

INSTRUMENTS AND SYSTEMS



ELEKTRONIC LOADS
AC SOURCES
SAFETY TEST UNITS
SAFETY TEST HOODS
TEST SYSTEMS
BURN IN SYSTEMS



Electronic AC Sources

Electronic AC Sources EAQ-M

Page 8 - 11

Motordriven AC Sources EAQ-MT

Page 12 - 15

EAQ

AC
SOURCES

Electronic Loads

Electronic I Constant and R Constant Loads ESL

Page 16 - 19

Dynamic Loads EDL

Page 20 - 23

Solar Modul Loads ESL-Solar

Page 24 - 27

ExL

ELECTRONIC
LOADS

Safety Test Units

Safety test units EST-HV, SL, ISO, AB

Page 28 - 37

VDE/EN Safety Compact Tester EST-USB

Page 38 - 43

Safety Test Hoods HPH

Page 44 - 47

EST

SAFETY TEST
UNITS

Test Systems

Test and Handling Systems Function

Page 48 - 50

Test and Handling Systems Function Test and Safety Test

Page 51 - 56

Test Systems Burn In Test

Page 57 - 63

EE

TEST SYSTEMS



The companies have to face increasing challenges. The market conditions are becoming more and more difficult. Only these companies are successful that react **creatively and flexible** on the fast changes.



We made it to our business to develop units and systems that enable you to fulfil the task in an **innovative and fast** manner and therefore to stay competitive.

Only the **satisfaction of the customer** can advance a company. Our main focus has been put on this guiding principle for years. The successes that have been yielded so far, show that we are right.



The high rank of **quality**, which already plays a major role in the early stage of development, has always been important to us. Permanent testing of the own production quality ensures the future implementation of the products at our customers.



A personal contact partner will be at your disposal in our sales department. In the concrete deliberation **solutions and strategies** will be found along with you.

Benefit from our many years of experience in the measuring units and system technology sector.

ET Instrumente GmbH

January 2016



Division Instruments



Division Test Systems

CREATE INNOVATIONS



Production- and office building of ET Instrumente and ET Testsysteme in Hockenheim

Quality



Where machines do not operate with sufficient precision, the foreman still lends a hand

We have always been aware of the high value placed on quality, the basis for which is already set in the early development phase. Constant monitoring of our quality of conformance ensures the later reliable application of our products in situ, in the test bay, in service, and in production. Therefore, at ET Testsysteme; all components and assemblies used are thoroughly tested before being allowed to take their specific place in the system. The complete systems are subject to numerous functional-endurance and burn-in tests, so that, before they finally "go on line", they have successfully withstood many hours of test operation. One of the characteristics of our thoroughness is that when developing our systems, we not only adhere to statutory regulations, but also to other, considerably more stringent ones, namely, our own. Apart from the testing of assemblies subject to electrostatic interference (EIA's) and electrostatic discharge-proof (ESD) equipment, and the preliminary test of the individual assemblies, assurance of the quality standard also includes the subsequent burn-in test and final inspection of these. The consciousness of all employees that only the fulfilment of the highest quality requirements suffices is, however, our most valuable asset, which is why this is constantly raised and promoted.

Service



Our Technical Customer Service Department is pleased to give you in-depth and qualified advice.

Via your ET Instrumente Service Hotline, you can quickly obtain expert information on our products. Your inquiries and orders will be dealt with by our competent sales personnel, who are pleased to provide you with commercial and technical information at all times. Are you, apart from this, interested in specific solutions? If you want to translate special product requirements and concepts into reality, our Product Manager will advise you, without obligation, in an informative discussion, upon request, also at your offices. Our service, thus, begins long before the system is commissioned and is continued in the form of customerorientated support. Systems from ET Instrumente are used world-wide and, consequently, are also serviced world-wide. Naturally, our service technicians are also on the spot if required or requested. An example of this is our calibration service. It offers professional service with the shortest possible down-times. Date co-ordination and the possibility of calibrating at the weekend or overnight, guarantee absolute system availability and ensure adherence to important production deadlines.

Partnership



The company Panasonic Matsushita Electronics Components GmbH has been using ET Testsysteme systems since 1989.

The photo shows the seventh system being delivered. Now they have over 30 systems.



With the decision in favour of a system from ET Testsysteme, a long standing partnership begins which guarantees you optimum and long-term system safety. Renowned companies throughout the world have already decided to use systems and Instruments from ET Testsysteme and ET Instrumente. Here some customer from A - Z:

Our units and systems are used world wide:

ABB, AD Elektronik, AEG, Agilent, APT, APW, Artesyn, Ascom, Autmatec, AVM, Ballard, Balluff, BASF, Baumüller, bbcom, Beckhoff, Beck IPC, BDT, Behlke, Behr France, Bepro, Berger Lahr, Bernecker&Rainer, Beru, Beurer, Bicc Vero, Binder, Biniec, Bircher, Bios Dental, Block Transformatoren, BMW, Bodenseewerk, Bosch Rexroth, Bosch Thermotechnik, Bosch, Boss Energiesysteme, Braun, Brockhaus Messtechnik, BSH, Busch Jäger, Bus Elektronik, BVR electronic, CEAG, Cern, CGK, Chang Feng Sience Technology, Cobes, Continental ISAD, Convertec, Cooper Tools, CTDI Nethouse Services, CTM, Daimler Chrysler, Danfoss, DASA, DBK, Debis, Delphi Automotive Systems, Delphi Systeme, Delta, Denke, Digitaltest, DSL electronic, DSK, DeTeWe, Deutsche Vortex, Dewert, Doit, Draftex International, dspace, Deutsche Vortex; Dungs, EADS, EGO, EKS Magnete, Elba, Electrottype, Elna Trenew, Endress+Hauser, Enertron, Entrelec Schiele, Epis, ETA, Eupec, EVI Audio, Fabrimex, Femo, Fernmeldezeugamt, Festo AG, Fischer, Fischer Georg Kunststoffamaturen, Fortec, Frankl & Kirchner, Friatec AG, Friedrichsfeld GmbH, Gebrüder Frei, Gavazzi, Gillette, Grundig, Harms& Wende, Hartmann&Braun, Heidelberger Druck, Heika, Heraeus, Hewlett Packard, Hilti, Hima, Hirschmann, Honeywell, Hydac, Ibb, Imatec, IMD, Industrieautomation, Inst. Dr. Förster, Instronic, Ipek Spezial, Iskra, Iskratel, Isopad, ITE, Jumo, Kaiser Martin, Kapsch, KHS, Kleintges, Kniel, Knürr, Krauss-Maffay-Wegmann, Leica, Lenze, Letron, Leybold, Liebherr, Litef, LJ Elektronik, Loral, Löwen-Automaten, Lucent, Lütze, Matsushita, Medica, Meinberg, Merten, Micro-Hybrid, Miele&Cie, Moeller, MSC, MTD, MTM, Multek, Multer, Murr Elektronik, MurrPlastik, MVL, Nexor Systeme, Nicolay, Oase Wübker, Omron, Orametrix, Osram, Panasonic, Papst-Motoren, Pari, Penta, Pepperl&Fuchs, Philips, Pico, Pilz, Preh, Protea, Puls, Quasar, Quel, Remix Group, Retsch, Rhewa, Richard Halm, Rittal, Rittmeyer, Riva System, Roeloffzen, Rohde& Schwarz, Rowenta, SAIA Burgess, Sauron, Schneider electric, Schneider Rundfunkwerke, Schenk Rotec, Schuntermann & Benninghoven, Schurter AG, Scintilla SCR, SEA, Secheron, SEL, Sennheiser, Siemens, Sirona, SLG, Smart, Smith Societe Electronique de la Sauer, Soma, Softing, Spaun, Still, STN Atlas, STN Altas Elektronik, Storz, T&N, Tadmod, Taunus, Technolase, TectroAn, Tectron, Tekimenta, Telefunken System Technik, Telekom, Telesincro/Honeywell Bull, Telic Alcatel, Temic, Test Ware, Thermo Electron, Thermo Haake, Thyssen AG Henschel, Thyssen Krupp, Tienew, Treisra, Trenew, Truma, TSP Electronic, T-Systems PCM, Tyco Thermal Controls, Valeo, VDO, Vero Electronics, Viessmann, Vishay, Voith Turbo, Voltec, Vosslock, Vossloh-Schwabe, Wago, Wandfluh, Weinmann, Werma, Wessel-Werk, Wetrok, Witte Nejdek, Witte Velbert, WOKA, W.O.M., Wurm-Systeme, Xerox, Yokojana Europe, Ziehl, Zytec

The complete production

- 
ZERTIFIKAT
Die TÜV CERT-Zertifizierungsstelle
des TÜV Saarland e.V.
bescheinigt gemäß TÜV CERT-Verfahren,
dass das Unternehmen

ET Industrie GmbH
Neckarauer Straße 2 • D-68766 Hockenheim
für den Geltungsbereich
**Entwicklung, Produktion, Vertrieb und Service
von elektronischen Prüfgeräten und Testsystemen**
ein Qualitätsmanagementsystem eingeführt hat
und anwendet.
Durch ein Audit, Bericht-Nr. B 051/06,
wurde der Nachweis erbracht, dass die Forderungen der
DIN EN ISO 9001:2015
erfüllt sind. Dieses Zertifikat ist gültig bis **2009-02-13**.
Zertifikat-Registrieren-Nr. **71 100 G 015**
- 
TÜV SÜD
TÜV SAARLAND
TÜV NORD
- 
Handwritten signature
TÜV CERT-Zertifizierungsstelle
des TÜV Saarland e.V.
- Sulzbach, 2006-02-14



Fairs



Fair stand from ET Instrumente and ET Testsysteme

ET Instrumente and ET Testsysteme is present on many national and international fairs in the world. Here we show newest innovations and trends. The fair offers also good possibility to learn more about our company and/or to maintain the partnership.

A Perfect Support



Meeting from our distributer partner from all over the World for product training by ET Instrumente and ET Testsysteme in Hockenheim

In Germany, as well as in many countries in the world through our selling partners, we are always endeavor our customers and users to give a optimal support with the selection of the correct products and with help for your applications. We are to be to help you competently and optimally, to find the solution of your problems.

Electronic AC Source EAQ-M



For the complete line simulation
of all technical networks from DC - 2000 Hz



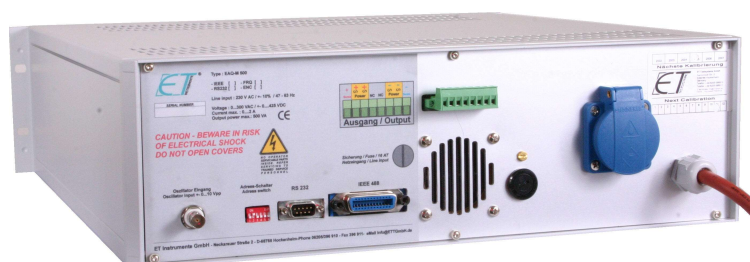
On one Hand Simulation on the other Analysis

- CV- and CC-Mode !
- AC Voltage 0..300 Vrms (500V)
- DC Voltage 0..425 Vdc (700V)
- Frequency DC, 1 - 500 Hz (2000 Hz)
- Phase-triggered-switch on-and off
- External Oscillator input
- RS 232- Interface, IEEE 488 (option)
- Measurement Vrms V, Crms A, Cpeak A, Power W, Frequency Hz
- LCD Display for all settings and measurements
- Very low crest factor typ. < 0,2%

The electronic AC sources of the series EAQ-M have been developed for the simulation and analysis of one- or three-phase line voltage. In standard sine wave voltage as well as DC voltage and DC voltage with superposed AC-voltage can be produced. Because of this extensive function outfit, these models can produce all possible technical networks. They fit very well for supplying and testing power supplies, transformers, motors, lamps, heaters, domestic appliances etc., just to name a few. For the measurement of the effective voltage, the frequency, the effective current, the peak current as well as for the power, there are 4 digit displays. The manual operation is performed through a potentiometer. DC voltage, AC voltage, frequency and current can be regulated.

Back panel EAQ-M250/500

Picture shows AC source EAQ-M 250 or EAQ-M-500 with options RS 232, IEEE and SSD

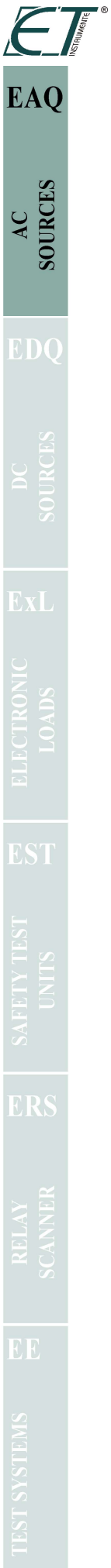


The new LCD-Display offers the total overview of all adjustments and measurements. Continuously the adjusted values of AC-Voltage, DC-Voltage, Current, Frequency and Phase-Angle for switching the output on and off, are displayed. In the range of the measurements the true RMS value of the Voltage, the true RMS value of the Current, the Peak-Current, the Real Power, the Apparent Power and the Power Factor are continuously displayed and refreshed. Not only the new display makes the AC-Source easier to operate, also the new operation features make it real simple to use the AC-Source Type EAQ-M. By pressing a button the fixed frequency can be selected between 50, 60 and 400 Hz and also variable frequency is available. To change between standard sine wave output and user curve it is only a button to press. The last adjustments before switching the unit off at the main switch will be saved and are available by pressing the button POL (PowerOnLast) after switching the unit on again. The output voltage, the DC-Voltage, the Current, the Frequency and the Phase Angle is adjusted on a potentiometer. To switch the potentiometer between the different parameters it just has to be pressed.

From now on the Electronic AC -Source comes with Arbitrary Function. By simply switching via interface a change between sine wave and variable user curve is possible. The user memory can be set with up to 1024 dots for the user curve. Now very easy voltage spikes, drop outs, often in reality existing cut off crest voltage and much more can be simulated. The wave form is transferred via the optional available RS232- or IEEE-488-Interface and then selected by sending a command or pressing a button. With this feature the electronic AC-Source can also be used as an arbitrary function generator with high power and high voltage of up to 425 V.

Short specification EAQ-M 1 phase Electronic AC Source				
Type	Power	Voltage	Current rms	Case 19"
EAQ-M-250	250 VA	0...300 Vrms / +-425 Vdc	1.00A	3 U, 490 mm
EAQ-M-500	500 VA	0...300 Vrms / +-425 Vdc	2.00A	3 U, 490 mm

Short specification options EAQ-M 1- phase Electronic AC Source	
Option	Description
-ENC	Without operation a. indication (only with option -A, or -RS232, or -IEEE488)
-FRQ1	Extended frequency range 1...1000 Hz
-FRQ2	Extended frequency range 1...2000 Hz
-V500	Extended voltage range 0...500 Vrms / 700 Vdc (I -70%)
-IEEE	IEEE 488 Interface, Programming and measurement, Standard SCPI Format
-RS232	RS232-Interface, Programming and measurement, Standard SCPI Format
-USB	USB-Interface, Programming and measurement, Standard SCPI Format
-CR2	2. Current measurement range Cmax/10 (No POL Function)
-OL	No 19" Rack
-SSD	Schuko output on the rear side (see picture page 8)



LCD Displays :	The new LCD-Display offers the total overview of all adjustments and measurements. Continuously the adjusted values of AC-Voltage, DC-Voltage, Current, Frequency and Phase-Angle for switching the output on and off, are displayed. In the range of the measurements the true RMS value of the Voltage, the true RMS value of the Current, the Peak-Current, the Real Power, the Apparent Power and the Power Factor are continuously displayed and refreshed.
Settings :	The adjustments of voltage Vdc, voltage Vac, current limitation A and frequency follow respectively through a potentiometer.
Source Activation :	After switching on the unit, the power output is inactive and disconnected through a relay. Only after pressing the key "ON-OFF" the power output will be activated and the relay at the output operates. Now the previously set value for voltage or current will be effective at the power output.
Stand-By-Function :	The electronic AC source can be switched on and off by the key "Stand-By". This key is mainly used at the phase-triggered switching on and off of the AC output voltage. By pressing the key "Stand By" the power output of the previously set phase position will be activated or inactivated.
Operating Modes :	The source operates in constant-voltage as well as in constant-current mode. The LCD display indicates the constant-current mode.
Fixed Frequencies :	Three keys enable the precise adjustment of three fixed frequencies, 50 Hz, 60 Hz and 400 Hz. All other possible frequencies can be set by the potentiometer.
Ext. Oscillator Input :	Via the external oscillator input, which is on the back of the unit, a signal with an individual wave form can be performed. The source operates as a pure power amplifier in this mode. The frequency of the signal is limited by the maximum frequency of the amplifier (depending on option).
Protective Devices :	The source has got a number of protective measures to ensure intrinsic safety. In case of short circuit, overcurrent, overtemperature and overvoltage the source switches off. The switching off in case of an error is indicated in the LCD display.
AC/DC Voltage :	When AC and DC-output voltage are switched on simultaneously, AC and DC voltage are coupled and a DC voltage with superposed AC voltage is available at the power output.
Phase Trigger Mode :	The switch on and switch off angle of the phase at the output can be adjusted in a range of 0° - 360°. The switch on of the phase triggered mode is performed by the stand by function. The angle is adjusted by a potentiometer.
Peak Current :	The measurement of the starting peak current of the connected application is also possible. The indication of the value on the amperemeter is activated by a key. The measurement is now simply activated by switching on and off of the "Stand By" key.



System Application

With the option -ENC the operation of the front panel is dropped, which also leads to a cost reduction. The source is now perfect for the pure system operation in test systems and appliances. USB, IEEE 488, RS232 and the analogue bus are available as interface to the system..

- Interfaces :** As an option the interfaces IEEE 488 and RS232 are available. You will find the description to this on the next page.
- Desk Top Case :** For sources up to case size 6U there is a robust well-designed desk top case available.
- Power Outlets :** The output of the source is always on the backside of the unit and is carried out as screw terminal. The types without option -ENC do have an additional output on the front panel. Depending on the type and performance the output is carried out as plug outlet or CEKON.

Specification EAQ-M

Type	EAQ-M-250	EAQ-M-500
Output data		
AC - Power	250 VA	500 VA
DC - power	250 W	500 W
Output Voltage AC	0 – 300 VAC	0 – 300 VAC
Output Voltage DC	+0 - 425 VDC	+0 - 425 VDC
Maximum Effective Current	1 A	2 A
Maximum DC Current	1,4 A	2,8 A
Maximum Peak Current	1,7 A	3,4 A
Frequency Power Amplifier	DC – 1 kHz	DC – 1 kHz
Line Regulation	0.1%	0,1 %
Load Regulation	0.2%	0,2 %
Distortion Factor at Pmax 50Hz	0.2%	0,2%
Frequenz Standard	1 – 500 Hz	1 – 500 Hz
Frequency FRQ1 (Option)	1 – 1000 Hz	1 – 1000 Hz
Frequency FRQ2 (Option)	1– 2000 Hz	1 – 2000 Hz
Programming Accuracy		
AC Voltage (10-400Hz)	0,1 %	0,1 %
DC Voltage	0,1 %	0,1 %
Effective Current (DC; 40 – 400 Hz)	0.2 %	0.2%
Turn on Phase (0 – 360°)	1°	1°
Frequency	0,1 %	0,1 %
Measurement (DC; 40 – 400 Hz)		
Effective Voltage	0,2 %	0,2 %
Peak Current	0,8%	0,8%
Effective Current	0,3%	0,3 %
Effective Power	0,8%	0,8 %
Frequency	0,2 %	0,2 %
Mains Input		
Line Input -10%/+15%	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC

Motor Controlled AC Source EAQ-MT



For line simulation
of 1- and 3- phase networks



The Cost Reduced Solution at High Power

- CV Mode
- AC Voltage 0...270 Vrms (500 V)
- Performances up to 50000 VA !
- Fast Response Times typ. 100V/Sek.
- Adjustable Overcurrent Switching-off
- USB, RS 232, IEEE 488 Interface (Option)
- Measurements Vrms V, Crms A
- Switching-on and off via relay (Option)

*Picture shows EAQ-MT-3P with
Options:*

*-IND
-ESA
-AREL
-AF
-FR*

The AC sources of the series EAQ-MT have been developed for the simulation and analysis of one or three phase line voltage particularly for high power. The output voltage is infinitely variable between 1 and 100% of the nominal voltage and is being kept constant with a deviation of < 1%. The preset reference input can be reached with the potentiometer as well as via the optional interfaces. In 3 phase units the regulation is controlled by phase L1. The structure of the AC source EAQ-MT consists of a regulated ring transformer with isolation. The regulated ring transformer is operated through a DC motor. The set voltage is being kept constant at deviations of the line input voltage as well as at load variations at the output.

Short specification EAQ-MT 1- and 3 Phase AC Sources						
Type	Power max	Voltage	Current	Phases	Case	
EAQ-MT-2708		2160 VA	3...270Vrms	8.0 A	1	19", 6U,540mm
EAQ-MT-27016		4320 VA	3...270Vrms	16.0 A	1	19", 9U,540mm
EAQ-MT-27020		5400 VA	3...270Vrms	20.0 A	1	19", 9U,540mm
EAQ-MT-27025		6750 VA	3...270Vrms	25.0 A	1	19", 12U,540mm
EAQ-MT-27030		8100 VA	3...270Vrms	30.0 A	1	19", 12U,540mm
EAQ-MT-27035		9450 VA	3...270Vrms	35.0 A	1	19", 15U,600mm
EAQ-MT-27040		10800 VA	3...270Vrms	40.0 A	1	19", 15U,600mm
EAQ-MT-27050		13500 VA	3...270Vrms	50.0 A	1	19", 18U,600mm
EAQ-MT-27065		17550 VA	3...270Vrms	65.0 A	1	19", 18U,600mm
EAQ-MT-3P-2702		540 VA	3...270Vrms	2.0 A	3	19", 12U,540mm
EAQ-MT-3P-2705		1350 VA	3...270Vrms	5.0 A	3	19", 12U,540mm
EAQ-MT-3P-2708		2160 VA	3...270Vrms	8.0 A	3	19", 12U,540mm
EAQ-MT-3P-27016		4320 VA	3...270Vrms	16.0 A	3	19", 15U,600mm
EAQ-MT-3P-27020		5400 VA	3...270Vrms	20.0 A	3	19", 15U,600mm
EAQ-MT-3P-27025		6750 VA	3...270Vrms	25.0 A	3	19", 18U,600mm
EAQ-MT-3P-27035		9450 VA	3...270Vrms	35.0 A	3	19", 18U,600mm
EAQ-MT-3P-27050		13500 VA	3...270Vrms	50.0 A	3	19", 24U,600mm
EAQ-MT-3P-27065		17550 VA	3...270Vrms	65.0 A	3	19", 24U,600mm
The technical data of the 3-phase source refers to each phase						

Short specification options EAQ-MT 1- and 3 Phase AC Sources	
Option	Description
-ENC	Without operation and indication (only with Option -A, -RS232, -IEEE488)
-V300	Extended voltage range 3...300 V AC
-V350	Extended voltage range 3...350 V AC
-V400	Extended voltage range 3...400 V AC
-V500	Extended voltage range 3...500 V AC
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-FR	Rack with wheels
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-SA	Automatic circuit breaker instead of safety fuse at the output
-ESA	Adjustable overcurrent switching-off (10%-110% of nominal current)
-OVP	Adjustable over voltage protection (10%-110% from U-Max)
-OVPM	Einstellbare Überspannungsabschaltung (10%-110% von U-Nenn) nur manuell
-IND	Digital display for voltage and current
-PP	Digital display for voltage Phase-Phase (only together with -IND)
-AREL	On- and off-switching of the output voltage by a power relay
-AF	Additional output on the front of the unit (plug outlet or Cekon socket)
-OG	Version without galvanic isolation
-USB	USB Interface, Programming and measurement

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Unit Description EAQ-MT



Analogue Indication : The AC source EAQ-MT has got two and the three phases source six analogue instruments for the indication of voltage and current in each phase. Optionally the source can be equipped with digital indications.

Adjustments : The adjustments of the voltage V_{ac} will follow through a 10-turn potentiometer.

Fuse Protection : The source has got an input and output safety fuse. Optionally the source may be equipped with an automatic circuit breaker at the output. A manual adjustable over-current switching-off is also available. The switching-off can be reached through a power relay.

Analogue Interface : The optionally available analogue interface enables the user the programming and the reading of data via a 0...5 Vdc signal. Changing and checking modes are possible via digital TTL signals.

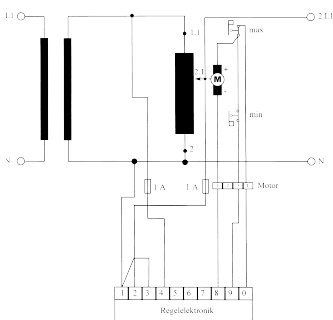


*Picture on the left shows EAQ-MT with options:
-FR*



*Picture on the right shows EAQ-MT-3P with options:
-IND
-PP
-AF
-FR*

Principal EAQ-MT circuit



EAQ-MT-2708

Specification EAQ-MT and EAQ-MT-3P



Type	EAQ-MT-2708	EAQ-MT-27016	EAQ-MT-27020	EAQ-MT-27025	EAQ-MT-27030
Output data					
Power	2160 VA	4320 VA	5400 VA	6750 VA	8100 VA
Output Voltage AC	3 – 270 VAC	3 – 270 VAC	3 – 270 VAC	3 – 270 VAC	3 – 270 VAC
Maximum Effective Current	8 A	16 A	20 A	25 A	30 A
Line Regulation	1%	1%	1 %	1%	1%
Load Regulation	1%	1%	1 %	1%	1%
Programming Accuracy					
AC Voltage	1,0 %	1,0 %	1,0 %	1,0 %	1,0 %
Current switch off (Option)	5,0%	5,0%	5,0 %	5,0%	5,0%
Measurement					
Effective Voltage	0,15 %	0,15 %	0,15 %	0,15 %	0,15 %
Effective Current	0,2%	0,2 %	0,2 %	0,2 %	0,2 %
Wirkleistung (Option)	0,5 %	0,5 %	0,5 %	0,5 %	0,5 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	2x400VAC	2x400VAC	2x400VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	2x200VAC	2x200VAC	2x200VAC
Input Frequency	47-400 Hz	47-400 Hz	47-400 Hz	47-200 Hz	47-400 Hz
Insulation Voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
The technical data of the 3-phase sources refers to each phase					
The line input of EAQ-TIP-3P is always a 3-phase input					
Type	EAQ-MT-27035	EAQ-MT-27040	EAQ-MT-27050	EAQ-MT-27065	EAQ-MT-3P-2702
Output data					
Power	9450 VA	10800 VA	13500 VA	17550 VA	540 VA
Output Voltage AC	3 – 270 VAC	3 – 270 VAC	3 – 270 VAC	3 – 270 VAC	3 – 270 VAC
Maximum Effective Current	35 A	40 A	50 A	65 A	2 A
Line Regulation	1%	1%	1 %	1%	1%
Load Regulation	1%	1%	1 %	1%	1%
Programming Accuracy					
AC Voltage	1,0 %	1,0 %	1,0 %	1,0 %	1,0 %
Current switch off (Option)	5,0%	5,0%	5,0 %	5,0%	5,0%
Measurement					
Effective Voltage	0,15 %	0,15 %	0,15 %	0,15 %	0,15 %
Effective Current	0,2%	0,2 %	0,2 %	0,2 %	0,2 %
Effective Power (Option)	0,5 %	0,5 %	0,5 %	0,5 %	0,5 %
Mains Input					
Line Input -10%/+15%	2x400VAC	2x400VAC	2x400VAC	2x400VAC	230VAC
Line Input ±10% (Option -Z)	2x200VAC	2x200VAC	2x200VAC	2x200VAC	115VAC
Input Frequency	47-400 Hz	47-400 Hz	47-400 Hz	47-200 Hz	47-400 Hz
Insulation Voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
The technical data of the 3-phase sources refers to each phase					
The line input of EAQ-TIP-3P is always a 3-phase input					

IEEE 488, USB, RS232 : Optionally the AC voltage source EAQ-MT may be equipped with the interfaces IEEE 488 and/or USB and/or RS 232. All adjustments and measurements may be carried out with the interfaces. The resolution of the programming when setting and measuring is 12 bit.

Power outputs : The output of the source is always on the backside of the unit. It is carried out as screw terminal. The types without option -AF have got an additional output on the front panel. Depending on the type and performance, the output is carried out as plug outlet contact or CEKON connector.

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Electronic Load ESL-M



Constant current and resistance regulation
Voltages 60 - 500 Vdc • Currents 1 - 1000 A • Power from 100 - 20000W



*ESL 2000 with adjustable under voltage cut off
case 19", 6U*

The Electronic Load for Laboratory and System Applications

- R- and C-constant !
- DC Voltage up to 500 Vdc
- DC Currents up to 1000 A
- Powers up to 20 kW
- Pre-setting functions
- Up to 500 W also deliverable as 3 U/42TE Euro cassette
- Option USB, RS 232, IEEE 488 or Analogue Interface



ESL 10000-C1000-A, Case 19", 18U with 1000A output



*ESL 500-AKF
Case 235x135x435mm*

The electronic load ESL is one of the most modern version of the outdated sliding resistor. The modes of operation current- and resistance constant guarantee continuously and electronically controlled load of an output on a supply mains, an electric circuit, a battery etc.. The LCD display shows all set and measure values.

Optionally the programming and measuring may follow via the USB, RS232, IEEE488 or analogue interface.

Short specification ESL				
Type	Power W	Voltage Vdc*	Current Adc*	Case
ESL-100	100 W	1....60 Vdc	0.....20 A	235x135x435mm
ESL-250	250 W	1....60 Vdc	0.....30 A	235x135x435mm
ESL-500	500 W	1....60 Vdc	0.....50 A	235x135x435mm
ESL-750	750 W	1....60 Vdc	0.....75 A	19", 3U,490mm
ESL-1000	1000 W	1....60 Vdc	0....100 A	19", 3U,490mm
ESL-1500	1500 W	1....60 Vdc	0....125 A	19", 3U,490mm
ESL-2000	2000 W	1....60 Vdc	0....150 A	19", 6U,540mm
ESL-3000	3000 W	1....60 Vdc	0....200 A	19", 6U,540mm
ESL-4000	4000 W	1....60 Vdc	0....250 A	19", 9U,600mm
ESL-5000	5000 W	1....60 Vdc	0....300 A	19", 9U,600mm
ESL-6000	6000 W	1....60 Vdc	0....350 A	19",12U,600mm
ESL-7000	7000 W	1....60 Vdc	0....400 A	19",12U,600mm
ESL-8000	8000 W	1....60 Vdc	0....500 A	19",15U,600mm
ESL-9000	9000 W	1....60 Vdc	0....550 A	19",15U,600mm
ESL-10000	10000 W	1....60 Vdc	0....600 A	19",15U,600mm
ESL-12000	12000 W	1....60 Vdc	0....700 A	19",18U,600mm
ESL-14000	14000 W	1....60 Vdc	0....800 A	19",21U,600mm
ESL-16000	16000 W	1....60 Vdc	0....900 A	19",24U,600mm
ESL-18000	18000 W	1....60 Vdc	0..1000 A	19",27U,600mm
ESL-20000	20000 W	1....60 Vdc	0..1000 A	19",30U,600mm
* Please choose higher voltages with option -V and smaller currents with option -C				

Short specification options ESL	
Option	Description
-ENC	Without operation and indication (only with Option -A,-RS232,-USB or IEEE)
-Cxxx	Customer specific current < standard value (minimum 1A)
-V100	Voltage 1...100 V CmaxNew = Cmax -50%
-V250	Voltage 1...250 V CmaxNew = Cmax -75%
-V500	Voltage 1...500 V CmaxNew = Cmax -90%
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232 Interface, Programming and measurement
-IEEE+RS232	IEEE488 und RS232 Interface, Programming and measurement
-NZ	19" case for ESL-100-500
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-AG	Analogue Interface as -A with galvanic isolation for 0...5 signals
-EK	Euro cassette 3U, 42 TE, 430 mm (only with option -ENC up to 500 W)
-OL	Without 19" holders (only von ESL-750 to ESL-3000)
-KR	Build in short circuit relays
-USB	USB Interface, Programming and measurement
-EUAB	Adjustable under voltage cut off
-AKF	Safety output connectors on the front side (only up to 20A)

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Unit Description ESL-M



- LCD display :** The electronic load ESL has a big LCD display. Set values and measure values are indicated at the same time.
- Adjustments :** The settings of current A can be reached through a potentiometer.
- Operating Mode :** The load operates in the constant-resistance as well as in the constant-current mode.
- Interfaces :** The interfaces USB, RS 23, IEEE 488 and the analogue interface are optionally available.
All settings and measurements can be carried out with the interfaces. The resolution for programming and measuring is 12 bit.
- Power Outlet :** The output of the load is always on the backside of the unit and is carried out as screw terminal up to 300A and > 300A as an sopper rail . As an option there is an additional output on the front panel carried out as a safety pole terminal. The measurement of the output voltage (Sense) is at separate outputs on the back of the unit.
- Maximum Current :** The maximum adjustable current emerges from the order table. If a lower maximum current is needed due to a better resolution, this can simply be chosen with the option -C i.e. ESL-100-C5 -Now the load has got a maximum current of 5 Ampere with the option -C5 instead of a maximum current of 20 Ampere.
- Higher Voltage :** With the option V100 up to V500 the input voltage of the load can be increased. Attention has to be paid to the fact that through increasing the voltage, the maximum current is reduced (for current reduction see option table). ESL-1000-V250 for example has now got an input voltage of 1...250 Vdc and a current of 0...25 A. The power of 1000 W remains.

*Back side
ESL 500-USB
Case 235x135x435mm*



Specification ESL



Type	ESL-100	ESL-250	ESL-500	ESL-750	ESL-1000
Output Data					
Power max.	100 W	250 W	500 W	750 W	1000 W
Input voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 20 ADC	0 – 30 ADC	0 – 50 ADC	0 – 75 ADC	0 – 100 ADC
Current Rise Time max. ms	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Isolation voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
Type	ESL-1500	ESL-2000	ESL-3000	ESL-4000	ESL-5000
Output Data					
Power max.	1500 W	2000 W	3000 W	4000 W	5000 W
Input voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 125 ADC	0 – 150 ADC	0 – 200 ADC	0 – 250 ADC	0 – 300 ADC
Current Rise Time max. ms	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Isolation voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
Type	ESL-6000	ESL-7000	ESL-8000	ESL-9000	ESL-10000
Output Data					
Power max.	6000 W	7000 W	8000 W	9000 W	10000 W
Input voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 350 ADC	0 – 400 ADC	0 – 450 ADC	0 – 550 ADC	0 – 600 ADC
Current Rise Time max. ms	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Isolation voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
Type	ESL-12000	ESL-14000	ESL-16000	ESL-18000	ESL-20000
Output Data					
Power max.	12000 W	14000 W	16000 W	18000 W	20000 W
Input voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 700 ADC	0 – 800 ADC	0 – 900 ADC	0 – 1000 ADC	0 – 1000 ADC
Current Rise Time max. ms	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Isolation voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Dynamic Load EDL



for the complete load simulation
static and dynamic from DC - 2000 Hz



EDL 1000-AKF in 19", 3HE Case

*EDL 500-AKF
in 349x167x440mm Case*



More Load Simulation More Functions

- R- and I-Konstant !
- Dynamic functions :
 - 1...2000Hz Square Wave
 - Impuls duty cycle 5-95%
- DC Voltage up to 500 Vdc
- DC Current up to 1000 A
- Power up to 20 kW
- Up to 500W also deliverable as 3 HE/42TE Euro cassette
- Optional RS 232-, IEEE 488-, Analog- or USB-Interface



*Electronic Load
EDL-4000 with 250A
screw terminal.*

The dynamic loads EDL-M have got almost every technical realisable load simulation at their disposal and still is extremely economically priced. The dynamic load EDL-M is an electronic load that can be flexibly inserted referring to handling and extent of performance. The two modes of operation, constant-current and -resistance are completed by the dynamic function. The shape of the curve is a square wave duty cycle. The impulse-pause cycle of the rectangle curve as well as the frequency can be set. The standard programme on various types is completed by the simple, optional choice of different voltage and current classes. Optionally the programming can be made via the analogue-, USB, RS232 or IEEE 488-interface.

Short specification EDL				
Type	Power	Voltage Vdc*	Current Adc*	Case
EDL-100	100 W	1...60 Vdc	0.....20 A	235x135x435mm
EDL-250	250 W	1...60 Vdc	0.....30 A	235x135x435mm
EDL-500	500 W	1...60 Vdc	0.....50 A	235x135x435mm
EDL-750	750 W	1...60 Vdc	0.....75 A	19", 3U,490mm
EDL-1000	1000 W	1...60 Vdc	0....100 A	19", 3U,490mm
EDL-1500	1500 W	1...60 Vdc	0....125 A	19", 3U,490mm
EDL-2000	2000 W	1...60 Vdc	0....150 A	19", 6U,540mm
EDL-3000	3000 W	1...60 Vdc	0....200 A	19", 6U,540mm
EDL-4000	4000 W	1...60 Vdc	0....250 A	19", 9U,600mm
EDL-5000	5000 W	1...60 Vdc	0....300 A	19", 9U,600mm
EDL-6000	6000 W	1...60 Vdc	0....350 A	19",12U,600mm
EDL-7000	7000 W	1...60 Vdc	0....400 A	19",12U,600mm
EDL-8000	8000 W	1...60 Vdc	0....500 A	19",15U,600mm
EDL-9000	9000 W	1...60 Vdc	0....550 A	19",15U,600mm
EDL-10000	10000 W	1...60 Vdc	0....600 A	19",15U,600mm
EDL-12000	12000 W	1...60 Vdc	0....700 A	19",18U,600mm
EDL-14000	14000 W	1...60 Vdc	0....800 A	19",21U,600mm
EDL-16000	16000 W	1...60 Vdc	0....900 A	19",24U,600mm
EDL-18000	18000 W	1...60 Vdc	0..1000 A	19",27U,600mm
EDL-20000	20000 W	1...60 Vdc	0..1000 A	19",30U,600mm
* Please choose higher voltages with option -V smaller currents with option -C				

Short specification options EDL	
Option	Description
-ENC	Without operation and instruction(only with option A, RS232, USB or IEEE)
-Cxxx	Customer specific current < Standard value (minimum 1A)
-V100	Voltage 1...100 V I _{max} New = I _{max} -50%
-V250	Voltage 1...250 V I _{max} New = I _{max} -75%
-V500	Voltage 1...500 V I _{max} New = I _{max} -90%
-IEEE	IEEE 488 Interface, Programming und measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-NZ	19" Case for EAQ-M-100-500
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-AG	Analogue Interface as -A with galvanic isolation for 0...5 Vdc signals
-EK	Module cassette 3HE, 42 TE, 430 mm (only with option -ENC - 500 W)
-OL	Without 19" holders (only for ESL-M-750 to ESL-M-3000)
-KR	Build in short circuit relay
-USB	USB-Interface, Programming and measurement
-EUAB	Adjustable under voltage cut off
-AKF	Safety output connectors on the front side (only up to 20A)
-CV	Constant Voltage
-CP	Constant Power

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Unit Description EDL



Digital Display :	The electronic load EDL has a big LCD display. Set values and measure values are indicated at the same time.
Adjustments :	The settings of static current Adc, dynamic current, frequency and duty cycle can be reached through the potentiometer for each parameter.
Operating Mode :	The load operates in the constant-resistance as well as in the constant-current mode. The LCD display indicates the mode.
Interfaces :	The interfaces IEEE 488, USB, RS 232 and the analogue interface are optionally available. All settings and measurements can be carried out with the interfaces. The resolution for programming and measuring is 12 bit.
Power Outlet :	The output of the load is always on the backside of the unit and is carried out as screw terminal. There is an additional output on the front panel as a screw terminal or pole terminal depending on the type. The measurement of the output voltage (Sense) is at separate outputs on the back of the unit.
Maximum Current :	The maximum adjustable current emerge from the order table. If a lower maximum current is needed due to a better resolution, this can simply be chosen with the option -C i.e. ESL-100-C5 - now the load has got a maximum current of 5 Ampere with the option -C5 instead of a maximal current of 20 Ampere.
Higher Voltage :	With the option V100 up to V500 the input voltage of the load can be increased. Attention has to be paid to the fact that through increasing the voltage mode, the maximum current is reduced (for current reduction see option table). EDL-1000-V250 for example has now got an input voltage of 1...250 Vdc and a current of 0...50 A. The power of 1000 W remains.
Switching OFF :	The load has got protective device and switching-offs for all possible errors. In case of overpower, overcurrent or overtemperature the load switches off. The error is indicated through the LCD display. With the Stand By key the load can be switched on again.

Specification EDL



Type	EDL-100	EDL-250	EDL-500	EDL-750	EDL-1000
Output data					
Power	100 W	250 W	500 W	750 W	1000 W
Input Voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 20 ADC	0 – 30 ADC	0 – 50 ADC	0 – 75 ADC	0 – 100 ADC
Dynamic C Square Wave Frequency	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz
Dynamic Duty Cycle Adjustment	5 – 95%	5 – 95%	5 – 95%	5 – 95%	5 – 95%
Current Rise Time	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Insulation Voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
Type	EDL-1500	EDL-2000	EDL-3000	EDL-4000	EDL-5000
Output data					
Power	1500 W	2000 W	3000 W	4000 W	5000 W
Input Voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 125 ADC	0 – 150 ADC	0 – 200 ADC	0 – 250 ADC	0 – 300 ADC
Dynamic C Square Wave Frequency	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz
Dynamic Duty Cycle Adjustment	5 – 95%	5 – 95%	5 – 95%	5 – 95%	5 – 95%
Current Rise Time	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Insulation Voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
Type	EDL-6000	EDL-7000	EDL-8000	EDL-9000	EDL-10000
Output data					
Power	6000 W	7000 W	8000 W	9000 W	10000 W
Input Voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 350 ADC	0 – 400 ADC	0 – 450 ADC	0 – 550 ADC	0 – 600 ADC
Dynamic C Square Wave Frequency	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz
Dynamic Duty Cycle Adjustment	5 – 95%	5 – 95%	5 – 95%	5 – 95%	5 – 95%
Current Rise Time	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Insulation Voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff
Type	EDL-12000	EDL-14000	EDL-16000	EDL-18000	EDL-20000
Output data					
Power	12000 W	14000 W	16000 W	18000 W	20000 W
Input Voltage	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	1 – 60 VDC	0 – 60 VDC
Current	0 – 700 ADC	0 – 800 ADC	0 – 900 ADC	0 – 1000 ADC	0 – 1000 ADC
Dynamic C Square Wave Frequency	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz	1 – 2000 Hz
Dynamic Duty Cycle Adjustment	5 – 95%	5 – 95%	5 – 95%	5 – 95%	5 – 95%
Current Rise Time	1	1	1	1	1
Programming Accuracy					
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Measurement					
Voltage	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Current	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %
Mains Input					
Line Input -10%/+15%	230VAC	230VAC	230VAC	230VAC	230VAC
Line Input ±10% (Option -Z)	115VAC	115VAC	115VAC	115VAC	115VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz	47-63 Hz
Insulation Voltage	2000Veff	2000Veff	2000Veff	2000Veff	2000Veff

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Electronic Load ESL-Solar 500

Test and characteristic of crystalline and thin film
solar modules



PV module test easily made

- V-, R- and C-constant, MPP Track, MPP Scan, U_{oc} , I_{sc} , P_{mpp} , U_{mpp} , I_{mpp}
- Standard 0..100VDC / 0...10ADC / 500W
- Table and system devices available
- USB and RS 232 Interface
- Software include

The electronic load ESL-Solar 500 was developed particularly for the test of crystalline and thin film solar modules and solar cells. All necessary load tests of the solar modules can be accomplished with the ESL-Solar 500. The load has constant current, resistance and voltage as well as the mode MPP (Maximum Power Point) tracking and MPP scanning. All functions are shown over the clear multi-function display or over in series existing interfaces USB and RS232. The interface IEEE 488 is optionally available.

While the mode MPP TRACK, released by push of a button or bus instruction, adjusts continuously the MPP, then can be regarded with the MPP Scan an individual capacity range of the solar module. This is for example necessary, if one liked to regard the behavior of unfavorably installed solar modules such a case were the assembly with some hard shadow develops. Here develops not only one MPP (maximum power POINT), but for two or even more than two MPP. With the MPP the TRACKs and Scan won data can be selected over the interfaces. Voltage, current and power are constantly indicated in the display. To get an accurate power curve, voltage and current value are measured and the same time. The use of the ESL-Solar 500 is suitable not only by the development of solar cells and modules, but also in the production of the modules, in the incoming inspection of dealers and solar system installer. The ESL-Solar 500 is accommodated in a portable housing (235x135x435 mm). As dual equipment it is implemented in 19" housings (ESL-Solar 500D). For applications of systems it is available as dual equipment, i.e. two loads in a housing (19" , 2HE, 380mm), without manual operation and desplay, type ESL-Solar 500D-ENC. Optionally the ESL-Solar 500 is available with an visible light power and temperature measuring sensor. The visible light power measuring has an range of 0...1200W/m² and a temperature measuring range of -20°C to +80 °C. The option designation is "S". Over the software the peak power of the PV-modules can calculated according the standard DIN EN 60891 to 1000W/m².



Frontal view
ESL-Solar 500D ; 19", 3U, 490mm case



Back side
ESL-Solar 500; 235x135x435mm case with
standard carrying handle



Frontal and back side
ESL-Solar 500D-ENC; 19", 2U, 380mm case

LCD-Display : The electronic load ESL solar possesses an LCD display. Here all set and measured values are indicated. The measured values achievement, voltage, current and power indicated at the same time.

Adjustments : All adjustments take place with a rotary button incremental giver. Changing between the different adjustments takes place through pressures of the rotary button.

Operating Mode : The load works in constant voltage, constant current and constant resistance mode, and in the MPP Tracking and MPP Scan mode. UOC, ISC, Pmpp, Umpp and MPP can be read easily on the LCD display and/or over the software transferred via interface.

Interface : As interfaces USB and RS232 are available, optionally are available the IEEE 488. All adjustments and measurements can be done with the interfaces. The resolution of programming and measuring is 12 bits. Programming takes place with SCPI format.

Power Outlet : The output of all types is on the backside and is implemented as screw connection clamp. The types ESL-Solar 500 and ESL-Solar 500D has an additional output on the front panel. The measurement of the output voltage (sense $\pm$) is at separate inputs on the back side.

Software : The software for control and measurement is include. The parallel test of two solar modules with comparison is possible. Here also solar modules can compare with a reference solar module

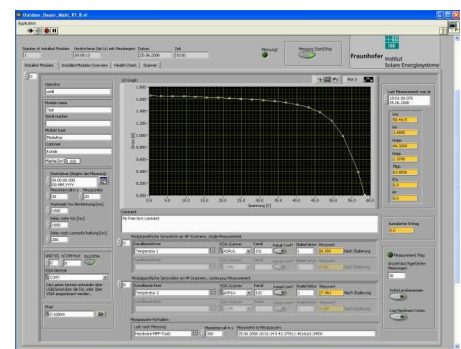


System engineering : Precision Monitoring System

For precision or long-term measurements the Fraunhofer ISE in Freiburg Germany has developed an LabView based software system, which makes power measurements possible (IU characteristic curves) by means of reference cell or Pyranometer during interruption of the Mpp Trackings after set time intervals. The characteristics become with preselected resolution voltage-equidistantly measured and with irradiation, module temperature and from that knowing module characteristic values are archives. Optionally an comprehensive climatic data monitoring system can be integrated. If necessary also an spectroradiometer for the periodic collection of the spectral irradiation can be integrated.



The picture shows a system for parallel test of 32 solar modules. The system includes 16 pieces of ESL-Solar 500D-ENC



Specification ESL-Solar

Typ	ESL-Solar 500	ESL-Solar 500D	ESL-Solar 500D-ENC
Output data			
Power	500 W	2 x 500 W	2 x 500 W
Input Voltage	0 – 100 VDC	2 x 0 – 100 VDC	2 x 0 – 100 VDC
Current	0 – 10 ADC	2 x 0 – 10 ADC	2 x 0 – 10 ADC
Current rise time max. ms	1	1	1
Operating mode	CV, CC, CR, MPP Track, MPP Scan	CV, CC, CR, MPP Track, MPP Scan	CV, CC, CR, MPP Track, MPP Scan
Programming Accuracy	0,2 %	0,2 %	0,2 %
Measurement			
Voltage / Current	0,2 %	0,2 %	0,2 %
MPP	0,4 %	0,4 %	0,4 %
Mains Input			
Line Input -10%/+15%	230VAC	230VAC	230VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz
Insolation Voltage	2000Veff	2000Veff	2000Veff
Manuel operation and adjustment			
	available	available	not available
Interface			
USB and RS232	available	available	available
IEEE 488	optional	optional	not available
Resolution	12 Bit	12 Bit	12 Bit
Case	235x135x435 mm	19", 3U, 490mm	19", 2U, 380mm

Typ	ESL-Solar 500V150	ESL-Solar 500DV150	ESL-Solar 500DV150-ENC
Output data			
Power	500 W	2 x 500 W	2 x 500 W
Input Voltage	0 – 150 VDC	2 x 0 – 150 VDC	2 x 0 – 150 VDC
Current	0 – 7,5 ADC	2 x 0 – 7,5 ADC	2 x 0 – 7,5 ADC
Current rise time max. ms	1	1	1
Operating mode	CV, CC, CR, MPP Track, MPP Scan	CV, CC, CR, MPP Track, MPP Scan	CV, CC, CR, MPP Track, MPP Scan
Programming Accuracy	0,2 %	0,2 %	0,2 %
Measurement			
Voltage / Current	0,2 %	0,2 %	0,2 %
MPP	0,4 %	0,4 %	0,4 %
Mains Input			
Line Input -10%/+15%	230VAC	230VAC	230VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz
Insolation Voltage	2000Veff	2000Veff	2000Veff
Manuel operation and adjustment			
	available	available	not available
Interface			
USB and RS232	available	available	available
IEEE 488	optional	optional	not available
Resolution	12 Bit	12 Bit	12 Bit
Case	235x135x435 mm	19", 3U, 490mm	19", 2U, 380mm

Typ	ESL-Solar 500V250	ESL-Solar 500DV250	ESL-Solar 500DV250-ENC
Output data			
Power	500 W	2 x 500 W	2 x 500 W
Input Voltage	0 – 250 VDC	2 x 0 – 250 VDC	2 x 0 – 250 VDC
Current	0 – 5 ADC	2 x 0 – 5 ADC	2 x 0 – 5 ADC
Current rise time max. ms	1	1	1
Operating mode	CV, CC, CR, MPP Track, MPP Scan	CV, CC, CR, MPP Track, MPP Scan	CV, CC, CR, MPP Track, MPP Scan
Programming Accuracy	0,2 %	0,2 %	0,2 %
Measurement			
Voltage / Current	0,2 %	0,2 %	0,2 %
MPP	0,4 %	0,4 %	0,4 %
Mains Input			
Line Input -10%/+15%	230VAC	230VAC	230VAC
Input Frequency	47-63 Hz	47-63 Hz	47-63 Hz
Insolation Voltage	2000Veff	2000Veff	2000Veff
Manuel operation and adjustment			
	available	available	not available
Interface			
USB and RS232	available	available	available
IEEE 488	optional	optional	not available
Resolution	12 Bit	12 Bit	12 Bit
Case	235x135x435 mm	19", 3U, 490mm	19", 2U, 380mm

EAQ

AC
QUELLEN

EDQ

DC
QUELLEN

ExL

ELECTRONIC
LOADS

EST

SICHERHEITS-
TEST GERÄTE

ERS

RELAIS
SCANNER

EE

PRÜFSYSTEME

High Voltage Test Unit EST-HV500AC



For EN-, IEC and VDE- Test
Test power 500VA • Isolated output



High Voltage Test Unit also for the Entrance Examination

- Test voltage range 1 = 0 - 6000 Vac
- Test voltage range 2 = 0 - 6000 Vdc (Option)
- Test voltage 0 - 6000 Vdc
- Ramp up and down function
- PASS / FAIL indicator, optically and acoustically
- Automatic and manual operation
- Adjustable test time
- Safety circuit input
- External start input
- Current switch-off 0 - 100 mA
- Option RS 232- , IEEE 488-, Analogue- or USB Interface

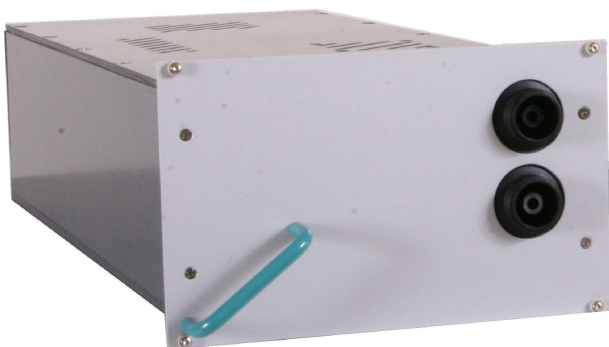
With the high voltage test unit EST-HV the dielectric strength tests on units, systems, packages, components and insulation material of all kinds can be practicabled. The operational area is in manufacturing, incoming inspection and service, also investigation and development. The high voltage test unit EST-HV500AC gives a isolated adjustable test voltage of 0 - 6000 Vac. With the option -DC is a second range with a direct voltage of 0 - 6000 Vdc available. Optional a programming and measurement can occur by analogue-, USB, RS 232- and IEEE 488 interface. A version without any operating elements -ENC is also available. With the option -ENC the case will get smaller from 19" width to an euro cassette 3 U, 42 TE, 450 mm. The smaller case is only available with the analogue interface.

Short specification EST-HV500AC

Type	Power max.	Voltage Vac	Current mA	Case
EST-HV500AC	500 VA	0....6000 Vac	0....100 m A	19",3HE,540mm

Short specification Options EST-HV500AC

Option	Description
-DC	2nd Voltage range 0.... 6000 Vdc
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-EK	Euro cassette (only with Option -A and ENC)
-EEHV-WIN	Windows Software package EEHV-WIN (control over RS232,USB, IEEE 488)
-USB	USB-Interface, Programming and measurement
-ENC	Without operation and indication (only with Option A, RS232, USB or IEEE)
-HVPP	High voltage test pistols with 3m Kabel and HV-Connector
-HVPPS	High Voltage Test Pistole with start button, 3m Cable and HV-Connector
-HVKS3m	3m High Voltage Cable with HV-Connector and open End
-HVKS5m	5m High Voltage Cable with HV-Connector and open End
-EST-ÜLINT1	Schuko, USA, UK and Laboratory adapter (One side open end)
-EST-ÜLINT2	Schuko, USA, UK and Swiss adapter (One side open end)



High Voltage Test pistols HVPP



High Voltage Cable HVKS3m



**International Adapter
EST-ÜLINT1**



**High Voltage Test Unit
EST-HV-500AC-EK-A**

Specification

Mains Input	: 230 Vac $\pm$ 10% 47-63 Hz
Accuracy	: Voltage < 2 %
Ripple on DC	: < 5 % not loaded
Digital indication	: available
Dimension	: 19", 3U, 540mm
Dimension with Opt. EK:	: 3 U, 42TE, 450 mm

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

High Voltage Test Unit EST-HV60DC



For the production test
Test power 60W • Isolated output



DC- High Voltage Test Unit

- Test voltage 0 - 6000 Vdc
- Ramp up and down function
- PASS / FAIL indicator, optically and acustically
- Automatic and manuel operation
- Adjustable test time
- Safety circuit input
- External start input
- Optional RS 232-, IEEE 488-, Analogue- or USB-Interface

With the high voltage test unit EST-HVDC the dielectric strength tests on units, systems, packages, components and insulation material of all kinds can be practicabled. The operational area is in the manufacturing, the incomming inspection and the service. The high voltage test unit EST-HV60DC gives a isolated adjustable test voltage of 0 - 6000 Vdc. Optional a programming and measurement can occur by analogue-, RS 232, USB or IEEE 488 interface. A version without any operating elements -ENC is also available. With the option -ENC the case will get smaller from ½ 19" width to an euro cassette 3 U, 14 TE, 380 mm. The smaller case is only available with the analogue interface.

Short specification EST-HV60DC

Type	Power max.	Voltage Vac	Current mA	Case
EST-HV60DC	60 W	0....6000 Vdc	0....10 m A	235x135x435mm

EAQ

AC
SOURCES

Short specification options EST-HV60DC

Option	Description
-SSB	Safety current limit - $I_{max}=U/600k\Omega$
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-EK	Euro cassette (only with Option -A and ENC)
-EEHV-WIN	Windows Software package EEHV-WIN (control over RS232,USB, IEEE 488)
-USB	USB-Interface, Programming and measurement
-ENC	Without operation and indication (only with Option A, RS232, USB or IEEE)
-HVPP	High voltage test pistols with 3m Kabel and HV-Connector
-HVPPS	High Voltage Test Pistole with start button, 3m Cable and HV-Connector
-HVKS3m	3m High Voltage Cable with HV-Connector and open End
-HVKS5m	5m High Voltage Cable with HV-Connector and open End
-EST-ÜLINT1	Schuko, USA, UK and Laboratory adapter (One side open end)
-EST-ÜLINT2	Schuko, USA, UK and Swiss adapter (One side open end)

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS



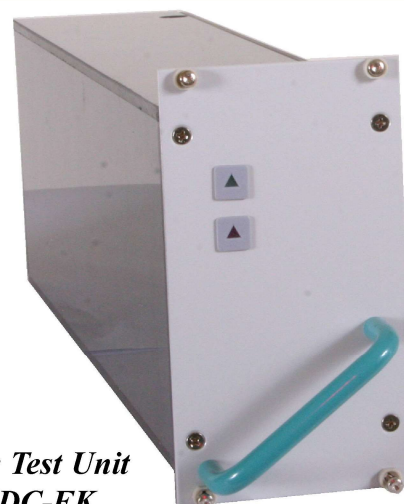
High Voltage Test pistols HVPP



High Voltage Cable HVKS3m



*International Adapter
EST-ÜLINT1*



*High Voltage Test Unit
EST-HV60DC-EK*

Specification

Mains Input	: 230 Vac $\pm$ 10% 47-63 Hz
Accuracy	: Voltage < 2 %
Ripple	: < 5 % not loaded
Digital indication	: available
Dimension	: 235x135x435mm
Dimension with Opt. EK	: 3 U, 14TE, 380 mm

PE Conductor Test Unit EST-SL



Test current 5 - 30 A adjustable



PE Conductor Test in four-wire measurement technique

- Test current 5 - 30 A
- Four-wire measurement technique
- PASS / FAIL indicator, optically and acoustically
- Automatic and manual operation
- Adjustable test time
- Optional RS 232-, IEEE 488-, Analogue- or USB-Interface

Exact electrical connection of the PE conductor with the case ensures, that in case of failure no voltage can occur to the case because of switching off by the fuse. The test of the PE conductor resistance is a very important part of the safety test. With an AC current of 5 A AC to 30 A AC, which is adjustable, change over resistance will be measured in four-wire measurement technique. The measurement range is in standard 0 - 0.2 Ohm. The adaption to the test item appears over a plug socket. Optional a programming and measurement can occur by analogue, USB, RS 232 and IEEE 488 interface. A version without any operating elements -ENC is also available. With the option -ENC the case will get smaller from ½ 19" width to a euro cassette 3 U, 28 TE, 220 mm. The smaller case is only available with the analogue interface.

Short specification EST-SL

Type	Meas. Resistance	Voltage Vdc	Current A	Case
EST-SL	0 - 0,2 Ohm	15 Vdc max.	5 - 30 A	235x135x435mm

Short specification Options EST-SL

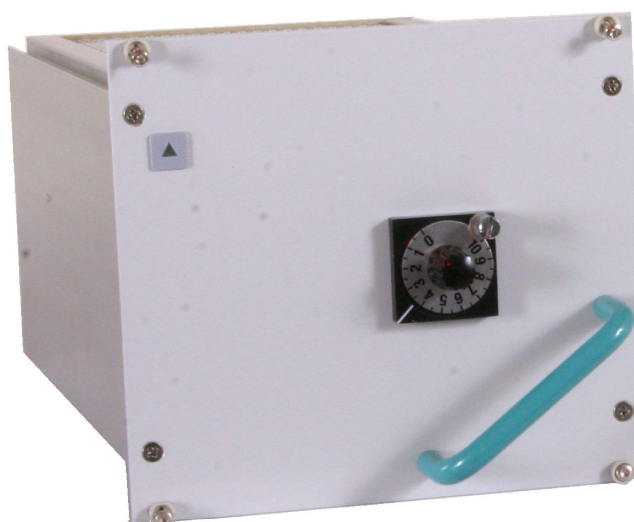
Option	Description
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-EK	Euro cassette (only with Option -A and ENC)
-SLPS	Protective ground probe with 5m cable, start button and connector
-SLPK	Protective ground probe clamp with 5m cable and connector
-EEHV-WIN	Windows Software package EEHV-WIN (control over RS232,USB, IEEE 488)
-USB	USB-Interface, Programming and measurement
-ENC	Without operation and indication (only with Option A, RS232, USB or IEEE)



PE Conductor Test Probe SLPS



PE Conductor Test Clamp SLPK



*Protective Conductor Test Unit
EST-SL-EK-A*

Specification

Mains Input	: 230 Vac $\pm$ 10% 47-63 Hz
Accuracy	: Widerstand $<$ 1.5 %
Ripple	: 0 - 0,2 Ohm
Operating indic.	: available
Voltage max.	: 15 Veff
Dimension	: 235x135x435mm
Dimension with Opt. EK:	3 U, 28TE, 220 mm

Insulation Test Unit EST-ISO



For laboratory and system application



Insulation Test Unit with Safety Current Limitation

- Test Voltage 500 Vdc
- Safety current limited maximum 4 mA
- PASS / FAIL indicator, optically and acoustically
- Automatic and manuel operation
- Adjustable test time
- Optional RS 232-, IEEE 488-, Analogue- or USB Interface

The insulation test unit EST-ISO is measuring with a test voltage of 500 V DC the insulation resistance of components, units and systems. The resistance measurement range is 0,5 M Ohm to 50 M Ohm. The insulation unit has got safety current limitation which is connected with short switch off times in case of an error. The measurement resolution is 12 bit. The adaption to the test item follows via plug and 4mm plug-in sockets.

Optionally the programming and measurement be realised via analogue-, RS 232- and IEEE 488 interface. A version without any operating elements -ENC is also available. With the option -ENC the case will get smaller from ½ 19" width to a euro cassette 3 U, 14 TE, 220 mm. The smaller case is only available with the analogue interface.

Short specification EST-ISO

Type	Meas. Resistance	Voltage Vdc	Current mA	Case
EST-SL	5 - 50 MOhm	500 Vdc	max. 4mA	235x135x435mm

Short specification options EST-ISO

Option	Description
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-EK	Euro cassette (only with Option -A and ENC)
-S23	Insulation test probe (Description see chapter accessories)
-EEHV-WIN	Windows Software package EEHV-WIN (control over RS232,USB, IEEE 488)
-USB	USB-Interface, Programming and measurement
-ENC	Without operation and indication (only with Option A, RS232, USB or IEEE)



***Insulation Test Unit
EST-ISO-EK-A***

Specification

Mains Input	: 230 Vac $\pm$ 10% 47-63 Hz
Accuracy	: < 1.5 %
Ripple	: < 1 %
Operating indic.	: available
Dimension	: 235x135x435m
Dimension with Opt. EK:	3U, 14TE, 220 mm

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Leakage Current Test Unit EST-AB



**With adjustable supply voltage
Test A1 - A2 - B • Isolated output**



Leakage Current Test Unit with built in AC - Source

- **Test voltage 3 - 270 Vac**
- **Matrix A1 -A2**
- **Option RS 232-, IEEE 488-, Analogue-, USB Interface**

The leakage current test is of particular importance. Compared to the other safety tests - which are without powering up, the test will be done with a higher rated mains voltage. The voltage source of the unit is galvanic isolated. The supply voltage can be adjusted before and it is indicated. The leakage current measurement has got a matrix A1, A2 (L and N changed) and the matrix B (short circuit L+N). Optionally a programming and measurement take place via analogue, USB, RS 232 and IEEE 488 interface. A version without any operating elements -ENC is also available. With the option -ENC the case will get smaller from ½ 19" width to a euro cassette 3 U, 42 TE, 400 mm. The smaller case is only available with the analogue interface.

Short specification EST-AB

Type	Power max.	Voltage Vac	Meas. current	Case
EST-AB-C10	500 VA	3....270 Vac	0....10 m A	19",3HE,490mm
EST-AB-C5	500 VA	3....270 Vac	0.....5 m A	19",3HE,490mm
EST-AB-C1	500 VA	3....270 Vac	0.....1 m A	19",3HE,490mm

Short specification options EST-AB

Option	Description
-IEEE	IEEE 488 Interface, Programming and measurement
-RS232	RS232-Interface, Programming and measurement
-IEEE+RS232	IEEE488 and RS232-Interface, Programming and measurement
-A	Analogue Interface (0...5 Vdc, TTL), Programming and measurement
-EK	Euro cassette (only with Option -A and ENC)
-EEHV-WIN	Windows Software package EEHV-WIN (control over RS232,USB, IEEE 488)
-USB	USB-Interface, Programming and measurement



*Leakage Current Test Unit
EST-AB-EK-A*

Specification

Mains Input	: 230 Vac $\pm$ 10% 47-63 Hz
Accuracy	: Voltage < 2 %
Accuracy	: Voltage < 1.5 %
Operating indic.	: available
Matrix	: A1, A2
Dimension	: 19", 3U, 490mm
Dimension with Opt. EK:	3U, 42TE, 400 mm

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Safety Compact-Tester EST-USB



for all electrical safety tests
conform to all valid standards (CE-Marking)

High Voltage Test - PE-Conductor Test - Insulation Test - Leakage Current Test

On one hand manually
on the other fully automatic



Safety Test Unit in the 19" Desk top case 6U

The comfortable handling of the Safety Compact Tester is possible with a clearly arranged LCD Display offers a view of all necessary parameters, such as measured values, limit values, etc.. With only one control button all functions are adjustable via an easy menu selection. The Control System can handle one or more units. Standard is the integrated Centronics Interface to which a printer can be used without any special software. All measured values can be transferred to another computer via USB or RS232 Interface. If using more than one test unit the control system also offers in standard a fully automatic test procedure. The complete switching from High Voltage Test to PE-Conductor Test to Insulation Test and to Leakage Current Test is realized by the built in special high voltage relay matrix.

The Unit contains as an option the display and operation and the case with the necessary corresponding connectors. There are three different Base-Units available, which are connectable to the four different Safety Test Units. The Single-Base-Unit for one Test Unit, the Dual-Base-Unit for two Test Units can be combined individually with four possible cassettes Type: SL-E, ISO-E, AB-E and HV-E . The last is the Full-Base-Unit for all four Safety Test Units. The 19"- Base-Units are in desk top or in 19"- Rack version available.

Specification High Voltage Test Unit Type HV500AC/-DC

- High Voltage 0..5000V AC or (DC)
- Ramp function for rise and fall separately adjustable
- Adjustable Remaintime 1-99999 Sec.
- High Voltage- and current indication

Power max.	: 500 VA
Voltage	: 0-6000 Vac(dc)
Current	: 0-100 mA
Frequency	: 50 Hz
Resolution	: 12 Bit
Distortion factor	: < 5%

Specification High Voltage Test Unit Type HV60DC

- High Voltage 0..6000Vdc
- Ramp function for rise and fall separately adjustable
- Adjustable Remaintime 1-99999 Sec.
- High Voltage- and current indication

Power cont.	: 60 W
Voltage	: 0-6000 Vdc
Current max.	: 0-10 mA
Frequency	: DC
Resolution	: 12 Bit
Ripple	: < 1%

Specification PE Conductor Test Unit Type SL

- Four -wire measurement technique
- Adjustable Remaintime 1-99 Sec.
- Resistance, current- and voltage measurement
- Resistance limit value input
- Test current manually adjustable

Range	: 0...0,2Ohm
Current	: 5...30 A
Voltage max	: 15 Veff.
Genauigkeit	: < 1.5 %
Resolution	: 12 Bit
Distortion factor	: < 5 %

Short specification EST-USB		
Type	Description	Case
EST-USB1	Single-base	19" rack / 3U / 540mm
EST-USB2	Dual-base	19" rack / 3U / 540mm
EST-USB	Fully-base	19" rack / 6U / 540mm
SL	PE Conductor Test Unit	3U / 28TE cassette
ISO	Insulation Test Unit	3U / 14TE cassette
AB	Leakage Current Test Unit	3U / 14TE cassette
HV500AC	AC-High Voltage Test Unit	3U / 42TE cassette
HV500AC-DC	AC/DC-High Voltage Test Unit	3U / 42TE cassette
HV60DC	DC-High Voltage Test Unit	3U / 14TE cassette

Short specification Options EST-USB	
Option	Description
-IEEE	IEEE 488 Interface, Programming and measurement
-WL	Signal lamp set
-SLPS	PE conductor test pistol
-SLPK	PE conductor cable with clamb
-SB	Safety current protection - $I_{max} = U/600k\Omega$ (only for HV60DC)
-3P	3 Phasen Leakage current matrix, 32A, 3*253V Fixed voltage, no g/i

! Order example	: PE conductor and insulation test type in dual base unit EST-USB2-SL-ISO
! Caution	: In the base unit EST-USB2 the following combinations are possible HV60DC and SL or HV60DC and ISO or SL and ISO

Specification Insulation Test Unit Type ISO	
<ul style="list-style-type: none"> Test voltage 500 VDC Adjustable test time 1-99999 Sec. Resistance measurement 0,5-50MΩ Resistance limit value input Safety current limitation < 4mA 	
Range	: 0,5....50M Ω
Current	: < 4 mA
Voltage	: 500 Vdc
Accuracy	: < 1.5 %
Resolution	: 12 Bit
Ripple	: < 1 %

Specification Leakage Current Test Unit		
Type AB	Type AB-3P	
<ul style="list-style-type: none">• Operation mode A1/A2 chooseable• Adjustable test time 1-99999 Sec.• Leakage current- and test voltage meas.• Current limitation value input seperated for A1 and A2		
Range	: 0...5 mA	Only as single unit available 1-99999 Sec. Leakage current- and L1 meas. Fixed voltage 3 x 253V / N no regulation, no galvanic isolation, 32 A each Phase
Mode	: A1/A2	Normal and all Single Fail
Test voltage max	: 270 Vac	3 x 253V against N
Accuracy	: < 1.5 %	< 1.5 %
Resolution	: 12 Bit	12 Bit
Phase	: 1	3

Unit Description EST-USB



Manual Operation : The manual operation works the same way as you have been used to so far. There is a potentiometer and with that you can adjust exactly i.e. voltage or current. The choice of functions follows by turning or by pressing the potentiometer.

Automatic Operation : There are numerous automatic functions available. Voltage and current curves with limit values can be programmed. The file can be called up any time.

Indication

Measurement Values : The measured values are displayed as numerical values and diagrams. The limit values or the envelope curves can also be shown.

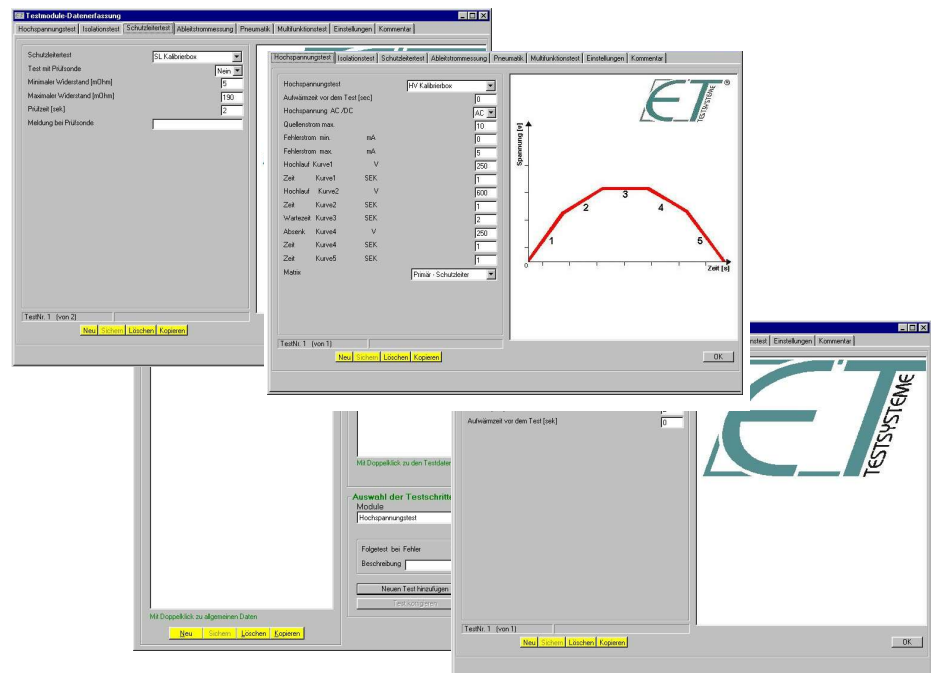
Tipturn E :

The comfortable handling of the unit EST-USB is possible with only one potentiometer. The button on the front of the unit can be turned and pressed. By turning the button, the individual menu items can be chosen and by pressing the button, the chosen function is called up.

Standard Equipment : The extensive standard equipment of the safety tester EST-USB consists of USB and RS 232 interface, safety lamp output, safety test hood and start contact input and automatic testing via software.

IEEE 488 Interface : As option the interface IEEE 488 is available. All adjustments and measurements can be done by this interface. The resolution of the programming by setting and measuring is 12 bit.

Software EEHV/EST : For control the unit without the option manual operation and for data store the software is available.



Languages :	The indication of the language is English.	EAQ
Automatic Mode :	The automatic mode offers the possibility to generate an automatic test process consisting of various tests such as measurement of voltage and current, trace process, ramp function, etc.. The test process can be stored as a file with an optional name.	AC SOURCES
Result of Measurement :	The determined result of measurement in the automatic test can either be printed right after the test or any time later via the Software EEHV/EST.	EDQ
Storage of Measurement Data :	It is possible to store the measurement data (records). The software works with Windows 98, NT, 2000, XP and Vista.	DC SOURCES
Choose Test :	In the main menu single tests can be chosen the button. High voltage, PE conductor, insulation and leakage voltage test can be called up each for a manual or an automatic test. The change into an automatic test, the on- and off-switching of the helpline and the calling up for the basic adjustments are possible.	ExL
Test Auto / Manu :	Each of the four safety tests can be started in the basic menu "Manu". Changeable parameters can be adjusted by the tipturn. The measured values will be displayed digital and by a graphic on the display. In the operating mode auto the parameters of the last stored automatic test will be called up. The test will be started and it runs fully automatically. The test result will be shown in the display at the end of the test with PASS for good and FAIL for error.	ELECTRONIC LOADS
Serial Number Input :	The serial number input is possible via Software EEHV/EST	EST
LCD Display :	As an option the LCD display is possible.	SAFETY TEST UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

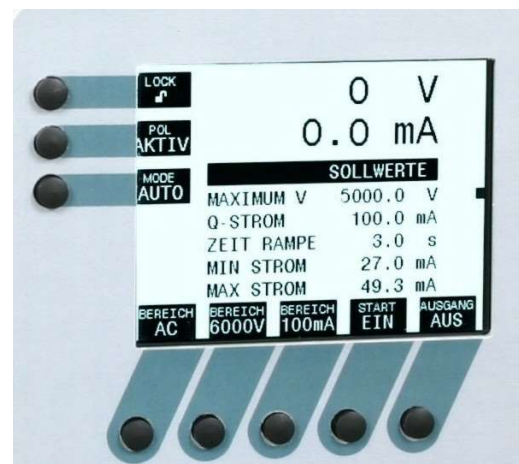
Description EST-USB



High Voltage Test :

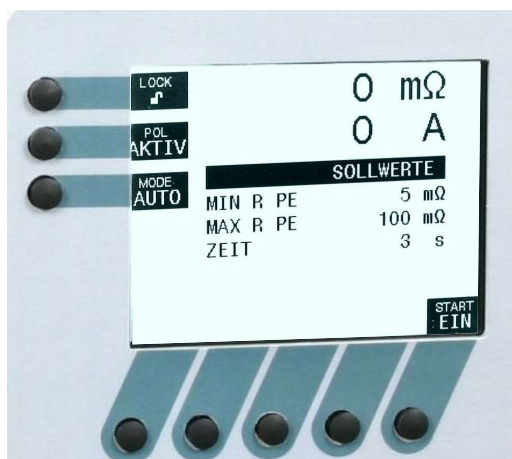
In the operating mode “Auto” the value of the high voltage, the maximum current, the minimum and maximum switch off current as well as the rise time, the waiting time and the fall time of the voltage ramp of the last stored automatic test can be directly taken over or through previously calling up of the function presetting, optionally changed. In the operating mode “Manu” the unit can be used as a conventional high voltage source. The output voltage is being increased by simply turning the button. The switch off current value is automatically taken over from the last stored specification, however it is changeable before the start of the tester.

Menu High Voltage AUTO



PE Conductor Test :

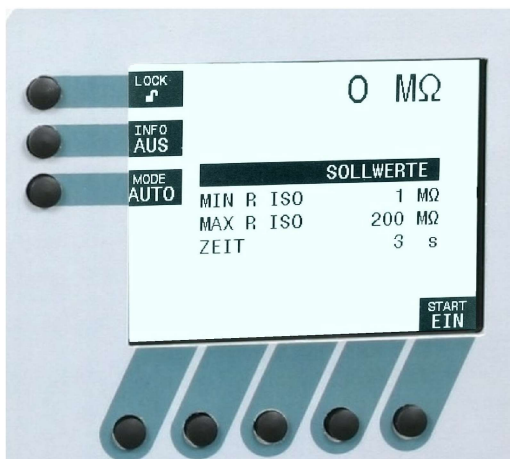
The operating mode “Auto” of the minimum permissible and the maximum permissible resistance as well as the test time have to be set when testing the PE conductor connection. These parameters are available from the last stored test file but can be changed if requested, also. In the operating mode “Manu” the test is started when pressing the tipturn and the measured resistance is indicated. The manual test can take place up to 99 seconds and ends after expiration of this time frame automatically as long as the test has not been stopped by the user, by pushing the button.



Menu PE Conductor MANU

Insulation Test :

The insulation test is carried out with its fixed voltage of 500 Vdc. The parameter minimum permissible and maximum permissible resistance and the test time are adjustable. In the “AUTO” test these values are automatically taken over from the last processed automatic test and are immediately available after calling up the function. With the Manu test the voltage is applied to the unit under test and the measured resistance is displayed digitally and graphically. The test lasts 99 seconds maximum..



Menu Insulation Test MANU

Leakage Current Test :

In the operating mode “AUTO” the supply voltage of the unit under test, the choice of the matrix for A1 or A2, the minimum and maximum permissible leakage current and the test time can be changed. By choosing the matrix the according wiring of L and N are graphically illustrated ahead at the test. The automatically recorded values of the automatic test can be taken over by simply pushing the button and the test can be started immediately after calling up of function. In the operating mode “MANU” supplied voltage of the unit under test is being increased or decreased by turning the button after the start.

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Safety Test Hood

HPH 1 - HPH 2 - HPH 5 - HPH 6



The test hoods HPH 1,2,5 and 6 are ideal for the high-voltage test up to 10 KV. The case is manufactured of highly-insulating, grey synthetic material, which is welded all round. Closing of the light-weight, hinged, acrylic-glass hood is monitored via a safety switch. An exchangeable baseplate inside the test hood makes adaptation for different test objects possible. The adapter plate can also have built-on accessories (e.g., test needles) extending into the available bottom space.

The hood cover is of transparent acrylic glass, so the test object is always visible and can, thus, also be optically evaluated, during the test.

Technical Data					
		HPH1	HPH2	HPH5	HPH6
		mm	mm	mm	mm
Outer dim.	B	500	445	690	690
	H	370	489	370	485
	T	600	853	653	853
Inner dim.	B	460	404	666	666
	H	260	405	300	415
	T	420	740	550	750
Adapter	B	250	250	490	490
	H	10	10	10	10
	T	300	300	180	280
Bottom space		70	40		
Mat. thickness: PVC 10 mm / Acryl 8 mm					

Options for HPH 1, 2, 5 and 6	
No.	Description options
H01	Safety switch with locking device 24 VDC
H02	Safety switch with locking device 230 VAC
H03	Safety lamps red and green mounted
H04	Interface connector B16
H05	Interf. connector, multicontact without inserts
H06	Euro plug
H07	Pneumatic built in euro plug
H08x	Interface connector pole terminals x=quantity
H09	Pneumatic interface to lift and lower a cylinder (incl. pressure reducer)
H10	Additional adapter plate
H15	19" Version (only HPH1 and 2)
Options H 01, 02, 04, 05, 06, 08 do not include wiring; this can be optionally offered.	

Safety Test Hood HPH 3



The test hood HPH 3 is designed purely as a desk version. It is ideal for tests with dangerous voltages and, in particular, for the high-voltage test up to 10 KV. The test hood HPH 3 can also be used for mechanical tests in which shock-hazard protection is necessary. The case is manufactured of highly-insulating, grey synthetic material, which is welded all round. The acrylic-glass hood is equipped with a safety monitoring device. An internal, exchangeable adapter plate accommodates the different test object adapters.

The test hood HPH 3 is ideal for very wide and deep test objects. The opening and closing of the acrylic-glass hood is assisted by means of two gas-pressure shock absorbers.

Technical Data HPH3			
		mm	
Outer dim.	B	600	
	H	310	
	T	690	
Inner dim.	B	580	
	H	250	
	T	670	
Adapter	B	250	
	H	10	
	T	300	
	Bottom space	40	
Mat. thickness :PVC 10 mm / Acryl 8 mm			

Options for HPH 3	
No.	Description option
H01	Safety switch with locking device 24 VDC
H02	Safety switch with locking device 230 VAC
H03	Safety lamps red and green mounted
H04	Interface connector B16
H05	Interf. connector, multicontact without inserts
H06	Euro plug
H07	Pneumatic built in euro plug
H08x	Interface connector pole terminals x=quantity
H09	Pneumatic interface to lift and lower a cylinder (incl. pressure reducer)
H10	Additional adapter plate
Options H 01, 02, 04, 05, 06, 08 do not include wiring; this can be optionally offered.	

EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

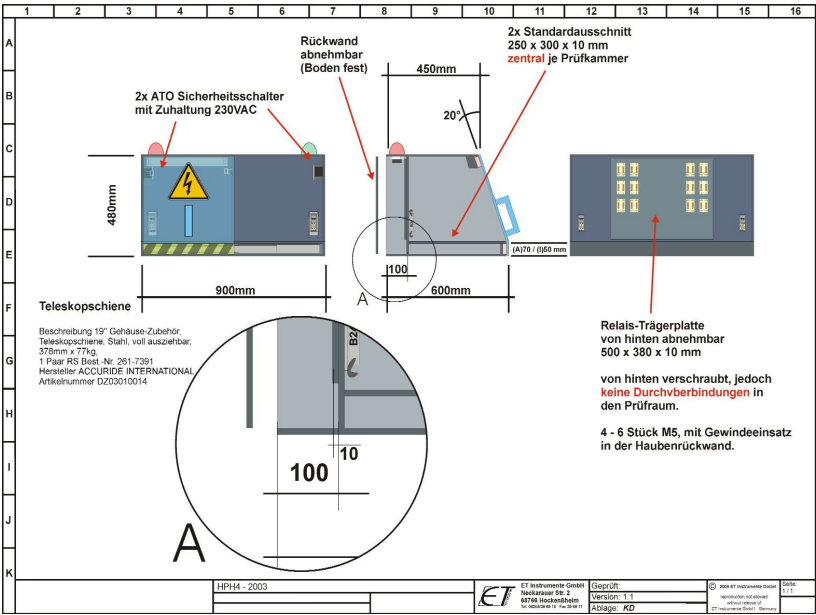
Safety Test Hood HPH 4



The tandem test hood HPH4 allows test objects to be simultaneously tested and contacted. While testing is carried out in one chamber, the test object can be removed from the other chamber and a new one can be contacted. The acrylic-glass hood is simply pushed from one chamber to the other. A space behind the chambers allows the installation of, e.g., high-voltage relays. One exchangeable adapter plate is provided per chamber. The hood can be installed not only on a desk, but is also designed to allow installation in a double 19" rack.

The standard basic dimensions, i.e., height (vertical-module grid) and depth (50 mm grid), of the tandem test hood HPH 4 can be optionally modified.

Dimension HPH4		
		mm
Outer dim.	B	900
	H	480
	T	600



Options for HPH 4

No. Description options

- H01 Safety switch with locking device 24 VDC
 - H02 Safety switch with locking device 230 VAC
 - H03 Safety lamps red and green mounted
 - H04 Interface connector B16
 - H05 Interf. connector, multicontact without inserts
 - H06 Euro plug
 - H07 Pneumatic built in euro plug
 - H08x Interface connector pole terminals x=quantity
 - H09 Pneumatic interface to lift and lower a cylinder (incl. pressure reducer)
 - H10 Additional adapter plate
 - H11x Greater depth. interior x = dimension in mm
 - H12x Greater height interior x = dimension in
- Options H 01, 02, 04, 05, 06, 08 do not include wiring; this can be optionally offered.

Safety Test Hood HPH/VP 1



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS



The test hood HPH/VP 1 is a pneumatically-controlled protective hood and can either be integrated in a conveyor belt system or employed as an individual job-site solution. The hood, the structure of which is in aluminium-profile, is totally insulated in the testing area by means of an acrylic-glass hood. The lifting and lowering of the hood is pneumatically controlled via linear guides accommodated on ball bearings. The hood is closed by means of two-hand operation; it can also be opened via an external signal. The test hood is available with different dimensions. An integrated bench is available as optional equipment, also.

The pneumatic and SPC-controlled safety test hood HPH/VP 1 offers perfect technology combined with absolute safety.

Technical Data HPH/VP1

Outer dim.	:Breite	1000 mm
	:Höhe	2350 mm
	:Tiefe	800 mm
Inner dim.	:Breite	860 mm
Chamber	:Höhe	750 mm
	:Tiefe	660 mm
Mat. thickness	:Acryl	10 mm
Safety	:Safety switch, emergency OFF safety circuit, two-hand operation hood safety interlock	
Lamps	:Safety lamps red and green	
Power Input	:230 V $\pm$ 10% / 50 Hz	
Control	:SPS	
Logistic signals	:Hood state, lift hood	
Pneumatic	:Incl. pressure reducer, input min. 6 bar	

Options for HPH / VP1

Nr.	Description Options
H04	Interface connector B16
H05	Interf. connector, multicontact without inserts
H06	Euro plug
H07	Pneumatic built in euro plug
H08x	Interface connector pole terminals x=quantity
H09	Pneumatic interface to lift and lower a cylinder (incl. pressure reducer)
H10	Additional adapter plate
H11x	Greater depth. interior x = dimension in mm
H12x	Greater height interior x = dimension in mm
H13x	Greater width interior x = dimension in mm
H14x	Integrated bench
Options H 01, 02, 04, 05, 06, 08 do not include wiring; this can be optionally offered.	

The standard and customer-specific test systems serie EE



Due to the modular design of their hard and software, our test systems can be configured in such a variety of ways, that customer-specific applications and problem solutions can, largely, be put together using the existing standard components. The possibility of using already existing components fulfils the optimum prerequisite for a low-cost, customer-specific test system. Thanks to the already created interfaces, it is easy to integrate any special modules required into the standard elements. Years of experience in the field of special test pieces allows a large number of already existing modules to be used and, thus, the uncomplicated and quick assembly of the necessary elements. A wide variety of hardware components is already available and, due to our own development capacities, any supplementary applications needed can be quickly added. The type of the product to be tested, as well as the desired degree of automation, define the actual basic prerequisites for the overall concept. Our experienced Applications Engineers competently and quickly develop the problem solution together with the customer and professionally put together the necessary sub-segments, so that, due to the clear structures, the overall solution is immediately recognisable. The customer-specific test systems, already developed and produced by us have been in use throughout the world for many years and are evidence of our enormous empirical potential and know-how, from which our customers can benefit every day.

We offer Test Systems for the following Ranges and Units :

Power Supplies
Batteries
Transformers
Lamps and Luminaries
Electric Motors
Solid State Relays
Mechanical Relays
Cables and Lines
Fuses
Solenoid Valves
Industrial Heaters
Fans
Domestic Appliances
Medical Equipment
Sensors
Switches and Plugs
Consumer Electronics

Test System Serie EE Function-and Safety Test

Test- and Handling System for
heatings



Test- and Handling System for
thyristor modules



Test- and Handling System for
solid state relais



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Test System Serie EE Function and Safety Test



Test System for motor electronic
moduls



Test System for power supplies



Test- and Handling System for
high voltage modules



Test System Serie EE Function Test

Test- and Handling System for sensors



Test System for power supplies



Test- and Handling System for auto switches



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Test System Serie EE Function Test



Test System for
auto electronic modules



Test- and Handling System for
motors



Test- and Montage System for
heatings



Test System Serie EE Function Test

Test- and Montage System for heatings



Test System for CAN-Bus switch modules



Test System for power elektronik modules



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Test System Serie EE Function Test



Test System for
welding units



Test System EEP 7 for
power supplies



Test System with multiple hood
for fuses



Test System Serie EE Function Test

Test System for
SMD fuses



Test System for
fuses



Test System for
electronic fuses



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Test System Serie EE Function Test



Test System for
electronic control modules



Test System for
electric valve



Test- and Handling System for
motor electronic modules



Test System Serie EE Safety Test

Safety Test System EEHV 3



Safety Test System EEHV 4 with integrate pneumatic tandem hood



Safety Test System EEHV 6 with integrate pneumatic hood



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Test System Serie EE Safety Test



Safety Test- and Handling System



Safety Test System for 19" racks
with wheels



Safety Compact Tester
EST-TIP with
pneumatic hood



Test System Serie EE Safety Test

Safety Test System with
test hood HPH1



Safety Tester with
test hood HPH2 and pneumatic
Adapter



Safety Compact Tester
EST-TIP with
tandem test hood HPH4



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Burn-In-Test System Serie EBI



Burn In Test System EBI/T

Test System EBI undertakes packages and terminals for a "burn in" test. It gives already in the basic equipment the unit for a parallel test of test items. The test takes place by 55 °C. This temperature will be held in the test system by $\pm 5^{\circ}\text{C}$ constant. The heating phase from room temperature to "Burn In Temperature" is typical only 30 min. A controller can switch different groups of the test items and simulate different operating conditions. The test items can also run under a load. The course of these tests, i.e. groups, can be free programmed. The test chamber is provided with safety switch, which will prevent the opening of the door during the test. Only after the complete test or by stopping the test and after a certain cool down phase the chamber door can be opened.

To load the test item outputs, electronic loads or resistors can be used. Optional also the primary supply of the test item can be varied. Temperature measurement spots at the test items can be recorded and stored. It gives the possibility to record the temperature runs at the test item. The test time can be varied from a few minutes up to a few days. With especially constructed test openings the test places can be adapted to different test items. A window allows a visual control of the test items during the test. The fixed rolls permits the change of location. On the bottom of the test chamber are bars, which enable the easy transport by a fork lifter.



Burn-In-Test System Serie EBI

Burn-In-System for electronic modules



Burn-In-System for 19" rack simulation



Burn-In-System with multiple chamber



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Burn-In-Test System Serie EBI



Burn-In-System for parts



Burn-In-System with line back operation



Burn-In-System for motor electronic



Burn-In-Test System Serie EBI

Burn-In-System for
Beamer lamp electronic



Burn-In-System in
line production



Burn-In-System for
EX-power supplies



EAQ

AC
SOURCES

EDQ

DC
SOURCES

ExL

ELECTRONIC
LOADS

EST

SAFETY TEST
UNITS

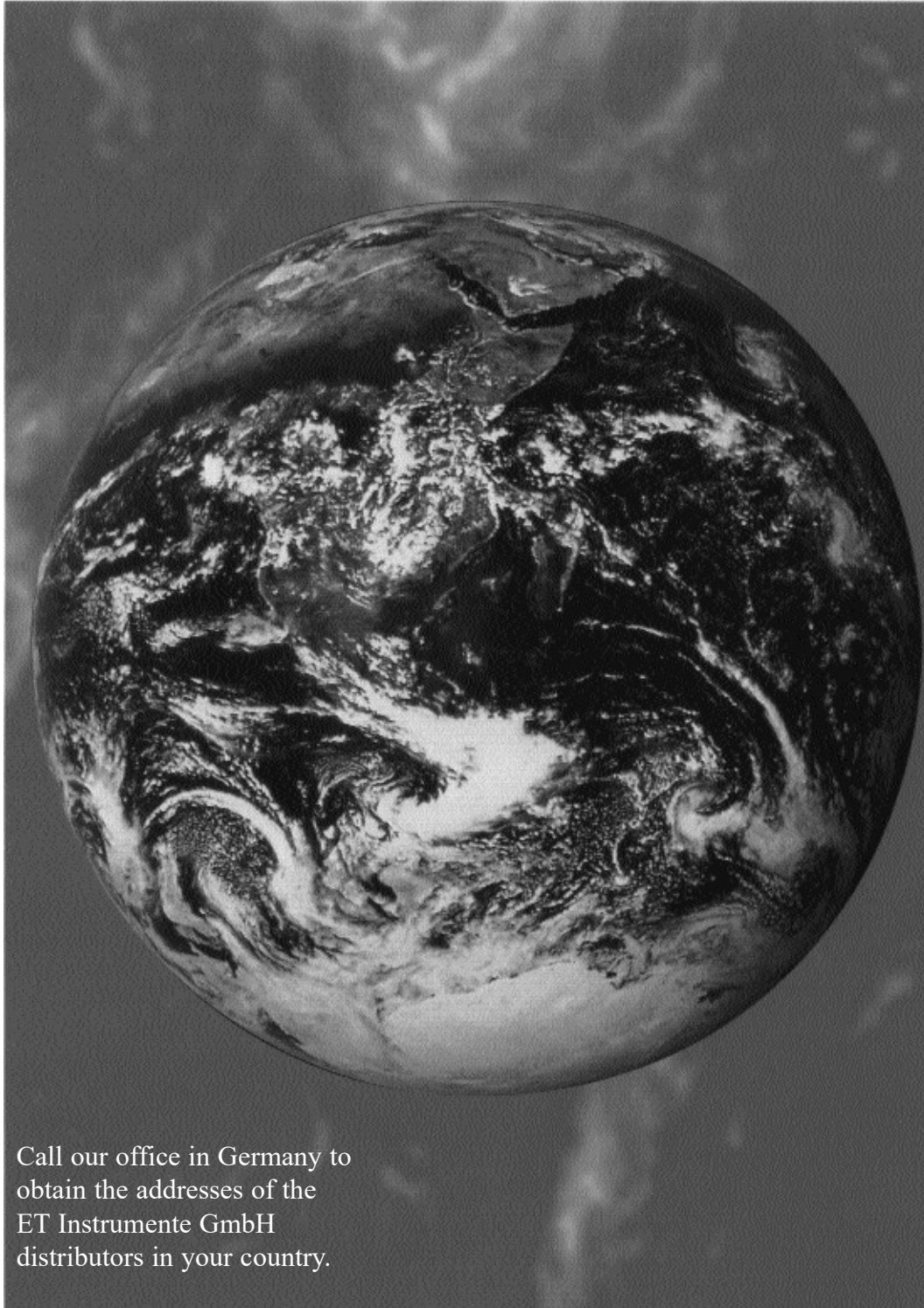
ERS

RELAY
SCANNER

EE

TEST SYSTEMS

Our Distributors



Call our office in Germany to
obtain the addresses of the
ET Instrumente GmbH
distributors in your country.

The newest technical specification you always get with a quotation.

Edition 2015 Version V.10.20E / Printed in Germany / Redaktion Marketing ET Instrumente GmbH

ET Instrumente GmbH - Neckarauer Straße 2 - D-68766 Hockenheim - Phone.: +49/ 6205-396 910 - Fax: +49/ 6205-396 911
E-Mail: INFO@ETTGmbH.de - Internet <http://www.ETTGmbH.de>