

Excellent Technology, Efficiency and Quality



**Secure Power for Oil & Gas,
Petrochemical & Chemical Plants**



Power protection systems for oil & gas, petrochemical and chemical production and processing

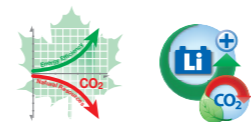
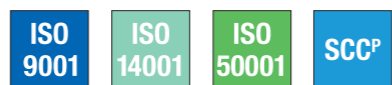
Power supply reliability is crucial for safe and efficient operation in the oil & gas industry as well as in petrochemical and chemical plants.

System outages due to power failures or even minor disturbances in the power supply can interrupt the process chain with serious environmental and financial consequences and may jeopardize the safety of human lives.

Industrial-grade power protection solutions like UPS systems, Inverters and DC systems with stand-by lead acid or nickel cadmium batteries provide emergency back-up power for mission-critical applications.

For more than seven decades BENNING has designed, manufactured, tested, installed and serviced AC and DC emergency power solutions that ensure the stable and safe operation of all types of critical loads in the oil & gas, petrochemical, chemical, energy and utility industries.

Today BENNING is a leading global supplier of customized high quality backup power systems with field proven reliability. BENNING's headquarter is located in Bocholt/Germany with manufacturing plants in Germany, Ireland and Romania. All manufacturing facilities are certified in accordance with ISO 9001 and ISO 14001.



Wholly owned Benning subsidiaries in 25 countries and a network of agents across Europe, the Americas and Asia have experienced teams to provide a global reach with local solutions.

Working with many of the world's biggest engineering contractors BENNING provides dedicated management teams for every project through all phases from the first design to final installation. This includes specification review, project management, detailed documentation and engineering calculations.

Most of the power protection projects for the Oil & Gas industry are designed to customer specifications and require unique engineering or design work and significant customization activities. BENNING's organization has considerable experience in handling this kind of ETO (Engineer-To-Order) project.

Many of BENNING's subsidiaries have their own local assembly and test facilities and are able to assemble customized power solutions and to arrange customer defined system testing. At the customers request, tests may be witnessed by 3rd party agencies or certification bodies e.g. DNV, ABS or TÜV. In many cases customers visit our subsidiaries to witness the tests themselves (FAT, Factory Acceptance Test).

High efficiency modular power solutions (SMPS technology)

Over 30 years ago BENNING started producing SMPS (Switch mode power supplies) for telecom and medical applications. These AC and DC power modules with SMPS technology are 4 to 5 times lower in weight and volume and up to 20 % higher in efficiency when compared to traditional solutions and are now available for industrial applications.

SMPS technology with its modular architecture allows the flexible design of redundant power system configurations with easy and rapid replacement and scalability. N+x redundancy ensures a high level of availability with less initial investment. All SMPS modules are hot plug-able and can be replaced at any time whilst the load continues to be supplied with secure power.

Today BENNING offers a wide range of modular industrial-grade UPS, inverter, rectifier and DC-DC systems with SMPS technology.



ENERTRONIC modular SE with 20 kVA power modules. Output power 80 kVA (n+1)



BENNING's strategy is to develop relationships based on a long-term commitment policy that provides efficient service and optimum benefit to its customers.

BENNING's industrial power solutions for applications in the oil & gas and petrochemical industries include:

UPS systems	<p>ENERTRONIC I: 1-phase, AC output 10 kVA – 120 kVA 3-phase, AC output 10 kVA – 200 kVA</p> <p>ENERTRONIC modular SE: 3-phase, AC output 20 – 500 kVA</p>	<ul style="list-style-type: none"> • UPS (for single or parallel redundant operation) • Modular UPS systems
Industrial inverters	<p>INVERTRONIC: 1-phase, AC output 10 kVA – 120 kVA 3-phase, AC output 10 kVA – 200 kVA</p> <p>INVERTRONIC modular 3-phase, AC output 15 – 180 kVA</p>	<ul style="list-style-type: none"> • Inverters, (for single or parallel redundant operation) • Modular inverter systems
Industrial DC systems	<p>THYROTRONIC: DC output: 24 V, 20 A – 1200 A 48 V/60 V, 10 A – 1200 A 110 V/220 V, 5 A – 1200 A</p>	<ul style="list-style-type: none"> • DC Systems (for single or parallel redundant operation)
Modular power systems	<p>TEBECHOP, inverters, rectifiers, DC-DC converter</p>	<ul style="list-style-type: none"> • SMPS technology

BENNING's power solutions, renowned for their reliability, are designed to meet the strict requirements for installations in:

<ul style="list-style-type: none"> • Refineries • Pipeline control centers • Chemical and petrochemical plants • Gas processing and booster stations • FLNG (Floating Liquefied Natural Gas) • FPSO (Floating Production Storage and Offloading) 	<ul style="list-style-type: none"> • Emergency lighting • Fire and gas detection systems • Instrumentation and process control • Telecommunications • Radio and paging communication • HV and MV switchgear tripping • Navigational aids • Gas turbine control • Lube-oil pump supply • Data processing • Signaling
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Germany / factory I, 46397 BOCHOLT



Germany / factory II, 46397 BOCHOLT



Austria, 3423 ST. ANDRÄ-WÖRDERN



Belgium, 2800 MECHELEN



Belarus, 224030, BREST, REPUBLIC BELARUS



Croatia, 10000 ZAGREB



Czech Republic, 293 06 KOSMONOSY



Greece, ATHENS, LYKOVRSI 141 23



Poland, 05-503 GLOSKÓW



Spain, 28970 HUMANES, MADRID



South East Asia, SINGAPORE 539218



UAE, ABU DHABI



France, 27404 LOUVIERS CEDEX



Hungary, 2541 LÁBATLAN



Italy, 40033 CASALECCHIO DI RENO (BO)



P. R. China, 101113 BEIJING



Sweden, 19129 SOLLENTUNA



U.S.A., RICHARDSON, TEXAS 75081



United Kingdom, BERKSHIRE



Ireland, WEXFORD / REP. IRELAND



Netherlands, 3992 AK HOUTEN



Romania, 327055 BUCHIN AT CARANSEBES



Russian Federation, 142000 MOSCOW REGION



Switzerland, 8305 DIETLIKON



Slovakia, 902 01 PEZINOK



Turkey, 34882 KARTAL, ISTANBUL



South East Asia, SINGAPORE 539218



UAE, ABU DHABI

Global service organization

BENNING has considerable experience ranging from complete power systems design and installation to scheduled check-up and preventive maintenance programs.



The service center and training headquarters are located in Bocholt/Germany.

A global network of BENNING subsidiaries and several partners provide installation, commissioning, operation and maintenance services world-wide.

Spare part management

BENNING can provide critical spares or replacement parts at very short notice, delivered to any destination in the world.

Operation and maintenance services can include remote monitoring, preventive maintenance, corrective maintenance, battery management, replacement, refurbishment and in-house repairs.

24/7 service hot-line and rapid response maintenance contracts are available.

Preventive maintenance service

Our standard preventive maintenance service includes:

- Visual check
- Functional checks
- Alarm checks
- Alarm history check
- Battery check
- Report with recommendations

Training courses

BENNING has developed a comprehensive range of training courses specially aimed at technicians and engineers who work on industrial emergency power systems and battery installations.



These Courses can be customized to meet specific needs. All training courses include theory and hands-on practice.

ENERTRONIC I Industrial UPS Systems

Key Features:

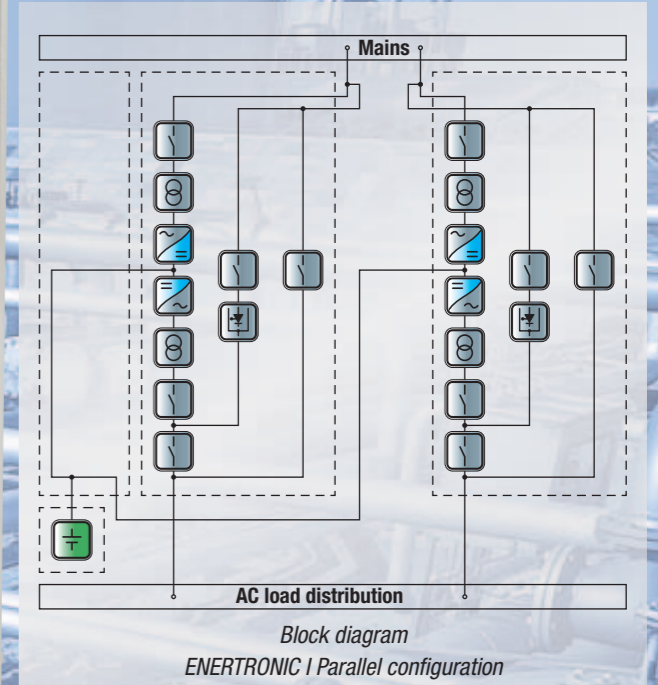
- Single or three phase output
- True on-line double conversion UPS (VFI SS 111)
- High efficiency even under partial load conditions
- Inverter with IGBT technology
- AC input power factor typ. 0.99
- Parallel configuration with up to 8 UPS
- Excellent dynamic and overload behaviour
- Monitored, redundant, speed controlled fans



ENERTRONIC I

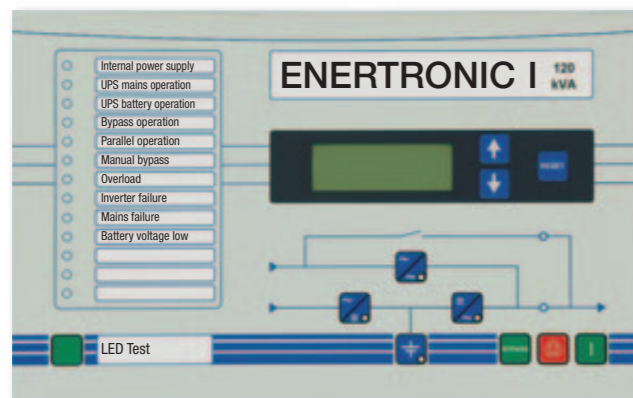


Interior view



The MMI (Man-machine interface) enables simple operation and monitoring of the ENERTRONIC I

Status and configuration data on the ENERTRONIC I UPS system is available through a 4-line 80 character liquid crystal display mounted on the front panel. Push buttons provide intuitive navigation of the user menu to allow the system status to be viewed or parameters to be changed. 13 LEDs are provided to indicate the most important operation and fault signals.



MMI (Man-machine interface)

Measurements

Rectifier:

- Input voltage (phase to phase and phase to neutral)
- Input current per phase
- Frequency

Inverter:

- Output voltage (phase to phase and phase to neutral for three phase output systems)
- Output current (per phase)
- Apparent power
- Real power
- Frequency

Battery:

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

Bypass:

- Input voltage (phase to phase and phase to neutral for three phase systems)
- Input current (per phase)
- Frequency

An event recorder stores each occurring event (push button operation, switching event and error) with a date and time stamp. Up to 1200 entries can be stored.

The following information is indicated via 6 volt free change over contacts:

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

ENERTRONIC I 1-phase													
UPS nominal output power (cos. $\varphi = 0.8$ ind.)	[kVA]	10	20	30	40	50	60	80	100	120	-	-	

ENERTRONIC I 3-phase													
UPS nominal output power (cos. $\varphi = 0.8$ ind.)	[kVA]	10	20	30	40	50	60	80	100	120	160	200	

ENERTRONIC I 3-1 and 3-3													
Input													
Max. input current with high rate charging	[A]	16	35	50	65	80	96	112	155	186	248	310	
Transformer		autotransformer (Isolation transformer option)											
Input power factor	[cos. φ]	≥ 0.99 cos. φ (0.97 cos. φ at 25 % load)											
Nominal input voltage	[V]	3/N 400 V ± 15 % (others on request)											
Nominal input frequency	[Hz]	50 Hz ± 5 %											
Mains distortion at 100 % load	[%]	≤ 5											
Current ripple		< 5 A / 100 Ah											

Output													
Output voltage 1-phase	[V]	230 V ± 1 %											
Output voltage 3-phase	[V]	400 V ± 1 %											
Overload: - 3 ph	[%]	150 % 60 sec., 125 % 10 min.											
- 1 ph / N		220 % 60 sec., 180 % 10 min.											
Crest factor		≥ 3											
Frequency	[Hz]	50 or 60 Hz ± 3 %											

Intermediate DC circuit													
Voltage	[V]	110/125/220 (400 V on request)											
Max. charging current	[A]	6	13	20	27	34	41	55	69	83	110	135	

General data													
Over-all efficiency (AC to AC) without battery charging	[%]	typ. 90											
Heat dissipation at 100 % load	[kW]	1.4	2.2	3.2	4.2	5.2	6.3	8.4	10.4	12.6	16	19	
Ambient temperature	[°C]	- 5 to 40											

Technical changes reserved.

INVERTRONIC (1- and 3-phase) Industrial Inverter Systems

Key Features:

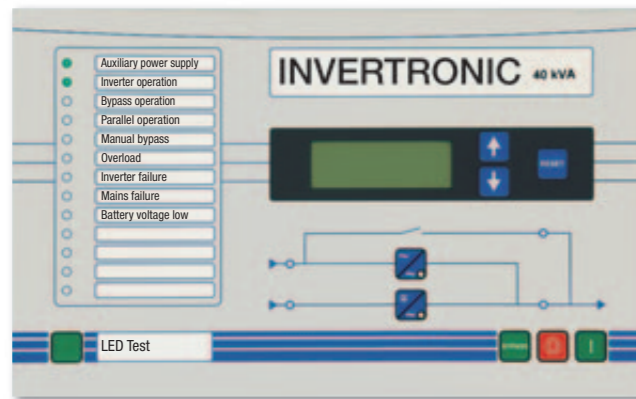
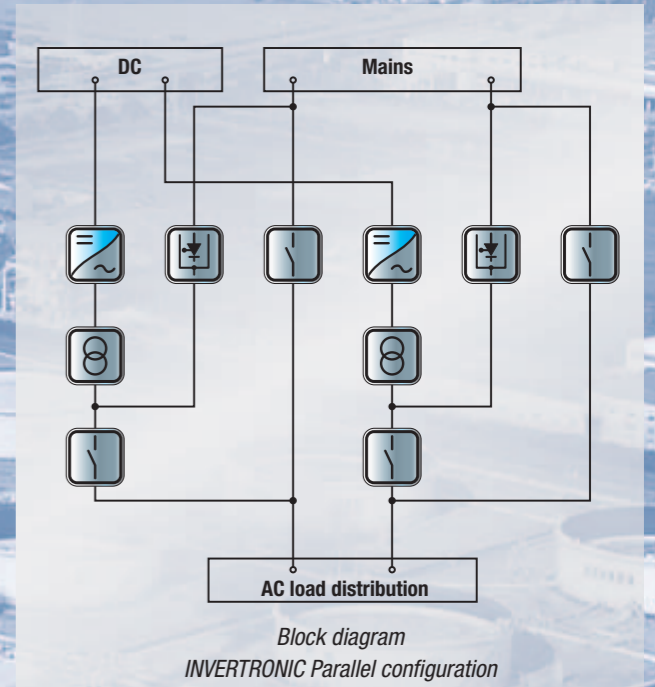
- High efficiency even under partial load conditions (IGBT technology)
- Parallel configuration with up to 8 Inverters
- Excellent dynamic and overload behaviour
- Monitored, redundant, speed controlled fans
- Built-in static-switch and manual bypass



INVERTRONIC Inverter



Interior view



MMI (Man-machine interface)

MMI (Man-machine interface)

Status and configuration data for the INVERTRONIC inverter system is available through a 4-line 80 character liquid crystal display mounted on the front panel. Push buttons allow intuitive navigation of the user menu to allow the system status to be viewed or parameters to be changed. 13 LEDs are provided to indicate the most important operation and fault signals.

Measurements

Inverter:

- Input voltage
- Input current
- Output voltage
- Output current per phase
- Output frequency
- Apparent power
- Real power

Bypass:

- Input voltage
- Input current per phase
- Input frequency

A recorder stores each occurring event (push button operation, switching event and error) with a date and time stamp. Up to 1200 entries can be stored.



Single Phase Inverter

UPS nominal output power (cos. $\phi = 0.8$ ind.) [kVA]	10	20	30	40	50	60	80	100	120
Inverter input									
Input voltage [V]	220								
Input voltage range [%]	-15 to +20								
Permitted DC ripple [%]	< 5 rms								
AC current feedback on DC input [%]	< 5 rms								
Switch on current	< I-Nom.								
Input current at cos. $\phi = 0.8$ and nominal input voltage [A]	40	80	118	156	196	233	307	383	460
DC power at battery operation [kW]	8.8	17.6	26	34.4	43	51.1	67.4	84.2	101
Efficiency at nominal load [%]	91	91	92	93	93	94	95	95	95
Inverter output									
Output voltage [V]	1/N 230 PE								
Adjustment range of output voltage [%]	± 5								
Nominal output current [A]	43	86	130	173	217	260	347	434	521

Three Phase Inverter

UPS nominal output power (cos. $\phi = 0.8$ ind.) [kVA]	10	20	30	40	50	60	80	100	120	160	200
Inverter input											
Input voltage [V]	220										
Input voltage range [%]	-15 to +20										
Permitted DC ripple [%]	< 5 rms										
AC current feedback on DC input [%]	< 5 rms										
Switch on current	< I-Nom.										
Input current at cos. $\phi = 0.8$ and nominal input voltage [A]	40	79	116	154	193	233	307	383	460	612	765
DC power at battery operation [kW]	8.7	17.4	25.5	33.9	42.5	51.1	67.4	84.2	101	135	169
Efficiency at nominal load [%]	92	92	94	94	94	95	95	95	95	95	95
Inverter output											
Output voltage [V]	400/230 3-ph., N, PE										
Adjustment range of output voltage [%]	± 5										
Nominal output current per phase [A]	14.4	28.8	43.3	57.8	72.2	86.7	115	144	172	230	288

Technical changes reserved.

THYROTRONIC Industrial Rectifier Systems

Key Features:

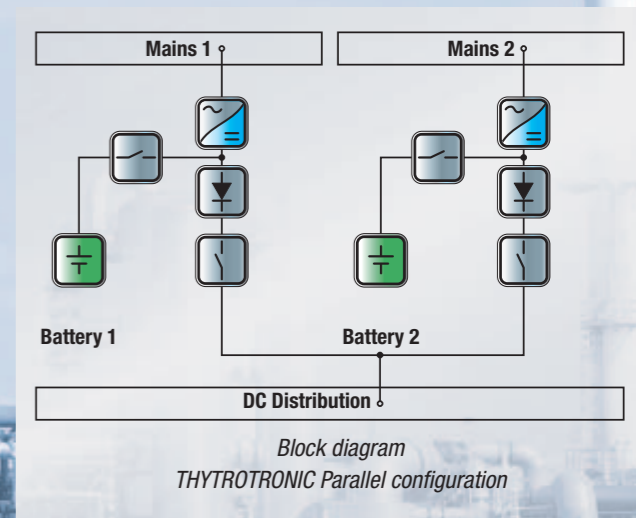
- 6-pulse microprocessor controlled thyristor technology with isolation transformer (Option: 12-pulse version)
- Advanced digital monitoring and signalling
- Comprehensive monitoring functions with internal event log to save up to 200 log files
- Industrial design with high MTBF and low MTTR
- Standard or customer configurations



THYROTRONIC Rectifier

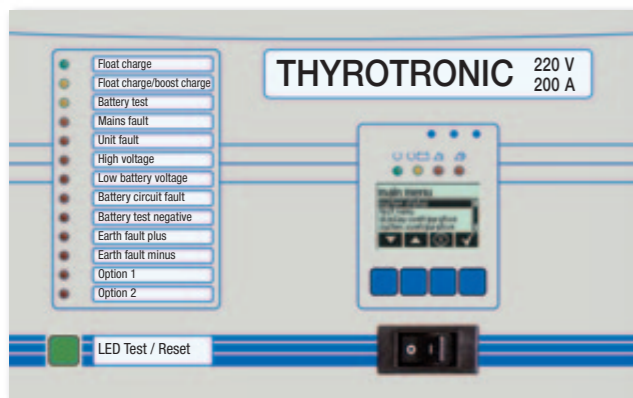


THYROTRONIC interior view

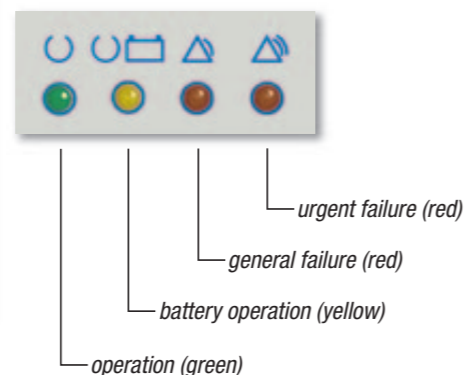


MMI (Man-machine interface)

The MMI (Man-machine interface) mounted on the front door of the THYROTRONIC features 13 LEDs to indicate system operational status and alarms. The integrated LCD shows measurements in plain text and the built-in key-pad allows the user to set operational parameters and to get access to the event and alarm log.



MMI (Man-machine interface)



Mains input		
Input voltage	[VAC]	230 ± 10 % 1-phase 3 x 400 ± 10 % 3-phase others on request
Frequency	[Hz]	50/60 Hz ± 5 %
Power factor		~0.83 at nominal mains voltage and float charging

Rectifier output		
Output voltage	[VDC]	24, 48, 60, 110, 125, 220
Output current	[A]	5 – 1200
Adjustment range	[%]	0 - 50 battery charging current limit
Current accuracy	[%]	± 2
Characteristic		IU in acc. DIN41773 at float and boost
Boost voltage	[V/C]	2.4 lead acid battery 1.55 NiCd battery
Float voltage	[V/C]	2.23 lead acid battery 1.40 NiCd battery
Equalize voltage	[V/C]	2.7 lead acid battery 1.7 NiCd battery with reduced current
Output voltage adjustment range	[%]	± 5
Voltage accuracy	[%]	± 0.5
Ripple	[%]	< 5 rms without battery option < 2 rms without battery
Efficiency	[%]	85 - 94 % type dependent

General data	
EMC	EN 61000-6-2, EN 61000-6-3
Rel. humidity	[%] < 95 non condensing
Audible noise	[dB A] < 65 measured at 1 m distance and half rectifier height
Installation height	[m] max. 1000 above sea level max. 2000 above sea level with derating to 92 % I nominal convection
Cooling	
Ambient temperature	[°C] -5 to 40 with 100 % I nominal -5 to 50 with 88 % I nominal
Storage temperature	[°C] -20 to +70
Cabinet protection	IP 20 IEC60529
Cabinet	Steel framed floor standing cabinet, Lockable front door
Paint finish	RAL 7035 structured powder coating
Volt free alarms	mains failure battery voltage low common alarm

Options	
Interfaces	MOD Bus Profibus additional relay contacts
Higher IP protection	
Voltage dropping diodes	
Analogue instrumentation	
Additional monitoring components	

Technical changes reserved.

ENERTRONIC modular SE 3-Phase Modular UPS Systems

Key Features:

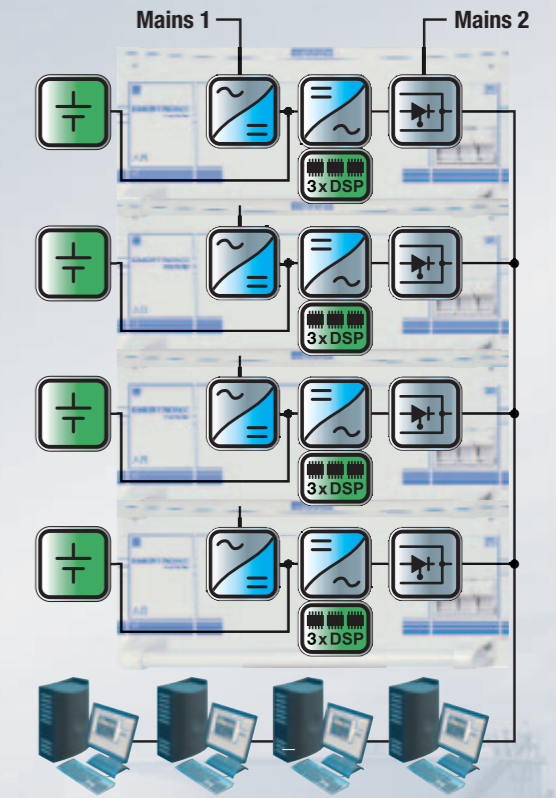
- Scalable UPS systems with hot-plug power modules
- N+1 redundancy ensures maximum availability
- Advanced UPS design with IGBT and MOSFET semiconductors and DSP processors
- UPS classification VFI-SS-111 in accordance with EN/IEC 62040-3
- High efficiency, even with partial load, reduces energy losses
- Sinewave input current (powerfactor 0.99)
- Input current with low harmonic distortion (THDi < 5 %)
- Short MTTR (Mean Time To Repair)
- Replacement of modules without load interruption
- Online diagnostics and monitoring



ENERTRONIC modular SE

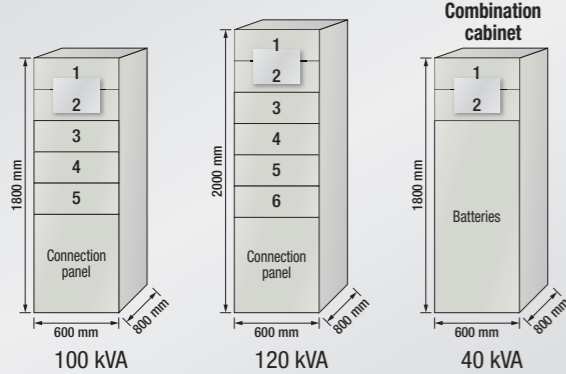


ENERTRONIC modular SE with built-in batteries. Output power 20 kVA (n+1)

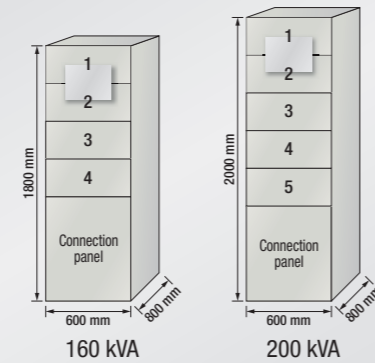


Block diagram ENERTRONIC modular SE decentralised parallel architecture

Systems with 20 kVA modules



Systems with 40 kVA modules



Display der ENERTRONIC modular SE



Combination cabinets with built-in batteries

Cabinet dimensions: 1800 X 600 x 800 mm (Height x width x depth)

UPS systems	20 kVA modules	
Output power [kVA]	20	40
No. of modules	1	2
Battery time (at max. output power) [min]	32	13

System cabinets

Modules	20 kVA		40 kVA	
Output power [kVA]	100	120	160	200
No. of modules	1-5	1-6	1-4	1-5
Weight* [kg]	190	210	210	240

* Weight without modules

ENERTRONIC modular SE	20 ... 500 kW	40 ... 1000 kW
Power (cos φ = 1.0)	20 ... 500 kW	40 ... 1000 kW
Module power	20 kW	40 kW
Footprint UPS Cabinet (W x D)	600 x 800 mm	600 x 800 mm
Power per m ²	Up to 250 kW/m ²	Up to 415 kW/m ²
Maximum number of modules per system	25	
Operating temperature range	0 ... 40 °C (above this there is a power reduction)	
Relative humidity	5 ... 95 % (non-condensing)	
Noise level	Typically < 65 dBA	
Protection	IP20 (others on request)	
Installation height	1000 m (without power reduction)	

Input	
Voltage	3 / N 400 V ± 15 %
Frequency	50 Hz ± 5 % / 60 Hz ± 5 %
Total distortion THDi (100 % load)	≤ 3 %
Input power factor	≥ 0.99

Output (Inverter operation)	
Voltage	380 V / 400 V / 415 V
Voltage tolerance (static)	± 1 %
Frequency tolerance	± 0.1 %
Total distortion THDU	Linear load ≤ 1 %
Efficiency	99 % (SE Mode), 96 % (double inverter operation)
Overload operation, inverter	150 % for 60 s, 125 % for 10 min, 110 % for 30 min
Overload operation, bypass	1000 % for 100 ms, 150 % for 1 min, 125 % continuous
Short circuit response, inverter	> 200 % for 1 s
Short circuit response, bypass	1000 % for 100 ms

Battery	
Nominal voltage	480 - 576 V (240 - 288 Pb cells)
Battery technologies	Lead, nickel cadmium, lithium ion (optional)

INVERTRONIC modular Modular Industrial Inverter Systems

Key Features:

- Scalable 3-phase inverter system with hot-plug power modules
- Each Inverter module with its own electronic bypass
- Short MTTR (Mean TIME To Repair): Replacement of modules without any load interruption
- N+1 redundancy maximises output availability
- High energy efficiency, even with partial load, saves energy costs
- Advanced inverter technology with DSP processors and IGBT/MOSFET semiconductors
- Less volume and weight reduces floor space required and lowers transport and installation costs



INVERTRONIC modular 45 kVA

TEBECHOP 4000 (SMPS Technology) Modular Industrial Rectifier Systems

Key Features:

- convection cooled
- Low volume and weight
- Reliable, modular, hot-plug technology
- Easily scalable output power
- Low output ripple
- Excellent dynamic performance
- High efficiency
- Sinusoidal input current
- Flexible operation (with or without battery back-up)
- System monitoring with MCU 2500
- Remote monitoring via modem, HTML, SNMP, Modbus or Profibus



Modular rectifier system with 4 TEBECHOP 4000 rectifiers

INVERTRONIC modular 10 - 50 kVA / 15 - 90 kVA (rated output power at each system cabinet*1)							
Rated output power at: - DC-Input 48 V	[kVA]	10	20	30	40	50	-
- DC-Input 110 V/220 V		15	30	45	60	75	90
No. of modules		1	2	3	4	5	6

*1: Two system cabinets with maximum 12 modules can be paralleled, to increase the output power capacity.

Inverter input							
Input voltage range	[%]	-15 to +20					
Permitted DC ripple	[%]	< 5 rms					
Input current at 48 V DC	[A]	195	390	585	780	975	-
Input current at 110 V DC	[A]	116	232	348	464	580	716
Input current at 220 V DC	[A]	58	116	174	232	290	348
DC Power at battery operation	[kW]	13*	26*	39*	52*	65*	78*

* Input voltage DC 110 V / 220 V

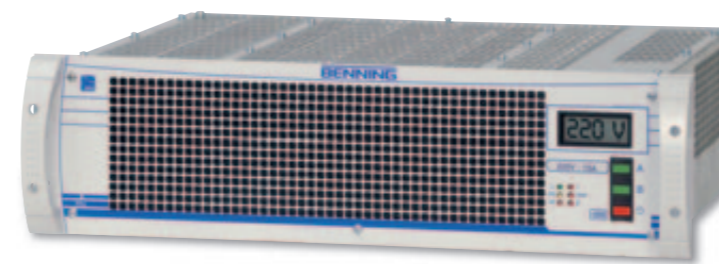
Inverter output		
Output voltage	[V]	400/230, 3-ph., N, PE
Adjustment range of output voltage	[%]	± 5
Voltage tolerance: - static		± 1
- dynamic	[%]	≤ 5 for 100 % load step
- unbalanced load		≤ 2 at 100 % unbalanced load
Regulation time	[msec]	≤ 25
Motor load		100 % permitted (note inrush current)
Overload behaviour	[%]	50 for 60 sec. 25 for 10 min.
Short-circuit behaviour		short circuit proof
Short-circuit current	[A]	2 x I-nom for 4 sec.
Output frequency	[Hz]	50 (60) ± 0.1 % quartz or mains synchronised
Synchronisation range	[Hz]	50 (60) ± 3 %
Wave form		Sine wave
Distortion factor	[%]	≤ 2 with linear load ≤ 5 with non linear load according to EN 50091-1-1
Efficiency: - Input voltage DC 48 V	[%]	≥ 89
- Input voltage DC 110 V/220 V	[%]	≥ 92

Technical changes reserved.

TEBECHOP 4000

The convection cooled TEBECHOP 4000 rectifier offers reduced operating costs due to its very low heat dissipation enabled by its high efficiency (even under partial load conditions).

Scalability of the output power as well as redundant system configurations (such as n + 1 redundancy) are possible.



TEBECHOP 4000, 220 V - 15 A

TEBECHOP 4000 module	
Output power	[W] 4000

Input	
Voltage range	[V] 1 x 85-264
Current (at 230 V)	[A] 15
Frequency	[Hz] 47 - 63
Power factor	[A] 0.99

Output						
Voltage	[V]	24	48	60	110	220
Current	[A]	60	50	40	30	15

Characteristic		IU
Boost voltage	[V/C]	2.4
Float voltage	[V/C]	2.23
Voltage tolerance:		
- static	[V/C]	± 1 (typical ± 0.5 %)
- dynamic		± 5 (load Δ 10 % - 90 % - 10 %)
Response time	[ms]	< 2 (load Δ 10 % - 90 % - 10 %)
Efficiency	[%]	≥ 93
Ripple	[%]	< 1 rms
EMC		class B in acc. EN 55022
Protection class		1 in acc. VDE 0804 and IEC 60950
Protection		IP 20
Ambient temperature	[°C]	0 - 50
Installation height	[m]	up to max. 2000 ASL
Humidity class		F in acc. DIN 40040
Cooling		convection
Voltage - current display		LCD on front panel

Dimensions	
Height x width x depth	[mm] 133* x 483* x 400 (* front panel)

Technical changes reserved.

TEBECHOP 3000 I Rectifier and DC-DC Converter Modules

Key Features:

- Modular rectifiers, DC/DC converters and inverters can be combined in a system
- Redundant, scalable, hot-plug technology
- Excellent overall efficiency and low volume and weight
- Replacement of modules without any load break
- Remote and local control and monitoring with MCU 2500



Rectifier plug-in unit with 4 TEBECHOP 3000 I and MCU 2500
Output voltage 110 V, output current 80 A



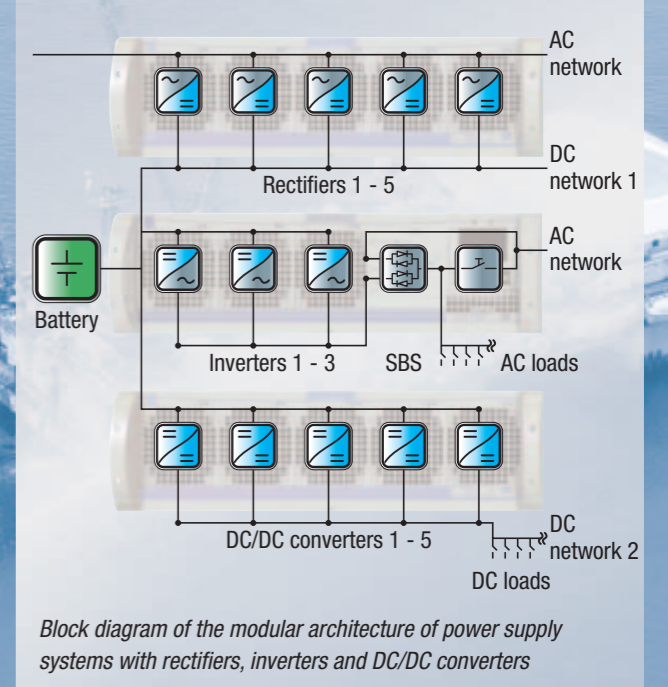
DC/DC converter plug-in unit with 5 TEBECHOP 3000 IDC
Output voltage 24 V, output current 250 A

INVERTRONIC compact Inverter Modules

Combined power supply system
(similar to block diagram)



Inverter plug-in unit with 3 INVERTRONIC compact, static and manual bypass



Block diagram of the modular architecture of power supply systems with rectifiers, inverters and DC/DC converters

Output power	[W]	3000 I	6000 I	9000 I	12000 I	15000 I
Number of rectifiers per 19" rack		1	2	3	4	5
Input voltage	[V]	1 x 85 – 264*1				
Input current (at 1 x 230 V)	[A]	15	30	45	60	75
Frequency	[Hz]	47 – 63				
Power factor		0.99				
Output current at: - 24 V		70/70	140/140	210/210	280/280	350/350
- 48 V		50/60	100/120	150/180	200/240	250/300
- 60 V	[A]	40/48	80/96	120/144	160/192	200/240
- 110 V		20/24	40/48	60/72	80/96	100/120
- 220 V		10/12	20/24	30/36	40/48	50/60
Characteristic		IU/IPU				
Output voltage						
- Boost	[V/C]	2.4				
- Float	[V/C]	2.23				

*1 power derating at 205 V input voltage

Number of DC/DC converters per 19" rack		1	2	3	4	5
DC input voltage	[V]	110 – 220*2				
Permissible voltage range	[V]	85 – 265				
Output current at: - 24 V		23/50	46/100	69/150	92/200	115/250
- 48 V		18/40	36/80	54/120	72/160	90/200
- 60 V	[A]	18/40	36/80	54/120	72/160	90/200
- 110 V		8/20	16/40	24/60	32/80	40/100
- 220 V		4/10	8/20	12/30	16/40	20/50

*2 power derating at 110 V input

Additional data for rectifiers and DC/DC converters	
Output voltage stability: - static	± 1 (typically ± 0.5 %)
- dynamic	± 4 (load Δ 10 % - 90 % - 10 %)
Efficiency	[%] 85 - 93
Radio Frequency interference	Class B to EN 55022
Ingress Protection	IP 20
Ambient temperature	[°C] -5 to +40

Technical changes reserved.

Number of inverter modules per 19" rack		1	2	3	4	5
Rated output power at (cos. φ = 0.8)	[kVA]	1.5	3.0	4.5	6.0	7.5
DC-Input 110 V/220 V						

Inverter input	
Input voltage	110/220
Input voltage range	[%] -15 to +20
Permitted DC ripple Voltage	[%] < 5 rms
Input current at 110 V DC	[A] 12 24 36 48 60
Input current at 220 V DC	[A] 6 12 18 24 30

Inverter output	
Output voltage	[V] 220/230/240 1-ph., N, PE (selectable)
Voltage tolerance: - static	[%] ± 1
- dynamic	[%] ≤ 10 at 100 % load step
Regulation time	[msec] ≤ 25
Output current at 230 V AC	[A] 6.5 13.0 19.5 26.0 32.5
Motorload	[%] 100 (beware of starting current)
Overload behaviour	[%] 2.0 x I-nom for 4 sec., 1.2 x I-nom for 60 sec., then switch off
Short-circuit current	[A] 2.1 x I-nom for 4 sec.
Output frequency	[Hz] 50 (60) ± 0.1 % oscillator or mains synchronised
Synchronisation range	[Hz] 50 (60) ± 5 % (selectable)
Wave form	sinusoidal
Distortion factor	[%] ≤ 2 with linear load, ≤ 5 with non linear load according to EN 50091-1-1
Efficiency at nominal output power and input voltage DC 110/220 V	[%] ≥ 91.5

Static bypass	
Rated output power	[kVA] 23 (at 230 V AC)

Technical changes reserved.

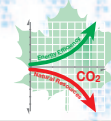
BENNING worldwide

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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

000 «BENNING Elektrotechnik
und Elektronik»
Masherova Ave., 6A, 1003
224030, BREST
Tel.: +375 162 / 51 25 12
Fax: +375 162 / 51 24 44
E-mail: info@benning.by

Belgium

Benning Belgium
branch of Benning Vertriebsges. mbH
Wayenborgstraat 19
2800 MECHELEN
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.
Zahrádní ul. 894
293 06 KOSMONOSY
Tel.: +420 / 3 26 72 10 03
E-mail: odybt@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 13 95
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

Greece

Benning Hellas
Chanion 1, Lykovrisi 141 23
ATHENS
Tel.: +30 (0) 2 10 / 5 74 11 37
Fax: +30 (0) 2 10 / 5 78 25 54
E-mail: info@benning.gr

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@benning.hu

Italy

Benning Conversione di Energia S.r.L
Via Cimarosa, 81
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
branch of Benning Vertriebsges. mbH
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.
Korcunkowa 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.
No. 6 Guangyuan Dongjie
Tongzhou Industrial Development Zone
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

000 Benning Power Electronics
Domodedovo town,
microdistrict Severny,
"Benning" estate, bldg.1
142000 MOSCOW REGION
Tel.: +7 4 95 / 9 67 68 50
Fax: +7 4 95 / 9 67 68 51
E-mail: benning@benning.ru

Slovakia

Benning Slovensko, s.r.o.
Šenkvičká 3610/14W
902 01 PEZINOK
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

Turkey

Benning GmbH Turkey Liaison Office
Uğurmumcu Mh. Akşemsettin cd.
No:56 Aslı Bahçe Sitesi K:1 D:27
34882 KARTAL / ISTANBUL / TÜRKİYE
Tel.: +90 (0) 2 16 / 4 45 71 46
Fax: +90 (0) 2 16 / 4 45 71 47
E-mail: info@benning.com.tr

UAE

Benning Power Systems
Middle East / Office: 918,
9th Floor, AYA Business Center
ADNIC Building, Khalifa Street
ABU DHABI
Tel.: +971 (0) 2 / 4 18 91 50
E-mail: benningme@benning.fr

Ukraine

Benning Power Electronics
3 Sim'yi Sosninykh str.
03148 KYIV
Tel.: 0038 044 501 40 45
Fax: 0038 044 273 57 49
E-mail: info@benning.ua

United Kingdom

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

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