

Excellent Technology, Efficiency and Quality



UPS systems
ENERTRONIC L





ENERTRONIC L

secure and efficient

High security and economy

With the ENERTRONIC L BENNING has taken a further step forwards in terms of secure and efficient UPS technology. The UPS technology used in the ENERTRONIC L provides the highest reliability with optimum economy.

Due to continuous development, BENNING has succeeded in integrating new technologies into the UPS. IGBT transistors in the rectifier, SMD equipped printed circuit boards and internal CAN-Bus communications combine to offer the end user a secure and cost optimised solution for critical applications.

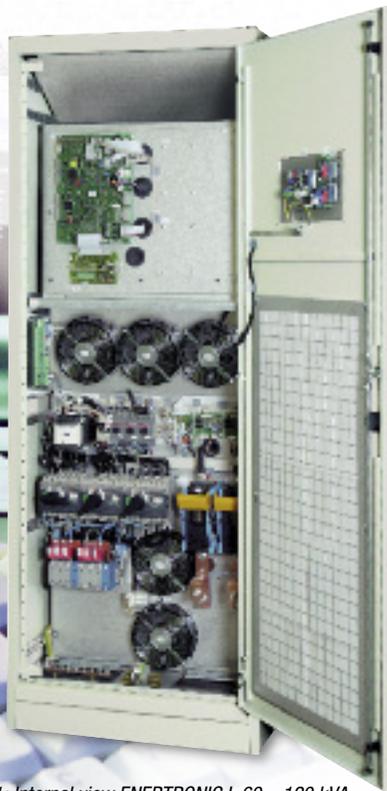


Fig. 1: Internal view ENERTRONIC L 60 – 120 kVA

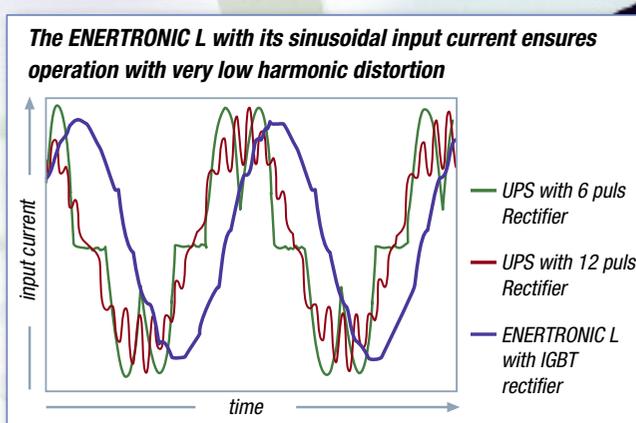


Fig. 2: Input current flow

General

Increasing complexity in data centres presents higher demands on UPS systems. Nonlinear and unbalanced loads must be catered for just as effectively as the peaks and overloads caused by high start up currents.

Critical applications must not only be protected against mains failures, but also against voltage peaks, troughs and transients.

UPS system design should form part of the building design and represents a significant investment with potentially high operating costs. Therefore, no compromise in the security and economy of the UPS should be considered.

The ENERTRONIC L fulfills these requirements by utilising new IGBT technology.

The substantial advantages of the ENERTRONIC L

- **Sinusoidal input current, no reactive power consumed (THD \leq 7 %, pf \geq 0.99)**
(see fig. 2)
- **On-line system (double conversion)**
- **Classification VFI SS 111 in acc. IEC 62040-3 for protection of critical load against all types of line disturbance**
- **Particularly suitable for computer loads (no-linear loads)**
- **Designed for double current in the neutral conductor**
- **Suitable for 100 % unbalanced load**
- **Parallel operation of up to 8 systems without a Common Mode Failure Point**
- **Optimum utilisation of emergency power generator**

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cost-optimized security

Reduced operating costs due to the use of the newest IGBT technology

Due to the use of IGBT power semiconductors for the rectifier and the inverter, the ENERTRONIC L operates virtually mains distortion free. (see fig. 2)

Due to power factor correction in the rectifier ($pf > 0.99$) only active power is consumed, eliminating the need for reactive power compensation units and resulting in no charge for reactive power by the utility company. Existing compensation units can naturally still be utilised. The cost of the ENERTRONIC L can be recouped in a few years.

A power factor > 0.99 reduces the apparent power (kVA) compared with conventional UPS's with the same power output by approx. 20 %, thereby reducing the cost of the input distribution.

Under partial load conditions as low as 25 %, the ENERTRONIC L still offers outstanding power factor values of $pf = 0.96$. UPS systems with 12 pulse thyristor bridge rectifiers and active filters have difficulty achieving similar results.



Fig. 3: ENERTRONIC L 200 kVA

Security without compromise

The ENERTRONIC L fulfills the highest requirements for secure power whilst being exceptionally economic. The combination of a 16-Bit micro-controller fed from two internal power supplies and the most modern control circuitry offer highly reliable regulation, and supervision of all UPS functions.

ENERTRONIC L is a genuine on-line UPS that uses double conversion technology to provide a constant output voltage and frequency. During a utility power failure an uninterrupted supply to the load is maintained by the inverter and battery. Even with 100 % unbalanced loads, the output voltage

remains constant to protect the supply to critical consumers. The quality of the output voltage is unaffected by changes in power demand. Enertronic L is also unaffected by nonlinear loads (the predominant part of all EDP systems) which produce high crest factors that may cause currents twice as high in the neutral conductor as in the phase conductors. The quality of the output voltage is not impaired by crest factors of up to 3:1. This limits the number of changeovers to bypass that are necessary, ensuring full UPS protection at all times.

The advantages of the ENERTRONIC L architecture

- **The ENERTRONIC L produces hardly any harmonics on the input when compared to UPS with conventional 6 or 12-pulse thyristor bridge rectifiers.**
Consumers that are parallel connected to ENERTRONIC L on the same utility power supply are unaffected.
- **If the ENERTRONIC L is to be used in conjunction with a Generator, the derating factor of the generator can be reduced when compared with conventional UPS, since less power reserves are required to deal with the harmonics.**
Reliability is increased by using a smaller number of components (higher MTBF)
- **No complex filter tuning required**
- **No filter losses**
- **No resonant effects during generator operation caused by poorly co-ordinated filters**
- **Increased reliability by minimising the number of internal interfaces and components. The CAN bus system used internally is utilised in many safety – critical systems**

ENERTRONIC L

powerful and compact

Compact high performance

Size and weight are considerations which impact heavily on the total cost of a UPS. The ENERTRONIC L uses the most modern technology and a specially developed high power heat sink to maximise power density (120 kVA on 0.64 m²).

Great attention was paid to designing an easy to service structure with maximum MTBF values. For example, fans are redundant, speed controlled, continuously monitored and located in the UPS air inlet to reduce their operating temperature, thereby enhancing their service life.

For maintenance purposes an internal manual bypass is included that directly connects the load to the utility supply during service.

Input and output circuit breakers in the UPS enable the unit to be completely isolated.

All important components are accessible from the front. The upper power section containing the IGBT's and the fan unit is slide mounted and can be withdrawn for maintenance purposes and/or exchanged completely.

Power section with control

Fan unit (speed controlled)

Control fuses

Circuit breakers and manual bypass

Battery fuse switch

AC connecting terminals

Fan unit (speed controlled)

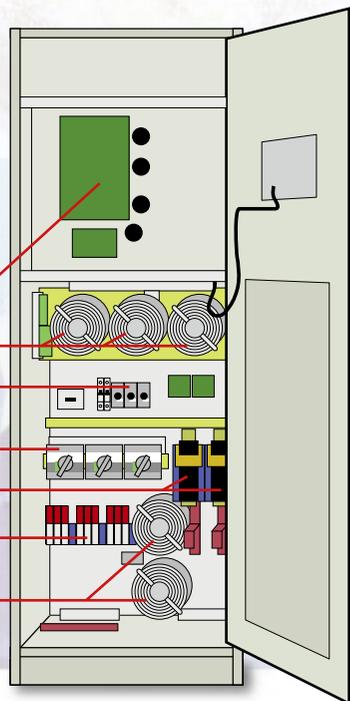


Fig. 4: Interior structure of the ENERTRONIC L 60 –120 kVA

User friendly operation

All UPS status information, alarm indications, control functions and measured values are readily available to the user via the touch screen (fig. 5).

The operating panel and touch screen provide the following measurement values:

Rectifier:

- Input voltage (phase/phase or phase/neutral)
- Input current per phase
- Frequency

Bypass:

- Input voltage (phase/phase or phase/neutral)
- Input current per phase
- Frequency

Inverter:

- Output voltage (phase/phase or phase/neutral)
- Output current per phase
- Output apparent power
- Output active power
- Frequency

Battery:

- Voltage
- Remaining back up time
- Charge/discharge current
- Remaining capacity

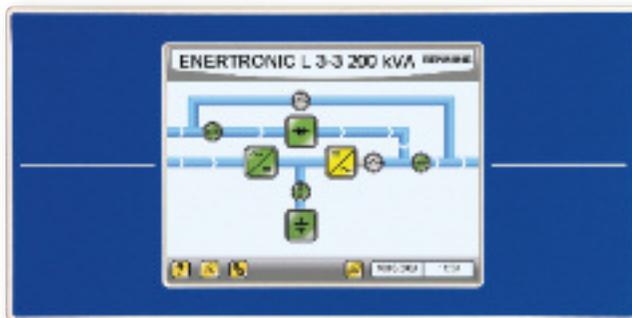


Fig. 5: Touch screen



ENERTRONIC L

service

Maximising battery availability

The battery is an essential part of each UPS system. The Enertronic L ensures that the condition of the battery is optimised to provide maximum battery availability.

- Temperature compensated float voltage charging maximises battery service life
- Low current ripple from the rectifier (in accordance with EUROBAT) maintains battery life expectancy
- Battery charging current limitation prevents overheating
- An internal low voltage disconnect facility provides reliable protection against excessive discharging of the battery
- Periodic automatic battery testing examines all battery connections
- The battery monitor confirms remaining battery capacity and determines the remaining back up time dependant on the actual load. When the time to run falls below a user selectable time threshold an alarm is provided
- **For battery maintenance purposes and examination of battery capacity, it is possible to perform a constant current discharge of the complete battery by discharging the energy via the rectifier into the mains. The ageing effect on the battery is thus easily determined.**

This simplifies UPS maintenance since the provision of load banks etc are not required and reduces the cost because maintenance can be achieved by a single technician

Redundant systems and system expansion

Up to 8 ENERTRONIC L UPS can be operated in parallel with no external control (each UPS can have master rights; active and passive master).

Expansion of UPS power with decentralised bypass (no single POINT OF failure) and the creation of redundant systems is easily achieved, even if unplanned.

By using static transfer switches from BENNING, two or more redundant power sources can be seamlessly provided.

Special features:

Touch screen for systems 60 – 200 kVA (Fig. 5)

- Graphical user interface showing energy flow and system status
- Intuitive operation due to windows® like design
- non latin language character sets available (e.g. russian, chinese, arabic)
- Fault diagnosis without the use of a PC
- Storage of high volumes of data possible via memory stick or SD card
- Password protection is provided to prevent inadvertent switch off
- An event monitor records the last 1200 events. Details of date, time and message are provided in plain text
- The touch screen is configurable and can be customised
- Remote interface available to monitor and adjust operating parameters

Service contracts

Service contracts offered by BENNING optimise the availability of the ENERTRONIC L over the actual working life of the UPS plant.

	Basic	Basic Plus	Advanced	Advanced Plus	Premium	Premium Plus
Carry out preventive maintenance	•	•	•	•	•	•
Discounts available on spare parts, labour and travel costs	•	•	•	•		
Fully comprehensive cover, excluding batteries					•	•
Free access to the 24/7 Hotline			•	•	•	•
Guaranteed response time			•	•	•	•
Battery capacity test		•		•		•

ENERTRONIC L

technical data

Technical data

ENERTRONIC L – 60, 80, 120, 160, 200 kVA

Type		ENERTRONIC L 60	ENERTRONIC L 80	ENERTRONIC L 120	ENERTRONIC L 160	ENERTRONIC L 200
rated output:	[kVA]	60	80	120	160	200
nominal active power:	[kW]	48	64	96	128	160

INPUT:

nominal input voltage:	[V]	400 ±15 %, 50 Hz ± 5 %				
current distortion factor:	[%]	≤ 7				
power factor:		≥ 0.99				
soft start at mains recovery:		over approx. 15 seconds				

OUTPUT

rated voltage:	[V]	400				
voltage tolerance:						
- static	[%]	< 1				
- with 100 % unbalanced load	[%]	< 1				
- with 100 % load step	[%]	< 5				
response time:	[ms]	≤ 10				
rated frequency:	[Hz]	50 ± 0.1 %				
distortion factor:						
- with linear load	[%]	< 1				
- with non linear load acc. EN 50091-1-1	[%]	< 5				
crest factor:		≥ 3				
overload:		150 % for 60 seconds, 125 % for 10 minutes				
short circuit:		200 % for 3 seconds				

Bypass

overload:		1000 % for 100 msecs, 150 % for 10 minutes				
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General data

overall efficiency:	[%]	93	93	93	94	94
power from the battery:	[kW]	49.3	65.6	98.5	131.5	164.1
EMC:		EN50091-2 standard class A (optional class B)				
cooling:		redundant, speed-controlled and monitored fans in UPS air inlet, equipped with individual ventilation flaps which close in case of fan failure to avoid back flow				
ambient temperature:	[°C]	0 to + 40				
relative humidity:	[%]	5 to 95 non condensing				
installation height:	[m]	< 1000 m ASL without derating				
cabinet protection:		IP 20 (higher protection optional)				
paint finish:		RAL 7035, textured				
dimensions (H x W x D):	[mm]	1800 x 800 x 800			1800 x 1000 x 800	
weight:	[kg]	470	530	600	850	850
cable entry:		Cable entry from below, optionally from above with additional 200 mm width				
cabinet options:		1 I/O card (12 dig. inputs., 6 dig. outputs, 6 relays); External service bypass in a separate cabinet; Battery cabinet or battery rack; Parallel operation				

ENERTRONIC L

diagnosis and monitoring on-line

ENERTRONIC L on-line: Diagnosis and monitoring

A special system enables remote diagnostics and monitoring with complete access to the system for fault-finding and repair. Many possibilities exist for both trained customer technicians and BENNING service personnel to monitor event logs and real time data such as voltage, current, power and frequencies.

The UPS can be configured to call for service automatically based on certain events.

SNMP – Integration of the ENERTRONIC L into network management using

The “Simple Network Management Protocol” (SNMP) is possible via, for example HP Openview, IBM Netview, Novell NMS and other SNMP compatible systems.

UPSMAN – Automated actions

UPSMAN allows the automation of different actions based on certain events. For example shut down of individual PC's via the network or alarm annunciation or generation of e-mails e.g. battery undervoltage.

UPSMAN is available for all usual operating systems. For detailed information refer to our CONNEXION leaflet.

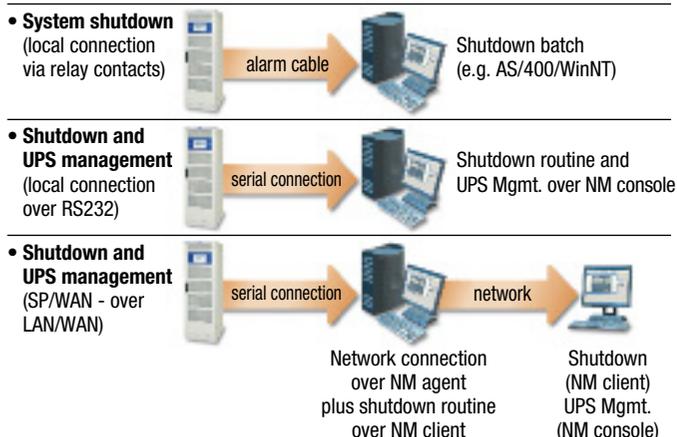
UPSMON – Factory data capture and monitoring

UPSMON is a complete information software package for monitoring and controlling of the ENERTRONIC L via serial interface, network or modem.

It is able to monitor real time information and record past events. The information can be represented in the form of individual building plans, electrical mimic diagrams or control elements of the devices.

The DDE interface provides compatibility with standard applications such as data bases or spread-sheets for further processing. Simple and clear commands make the software an efficient tool even for the non-expert.

UPS communication - 3 possibilities:



Customer interfaces

As standard the following alarms are available via the integrated relay card (volt free change-over contacts):

- Mains operation (mains OK)
- Battery operation
- Bypass operation
- Manual bypass activated
- Battery voltage low
- Common alarm

Serial interfaces RS232 and RS485 with MODBus protocol are available. An analogue output is available with 0 and/or 4 to 20 mA, which can be programmed to represent an internal analogue value, e.g. output apparent power.

A further relay card with 6 relays, a further interface card with an RS232 and RS485 interface and an additional Profibus interface or network interface (TCP/IP) can be added.

Remote operation

An optional controller (max 900 m cable length) allows the ENERTRONIC L to be remotely operated and monitored with similar functionality as available via the front panel.

This controller is connected to the RS485 interface in the ENERTRONIC L.

Remote control

As standard, the following remote control functions are provided:

- EMERGENCY Power OFF (EPO)
- Generator operation (blocks the bypass)
- Battery charging blocked (with generator operation)
- Bypass ON
- UPS ON
- UPS OFF
- Ext. Battery disconnect switch open

BENNING worldwide

Austria

Benning GmbH
Elektrotechnik und Elektronik
Eduard-Klinger-Str. 9
3423 ST. ANDRÄ-WÖRDERN
Tel.: +43 (0) 22 42 / 3 24 16-0
Fax: +43 (0) 22 42 / 3 24 23
E-mail: info@benning.at

Belarus

1000 BENNING Belarus
ul. Derzinskogo, 50
224030, BREST
Tel.: +375 (0) 1 62 / 22 07 21
Fax: +375 (0) 1 62 / 22 07 21
E-mail: info@benning.brest.by

Belgium

Benning Belgium
Power Electronics
Z. 2 Essenastraat 16
1740 TERNAT
Tel.: +32 (0) 2 / 5 82 87 85
Fax: +32 (0) 2 / 5 82 87 69
E-mail: info@benning.be

Croatia

Benning Zagreb d.o.o.
Trnjanska 61
10000 ZAGREB
Tel.: +385 (0) 1 / 6 31 22 80
Fax: +385 (0) 1 / 6 31 22 89
E-mail: info@benning.hr

Czech Republic

Benning CR s.r.o.
Zahradní ul. 894
293 06 KOSMONOSY
(Mladá Boleslav)
Tel.: +420 / 3 26 72 10 03
Fax: +420 / 3 26 72 25 33
E-mail: odbyt@benning.cz

France

Benning
conversion d'énergie
43, avenue Winston Churchill
B.P. 418
27404 LOUVIERS CEDEX
Tel.: +33 (0) / 2 32 25 23 94
Fax: +33 (0) / 2 32 25 08 64
E-mail: info@benning.fr

Germany

Benning Elektrotechnik und Elektronik
GmbH & Co. KG
Factory I: Münsterstr. 135-137
Factory II: Robert-Bosch-Str. 20
46397 BOCHOLT
Tel.: +49 (0) 28 71 / 93-0
Fax: +49 (0) 28 71 / 9 32 97
E-mail: info@benning.de

Great-Britain

Benning Power Electronics (UK) Ltd.
Oakley House
Hogwood Lane
Finchampstead
BERKSHIRE
RG 40 4QW
Tel.: +44 (0) 1 18 / 9 73 15 06
Fax: +44 (0) 1 18 / 9 73 15 08
E-mail: info@benninguk.com

Hungary

Benning Kft.
Power Electronics
Rákóczi út 145
2541 LÁBATLAN
Tel.: +36 (0) 33 / 50 76 00
Fax: +36 (0) 33 / 50 76 01
E-mail: benning@vnet.hu

Italy

Benning Conversione di Energia S.r.L.
Via 2 Giugno 1946, 8/B
40033 CASALECCHIO DI RENO (BO)
Tel.: +39 0 51 / 75 88 00
Fax: +39 0 51 / 6 16 76 55
E-mail: info@benningitalia.com

Netherlands

Benning NL
Power Electronics
Peppelkade 42
3992 AK HOUTEN
Tel.: +31 (0) 30 / 6 34 60 10
Fax: +31 (0) 30 / 6 34 60 20
E-mail: info@benning.nl

Poland

Benning Power Electronics Sp. z o.o.
Korczyńska 30
05-503 GŁOSKÓW
Tel.: +48 (0) 22 / 7 57 84 53
Fax: +48 (0) 22 / 7 57 84 52
E-mail: biuro@benning.biz

P. R. China

Benning Power Electronics (Beijing) Co., Ltd.
Tongzhou Industrial Development Zone
1-B BeiEr Street
101113 BEIJING
Tel.: +86 (0) 10 / 61 56 85 88
Fax: +86 (0) 10 / 61 50 62 00
E-mail: info@benning.cn

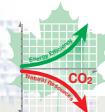
Russian Federation

Russian Federation
000 Benning Power Electronics
Schelkovskoye chausse 5
105122 MOSCOW
Tel.: +7 4 95 / 9 67 68 50
Fax: +7 4 95 / 9 67 68 51
E-mail: benning@benning.ru

ISO
9001

ISO
14001

SCC



Slovakia

Benning Slovensko, s.r.o.
Kukuríčná 17
83103 BRATISLAVA
Tel.: +421 (0) 2 / 44 45 99 42
Fax: +421 (0) 2 / 44 45 50 05
E-mail: benning@benning.sk

South East Asia

Benning Power Electronics Pte Ltd
85, Defu Lane 10
#05-00
SINGAPORE 539218
Tel.: +65 / 68 44 31 33
Fax: +65 / 68 44 32 79
E-mail: sales@benning.com.sg

Spain

Benning Conversión de Energía S.A.
C/Pico de Santa Catalina 2
Pol. Ind. Los Linares
28970 HUMANES, MADRID
Tel.: +34 91 / 6 04 81 10
Fax: +34 91 / 6 04 84 02
E-mail: benning@benning.es

Sweden

Benning Sweden AB
Box 990, Hovslagarev. 3B
19129 SOLLENTUNA
Tel.: +46 (0) 8 / 6 23 95 00
Fax: +46 (0) 8 / 96 97 72
E-mail: power@benning.se

Switzerland

Benning Power Electronics GmbH
Industriestrasse 6
8305 DIETLIKON
Tel.: +41 (0) 44 / 8 05 75 75
Fax: +41 (0) 44 / 8 05 75 80
E-mail: info@benning.ch

Ukraine

Benning Power Electronics
3 Sim'yi Sosniykh str.
03148 KYIV
Tel.: +380 (0) 44 / 5 01 40 45
Fax: +380 (0) 44 / 2 73 57 49
E-mail: info@benning.ua

U.S.A.

Benning Power Electronics, Inc.
1220 Presidential Drive
RICHARDSON, TEXAS 75081
Tel.: +1 2 14 / 5 53 14 44
Fax: +1 2 14 / 5 53 13 55
E-mail: sales@benning.us