BENNING
World Class Power Solutions

Excellent Technology, Efficiency and Quality

ENERTRONIC modular SE

- Modular Three-Phase UPS Systems
- Class Leading Power Availability
- Lowest Total Cost of Ownership

ENERTRONIC modular SE – Developed for the most demanding requirements

Fig. 1: ENERTRONIC modular SE 40 kW module

- **Maximum availability through:**
  - **Very high reliability**
  - **Very low mean time to repair (MTTR)**
  - **“hot swap” modularity**
  - **Modular self-configuration for N+1 redundancy**
  - **Black-start capability**
- **No single points of failure through:**
  - **Redundant critical circuits in each module**
  - **Multi-master operation**
  - **Decentralised parallel architecture**
- **Lowest running costs through:**
  - **Up to 96 % efficiency in double conversion mode**
  - **Up to 99 % efficient in “super efficiency” mode**
  - **“Pay as you grow” scalability**
- **Highest power quality through:**
  - **UPS classification VFI-SS-111**
  - **Input current total harmonic distortion (THDi) < 3 %**
  - **Input power factor ≥ 0.99 (adjustable)**
  - **Very high overload capability**

Optimum availability, operating costs and power quality

With its ENERTRONIC Modular SE UPS, BENNING now offers modular three-phase UPS systems that combine the benefits of class leading system availability, lowest total cost of ownership and highest power quality to protect sensitive and process critical electrical loads.
Power disturbances can have disastrous financial and operational consequences in almost every aspect of industry, commerce and data processing market sectors such as:

- **Process & Automation**
- **Infrastructure (inc. Utilities & Transport)**
- **Telecommunications**
- **Oil & Gas**
- **IT and Data Centre**

All have their own specific requirements that are fully met by the reliable, flexible and highly efficient ENERTRONIC modular SE.

ENERTRONIC modular SE – reliable power supply for operationally critical processes

Fig. 2: ENERTRONIC modular SE, 20 kW module

Maximum availability and lowest MTTR (Mean Time To Repair)

The ENERTRONIC modular SE combines the benefits of very high reliability and a very low mean time to repair (MTTR) to create a UPS system with the highest possible availability.

By using only the highest quality components, over specifying critical components and ensuring the design values reliability before cost, Benning has created a UPS with industrial grade reliability. When such reliability is combined with the repair and maintainability benefits of true “hot swap” modularity that can replace an entire UPS module in less than 10 minutes you have a UPS with “six nines” (99.9999 %) availability.

“Pay as you grow” Scalability

It’s not always easy to predict the size a critical load will be in, say, 10 years time and if a UPS is over-sized or under-sized, valuable capex is being wasted.
To eliminate the costs associated with significantly over-sizing or under-sizing the UPS at “day one” an ENERTRONIC modular SE UPS system should be installed. Only the exact number of modules needed to provide the required system capacity (or redundancy) need to be installed at “day one” and as the critical load increases, or decreases, so modules can be quickly added to, or removed from, the system to ensure that the UPS system is always sized to meet the needs of the critical load.

Fig. 3: Easy module swap due to hot plug technology and automatic module configuration.

Fig. 4: The UPS system is scalable and grows with your demands

No Single Points of Failure

By designing redundancy into each critical circuit in each module, by incorporating “multi-master” technology into each module that allows all modules to automatically operate as either the master or a slave, and by decentralising the parallel architecture of the modules, Benning has designed a UPS system with no single points of failure.

Highest power quality

Each ENERTRONIC modular SE UPS module is a highly efficient double conversion, serial on-line UPS (VFI-SS-111). By supplying the critical load via the ENERTRONIC modular SE’s rectifier and inverter the quality of voltage and frequency experienced by the critical load is significantly improved.
The ENERTRONIC modular SE’s rectifier incorporates 3 level IGBT technology, which means low mains input distortion and active power factor correction. The ENERTRONIC modular SE’s input current total harmonic distortion (THDi) is an impressive ≤ 3 % and its typical power input factor is an equally impressive $\cos(\varphi) \geq 0.99$. Each UPS module comprises:

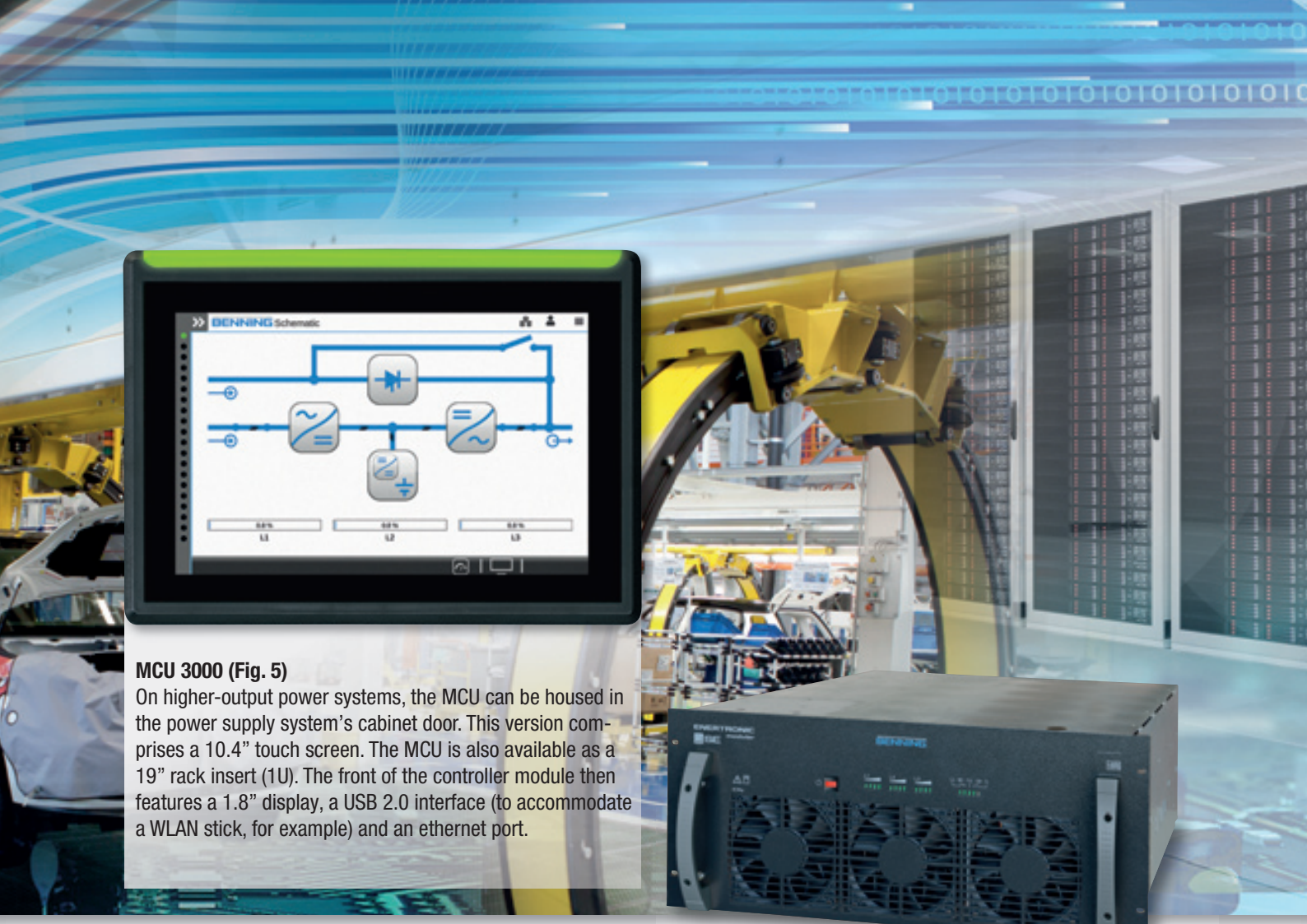
1. Three-phase rectifier with IGBT-3-Level technology
2. Three-phase inverter with IGBT-3-Level technology
3. Electronic switching unit (static bypass switch)
4. Redundant regulation/control unit

Lowest Total Cost of Ownership

With its “pay as you grow” scalability and very high operating efficiency, even at partial loads, the real running costs of the ENERTRONIC modular SE are minimised without the need to compromise on power quality.
If the highest possible efficiency is more important than voltage and frequency quality, the ENERTRONIC modular SE can be operated in its “Super Efficiency” mode. In this mode the critical load is fed via the static bypass line until the voltage and/or frequency of the mains moves outside of pre-set tolerances. At this point the critical load is break-free transferred onto the UPS inverter and is therefore fully protected from damaging mains borne disturbances including brown-outs and black-outs.

Automatic TCO and availability optimisation

The user selectable and configurable power optimisation mode automatically and simultaneously minimises total cost of ownership (TCO) and maximises system availability. It achieves this by using its inbuilt intelligence to place any individual modules in excess of the number needed to guarantee the required level of power protection into a “sleep” mode. All modules in this “sleep” mode remain fully ready to instantaneously provide power to the critical load should the need arise (e.g. in the event of a load increase) but will not be wasting energy by unnecessarily switching power. This means that the system is capable of automatically and intelligently delivering class leading system availability AND the lowest TCO.



MCU 3000 (Fig. 5)
On higher-output power systems, the MCU can be housed in the power supply system's cabinet door. This version comprises a 10.4" touch screen. The MCU is also available as a 19" rack insert (1U). The front of the controller module then features a 1.8" display, a USB 2.0 interface (to accommodate a WLAN stick, for example) and an ethernet port.

Fig. 6: ENERTRONIC modular SE, 40 kW module IT series

Extensive reporting and monitoring functions with MCU 3000

Web browser system values and configuration

Graphic user interface for all Windows OS systems

TCP/IP protocol: complete data transfer

RS232 series communication

Maintain long-term reliability – through the pro-active 360° service

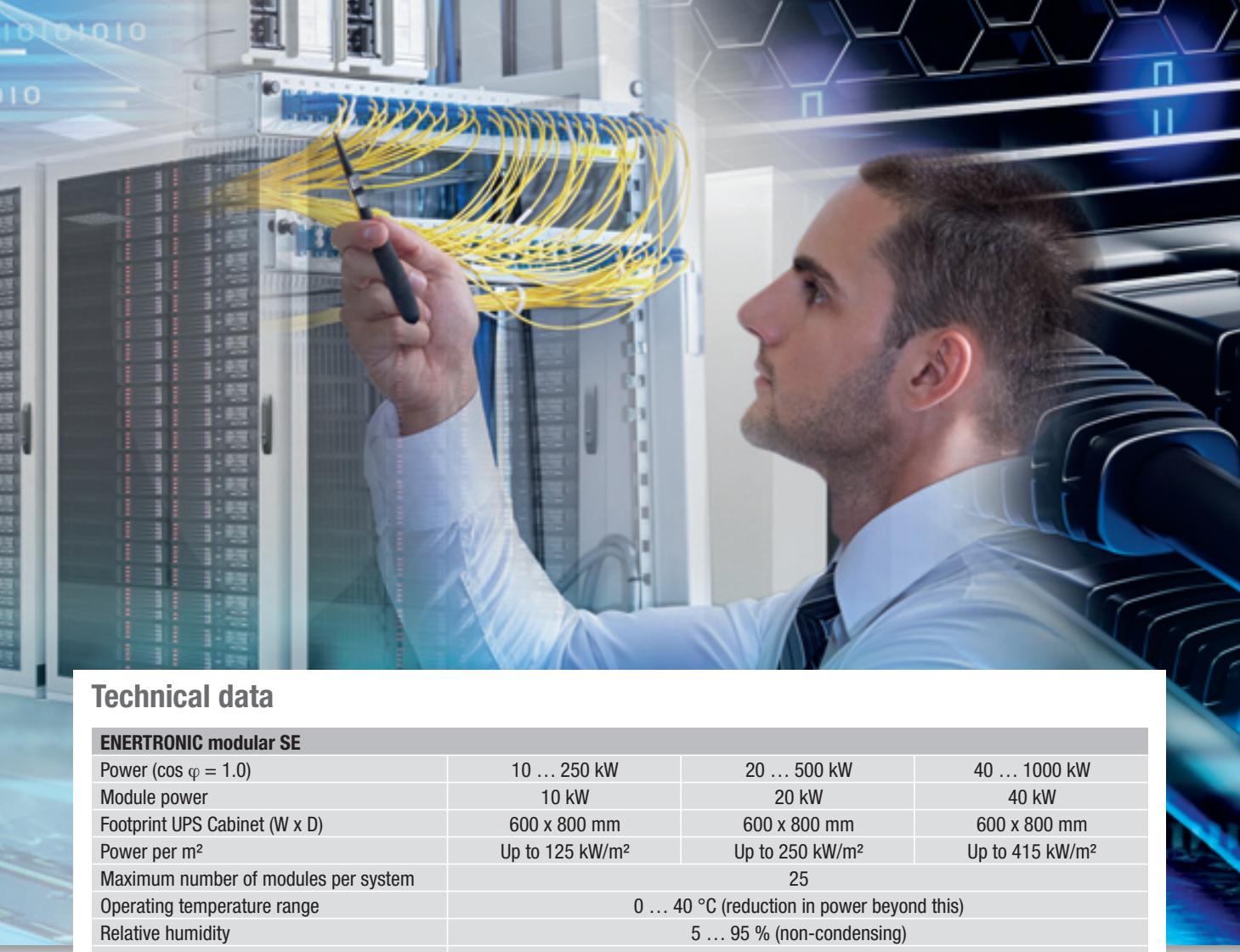
By placing your trust in a BENNING UPS installation you have decided on a high-quality product from a world leader in the production of AC and DC power supplies. BENNING UPS offers a reliable, globally orientated service structure that provides the best possible support for your requirements. You have access to high-quality support, spare parts and expert knowledge – wherever and whenever you require them.

With a BENNING service contract you can rely on a high standard of service with reliable delivery dates and rapid delivery of spare parts.

With its pro-active services BENNING can help you secure the maximum availability of your current supply – helping you meet the challenges of today and the opportunities of tomorrow.

www.benning-services.com

360°
pro-active service



Technical data

ENERTRONIC modular SE			
Power (cos φ = 1.0)	10 … 250 kW	20 … 500 kW	40 … 1000 kW
Module power	10 kW	20 kW	40 kW
Footprint UPS Cabinet (W x D)	600 x 800 mm	600 x 800 mm	600 x 800 mm
Power per m²	Up to 125 kW/m²	Up to 250 kW/m²	Up to 415 kW/m²
Maximum number of modules per system	25		
Operating temperature range	0 … 40 °C (reduction in power beyond this)		
Relative humidity	5 … 95 % (non-condensing)		
Noise level	typical < 65 dBA (as a function of power)		
Protection	IP20 (further classes on request)		
Installation height	1000 m (without reduction in power) (max. 5000 m)		
Cable entry point	Bottom (top on request)		
Paint	RAL 7035 / RAL 7021 (other colours on request)		
Ventilation	redundant forced-air ventilated		
Classification	VFI-SS-111 (according to IEC / EN 62040-3)		
Standards			
Safety	IEC / EN 62040-1		
EMC	IEC / EN 62040-2		
Power	IEC / EN 62040-3		
Input			
Voltage	220/230/240 V ±15 % (L + N)		
	380/400/415 V ± 15 % (3ph + N)		
Frequency	50 Hz ± 5 % / 60 Hz ± 5 %		
Total distortion THDi (100 % load)	≤ 3 %		
Input power factor	≥ 0.99		
Output (Inverter operation)			
Voltage	220 V / 230 V / 240 V	380 V / 400 V / 415 V	
Voltage tolerance (static)	± 1 %		
Frequency tolerance	± 0.1 %		
Total distortion THDU	Linear load ≤ 1 %		
Efficiency	99 % (SE Mode) 95 % (double conversion)	99 % (SE Mode) 96 % (double conversion)	
Overload operation, inverter	150 % for 60 s, 125 % for 10 min, 110 % for 30 min		
Overload operation, bypass	1000 % for 100 ms, 150 % for > 10 min, 125 % continously		
Short circuit response, inverter	≥ 400 %	≥ 300 %	
Short circuit response, bypass	1000 % for 100 ms		
Battery			
Nominal voltage	480 - 576 V (240 - 288 Pb cells) (other on request)		
Battery technologies	Lead, nickel cadmium, lithium ion, ultra caps, redox flow		

We reserve the right to make technical changes

Maximum energy availability and cost-effective operation

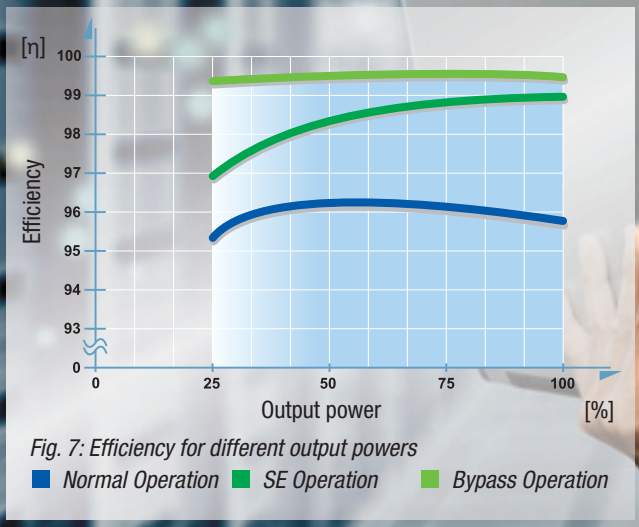


Fig. 7: Efficiency for different output powers

Normal Operation *SE Operation* *Bypass Operation*

“Hot Swap” modularity to 1,000 kW

Power capacities up to 1,000 kW can be achieved by paralleling UPS modules and cabinets. Each module can be up to 40 kW (cos(φ)=1) and automatically parallel with each other in either a parallel capacity or parallel redundant mode. The parallel mode is determined by the size of the load and is parallel redundant if it can be and parallel capacity if it has to be.

Up to 99 % efficiency

If the highest possible efficiency is more important than voltage and frequency quality the user can opt to operate the ENERTRONIC modular SE in its “Super Efficiency” mode.

In this mode the critical load is fed via the static bypass line until the voltage and/or frequency of the mains moves outside of pre-set tolerances. At this point the critical load is break-free transferred onto the UPS inverter and is therefore fully protected from damaging mains borne disturbances including brown-outs and black-outs.

In the SE mode, operating efficiencies of 99 % are achievable (see fig. 7).

Fig. 8: IT series for ENERTRONIC modular SE

Power density of 415 kW/m²

With its top ventilation (rear ventilation available as an option) and front access only maintainability, the ENERTRONIC modular SE can be placed against a wall or in a corner etc. This minimises the system’s operational footprint and gives it the class leading power density of up to 415 kW/m².

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