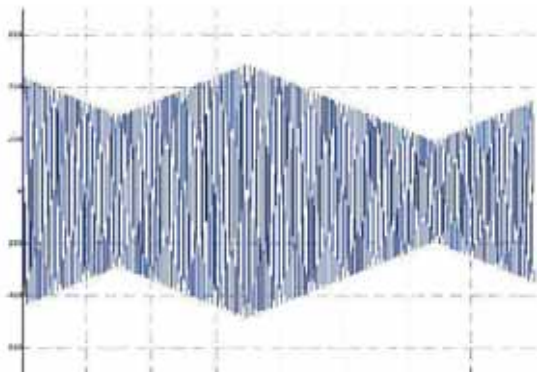
Voltage & Frequency Setting Interface at Step Change Mode



Voltage & Frequency Change Schematic Diagram

Gradual Change Mode

Voltage & Frequency Setting Interface at Gradual Change Mode



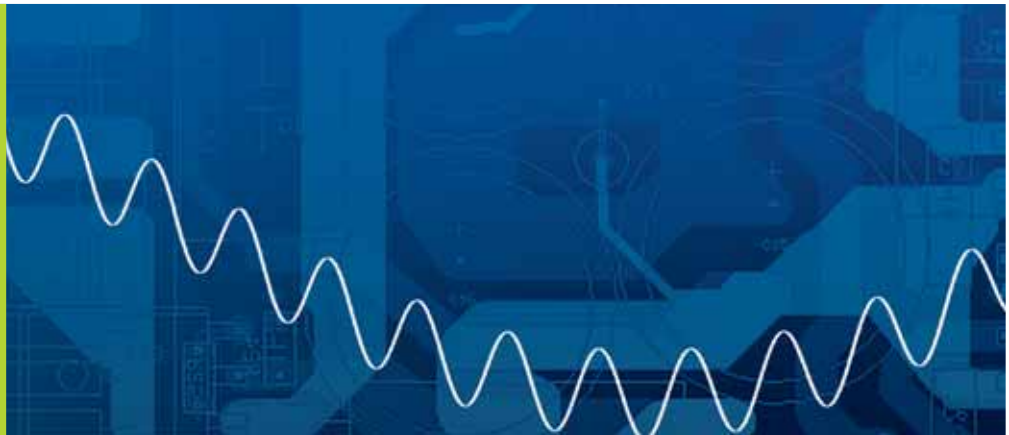
Voltage & Frequency Change Schematic Diagram

EAC/AFV Serie - 3-Phase (20 kVA - 200 kVA)

	Model			AFV-31020	AFV-31030	AFV-33015	AFV-33020	AFV-33030	AFV-33045	AFV-33060	AFV-33075	AFV-33100	AFW-33120	AFV-33150	AFV-33200
	Capacity (kVA)			20	30	15	20	30	45	60	75	100	120	150	200
	Circuit Type			IGBT / PWM Type											
Input	Phase			Three Phase											
Input	Voltage			220 V / 380 V											
Input	Frequency range			47 - 63 Hz											
Input	Voltage range			220 V / 380 V ± 15 %											
Input	Power factor			0.9											
Input	Max. current (A) (With full load)			37.4	56.1	28.1	37.4	56.1	84.2	112.2	140.3	187.1	224.5	280.6	374.1
Output	Phase			Single Phase		Three Phase									
Output	Wave			SINE Wave											
Output	Frequency regulation			≤ 0.01 %											
Output	GENERAL mode	Frequency		45 - 65 Hz. Optional 45 - 500 Hz. Res.: 0.1 Hz Accuracy: 0.01 %											
Output	GENERAL mode	Voltage	Low (V)	0 V - 150.0 V (L - N)											
Output	GENERAL mode	Voltage	High (V)	150.1 V - 300.0 V (L - N)											
Output	GENERAL mode	Max. current (A)	High (A)	83.3	125.0	20.8	27.8	41.7	62.5	83.3	104.2	138.9	166.7	208.3	277.8
Output	GENERAL mode	Max. current (A)	Low (A)	166.7	250.0	41.7	55.6	83.3	125.0	166.7	208.3	277.8	333.3	416.7	555.6
Output	GENERAL mode	Time Interval		Res.: standard 1 sec. and 0.02 sec- optional. Up to 99 Hr.											
Output	GENERAL mode	Number of settings		For selected voltage an frequency values up to 10 sets											
Output	GENERAL mode	Cycles		Up to 255.											
Output	STEP + GRADUAL CHANGE modes	Frequency		45 - 65 Hz. Optional 45 - 500 Hz. Res.: 0.1 Hz. Accuracy: 0.01 %											
Output	STEP + GRADUAL CHANGE modes	Voltage		10 to 300 V. Res.: 0.1 V. Accuracy: 1 %											
Output	STEP + GRADUAL CHANGE modes	Max. current (A)		Please refer to the above rows of Max. current (A)											
Output	STEP + GRADUAL CHANGE modes	Time Interval		Res.: standard 1 sec. and 0.02 sec- optional. Up to 99 Hr.											
Output	STEP + GRADUAL CHANGE modes	Number of settings		For selected voltage, frequency, and time values: Up to 24 sets under STEPPING mode, or 12 sets under GRADUAL CHANGE mode.											
Output	STEP + GRADUAL CHANGE modes	Cycles		Up to 255 cycles for each mode											
Output	3-Phase independent voltage control (Optional)			Not applicable		Each phase voltage could be set (to different values) independently.									
System	Line regulation			1 %											
System	Load regulation			± 1 % (linear load)											
System	THD			≤ 2 % (linear load)											
System	Efficiency			≥ 90 %											
System	Response time			≤ 2 ms											
System	Crest Factor			3 : 1											
System	Protection			Input no-fuse breaker, electronic circuit instant trip for over / low voltage, over current, over load, over temperature and short circuit protection and alarm system											
Display / Control	Front panel interface			Touch screen											
Display / Control	Frequency			Res.: 0.1 Hz. Accuracy: 0.5 % FS+4Counts.											
Display / Control	Voltage			Res.: 0.1 V. Accuracy: 0.5 % FS+4Counts.											
Display / Control	Current			Res.: 0.1 A. Accuracy: 0.5 % FS+4Counts.											
Display / Control	Remote	Ports		RS485 (D-Sub 9 - pin female). Optional RS232 or GPIB (Only one of the three exits)											
Display / Control	Remote	LabView driver		Support windows XP and versions afterward											
Display / Control	USB Port			For downloading log.											
Safety	Insulation resistance			10M ohm (Tested with DC 500 V)											
Safety	Insulation withstand voltage			Tested with AC 1,800 V 10 mA for 1 min											
Environment	Cooling system			Fan Cooling											
Environment	Temperature (Operating)			0° C - 45° C											
Environment	Humidity (Operating)			0 - 90 % (Non-condensing)											
Environment	Altitude (Operating)			1500 m											
	Dimensions (W*D*H) mm			600*800*1200		650*920*1248		700*800*1620				940*820*1700		1100*940*1850	
	Weight (kg)			300	350	400	420	425	435	490	525	716	777	1300	1400

EAC/AFV Serie - 3-Phase (300 kVA - 2.000 kVA)

	Model			AFV-33300	AFV-33400	AFV-33500	AFV-33600	AFV-33800	AFV-331000	AFV-331200	AFV-331500	AFV-332000
	Capacity (kVA)			300	400	500	600	800	1000	1200	1500	2000
	Circuit Type			IGBT / PWM Type								
Input	Phase			Three Phase								
Input	Voltage			220 V / 380 V								
Input	Frequency range			47 - 63 Hz								
Input	Voltage range			220 V / 380 V ± 15 %								
Input	Power factor			0.9		0.85						
Input	Max. current (A) (With full load)			561.2	748.2	990.3	1188.4	1584.5	1980.6	2376.7	2970.9	3961.2
Output	Phase			Three Phase								
Output	Wave			SINE Wave								
Output	Frequency regulation			≤ 0.01 %								
Output	GENERAL mode	Frequency		45 - 65 Hz. Optional 45 - 500 Hz. Res.: 0.1 Hz Accuracy: 0.01 %								
Output	GENERAL mode	Voltage	Low (V)	0 V - 150.0 V (L - N)								
Output	GENERAL mode	Voltage	High (V)	150.1 V - 300.0 V (L - N)								
Output	GENERAL mode	Max. current (A)	High (A)	416.7	555.6	694.4	833.3	1111.1	1388.9	166.7	2083.3	2777.8
Output	GENERAL mode	Max. current (A)	Low (A)	833.3	1111.1	1388.9	1666.7	2222.2	2777.8	3333.3	4166.7	5555.6
Output	GENERAL mode	Time Interval		Res.: standard 1 sec. and 0.02 sec- optional. Up to 99 Hr.								
Output	GENERAL mode	Number of settings		For selected voltage an frequency values up to 10 sets								
Output	GENERAL mode	Cycles		Up to 255.								
Output	STEP + GRADUAL CHANGE modes	Frequency		45 - 65 Hz. Optional 45 - 500 Hz. Res.: 0.1 Hz. Accuracy: 0.01 %								
Output	STEP + GRADUAL CHANGE modes	Voltage		10 to 300 V. Res.: 0.1 V. Accuracy: 1 %								
Output	STEP + GRADUAL CHANGE modes	Max. current (A)		Please refer to the above rows of Max. current (A)								
Output	STEP + GRADUAL CHANGE modes	Time Interval		Res.: standard 1 sec. and 0.02 sec- optional. Up to 99 Hr.								
Output	STEP + GRADUAL CHANGE modes	Number of settings		For selected voltage, frequency, and time values: Up to 24 sets under STEPPING mode, or 12 sets under GRADUAL CHANGE mode.								
Output	STEP + GRADUAL CHANGE modes	Cycles		Up to 255 cycles for each mode.								
Output	3-Phase independent voltage control (Optional)			Each phase voltage could be set (to different values) independently.								
System	Line regulation			< 1 %								
System	Load regulation			± 1 % (linear load)								
System	THD			≤ 2 % (linear load)								
System	Efficiency			≥ 90 %								
System	Response time			≤ 2 ms								
System	Crest Factor			3 : 1								
System	Protection			Input no-fuse breaker, electronic circuit instant trip for over / low voltage, over current, over load, over temperature and short circuit protection and alarm system								
Display / Control	Front panel interface			Touch screen								
Display / Control	Frequency			Res.: 0.1 Hz. Accuracy: 0.5 % FS+4Counts.								
Display / Control	Voltage			Res.: 0.1 V. Accuracy: 0.5 % FS+4Counts.								
Display / Control	Current			Res.: 0.1 A. Accuracy: 0.5 % FS+4Counts.								
Display / Control	Remote	Ports		RS485 (D-Sub 9 - pin female). Optional RS232 or GPIB (Only one of the three exits)								
Display / Control	Remote	LabView driver		Support windows XP and versions afterward								
Display / Control	USB Port			For downloading log.								
Safety	Insulation resistance			10M ohm (Tested with DC 500 V)								
Safety	Insulation withstand voltage			Tested with AC 1,800 V 10 mA for 1 min								
Environment	Cooling system			Fan Cooling								
Environment	Temperature (Operating)			0° C - 45° C								
Environment	Humidity (Operating)			0 - 90 % (Non-condensing)								
Environment	Altitude (Operating)			1500 m								
	Dimensions (W*D*H) mm			1400*1040*2000		4900*1400*2050		6300*1500*2050			/	/
	Weight (kg)			2200	2500	4500	5200	7000	8500	9200	/	/



AFV SERIES PRODUCT FEATURES

- **Multiple communication ports to choose**

  Standard RS485

  Optional RS232 or GPIB

  Support SCPI or LabView and optional MODBUS

- **Enhanced troubleshooting function**

  Fault code is shown in the screen in the event of fault; to enable quick troubleshooting and reduce downtime and therefore enhance uptime.

  Faultcode and message in the AFV unit can be replicated into USB memory stick available on models with touch screen for further survey.

- **Back-feed protection**

  When back-feeding occurs, over voltage is detected and then output is switched off immediately to protect load equipment and maintain safety.

- **Adjustable power limit**

  Within maximum power, output power is adjustable. It is both flexible and safe.

- **Independently adjustable three-phase output (optional)**

  Three-phase outputvaltage is independently adjustable.

  Work as one unit of three-phase power source or as three units of single-phase power source.

- **Eco-friendly and high-efficiency design**

  Power module technology: used to make size smaller and power density higher

  SMD technology: used to enhance the reliability of the AFV unit

  High-efficiency IGBT: low EMI and high inverter efficiency

  Lightning protection module: prevent a lightning storm from damaging the input/output circuitry and the AFV unit and load equipment

  Variable-speed fans: low noise, low maintenance and high energy efficiency

Home Electrical Appliances Manufacturers

- Air Conditioner
- Washing Machine
- Blender
- Microwave Oven
- Refrigerator
- Vacuum Cleaner
- Electric Shaver

Microwave oven

Air conditioner

Electric & Electronic Manufactures

- Switching Power Supply
- Transformer
- AC Fan
- Uninterruptible Power Supply
- Charger, Relay
- Compressor
- Passive Components
- Motor
- Grid simulation for inverters

Switching Power Supply

Compressor for Air Conditioner

IT Field

- OA Equipment
- Computer
- Monitor
- Fax Machine
- Photocopier
- Shredder
- Printer
- Scanner
- Peripherals

Motor

Transformer

General Lab

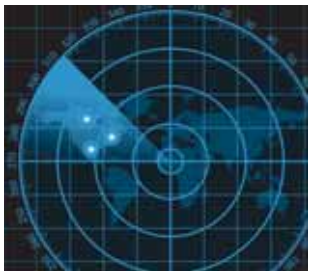
- AC Power Source Testing Life & Safety Test
- EMC Test
- Produkttest
- Product R & D

Product R & D

Ship

Others

- Airport Grounding Facilities
- Avionics Equipment
- Air Force System Diagnostics
- Military System Diagnostics
- Marine System
- Satellite Navigator
- 400 Hz Equipment & Instruments



Navigation

Airport Grounding Facilities

DC-Sources

HIGH-PERFORMANCE DC VOLTAGE SOURCES: THE LAB/XX SERIES

DC-Sources of the LAB series have been designed to meet the standards of industrial applications and proved highly effective wherever high performance in the smallest space is required: in laboratories and test fields, in the testing of power electronic components, circuit breakers or solar inverters, in the development of inverters, as substitution for accumulators and generally all tasks in the field of industrial and electronic manufacturing in which high currents are required.

MANY DIFFERENT OPERATION MODES FOR PROFESSIONAL APPLICATIONS

The series professional customization is reflected not least in the field-tested operation modes which facilitate the work for its user. While in U/I mode, settings for voltage and current are directly transmitted to the switching regulators without digital control, the UIP mode (U/I mode with adjustable limitation) allows the definition of maximum limits for voltage, current and power. When the maximum output voltage is reached, the unit automatically regulates the voltage. Whereas when in UIR mode, the unit keeps its internal resistance at the adjusted value. This feature is particularly interesting for inverter tests or for testing of loads with high starting currents.

With its solar cell simulation mode PVsim, the units additionally offer the ability to simulate the current and voltage curve of a solar cell. Thereby, open circuit voltage, short circuit current and Uo Ik are given. By this, the behavior of solar modules can be exactly simulated a feature, which is essential for testing photovoltaic components such as inverters or battery controllers. Additionally, the Maximum Power Point (MPP) for each UI curve is displayed (see page 28).

For user-defined applications, the LAB series offers a script mode. In this mode, the unit is controlled by a script, which can be saved to a MMC or SD memory card. The units recognize 18 different commands and processes scripts with up to 100 commands. Therewith, e. g. special startup curves for 12/24/42 DC (as used in test applications of the automotive segment) can be easily generated and afterwards called up at the touch of a button.
For test documentation or subsequent evaluation, the unit offers a datalog function to save all parameters in adjustable intervals on a memory card. In combination with a suitable script control, this function allows the setup of a stand-alone test station.

EVEN MORE INTERFACES

DC voltage sources of the LAB series come equipped with various interfaces. They allow full control of the unit and provide complete connection options. Besides GPIB bus, RS232, RS485, LAN and USB interfaces, a CAN and WLAN interface are available if required. The analog interface is galvanically isolated, self-calibrating and available as 5 V or 10 V version.

COMPACT DESIGN AND HIGH EFFICIENCY

The LAB/HP is short-circuit-proof and comes with voltage and current limit function. They enable the user to limit the maximum adjustable voltage and current range to protect the connected components from inadvertent overheating. Further, the unit is equipped with over voltage protection, a function that immediately disables the unit when exceeding an adjusted limit value. In addition to the current setup and measurement values, the graphical monochrome display shows the corresponding output characteristic. Another feature which normally cannot be found in this price category is the display of the current operating point on the output characteristic, which helps the user to see the condition of the tested device. Despite their high power, these units have very compact cases with integrated performance-controlled ventilation system. The interfaces, power outputs and power inlets are located on the rear panel of the unit. Power supply can be provided by a three-phase AC current with worldwide standard power voltages (3 x 208 V, 3 x 400 V 3 x 440 V or 3 x 480 V). Efficiency is between 85 % and 94 % depending on the unit version. These units effectively convert energy, produce less waste heat and minimize not only energy consumption but also subsequent expenses for cooling and ventilation.
In order to facilitate the performance of tests, ET System offers a free browser-based user interface for the LAN interface which helps the user to create testing procedures or to save test results.

DC-Sources 750 W - 250.000 W

LAB/SMP/E LAB/SMS/E LAB/HP/E

ECONOMY LINE

OVERVIEW

- Efficiency up to 94 %
- Compact design
- Active parallel and serial connectable
- Easiest operation via front panel
- Constant current, voltage
- Digital interfaces IEEE 488, RS485, USB and LAN (optional)
- Standard integrated ATI 5/10 galvanically isolated analogue interface: 0 - 5 V or 0 - 10 V (user selectable) and RS232
- 7-segment display
- Special version on request
- U_{max} and I_{max} randomly selectable to limit maximum output voltage and current

19“ x 1 U x 440 mm

Picture shows a 2,4 kW Version

PRODUCT EXAMPLES

Type	Power W	Voltage V	Current A
LAB/SMP/E 715	750	0 – 15	0 – 50
LAB/SMP/E 735	750	0 – 35	0 – 22
LAB/SMP/E 745	750	0 – 45	0 – 17
LAB/SMP/E 770	750	0 – 70	0 – 11
LAB/SMP/E 7150	750	0 – 150	0 – 5
LAB/SMP/E 7300	750	0 – 300	0 – 2,5
LAB/SMP/E 7600	750	0 – 600	0 – 1,2
LAB/SMP/E 71200	750	0 – 1200	0 – 0,6
LAB/SMP/E 115	1.200	0 – 15	0 – 80
LAB/SMP/E 135	1.200	0 – 35	0 – 35
LAB/SMP/E 145	1.200	0 – 45	0 – 30
LAB/SMP/E 170	1.200	0 – 70	0 – 20
LAB/SMP/E 1150	1.200	0 – 150	0 – 8
LAB/SMP/E 1300	1.200	0 – 300	0 – 4
LAB/SMP/E 1600	1.200	0 – 600	0 – 2
LAB/SMP/E 11200	1.200	0 – 1200	0 – 1
LAB/SMP/E 215	2.400	0 – 15	0 – 160
LAB/SMP/E 235	2.400	0 – 35	0 – 68
LAB/SMP/E 245	2.400	0 – 45	0 – 53
LAB/SMP/E 270	2.400	0 – 70	0 – 34
LAB/SMP/E 2150	2.400	0 – 150	0 – 16
LAB/SMP/E 2300	2.400	0 – 300	0 – 8
LAB/SMP/E 2600	2.400	0 – 600	0 – 4
LAB/SMP/E 21200	2.400	0 – 1200	0 – 2

OPTIONS

Appendix	Description
../230	230 / 207 - 253 VAC Input
../3P208	3 x 208 / 187 - 229 VAC Input
../3P400	3 x 400 / 360 - 440 VAC Input
../3P440	3 x 440 / 396 - 484 VAC Input
../3P480	3 x 480 / 432 - 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LTRS232	RS232 Interface
../LAN	LAN Interface
../USB	USB Interface

TECHNICAL DATAS

Input Voltage Specification

Input voltage range	1,2 kW 90 - 264 V AC / PFC | 2,4 kW 230 V AC +/-10 % / PFC
Input frequency	47 - 63 Hz

EMC ans Safety Standards

Safety standard	EN 60950
Emission	EN 61000-6-4:2007
Immunity	EN 61000-6-2:2005
Measurement, control- and laboratory equipment	EN 61010-1:2006

Output Specifications

Static Voltage Regulation	+/-0.05 % + 2 mV
Static Current Regulation	+/-0.1 % + 2 mA
Dynamic Load Regulation	< 2 ms (typ.)
Ripple	< 0.2 % (typ.)
Stability	+/-0.05 %
Programming Accuracy (Vout)	+/-0.05 % +2 mV
Isolation	3.000 V
Over Voltage Protection	0 - 120 % V_{max}
Cuircuit Protection	OC / OV / OT / OP
Line Regulation	< +/-0.1 % + 2 mV
Static Load Regulation	< +/-0.1 % + 2 mV

Programming & Controls

Output Control and Monitoring	Front panel and/or optional Analog 0 - +5V/+10V isolated / Digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions

Cooling	Fans
Operating temperature	0 - 50°C
Storage temperature	-20 - 70°C
Humidity	< 80 %
Operating height	< 2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	< 20 G
Weight	1,2 kW 7 kg | 2,4 kW 7,6 kg

DC-SOURCES LAB/SMS/E 3.000 W - 90.000 W

19” x 2 U x 440 - 600 mm

PRODUCT EXAMPLES

Type	Power W	Voltage V DC	Current A
LAB/SMS/E 315	3.000	0 - 15	0 - 200
LAB/SMS/E 335	3.000	0 - 35	0 - 90
LAB/SMS/E 345	3.000	0 - 45	0 - 70
LAB/SMS/E 370	3.000	0 - 70	0 - 45
LAB/SMS/E 3150	3.000	0 - 150	0 - 20
LAB/SMS/E 3300	3.000	0 - 300	0 - 10
LAB/SMS/E 3600	3.000	0 - 600	0 - 5
LAB/SMS/E 31000	3.000	0 - 1.000	0 - 3
LAB/SMS/E 31200	3.000	0 - 1.200	0 - 2,6
LAB/SMS/E 420	4.000	0 - 20	0 - 200
LAB/SMS/E 435	4.000	0 - 35	0 - 115
LAB/SMS/E 445	4.000	0 - 45	0 - 90
LAB/SMS/E 470	4.000	0 - 70	0 - 60
LAB/SMS/E 4150	4.000	0 - 150	0 - 30
LAB/SMS/E 4300	4.000	0 - 300	0 - 15
LAB/SMS/E 4600	4.000	0 - 600	0 - 7
LAB/SMS/E 41000	4.000	0 - 1.000	0 - 4
LAB/SMS/E 41200	4.000	0 - 1.200	0 - 3,4
LAB/SMS/E 525	5.000	0 - 25	0 - 200
LAB/SMS/E 535	5.000	0 - 35	0 - 150
LAB/SMS/E 545	5.000	0 - 45	0 - 120
LAB/SMS/E 570	5.000	0 - 70	0 - 75
LAB/SMS/E 5150	5.000	0 - 150	0 - 35
LAB/SMS/E 5300	5.000	0 - 300	0 - 17
LAB/SMS/E 5600	5.000	0 - 600	0 - 8,5
LAB/SMS/E 51000	5.000	0 - 1.000	0 - 5
LAB/SMS/E 51200	5.000	0 - 1.200	0 - 4,2
LAB/SMS/E 615	6.000	0 - 15	0 - 400
LAB/SMS/E 620	6.000	0 - 20	0 - 300
LAB/SMS/E 635	6.000	0 - 35	0 - 175
LAB/SMS/E 645	6.000	0 - 45	0 - 140
LAB/SMS/E 670	6.000	0 - 70	0 - 90
LAB/SMS/E 6150	6.000	0 - 150	0 - 40
LAB/SMS/E 6300	6.000	0 - 300	0 - 20
LAB/SMS/E 6600	6.000	0 - 600	0 - 10
LAB/SMS/E 61000	6.000	0 - 1.000	0 - 6
LAB/SMS/E 61200	6.000	0 - 1.200	0 - 5
LAB/SMS/E 820	8.000	0 - 20	0 - 440
LAB/SMS/E 825	8.000	0 - 25	0 - 320
LAB/SMS/E 835	8.000	0 - 35	0 - 230
LAB/SMS/E 845	8.000	0 - 45	0 - 180
LAB/SMS/E 870	8.000	0 - 70	0 - 115
LAB/SMS/E 8150	8.000	0 - 150	0 - 55
LAB/SMS/E 8300	8.000	0 - 300	0 - 30
LAB/SMS/E 8600	8.000	0 - 600	0 - 15
LAB/SMS/E 81000	8.000	0 - 1.000	0 - 8
LAB/SMS/E 81200	8.000	0 - 1.200	0 - 6,7
LAB/SMS/E 1020	10.000	0 - 20	0 - 500
LAB/SMS/E 1035	10.000	0 - 35	0 - 350
LAB/SMS/E 1045	10.000	0 - 45	0 - 250
LAB/SMS/E 1070	10.000	0 - 70	0 - 175
LAB/SMS/E 10150	10.000	0 - 150	0 - 75
LAB/SMS/E 10300	10.000	0 - 300	0 - 40
LAB/SMS/E 10600	10.000	0 - 600	0 - 17
LAB/SMS/E 101000	10.000	0 - 1.000	0 - 10
LAB/SMS/E 101200	10.000	0 - 1.200	0 - 8,4

OPTIONS

Appendix	Description
../230	230 / 207 - 253 VAC Input
../3P208	3 x 208 / 187 - 229 VAC Input
../3P400	3 x 400 / 360 - 440 VAC Input
../3P440	3 x 440 / 396 - 484 VAC Input
../3P480	3 x 480 / 432 - 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LTRS232	RS232 Interface
../LAN	LAN Interface
../USB	USB Interface

TECHNICAL DATA

Input Voltage Specification

Input Voltage Range	230 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
Input Frequency	47 - 63 Hz

EMC and Safety Standards

Safety Standard	EN 60950
Emitted Interference	EN 61000-6-4:2007
Interference Immunity	EN 61000-6-2:2005
Measurement, Control and Laboratory Equipment	EN 61010-1:2006

Output Specification

Voltage Regulation	±0.05 % + 2 mV
Current Regulation	±0.1 % + 2 mA
Response Time	< 2 ms (typ.)
Ripple	< 0.2 % (typ.)
Stability	±0.05 %
Voltage Programming Accuracy	±0.05 % +2 mV
Isolation	3.000 V
Overvoltage Protection	0 - 120 % V_{max}
Protective Devices	OC / OV / OT / OP
Line Regulation	<±0.1 % + 2 mV
Load Regulation	<±0.1 % + 2 mV

Programming & Control

Output Control and Measurement	Control panel and / or optionally: Isolated analogue interface 0 to +5 V / +10 V Digital (12 bit) Interfaces: RS232, RS485, IEEE488.2 (GPIB), LAN, USB, SD card

Ambient Conditions

Cooling	Forced air
Operating Temperature	0 to +50 °C
Storage Temperature	-20 to +70 °C
Humidity	<80 %
Operating Altitude	<2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	<20 G
Weight	3 - 5 kW = 18 kg, 6 - 10 kW = 25 kg

DC-SOURCES LAB/HP/E 5.000 W - 250.000 W

19“ x 3 U x 620 mm

PRODUCT EXAMPLES

Type	Power W	Voltage V DC	Current A
LAB/HP/E 520	5.000	0 - 20	0 - 250
LAB/HP/E 540	5.000	0 - 40	0 - 125
LAB/HP/E 580	5.000	0 - 80	0 - 65
LAB/HP/E 5100	5.000	0 - 100	0 - 50
LAB/HP/E 5150	5.000	0 - 150	0 - 35
LAB/HP/E 5300	5.000	0 - 300	0 - 17
LAB/HP/E 5600	5.000	0 - 600	0 - 8,5
LAB/HP/E 51000	5.000	0 - 1.000	0 - 5
LAB/HP/E 51200	5.000	0 - 1.200	0 - 4
LAB/HP/E 1020	10.000	0 - 20	0 - 500
LAB/HP/E 1040	10.000	0 - 40	0 - 250
LAB/HP/E 1080	10.000	0 - 80	0 - 130
LAB/HP/E 10100	10.000	0 - 100	0 - 100
LAB/HP/E 10150	10.000	0 - 150	0 - 70
LAB/HP/E 10300	10.000	0 - 300	0 - 34
LAB/HP/E 10600	10.000	0 - 600	0 - 17
LAB/HP/E 101000	10.000	0 - 1.000	0 - 10
LAB/HP/E 101200	10.000	0 - 1.200	0 - 8
LAB/HP/E 1520	15.000	0 - 20	0 - 750
LAB/HP/E 1540	15.000	0 - 40	0 - 375
LAB/HP/E 1580	15.000	0 - 80	0 - 195
LAB/HP/E 15100	15.000	0 - 100	0 - 150
LAB/HP/E 15150	15.000	0 - 150	0 - 100
LAB/HP/E 15300	15.000	0 - 300	0 - 50
LAB/HP/E 15600	15.000	0 - 600	0 - 25
LAB/HP/E 151000	15.000	0 - 1.000	0 - 15
LAB/HP/E 151200	15.000	0 - 1.200	0 - 12

OPTIONS

Appendix	Description
../230	230 / 207 - 253 VAC Input
../3P208	3 x 208 / 187 - 229 VAC Input
../3P400	3 x 400 / 360 - 440 VAC Input
../3P440	3 x 440 / 396 - 484 VAC Input
../3P480	3 x 480 / 432 - 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LTRS232	RS232 Interface
../LAN	LAN Interface
../USB	USB Interface

TECHNICAL DATA

Input Voltage Specification

Input Voltage Range	230 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
Input Frequency	47 - 63 Hz

EMC and Safety Standards

Safety Standard	EN 60950
Emitted Interference	EN 61000-6-4:2007
Interference Immunity	EN 61000-6-2:2005
Measurement, Control and Laboratory Equipment	EN 61010-1:2006

Output Specification

Voltage Regulation	±0.05 % + 2 mV
Current Regulation	±0.1 % + 2 mA
Control Time	< 2 ms (typ.)
Ripple	< 0.2 % (typ.)
Stability	±0.05 %
Voltage Programming Accuracy	±0.05 % +2 mV
Isolation	3000 V
Overvoltage Protection	0 - 120 % V_{max}
Protective Devices	OC / OV / OT / OP
Line Regulation	<±0.1 % + 2 mV
Load Regulation	<±0.1 % + 2 mV

Programming & Control

Output Control and Measurement	Control panel and / or optional analogue 0 to +5 V / +10 V isolated / digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions

Cooling	Forced air
Operating Temperature	0 to +50 °C
Storage Temperature	-20 to +70 °C
Humidity	<80 %
Operating Altitude	<2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	<20 G
Weight	5 kW = 19 kg, 10 kW = 26 kg, 15 kW = 33 kg

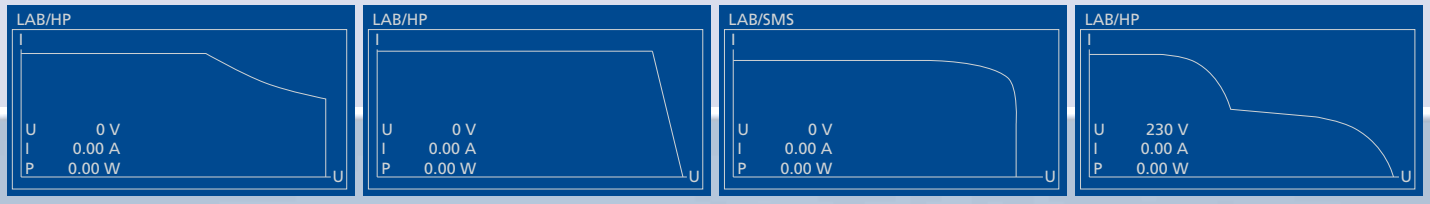
DC-Sources 750 W - 250.000 W

LAB/SMP LAB/SMS LAB/HP

PROFESSIONAL LINE

OVERVIEW

- Efficiency up to 94 %
- Active parallel and serial connectable
- Easiest operation via front panel
- Constant current, voltage, resistance and power operation
- Randomly programmable memory locations for U/I waves
- UI, UIP, UIR Mode, Simulation of PV-Arrays
- Script Control: process programming and booting from memory card
- Creating user defined output characteristics via memory card or digital interface
- Digital interfaces IEEE 488, RS485, USB and LAN (optional)
- Standard integrated ATI 5/10 galvanically isolated analogue interface 0 - 5 V or 0 - 10 V (user selectable) and RS232, Master/Slave, Soft Interlock
- Compact design
- Storable U/I wave forms (e.g. for PV simulation and sequential control)
- Graphical display
- Special version on request
- Datalog function: operation values can be saved in an adjustable interval to a memory card
- Script operation in combination with Datalog function allows an independent stand-alone test field setup
- U_{max} and I_{max} randomly selectable to limit maximum output voltage and current



19“ x 1 U x 440 mm

Picture shows a 2,4 kW Version

PRODUCT EXAMPLES

Type	Power W	Voltage V	Current A
LAB/SMP 715	750	0 – 15	0 – 50
LAB/SMP 735	750	0 – 35	0 – 22
LAB/SMP 745	750	0 – 45	0 – 17
LAB/SMP 770	750	0 – 70	0 – 11
LAB/SMP 7150	750	0 – 150	0 – 5
LAB/SMP 7300	750	0 – 300	0 – 2,5
LAB/SMP 7600	750	0 – 600	0 – 1,2
LAB/SMP 71200	750	0 – 1200	0 – 0,6
LAB/SMP 115	1.200	0 – 15	0 – 80
LAB/SMP 135	1.200	0 – 35	0 – 35
LAB/SMP 145	1.200	0 – 45	0 – 30
LAB/SMP 170	1.200	0 – 70	0 – 20
LAB/SMP 1150	1.200	0 – 150	0 – 8
LAB/SMP 1300	1.200	0 – 300	0 – 4
LAB/SMP 1600	1.200	0 – 600	0 – 2
LAB/SMP 11200	1.200	0 – 1200	0 – 1
LAB/SMP 215	2.400	0 – 15	0 – 160
LAB/SMP 235	2.400	0 – 35	0 – 68
LAB/SMP 245	2.400	0 – 45	0 – 53
LAB/SMP 270	2.400	0 – 70	0 – 34
LAB/SMP 2150	2.400	0 – 150	0 – 16
LAB/SMP 2300	2.400	0 – 300	0 – 8
LAB/SMP 2600	2.400	0 – 600	0 – 4
LAB/SMP 21200	2.400	0 – 1200	0 – 2

OPTIONS

Appendix	Description
../230	230 / 207 - 253 VAC Input
../3P208	3 x 208 / 187 - 229 VAC Input
../3P400	3 x 400 / 360 - 440 VAC Input
../3P440	3 x 440 / 396 - 484 VAC Input
../3P480	3 x 480 / 432 - 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LAN	LAN Interface
../USB	USB Interface
../KFZ12	Preselected Start-up Curve 12 V
../KFZ24	Preselected Start-up Curve 24 V
../OPT	Predefined Output characteristic
../SD	SD Card Slot

TECHNICAL DATAS

Input Voltage Specification

Input voltage range	1,2 kW 90 - 264 V AC / PFC | 2,4 kW 230 V AC +/-10 % / PFC
Input frequency	47 - 63 Hz

EMC ans Safety Standards

Safety standard	EN 60950
Emission	EN 61000-6-4:2007
Immunity	EN 61000-6-2:2005
Measurement, control- and laboratory equipment	EN 61010-1:2006

Output Specifications

Static Voltage Regulation	+/-0.05 % + 2 mV
Static Current Regulation	+/-0.1 % + 2 mA
Dynamic Load Regulation	< 2 ms (typ.)
Ripple	< 0.2 % (typ.)
Stability	+/-0.05 %
Programming Accuracy (Vout)	+/-0.05 % +2 mV
Isolation	3.000 V
Over Voltage Protection	0 - 120 % V_{max}
Cuircuit Protection	OC / OV / OT / OP
Line Regulation	< +/-0.1 % + 2 mV
Static Load Regulation	< +/-0.1 % + 2 mV

Programming & Controls

Output Control and Monitoring	Front panel and/or optional Analog 0 - +5V/+10V isolated / Digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions

Cooling	Fans
Operating temperature	0 - 50°C
Storage temperature	-20 - 70°C
Humidity	< 80 %
Operating height	< 2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	< 20 G
Weight	1,2 kW 7 kg | 2,4 kW 7,6 kg

DC-SOURCES LAB/SMS 3.000 W - 90.000 W

19” x 2 U x 440 - 600 mm

PRODUCT EXAMPLES

Type	Power W	Voltage V DC	Current A
LAB/SMS 315	3.000	0 - 15	0 - 200
LAB/SMS 335	3.000	0 - 35	0 - 90
LAB/SMS 345	3.000	0 - 45	0 - 70
LAB/SMS 370	3.000	0 - 70	0 - 45
LAB/SMS 3150	3.000	0 - 150	0 - 20
LAB/SMS 3300	3.000	0 - 300	0 - 10
LAB/SMS 3600	3.000	0 - 600	0 - 5
LAB/SMS 31000	3.000	0 - 1.000	0 - 3
LAB/SMS 31200	3.000	0 - 1.200	0 - 2,6
LAB/SMS 420	4.000	0 - 20	0 - 200
LAB/SMS 435	4.000	0 - 35	0 - 115
LAB/SMS 445	4.000	0 - 45	0 - 90
LAB/SMS 470	4.000	0 - 70	0 - 60
LAB/SMS 4150	4.000	0 - 150	0 - 30
LAB/SMS 4300	4.000	0 - 300	0 - 15
LAB/SMS 4600	4.000	0 - 600	0 - 7
LAB/SMS 41000	4.000	0 - 1.000	0 - 4
LAB/SMS 41200	4.000	0 - 1.200	0 - 3,4
LAB/SMS 525	5.000	0 - 25	0 - 200
LAB/SMS 535	5.000	0 - 35	0 - 150
LAB/SMS 545	5.000	0 - 45	0 - 120
LAB/SMS 570	5.000	0 - 70	0 - 75
LAB/SMS 5150	5.000	0 - 150	0 - 35
LAB/SMS 5300	5.000	0 - 300	0 - 17
LAB/SMS 5600	5.000	0 - 600	0 - 8,5
LAB/SMS 51000	5.000	0 - 1.000	0 - 5
LAB/SMS 51200	5.000	0 - 1.200	0 - 4,2
LAB/SMS 615	6.000	0 - 15	0 - 400
LAB/SMS 620	6.000	0 - 20	0 - 300
LAB/SMS 635	6.000	0 - 35	0 - 175
LAB/SMS 645	6.000	0 - 45	0 - 140
LAB/SMS 670	6.000	0 - 70	0 - 90
LAB/SMS 6150	6.000	0 - 150	0 - 40
LAB/SMS 6300	6.000	0 - 300	0 - 20
LAB/SMS 6600	6.000	0 - 600	0 - 10
LAB/SMS 61000	6.000	0 - 1.000	0 - 6
LAB/SMS 61200	6.000	0 - 1.200	0 - 5
LAB/SMS 820	8.000	0 - 20	0 - 440
LAB/SMS 825	8.000	0 - 25	0 - 320
LAB/SMS 835	8.000	0 - 35	0 - 230
LAB/SMS 845	8.000	0 - 45	0 - 180
LAB/SMS 870	8.000	0 - 70	0 - 115
LAB/SMS 8150	8.000	0 - 150	0 - 55
LAB/SMS 8300	8.000	0 - 300	0 - 30
LAB/SMS 8600	8.000	0 - 600	0 - 15
LAB/SMS 81000	8.000	0 - 1.000	0 - 8
LAB/SMS 81200	8.000	0 - 1.200	0 - 6,7
LAB/SMS 1020	10.000	0 - 20	0 - 500
LAB/SMS 1035	10.000	0 - 35	0 - 350
LAB/SMS 1045	10.000	0 - 45	0 - 250
LAB/SMS 1070	10.000	0 - 70	0 - 175
LAB/SMS 10150	10.000	0 - 150	0 - 75
LAB/SMS 10300	10.000	0 - 300	0 - 40
LAB/SMS 10600	10.000	0 - 600	0 - 17
LAB/SMS 101000	10.000	0 - 1.000	0 - 10
LAB/SMS 101200	10.000	0 - 1.200	0 - 8,4

OPTIONS

Appendix	Description
../230	230 / 207 - 253 VAC Input
../3P208	3 x 208 / 187 - 229 VAC Input
../3P400	3 x 400 / 360 - 440 VAC Input
../3P440	3 x 440 / 396 - 484 VAC Input
../3P480	3 x 480 / 432 - 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LAN	LAN Interface
../USB	USB Interface
../KFZ12	Preselected Start-up Curve 12 V
../KFZ24	Preselected Start-up Curve 24 V
../OPT	Predefined Output characteristic
../SD	SD Card Slot

TECHNICAL DATA

Input Voltage Specification

Input Voltage Range	230 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
Input Frequency	47 - 63 Hz

EMC and Safety Standards

Safety Standard	EN 60950
Emitted Interference	EN 61000-6-4:2007
Interference Immunity	EN 61000-6-2:2005
Measurement, Control and Laboratory Equipment	EN 61010-1:2006

Output Specification

Voltage Regulation	±0.05 % + 2 mV
Current Regulation	±0.1 % + 2 mA
Response Time	< 2 ms (typ.)
Ripple	< 0.2 % (typ.)
Stability	±0.05 %
Voltage Programming Accuracy	±0.05 % +2 mV
Isolation	3.000 V
Overvoltage Protection	0 - 120 % V_{max}
Protective Devices	OC / OV / OT / OP
Line Regulation	<±0.1 % + 2 mV
Load Regulation	<±0.1 % + 2 mV

Programming & Control

Output Control and Measurement	Control panel and / or optionally: Isolated analogue interface 0 to +5 V / +10 V Digital (12 bit) Interfaces: RS232, RS485, IEEE488.2 (GPIB), LAN, USB, SD card

Ambient Conditions

Cooling	Forced air
Operating Temperature	0 to +50 °C
Storage Temperature	-20 to +70 °C
Humidity	<80 %
Operating Altitude	<2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	<20 G
Weight	3 - 5 kW = 18 kg, 6 - 10 kW = 25 kg

DC-Sources LAB/HP 5.000 W - 250.000 W

19“ x 3 U x 620 mm

PRODUCT EXAMPLES

Type	Power W	Voltage V DC	Current A
LAB/HP 520	5.000	0 - 20	0 - 250
LAB/HP 540	5.000	0 - 40	0 - 125
LAB/HP 580	5.000	0 - 80	0 - 65
LAB/HP 5100	5.000	0 - 100	0 - 50
LAB/HP 5150	5.000	0 - 150	0 - 35
LAB/HP 5300	5.000	0 - 300	0 - 17
LAB/HP 5600	5.000	0 - 600	0 - 8,5
LAB/HP 51000	5.000	0 - 1.000	0 - 5
LAB/HP 51200	5.000	0 - 1.200	0 - 4
LAB/HP 1020	10.000	0 - 20	0 - 500
LAB/HP 1040	10.000	0 - 40	0 - 250
LAB/HP 1080	10.000	0 - 80	0 - 130
LAB/HP 10100	10.000	0 - 100	0 - 100
LAB/HP 10150	10.000	0 - 150	0 - 70
LAB/HP 10300	10.000	0 - 300	0 - 34
LAB/HP 10600	10.000	0 - 600	0 - 17
LAB/HP 101000	10.000	0 - 1.000	0 - 10
LAB/HP 101200	10.000	0 - 1.200	0 - 8
LAB/HP 1520	15.000	0 - 20	0 - 750
LAB/HP 1540	15.000	0 - 40	0 - 375
LAB/HP 1580	15.000	0 - 80	0 - 195
LAB/HP 15100	15.000	0 - 100	0 - 150
LAB/HP 15150	15.000	0 - 150	0 - 100
LAB/HP 15300	15.000	0 - 300	0 - 50
LAB/HP 15600	15.000	0 - 600	0 - 25
LAB/HP 151000	15.000	0 - 1.000	0 - 15
LAB/HP 151200	15.000	0 - 1.200	0 - 12

OPTIONS

Appendix	Description
../230	230 / 207 - 253 VAC Input
../3P208	3 x 208 / 187 - 229 VAC Input
../3P400	3 x 400 / 360 - 440 VAC Input
../3P440	3 x 440 / 396 - 484 VAC Input
../3P480	3 x 480 / 432 - 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LAN	LAN Interface
../USB	USB Interface
../KFZ12	Preselected Start-up Curve 12 V
../KFZ24	Preselected Start-up Curve 24 V
../OPT	Predefined Output characteristic
../SD	SD Card Slot

TECHNICAL DATA

Input Voltage Specification	
Input Voltage Range	230 V AC / 3 x 208 V AC / 3 x 400 V AC / 3 x 480 V AC ±10 %
Input Frequency	47 - 63 Hz

EMC and Safety Standards	
Safety Standard	EN 60950
Emitted Interference	EN 61000-6-4:2007
Interference Immunity	EN 61000-6-2:2005
Measurement, Control and Laboratory Equipment	EN 61010-1:2006

Output Specification	
Voltage Regulation	±0.05 % + 2 mV
Current Regulation	±0.1 % + 2 mA
Control Time	< 2 ms (typ.)
Ripple	< 0.2 % (typ.)
Stability	±0.05 %
Voltage Programming Accuracy	±0.05 % +2 mV
Isolation	3000 V
Overvoltage Protection	0 - 120 % V_{max}
Protective Devices	OC / OV / OT / OP
Line Regulation	<±0.1 % + 2 mV
Load Regulation	<±0.1 % + 2 mV

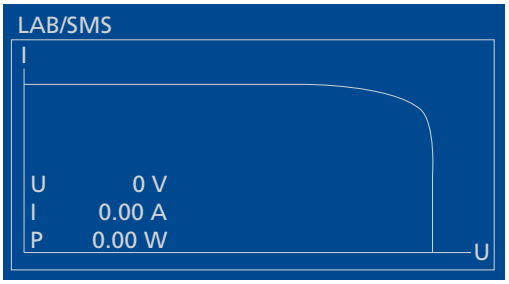
Programming & Control	
Output Control and Measurement	Control panel and / or optional analogue 0 to +5 V / +10 V isolated / digital 12 bit: RS232, RS485, IEEE488, LAN, USB, SD card

Ambient Conditions	
Cooling	Forced air
Operating Temperature	0 to +50 °C
Storage Temperature	-20 to +70 °C
Humidity	<80 %
Operating Altitude	<2.000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	<20 G
Weight	5 kW = 19 kg, 10 kW = 26 kg, 15 kW = 33 kg

MPP-TRACKING OPTIMIZES SOLAR INVERTERS

The aim of every solar system operator might be to bring out maximum performance from a photovoltaic system. To achieve this, the inverter plays a central role: the system only works at the optimal point and only produces the maximum yield when it is able to generate a maximum of utilizable performance out of the solar panel's currents. For testing the behavior of inverters during development, production and quality control, development engineers and production managers need reliable power sources.

DC power sources of the LAB series simulate the behavior of solar panels under real operating conditions. When operating in PV mode, these units are able to exactly emulate the I/U curve of photovoltaic modules and allow the development and testing of charging regulators and inverters.

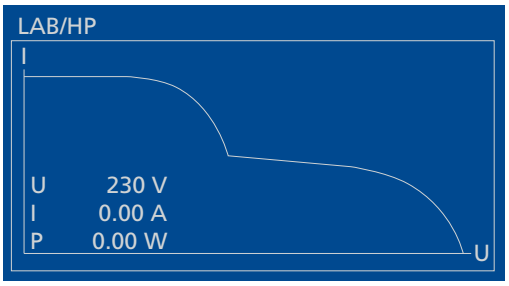


PVsim Graph: Units from the LAB series in PV mode simulate the I/U curve of a solar module.

SHADING SIMULATION

Under real conditions, solar modules are unable to generate permanent currents. In the medium term, the current strength varies due to solar radiation and outside temperature; and passing clouds or shading caused by leaves cause short term variations.

Inverters quickly need to adapt to such variations. In order to test how well this works, the power source to which the inverter is connected must be able to simulate such short term variations. The units of our LAB series manage these tasks without problems and therefore fulfill the requirements of the EN 50530 norm, which controls the test of inverters. With units from our LAB series, the user is able to upload free selectable U/I characteristics via SD card or digital interface and therefore to simulate the shading for an arbitrary number of modules even when assembling strings by parallel connections.



PV Sim: I/U curve of a partly shaded solar module.

Data 1. PV-Inverter			Data 2. PV-Inverter		
U_o	217	V	Uo	217	V
I_k	3,65	A	Ik	1,83	A
U_{mpp}	175	V	Umpp	175	V
I_{mpp}	3,15	A	Impp	1,58	A

Parameter			Parameter		
M	-2,2241	Ohm	M	-4,4781	Ohm
R_{pv}	-6,2412	Ohm	Rpv	-12,3385	Ohm
I_{ph}	3,6500	A	Iph	1,8300	A
I_o	0,0033	A	Io	0,0016	A
U_t	30,8984	V	Ut	30,7745	V
Step dI	0,0143	A			

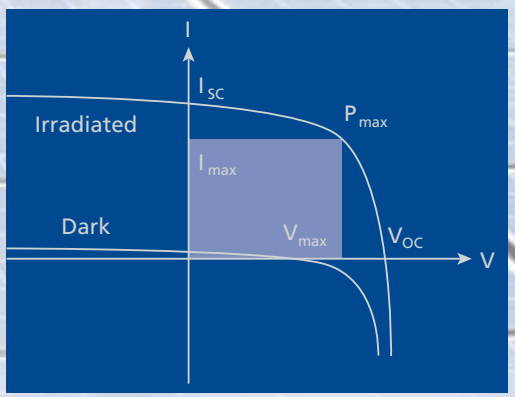
Using an Excel table to program a I/U curve corresponding to a partly shaded solar modul.

IMPROVEMENT OF AN INVERTER BY DISPLAYING THE MPP

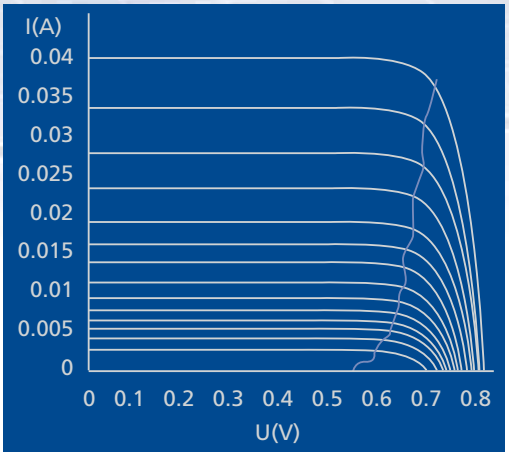
The power (P) of a solar module or module string is calculated as the product of voltage (U) and current (I). The correlation of both values follows a I/U curve. Due to the internal resistance of the solar module the basic rule is: the higher the flowing current, the smaller the applied voltage. When a certain combination of current and voltage is given, the electric power reaches its maximum. On an I/U curve, this point is called "Maximum Power Point" (MPP). Picture 1 shows the red line of a I/U curve. Pmax is the Maximum Power Point MPP. The yellow area marks the product of I and U on the point of highest performance - the Maximum Power Point.

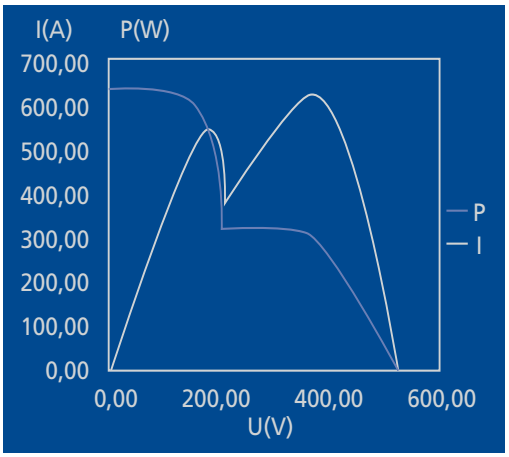
The central task of an inverter is to control the on any I/U curve as quickly as possible. The inverter must use the Maximum Power Point to operate because every other point on the curve indicates that the power generated by the solar module is not used to full extent. The corresponding electronic control is called MPP-Tracking (MPPT). The more exact it works, the better the performance provided by the PV module or by the laboratory power source. The faster MPP-Tracking occurs, the better the inverter adapts to changing irradiation conditions, e. g. occasional clouds or shading of the panel caused by swaying trees.

But how can a developer or test engineer know, that an inverter met the MPP or is able to maintain it? Units from the ET System electronic LAB series are perfectly prepared to answer this question: they can display the corresponding MPP for any arbitrary I/U curve. The LAB series is able to generate many different I/U curves and therefore the individual MPPs form a line on the display. Once the current operating point of an inverter is on this MPP line, the user can be sure that his inverter is working in the optimum range.



I/U curve





Different I/U characteristics of a PV generator depending on solar radiation.

Bidirectional DC-Sources

REGENERATIVE AC/DC CONVERTERS FROM THE LAB/SL SERIES

Regenerative AC/DC converters from the LAB/SL series can be applied where accumulators must be charged and their energy stored must be fed back into the grid, e. g. in development and tests of hybrid motor systems. Such electric drives have become more popular and with the large-scale use of hybrid motors in vehicles and vessels, these drives are distributed worldwide.

The hybrid motor technology requires the ability to load batteries with an AC power source and to supply electric motors with energy from these batteries. As a general rule, the electric machine works as drive motor or current generator, which can then be used for the recovery of breaking energy.

The extensive testing of hybrid motor systems in development labs requires regenerative AC/DC converters which function as device between battery and generator and motor. Our highly dynamic 2- quadrant-rectifier systems have been developed to carry out performance tests with electric motors which are applied in vehicles.

With the help of our LAB/SL series, all operation modes that play a role in hybrid motor tests and development can be simulated. When functioning as power source, the batteries are supplied with DC voltage and therefore loaded. In recovery mode, the LAB/SL draws power from the batteries and then converts it into AC voltage which can be used to drive an electric motor.

The use of modern IGBT rectifiers with PWM control allows a continuous transfer from power feed to recovery, as soon as the battery's voltage level drops under the nominal voltage. Additionally, these units offer a very fast control dynamic, which is the perfect condition for a realistic simulation of the steady change between charging and discharging.

NUMEROUS APPLICATIONS

Units from the LAB/SL series can be applied in the development of hybrid and electric vehicles as well as in the vehicle itself. A renowned automobile manufacturer from Germany is in use of more than a dozen LAB/SL units when developing electric vehicles. The motor sports department of a japanese automobile manufacturer also uses this technology as well as the racing team Scuderia Mensa, which uses similar devices as DC/DC converters to extract 12 V voltage from the high-voltage battery of a electric-powered racing car. Another leading automotive supplier uses our units from the LAB/SL series to test the installation of electrical motors in drives. These motors increase the startup torque and work as generators from which batteries are charged while driving.

FRAUNHOFER INSTITUTE IN DARMSTADT EVALUATES WITH LAB/SL

For years, the Fraunhofer Institute for Structural Durability and System Reliability LBF is in use of a LAB/SL with a capacity of 30 kW. Renowned German vehicle manufacturers and their suppliers have their wheel hub motors examined by the Institute concerning their electrical and mechanical properties.

Further application possibilities for the LAB/SL are still in trial but supposed to have an interesting future. There is a tendency in international shipping concerning stricter exhaust gas requirements which cannot necessarily be met by ships using heavy oil. Harbors like San Francisco and Los Angeles have forbidden the entrance of heavy-oil-fueled vessels due to environmental protection. A possible way out which still needs to be tested is the navigation close to the land with ships using electric motors. They are supplied with energy by accumulators when reaching the harbor and draw their charging current during a normal passage from generators powered by marine diesel.

Filling stations for electric vehicles can also adopt to the LAB/SL series. Charging batteries and recovering energy from stored vehicles to absorb peak-loads could be tasks to be performed by these units - an important aspect of Smart Grids. Wind energy plants e. g. could have their batteries charged with excess electricity from which AC currents can be produced in case of wind calms.

IMPRESSIVE TECHNICAL DETAILS

Unlike some competitor products, units from the LAB/SL series manage to work with only one power part and offer an excellent price-performance ratio, which helps to keep the costs for development and production at a low level. Nevertheless, these units provide outstanding technical data, high control dynamics (< 3ms) and a low ripple of less than 0.5 %. They adapt to the grid's sine curve when recovering and therefore avoid equalization currents. An active PFC (Power Factor Control) keeps voltage and current in phase and avoids the use of idle power.

The smallest adjustable output voltage is 1 % of the maximum output voltage. The units are equipped with galvanically isolated outputs and provide output voltages up to 1000 V and output currents up to 800 A for power ranges from 25 kW up to 500 kW according to the unit's version. Due to the fact that up to 4 units can be connected in parallel, maximum performances of up to 2 MW can be achieved.

User-friendly control functions and intuitive menu navigation facilitate everyday handling. Remote control via PC or CAN terminal is another important option available for our units. Besides the intelligent monitoring function, configurable interfaces like RS232, CAN and Ethernet are also available, providing an easy integration in different system and test environments. The robust design of the series with air cooling is appropriate for the installation in test fields and ET System electronic offers technical modifications and special models to meet the desires of every customer.

Bidirectional DC-Sources

LAB/HPR

OVERVIEW

- Full bidirectional operation made possible by grid-tie source sink technology
- Product line with various output voltages: 60, 100, 150, 300, 600, 800, 1.000, 1.200, 1.500 VDC
- Constant voltage (0 to 100 %), constant current (0 to 100 %), constant power operation (5 to 100 %) with automatic and fast crossover as well as mode indication and internal resistance simulation
- Compact design featuring integrated EMI and sine filters
- Power categories from 5 to 30 kW are available for each nominal output voltage
- Primary switched and galvanic isolated power supplies
- Extended product range with various extras and optional accessories
- Power increased easily through modular design: Parallel, series, matrix or multiload master-slave-operation
- Low cost while maintaining high efficiency by applying innovative IGBT and transformer technology
- Full digital control and regulation
- CE conformity
- Smart functions for monitoring
- Easy to use operating controls
- Lightweight
- Small footprint
- Air-cooling enclosures
- Customized designs
- Made in Germany

DESCRIPTION

Primary switched power supplies have the disadvantage though that they are not able to absorb energy coming from the load (generatoric or reactive energy).

TECHNICAL DATA

Type	Power W	Voltage V	Current A	Dimensions
LAB/HPR 560	5.000	0 - 60	0 - +/-85	19" x 6 U x 620 mm
LAB/HPR 5100	5.000	0 - 100	0 - +/-50	19" x 6 U x 620 mm
LAB/HPR 5150	5.000	0 - 150	0 - +/-35	19" x 6 U x 620 mm
LAB/HPR 5300	5.000	0 - 300	0 - +/-16	19" x 6 U x 620 mm
LAB/HPR 5600	5.000	0 - 600	0 - +/-8	19" x 6 U x 620 mm
LAB/HPR 5800	5.000	0 - 800	0 - +/-6	19" x 6 U x 620 mm
LAB/HPR 51000	5.000	0 - 1.000	0 - +/-5	19" x 6 U x 620 mm
LAB/HPR 51200	5.000	0 - 1.200	0 - +/-4	19" x 6 U x 620 mm
LAB/HPR 51500	5.000	0 - 1.500	0 - +/-3	19" x 6 U x 620 mm
LAB/HPR 1060	10.000	0 - 60	0 - +/-170	19" x 6 U x 620 mm
LAB/HPR 10100	10.000	0 - 100	0 - +/-100	19" x 6 U x 620 mm
LAB/HPR 10150	10.000	0 - 150	0 - +/-70	19" x 6 U x 620 mm
LAB/HPR 10300	10.000	0 - 300	0 - +/-35	19" x 6 U x 620 mm
LAB/HPR 10600	10.000	0 - 600	0 - +/-16	19" x 6 U x 620 mm
LAB/HPR 10800	10.000	0 - 800	0 - +/-13	19" x 6 U x 620 mm
LAB/HPR 101000	10.000	0 - 1.000	0 - +/-10	19" x 6 U x 620 mm
LAB/HPR 101200	10.000	0 - 1.200	0 - +/-8	19" x 6 U x 620 mm
LAB/HPR 101500	10.000	0 - 1.500	0 - +/-6	19" x 6 U x 620 mm
LAB/HPR 1560	15.000	0 - 60	0 - +/-250	19" x 6 U x 620 mm
LAB/HPR 15100	15.000	0 - 100	0 - +/-150	19" x 6 U x 620 mm
LAB/HPR 15150	15.000	0 - 150	0 - +/-100	19" x 6 U x 620 mm
LAB/HPR 15300	15.000	0 - 300	0 - +/-50	19" x 6 U x 620 mm
LAB/HPR 15600	15.000	0 - 600	0 - +/-25	19" x 6 U x 620 mm
LAB/HPR 15800	15.000	0 - 800	0 - +/-20	19" x 6 U x 620 mm
LAB/HPR 151000	15.000	0 - 1.000	0 - +/-15	19" x 6 U x 620 mm
LAB/HPR 151200	15.000	0 - 1.200	0 - +/-13	19" x 6 U x 620 mm
LAB/HPR 151500	15.000	0 - 1.500	0 - +/-10	19" x 6 U x 620 mm

Type	Power W	Voltage V	Current A	Dimensions
LAB/HPR 2060	20.000	0 - 60	0 - +/-335	19" x 9 U x 620 mm
LAB/HPR 20100	20.000	0 - 100	0 - +/-200	19" x 9 U x 620 mm
LAB/HPR 20150	20.000	0 - 150	0 - +/-135	19" x 9 U x 620 mm
LAB/HPR 20300	20.000	0 - 300	0 - +/-70	19" x 9 U x 620 mm
LAB/HPR 20600	20.000	0 - 600	0 - +/-35	19" x 9 U x 620 mm
LAB/HPR 20800	20.000	0 - 800	0 - +/-25	19" x 9 U x 620 mm
LAB/HPR 201000	20.000	0 - 1.000	0 - +/-20	19" x 9 U x 620 mm
LAB/HPR 201200	20.000	0 - 1.200	0 - +/-17	19" x 9 U x 620 mm
LAB/HPR 201500	20.000	0 - 1.500	0 - +/-15	19" x 9 U x 620 mm
LAB/HPR 2560	25.000	0 - 60	0 - +/-420	19" x 9 U x 620 mm
LAB/HPR 25100	25.000	0 - 100	0 - +/-250	19" x 9 U x 620 mm
LAB/HPR 25150	25.000	0 - 150	0 - +/-170	19" x 9 U x 620 mm
LAB/HPR 25300	25.000	0 - 300	0 - +/-85	19" x 9 U x 620 mm
LAB/HPR 25600	25.000	0 - 600	0 - +/-45	19" x 9 U x 620 mm
LAB/HPR 25800	25.000	0 - 800	0 - +/-35	19" x 9 U x 620 mm
LAB/HPR 251000	25.000	0 - 1.000	0 - +/-25	19" x 9 U x 620 mm
LAB/HPR 251200	25.000	0 - 1.200	0 - +/-20	19" x 9 U x 620 mm
LAB/HPR 251500	25.000	0 - 1.500	0 - +/-15	19" x 9 U x 620 mm
LAB/HPR 3060	30.000	0 - 60	0 - +/-500	19" x 9 U x 620 mm
LAB/HPR 30100	30.000	0 - 100	0 - +/-300	19" x 9 U x 620 mm
LAB/HPR 30150	30.000	0 - 150	0 - +/-200	19" x 9 U x 620 mm
LAB/HPR 30300	30.000	0 - 300	0 - +/-100	19" x 9 U x 620 mm
LAB/HPR 30600	30.000	0 - 600	0 - +/-50	19" x 9 U x 620 mm
LAB/HPR 30800	30.000	0 - 800	0 - +/-40	19" x 9 U x 620 mm
LAB/HPR 301000	30.000	0 - 1.000	0 - +/-30	19" x 9 U x 620 mm
LAB/HPR 301200	30.000	0 - 1.200	0 - +/-25	19" x 9 U x 620 mm
LAB/HPR 301500	30.000	0 - 1.500	0 - +/-20	19" x 9 U x 620 mm

Bidirectional DC-Sources

LAB/SL 200 kW - 2 MW

OVERVIEW

- Electrical isolation source and sink
- Continuous transfer from mains supply to energy recovery
- High dynamic (<1 - 3 msec)
- Low weight
- Compact design
- Graphical display
- Easiest operation via front panel
- Many operation modes (UI, UIR, UIP Mode, Simulation of PV-Arrays)
- Script Control: process programming and booting from memory card
- Creating user defined output characteristics via memory card or digital interface
- Script operation in combination with Datalog function allows an independent stand-alone Test field setup
- Many interface for test system
- Low ripple (< 0.5 %)
- Low mains feed back
- Paralleling possible up to 2 MW
- Intelligent monitoring functions
- Configurable interfaces (Relays, RS232, CAN)
- User friendly control function
- Simple operation through intuitional menu navigation
- Remote control by CAN-Terminals or PC
- Output voltage up to 1.200 V
- Output current to 800 A
- Robust construction for test field
- Air cooling
- Customer specific designs

DESCRIPTION

This 2 quadrant DC System is ideal for the evaluation of electrical motors used in modern vehicles. The use of modern control techniques with a PWM rectifier (IGBT) ensures high dynamics over the entire power range

The LAB/SL is offered with a range of computer interfaces to help simplify its integration into a wider test system.

TECHNICAL DATAS

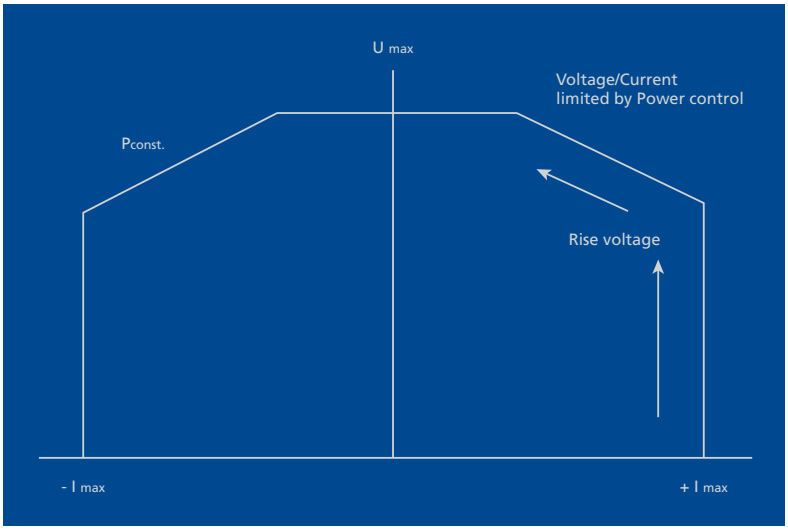
Rated power	Up to 500 kW
Rectifier type	IGBT, PWM, galvanic isolated
Power factor at nominal power	λ > 0.99
Input voltage	230 / 400 V, 3-phase, PE
Input frequency	50 (60) Hz ±5 %
Output voltage adjustable	Up to 1000 V
Output current	bis ±800 A
Voltage regulation static	±1 % (fs)
Ripple	< 0,5 % rms. (fs)
Current rise time	< 3 msec
Short circuit characteristic	Short circuit proof
EMC	EN 61000-6-4, EN 61000-6-2
Acoustic noise level	50 - 70 dB(A)
Cooling	AF forced air cooling
Efficiency at nominal Load	> 94 % at 220 V DC
Permissible ambient temperature	0 to +40 °C
Permissible climate	According to 3K3, EN 60721
Permissible operating altitude	1000 m above m.s.l.
Basic EN	EN 62040
Protection class	EN 60529 IP20
Colour	RAL 7035
Configurable monitoring	AC under voltage, switch off DC over and under voltage Current and Power limiting Temperature controlled Digital measurement system
Operation display	LC-Display Incremental control Intuitive menu navigation Optional: Operation terminal (CAN) Switch on controller
Remote signal	Operation / Failure
Configurable floating free contacts	Emergency off
Options	Ethernet, RS232, CAN

We will be pleased to discuss your individual requirements and help configure a system to suit your needs.

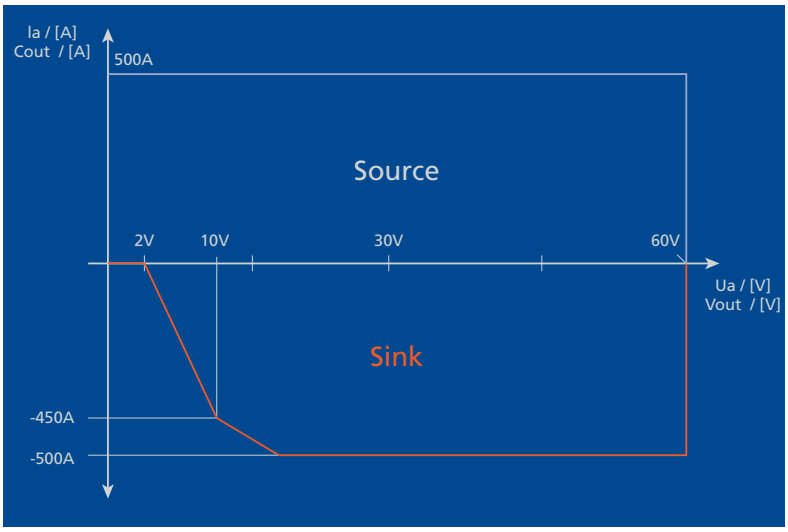
Bidirectional power supplies are ideal for all applications where considerable generatoric energies originate from the load or where highly dynamic switching between source and sink operation is required.

Typical application examples:

- Test of batteries and accumulators
- Test of fuel cell stacks and their characteristic curves
- Cyclic charge and discharge of energy storage devices, ULTRACAPS
- Test-bench-operation of general reactive loads in the motor vehicle industry, auxiliary operations
- Simulation of highly dynamic drive cycles in motor vehicle technology
- Development and testing of solar energy components like charge controller and inverter
- General high power bi-directional laboratory use
- Development and testing of hybrid and alternative drives for vehicles
- Simulation of highly dynamic drive cycles in motor vehicle technology



LAB/SL



LAB/HPR

Electronic Loads

ALWAYS LOADABLE: OUR ELECTRONIC LOADS

Electronic loads are essential in electronic development and electronic industry for testing the performance of charging devices, accumulators, power supplies and photovoltaic panels.

Only seldom can these components be combined with their later expected electricity consumers to test their performance under load. Therefore, electronic loads take the role of an adjustable consumer, which absorbs just the right amount of energy to thoroughly examine the desired components with appropriate currents and voltages.

Our high quality, solidly constructed loads of the ELP/DCM series, our customers have the best equipment. Our units provide a price performance that is simply unmatched and are particularly suitable for demanding endurance use within manufacturing, testing departments and development facilities.

SUITABLE FOR ALL PERFORMANCE CATEGORIES

The ELP/DCM series consists of 16 frame sizes which cover an enormous performance range between 150 W and 200 kW. These units are capable to absorb currents up to 1500 A with currents of up to 600 V. They provide all operation modes that are needed in a daily working routine. In Constant Current Mode, currents of up to 500 A can be absorbed with an accuracy of 0.05 % or 0.1 %. In Constant Resistance Mode, resistances between 0.03 Ω/ 0.3 Ω and 5 kΩ/ 10 kΩ can be adjusted with an accuracy of 16 bit. Constant voltages can be adjusted - according to the unit's version - to the maximum of 600 V with accuracies of 0.03 %+0.02/0.05 % FS. In Constant Power Mode up to 200 kW can be reached with an accuracy of 0.1/0.2 %+0.1/0.15 FS.

PRACTICAL FEATURES

Battery tests with input voltages between 0.5 and 120 V can also be performed with our units from the ELP/DCM series. Their maximum measurement capacity is 999 Ah with a resolution of 0.1 A and a potential measurement period between 1 s and 32 h. With their short-circuit function these units absorb currents between 3.3 and 1650 A with internal resistances between 7 and 55 mΩ. Depending on actual temperature and voltage settings, soft starts with delays between 1 ms and 200 s can be defined.

In dynamic tests, the rise and decay times can be defined, while desired current wave forms can be programmed very comfortably at the front panel of the unit. Current rise times of 2.5 A/uS allow dynamic load applications which are needed for different tasks in a daily working routine.

OVERALL PROTECTION AND LARGE-SCALE EQUIPMENT

All models from the ELP/DCM series are protected against over current, over voltage, over temperature and reverse polarity. Calibration is carried out via software and a power on self test guarantees a failure-free operation of the unit. As a standard, loads of the ELP/DCM series come equipped with RS232, RS485 and USB interface for external control and easy connection with test and production systems.

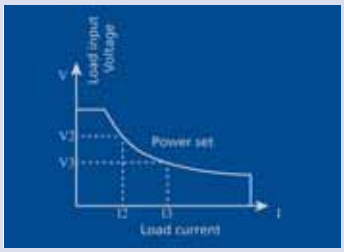
In their different performance classes, the units are very compact and available as tabletop unit, 19” built-in component or cabinet unit. The brilliant high-resolution display enables an easy reading of values and settings.

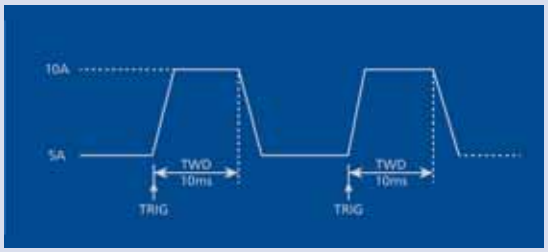
Electronic Loads 150 W - 200.000 W

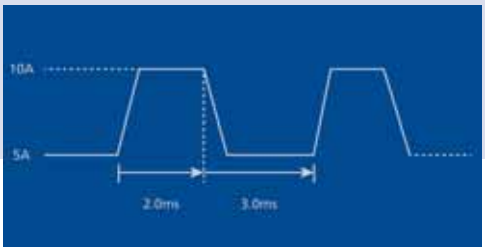
ELP/DCM

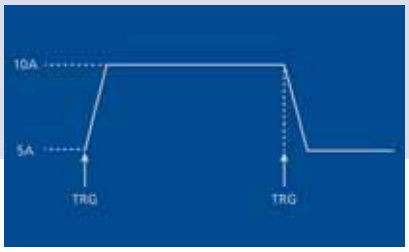
OVERVIEW

- 6 different modes of operation: CC, CR, CV, CP, CC+CV, CR+CV
- Overcurrent, overvoltage, overload, overtemperature and reverse polarity protection
- High resolution display
- Programmable soft-start (depending on temperature and voltage presets)
- Battery test and short-circuit test functions
- External trigger signals for input and output
- Dynamic operation with adjustable rise & fall times
- Current waveforms programmable via front panel
- Digital interfaces: RS232/RS485/USB
- Special versions available on request









ELECTRONIC LOADS

ELP/DCM 150 W -200.000 W

19" x 2 U x 520.5 mm -
19" x 20 U x 700 mm

PRODUCT EXAMPLES

Type	Power W	Voltage V DC	Current A
ELP/DCM9711	150	0 - 150	0 - 30
ELP/DCM9712	300	0 - 150	0 - 30
ELP/DCM9712B	300	0 - 500	0 - 15
ELP/DCM9712C	300	0 - 150	0 - 60
ELP/DCM9712B30	300	0 - 500	0 - 30
ELP/DCM9713	600	0 - 150	0 - 120
ELP/DCM9713B	600	0 - 500	0 - 30
ELP/DCM9714	1.200	0 - 150	0 - 240
ELP/DCM9714B	1.200	0 - 500	0 - 60
ELP/DCM9715	1,800	0 - 150	0 - 240
ELP/DCM9715B	1,800	0 - 500	0 - 120
ELP/DCM9716	2.400	0 - 150	0 - 240
ELP/DCM9716B	2.400	0 - 500	0 - 120
ELP/DCM9716E	3.000	0 - 150	0 - 480
ELP/DCM9717	3.600	0 - 150	0 - 240
ELP/DCM9717B	3.600	0 - 500	0 - 120
ELP/DCM9717C	3.600	0 - 150	0 - 500
ELP/DCM9718	6.000	0 - 150	0 - 240
ELP/DCM9718B	6.000	0 - 500	0 - 120
ELP/DCM9718D	6.000	0 - 500	0 - 240
ELP/DCM9718E	6.000	0 - 600	0 - 120
ELP/DCM9718F	6.000	0 - 150	0 - 480
ELP/DCM9834	10.000	0 - 150	0 - 500
ELP/DCM9835	15.000	0 - 150	0 - 500
ELP/DCM9835B	15.000	0 - 500	0 - 240
ELP/DCM9836	20.000	0 - 150	0 - 500
ELP/DCM9836B	20.000	0 - 500	0 - 240
ELP/DCM9837	35.000	0 - 150	0 - 500
ELP/DCM9837B	35.000	0 - 500	0 - 240
ELP/DCM9838	50.000	0 - 150	0 - 500
ELP/DCM9838B	50.000	0 - 500	0 - 240
ELP/DCM9839	50.000	0 - 500	0 - 240
ELP/DCM9839B	100.000	0 - 500	0 - 240
ELP/DCM9840	200.000	0 - 150	0 - 1.500
ELP/DCM9840B	200.000	0 - 500	0 - 500

OPTIONS

Appendix	Description
../LTRS232	RS232 interface
../LTRS485	RS485 interface
../USB	USB Interface
../19"	Unit mounted in to a rack / cabinet

TECHNICAL DATA

Input Voltage Specification	
Input Voltage Range	110 V AC / 230 V AC ±10 %
Input Frequency	47 - 63 Hz
Output Specification	
CC mode	
Range	0 - 1500 A
Resolution	0.1 - 10 mA
Accuracy	0.03 % - 0.05 %FS to 0.15 % +0.2 %FS
CV mode	
Range	0.1 - 600 V
Resolution	1 - 10 mV
Accuracy	0.03 % + 0.02 %FS to 0.03 % + 0.05 %FS
CR mode	>10 % for V and I
Range	0.03 - 10 k Ω
Resolution	16 bit
Accuracy	0.1 % + 0.1 %FS - 0.1 % + 0.15 %FS
CP mode	>10 % for V and I
Range	150 - 200.000 W
Resolution	1 mW - 100 mW
Accuracy	0.1 %+0.1 %FS - 0.2 %+0.15 %FS
Voltage measurement	
Range	0.1 - 600 V
Resolution	1 mV - 10 mV
Accuracy	0.015 % + 0.03 %FS to 0.015 % + 0.05 %FS
Current measurement	
Range	0 - 1.500 A
Resolution	0.01 - 10 mA
Accuracy	0.03 % + 0.05 %FS - 0.15 % + 0.2 %FS
Power measurement	>10 % for V and I
Range	100 - 200.000 W
Resolution	1 -100 mW
Accuracy	0.1 % + 0.1 %FS to 0.15 % + 0.2 %FS
Battery test	
Battery voltage	0.1 - 150V
Max. measuring capacity	999 Ah
Resolution	0.1 mA
Testing time	1s - 32 h
Dynamic test	
Rise time	2.5 - 5A / µS
Pulse duration	0 - 25 kHz
Duty cycle	60µs - 999s
Accuracy	±15 % offset + 10 %FS
CC soft start	1 - 1.000 ms
Short-circuit	
Current / CC mode	3.3 - 1.500 A
Voltage / CV mode	0 V
Resistance / CR mode	2.3 - 300 m Ω
Programming & Control	
Output Control and Measurement	Control panel and / or computer interface (16 bit): RS232, RS485, USB
Ambient Conditions	
Cooling	Forced Air
Operating Temperature	0 to +40 °C
Storage Temperature	-10 to +70 °C
Humidity	<80 %
Operating Altitude	<2000 m
Vibration	10 - 55 Hz / 1 min / 2G XYZ
Shock	<20 G
Weight	3.5 to 4,280 kg

MULTI-, BATTERIE- AND SOLAR-MODUL-TESTER

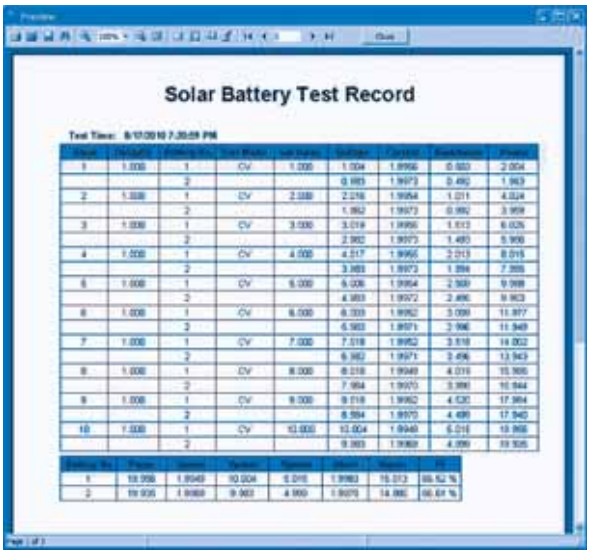
Application ELP/DCM91XX

OVERVIEW

- Automatic test and data aquisition
- Multichannel System possible (8, 16, 32, 64, 128, 256)
- Test parameters: P_{max}, Ip_{max}, Vp_{max}, Rp_{max}, I_{short}, V_{open}, FF, Rs and Rsh
- UI Curve in real time
- PT Curve in 24 h test or custom time set
- Export protocol to excel
- For each battery with the same or different specifications, the test list can be set with different working mode (CV/CC/CR/CW) and different test parameters
- Multichannel test the same time (parallel testing, very quick and accurate)
- For each channel, the biggest test step value is 1.000 and the smallest is 0.001, and the accuracy is very high
- Two-part intelligent search modes are provided, rough search first and then accurate search, by which the Pmax point could be found faster and more accurately.
- It is very suitable for real-time tracking day and night
- Systems from 150 W to 200 KW, current 15 A to 1500 A and voltage from 150 V bis 600 V are available

GENERALLY THE FOLLOWING KEY PARAMETERS OF A SOLAR BATTERY NEED TO BE TESTED:

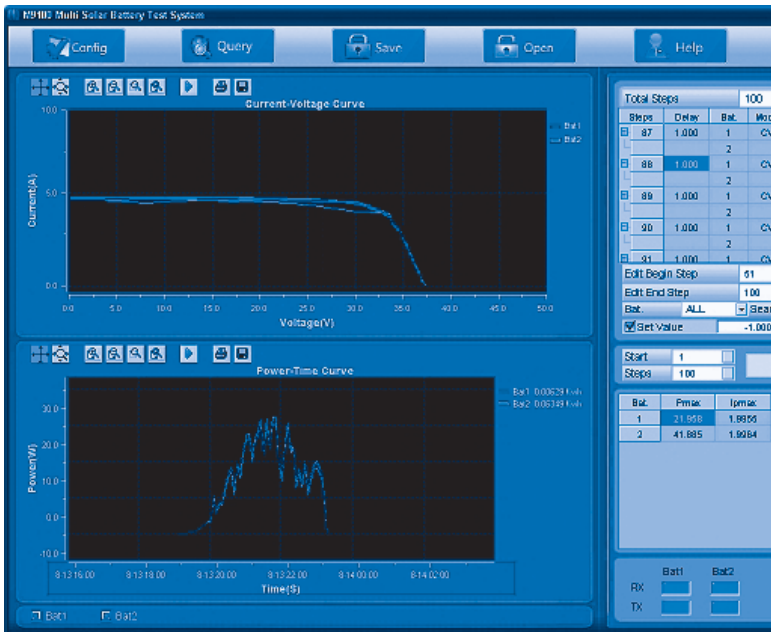
V_{open}	Open-circuit voltage, is the battery voltage when the battery current is 0
I_{short}	Short-circuit current, is the current drawn from the battery when the resistance of electronic load is 0
P_{max}	The maximum power of the battery. The Pmax point in I-V curve is usually called the maximum power point
Ip_{max}	The current value when battery is in the maximum power P_{max}
Vp_{max}	The voltage value when battery is in the maximum power P_{max}
Rp_{max}	The resistance value when battery is in the maximum power P_{max}
FF	Fill factor, is the ratio of Pmax to the Vopen and Ishort, that is, $P_{max}/(V_{open}*I_{short})$. FF is an important parameter which effects directly the solar battery performance. The bigger the FF value is, the higher utilization of solar battery to light is.
R_s	The series resistance of the battery.
R_{sh}	The shunt resistance of the battery.



SYSTEM

Model	9100	9104	9105	9106	9107	9108
Channel	8	16	32	64	128	256

The Test System is build by ELP/DCM97XX electronic loads.
Customized testsystem on request.



MULTI-, BATTERIE- AND SOLAR-MODUL-TESTER

Application ELP/DCM91XX

SREENSHOTS

Microsoft Excel - MultiBatteryData

File Edit View Insert Format Tools Data Window Help — Type a question for help

Arial 10 — G10

	A	B	C	D	E
1	Date	Time	Content	Bat1	Bat2
2	8/17/2010	9:08:37 AM	Pmax	14.726	21.921
3	8/17/2010	9:09:35 AM	Pmax	14.728	21.938
4	8/17/2010	9:10:40 AM	Pmax	14.738	21.486
5	8/17/2010	7:10:55 PM	Pmax	21.963	21.584
6	8/17/2010	7:12:36 PM	Pmax	21.961	21.934
7	8/17/2010	7:13:19 PM	Pmax	21.960	21.932
8	8/17/2010	7:13:57 PM	Pmax	21.074	21.486
9	8/17/2010	7:14:40 PM	Pmax	21.956	21.932
10	8/17/2010	7:15:18 PM	Pmax	21.956	21.931
11	8/17/2010	7:20:59 PM	Pmax	19.956	19.935

BatteryTest Record / Sheet1 / Sheet2 / Sheet3 — Ready — NUM

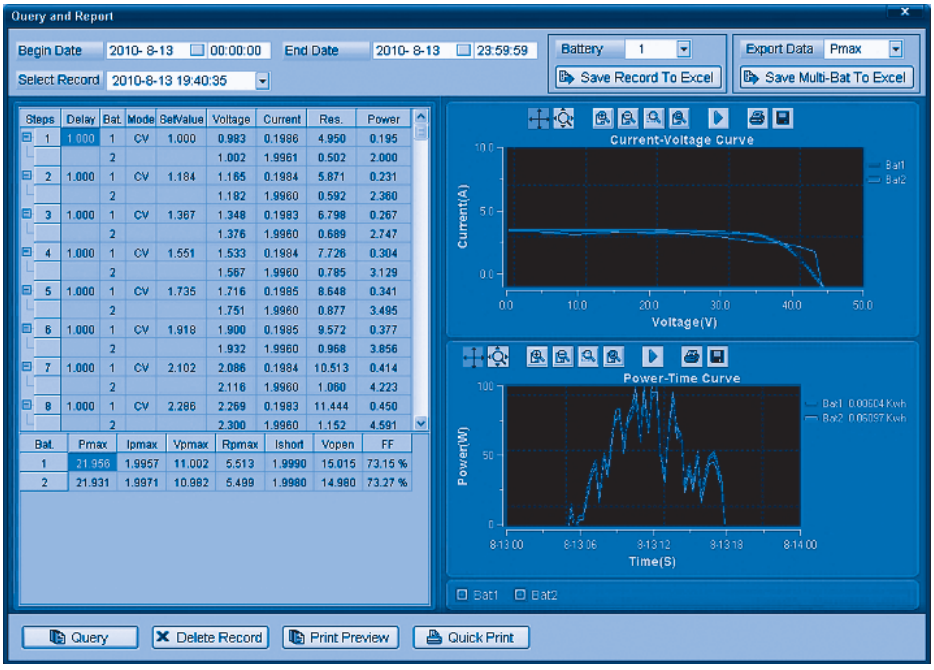
Microsoft Excel - SingleBatteryData

File Edit View Insert Format Tools Data Window Help — Type a question for help

Arial 10 — A12

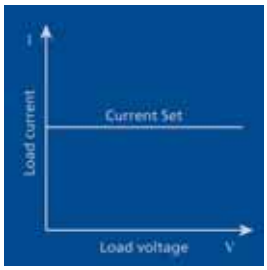
	A	B	C	D	E	F	G	H	I
1	Date	Time	Pmax	Vpmax	Ipmax	Rpmax	Ishort	Vopen	FF
2	8/17/2010	9:08:37 AM	14.726	0.758	19.4356	0.039	20.0384	0.977	75.20 %
3	8/17/2010	9:09:35 AM	14.728	0.758	19.4317	0.039	20.0377	0.977	75.22 %
4	8/17/2010	9:10:40 AM	14.738	0.759	19.4268	0.039	20.0381	0.977	75.30 %
5	8/17/2010	7:10:55 PM	21.963	11.002	1.9962	5.512	1.9980	30.015	36.62 %
6	8/17/2010	7:12:36 PM	21.961	11.002	1.9960	5.512	1.9995	30.016	36.59 %
7	8/17/2010	7:13:19 PM	21.960	11.003	1.9959	5.513	1.9994	20.014	54.88 %
8	8/17/2010	7:14:40 PM	21.956	11.002	1.9957	5.513	1.9972	13.012	84.49 %
9	8/17/2010	7:15:18 PM	21.956	11.002	1.9957	5.513	1.9990	15.015	73.15 %
10	8/17/2010	7:20:59 PM	19.956	10.004	1.9949	5.015	1.9983	15.013	66.52 %

BatteryTest Record / Sheet1 / Sheet2 / Sheet3 — Ready — NUM

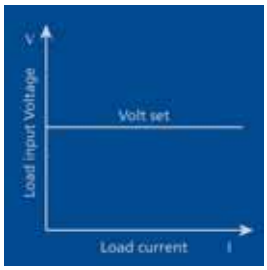


OPERATION MODES ELP/DCM

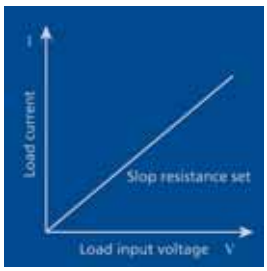
Loads Operation Modes



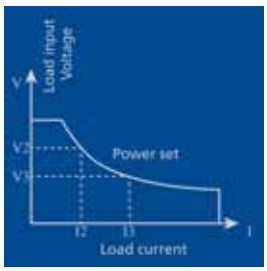
Constant Current Mode
In CC mode, the electronic load will sinc a current in accordance with the programmed value regardless of the input voltage. Please refer to the left graph.



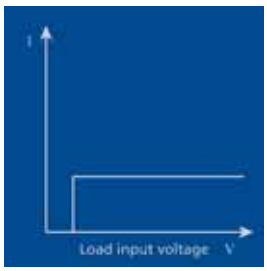
Constant Voltage Mode
In CV mode, the electronic load will attempt to sink enough current to control the source voltage to the programmed value. Please refer to the left graph.



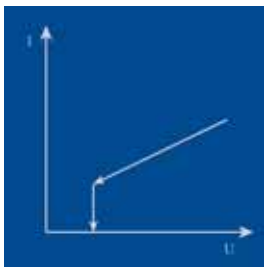
Constant Resistant Mode
In CR mode, the module will sink a current lineary proportional to the input voltage in accor dance with the programmed resistance. Please refer to the left graph.



Constant Power Mode
In CP mode, the electronic loads will consume a constant power. Please refer to the left Graph. If the load input voltage value increase, the load input current will decrease. Thereforce the load power (=V*I) will remain in the power set.

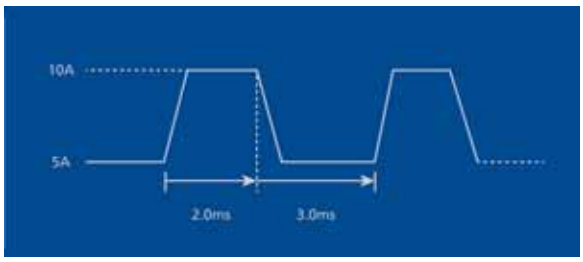


Constant Current Shifting into Constant Voltage Mode
In constant current shifting into constant voltage mode, the measured power supply can be avoiced from current strike damage.

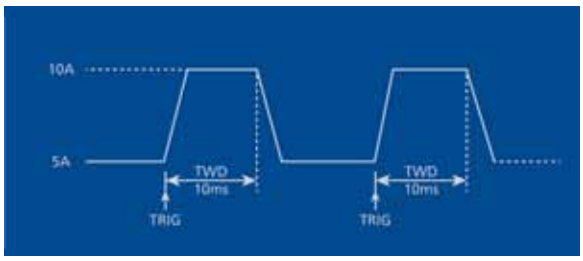


Constant Resistance Shifting into Constant Voltage Mode
In constant resistance shifting into constant voltage mode, the measured power supply can be avoiced from current strike damage.

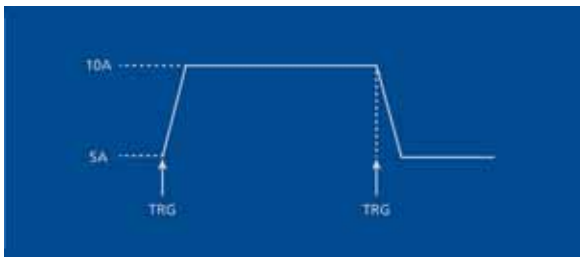
Dynamic Test



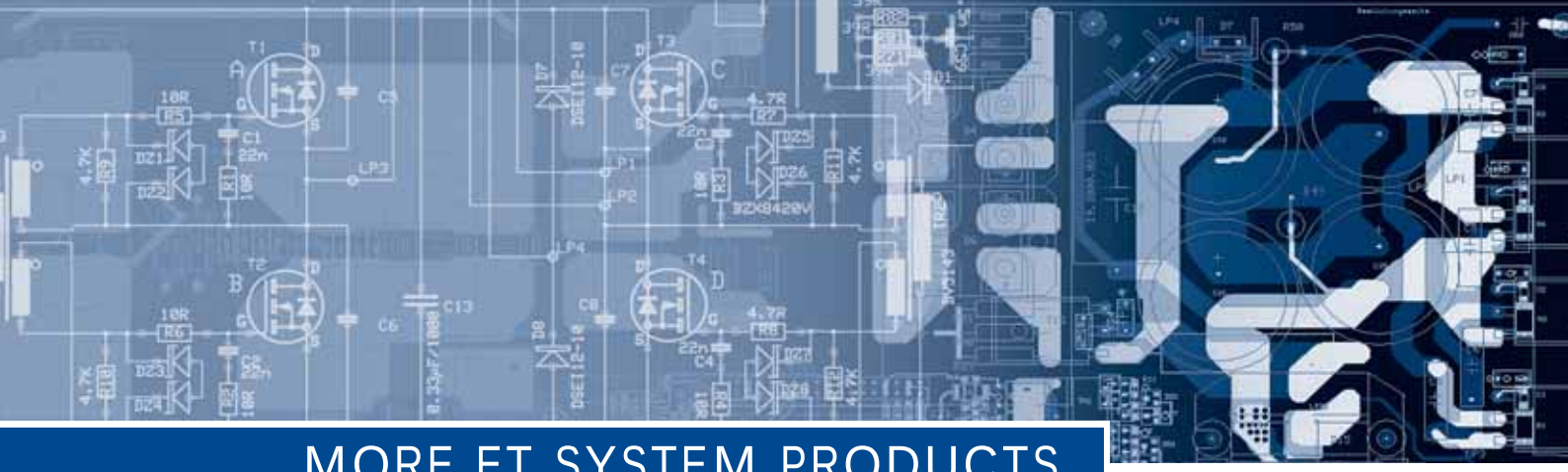
Continuous Operation Mode
in continous mode, the electronic load will periodically swich between value A and value B when the dynamic testing operation is turned on.



Pulse Operation Mode
In pulse mode, when the dynamic testing operation is turned on, the electronic load will switch to value B as receiving one tigger signal, taking the pulse time (TWD) of value B, load will return to value A.



Trigger Operation Mode
In trigger mode, when the dynamic testing operation is turned on, the electronic load will switch the state between value A and value B once receiving a triggering signal.



MORE ET SYSTEM PRODUCTS

DC-Sources - linear regulated

- High quality DC-Sources with a very low ripple (typ. 0.01 %)
- Constant voltage & current modes with preset function
- 3½ digit LED display for V and I
- Potential free output
- Excellent response times
- Indication of CC / CV mode
- Digital 12 bit interface: RS232, RS485, IEEE488.2 (GPIB), USB
- Also available as ATE versions

High Power DC-Sources

- Power outputs up to 1 MW
- SCR / IGBT power supply unit
- Currents up to 50.000 A
- Voltages up to 600 V DC
- 0 to V_{MAX} voltage range
- 0 to I_{MAX} current range
- 5 % ripple (opt. 1 %)
- Constant voltage / current mode

Power Supplies

- Power outputs from 75 W up to 5.000 W
- Compact design
- DC inputs
- Single output
- Overload and overtemperature protection
- Constant V / I operation
- Temperature controlled output
- Galvanically free output
- Active current sharing (n+1)
- Programmable V and I (0 - 5 V or 0 - 10 V)
- High efficiency up to 94 %
- Convection and fan cooled
- Excellent reliability
- Special versions available on request

High Voltage

Printer Modules - Power Supplies - Capacitor Chargers - HEP Research

- Power outputs from 0.5 W - 10.000 W
- 100 V - 70.000 V
- Stable output voltage
- Patented resonance mode technology
- Very low ripple
- Low radiated emissions
- Positive or negative output polarity
- RS232, CAN, IEEE 488.2 (GPIB) or analogue I / O
- Customer specific versions on request

Inverters

- Power outputs from 150 VA to 48.000 VA
- True sinewave output
- Full overload and short-circuit protection
- Overload and overtemperature protection
- Compact designs
- Excellent reliability
- Standby detection
- RS232 or LAN interfaces

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