

Excellent Technology, Efficiency, and Quality



## **INVERTRONIC modular SE**

3 Phase Inverter Systems  
Expandable up to 240 kVA  
with Modular Hot-Plug Design



# The world's highest power density, modular, true three phase inverter system for telecom



- **Maximum availability**
- **No single points of failure**
- **Lowest running costs**
- **Highest power quality**
- **AC or DC priority (selectable)**

- **Maximum availability through:**
  - Very high reliability
  - Certified for seismic applications
  - Very low mean time to repair (MTTR)
  - “Hot swap” modularity, hot pluggable 10 kVA Inverter modules each with built-in SBS for the ultimate scalability
  - Integrated manual bypass switch in cabinet
  - Modular self-configuration for N+1 redundancy
- **No single points of failure through:**
  - Redundant critical circuits in each module
  - Multi-master operation
  - Decentralised parallel architecture
- **Lowest running costs through:**
  - High efficiency
  - Small footprint, 60 kW systems in a single cabinet
  - “Pay as you grow” scalability, 3 phase inverter systems expandable up to 240 kVA
  - AC or DC primary software selectable feature
  - Unity power factor inverter modules 10 kVA / 10 kW
  - Optional features include: System bypass cabinets and distribution cabinets
  - Customized solutions
- **Highest power quality through:**
  - 4th Generation DSP Technology for outstanding dynamic step load response and maintenance of high quality, low distortion sine wave output into non-linear loads



Fig. 1: The UC-HE Cabinet used for the INVERTRONIC modular SE, is certified for seismic applications.



Fig. 2: The front door-mounted touch screen display shows operating mode and system parameters. If there is a mobile device or computer available, remote monitoring can be done conveniently via network or internet (HTML, SNMP).



Fig. 3: INVERTRONIC modular SE, 120 kVA

## INVERTRONIC modular SE ensures highest power protection and availability

BENNING has applied over 70 years of accumulated knowledge and experience in high reliability power electronics to design another world class solution.

Introducing – INVERTRONIC modular SE, the world's highest power density, modular, true three phase inverter system for telecom, datacenter, and other critical AC power applications.

The first model, with -48 V DC input and 208 / 120 V AC, 60 Hz output is targeted for the North American telecom industry. Recognizing that most telecom AC loads are single phase, why introduce a three phase inverter?

It allows for efficient load balancing between phases, particularly as this applies to a typical commercial building AC supply. Costs associated with distribution transformers, protective devices, and cabling can be minimized.

## Cost effective replacement

Many applications involve replacement of an existing UPS. Critical AC loads are now fed inverted power continuously from a -48 V DC plant with a typical 4 - 8 hours back-up time.

This configuration protects the loads from AC mains power disturbances. The cost of yearly UPS service contracts and associated separate UPS battery maintenance can also be eliminated.

Cutover from a three phase UPS to the INVERTRONIC modular SE is quick and easy because the inverter system output can be connected directly the existing three phase AC distribution. There is no need to incur the cost and downtime associated with disturbing the existing distribution panels and cabling.

## Enhanced system availability

To further enhance system availability, a new topology has been introduced whereby each inverter module has its own Static Bypass Switch (SBS), eliminating the one large transfer switch of past generations which can be a source of system failure. Secure data bus communications between modules provides for a coordinated transfer to back-up AC in the unlikely event of system failure or overload. Redundancy is determined dynamically, based on measurement of actual present load.

A transfer to back-up will take place when the system determines that its capacity has been exceeded either due to a non-redundant module failure or due to excess load on the output.



## INVERTRONIC modular SE

System / Module	
Module Output Power	10 kVA @ 1.0PF
System Output Power	10 ... 240 kVA @ 1.0PF
Maximum Number of Modules per Cabinet	6 modules for 60 kVA
Maximum number of Modules per System	24 modules for 240 kVA (4 cabinets)
DC Input	
Nominal Voltage	48 V DC
Voltage Range	42 ... 60 V DC (derated below 42 V DC)
Current (Maximum)	260 A per module
Inrush Current	soft-start, sequential start-up
Input Breaker / Fuse Required	300 A (minimum) / 400 A (maximum)
Bypass	
Input Voltage	208 / 120 V AC, 3 phase, 4 wire
Input Voltage Range	+10 / -15 %
Input Frequency	50 Hz or 60 Hz, $\pm 1 - 5$ % programmable
Input Current (Maximum per Cabinet)	167 A
Required Input Breaker (per Cabinet)	225 A
Efficiency (Bypass Operation)	> 99 %
Overload Operation - Bypass	150 % for 1 m, 125 % for 10 m
Short-circuit Behavior - Bypass	1000 % for 100 ms
AC Output	
Voltage	208 / 120 V AC, 3 phase, 4 wire
Voltage Tolerance (Static)	$\pm 1$ %
Frequency Tolerance	$\pm 0.1$ %
Total Harmonic Distortion (THDu)	$\leq 2$ % linear load
Efficiency (Inverter Operation)	~92 % @25 - 100 % load
Overload Operation - Inverter	150 % for 1 s, 125 % for 60 s
Short-circuit Operation - Inverter	300 % for 40 ms; $\geq 220$ % for 1 s
Mechanical	
Cabinet Dimensions	24.0" W x 31.5" D x 84" H (600 mm W x 800 mm D x 2134 mm H)
Cable Entry	top (standard) or bottom (optional with side cabinet)
Color	RAL 7021 (black grey)
Protection Class	IP20 (other protection classes available upon request)
Ventilation	redundant forced-air via variable speed fans
Seismic Protection	designed to GR-63 ; 1997 UBC / 1998 CBC Zone 4
Operating Temperature Range	0 ... 40 °C (derated 12.5 % per 5 °C above 40 °C, maximum 50 °C)
Relative Humidity	5 ... 95 % (non-condensing)
Noise	< 65 dBA
Altitude Above Sea Level	up to 3280 ft (1000 m) without reduction in power
Communications	
Display & Operating Panel	touch screen with mimic diagram and virtual status LEDs
Included	4x dry contacts - ethernet - RS23 - RS485 - USB - remote power off
Optional	MODBUS TCP, ASCII, RTU - SNMP (v1, v2c, v3) - SMTP - RCCMD - 4x dry contacts
Standards & Reliability	
Safety	UL1778, CSA C22.2 NO. 107.3-14, UL60950-1-07
EMC	FCC CFR47 Part 15 Class A
Module MTBF	> 250,000 hrs
System MTTR	< 10 minutes
System Availability	> 99.9999 %

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