BENNING
World Class Power Solutions

Excellent Technology, Efficiency and Quality

INVERTRONIC

- single and three phase IGBT inverters
- robust and reliable
- more than a match for tough industrial applications

INVERTRONIC – for maximum uptime for process-critical consumers in industry

- **outstanding availability**
- **high cost-effectiveness**
- **maximum power supply quality**

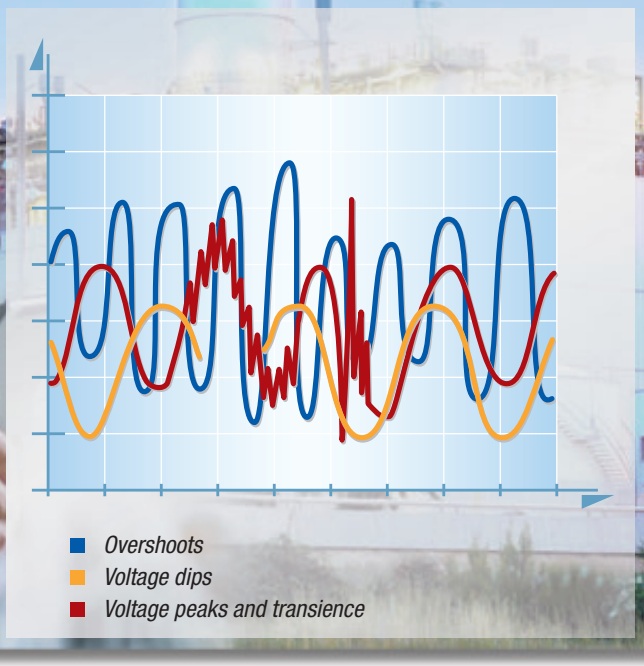


Fig. 1: Possible Irregularities

- **high quality of output voltage**
  - ideal sinewave output
  - low output ripple
  - good control dynamics even during rapid load cycles, thus no overshoot/undershoot with consumer voltage
  - marked improvement in quality of voltage and frequency – by comparison with standard grade, – and this results in a reduction of stress on consumers
- **digitally regulated switching concept**
  - can be configured rapidly
  - low parts count
  - straightforward optical and digital interfaces
- **extensive reporting and monitoring functions**
  - internal controllers
  - all currently used interfaces are available, e.g. remote monitoring/modem control, HTML or SNMP, MODBus or Profibus etc
- **Output expansion or redundancy configuration**
  - by parallel switching of up to 8 individual systems with smart bus connection
- **straightforward coupling of A and B rails**
  - via coupling switch with no interim changeover to bypass mode
- **Using any battery and rectifier infrastructure that's already in place**

Dependable, cost-effective solutions "Made in Germany"

Far-reaching budgeting and financial repercussions can arise as the result of faults in the area of power supply. Due to loads on public power supply system caused by repercussions from large-scale consumers, and due to energisation events during peak consumption periods – or in the event of lightning strike – it's impossible to prevent irregularities from arising. These will result in voltage dips, overshoots and transients in the public grid voltage (Fig. 1).
These may exert a considerable influence on the availability of connected consumers, giving rise to process faults or production failures.

For the supply of power to consumers requiring AC power which is independent of faults arising on the public grid, BENNING offers very robust, single-phase and three-phase inverter systems – in the form of the INVERTRONIC power inverter – for the tough applications that come up in industry, typically for:

- **the power stations sector**
- **the oil, gas and petrochemical industry**
- **the processing industry**

These are connected up to AC power grids that are supported (e.g. by batteries) and provide a reliable source of good quality electrical power to critical consumers.

INVERTRONIC power inverters…
for the most demanding requirements

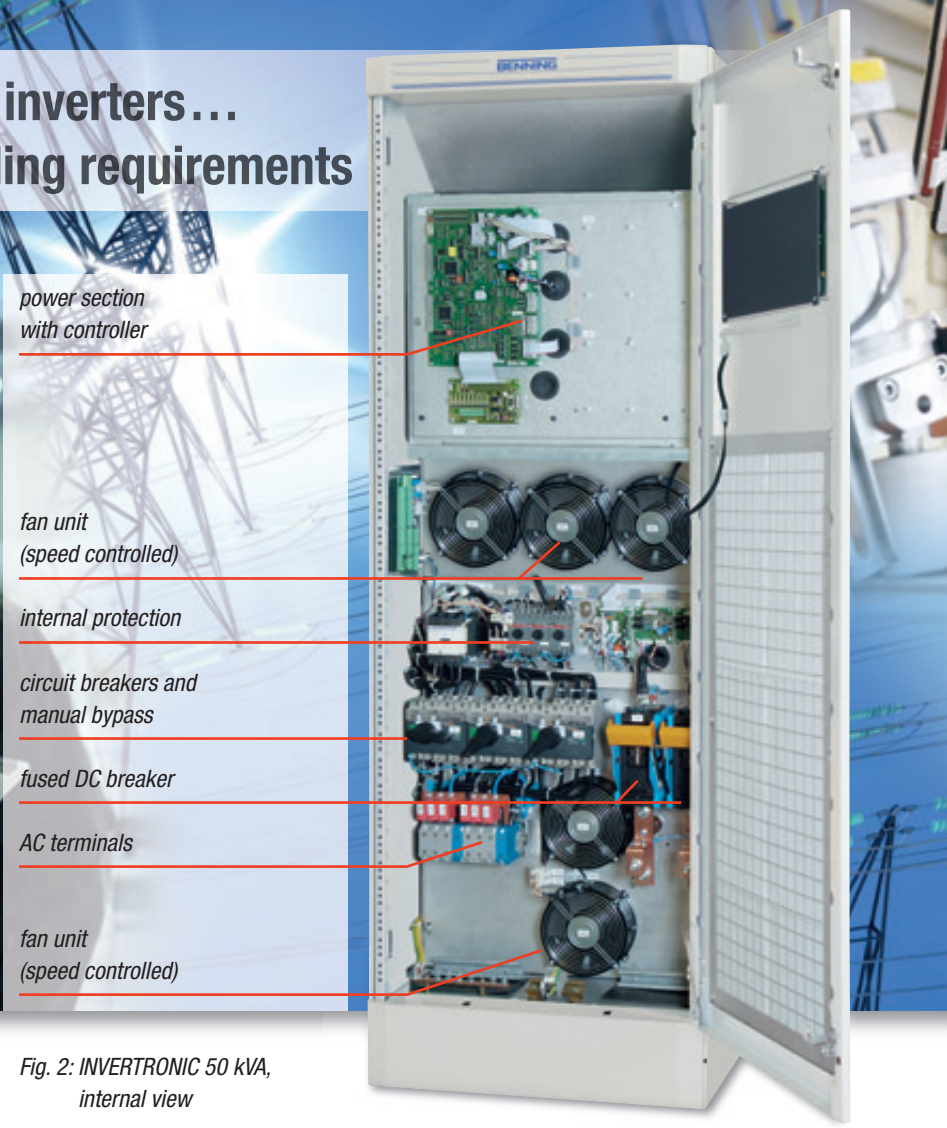


Fig. 2: INVERTRONIC 50 kVA, internal view

Static Bypass

The static bypass consists of a semiconductor switch in the bypass circuit. In the case of an appropriate deviation of the output voltage from the desired values, it switches the connected load automatically and without interruption to the mains.

The static bypass component of the installation facilitates uninterrupted change-over to direct mains supply (bypass mains), keeping the specified tolerances. The change-over can be initiated manually or automatically by a control signal. The µP monitoring is autonomous and prevents incorrect operation of the installation and any illogical switching functions of the static bypass. Thus, for example, an uninterrupted change-over, whether automatic or manual, is only possible when the voltage, frequency and phase conditions of the inverter are synchronised with the bypass mains. Mains frequency deviations, which lie outside the preset tolerances cause blocking of the change-over, or if the inverter fails, a change-over with an interruption.

A change back can only occur to a functioning inverter, and is in everycase uninterrupted even if the mains should fail on a test change-over.

The static bypass has an overload capability of 150 % for 10 min. and 1000 % for 100 ms.
After the presence of an overload or a short-circuit, it automatically resets the load to the inverter, if normal operation is possible.

The static bypass consists of a microprocessor-controlled anti parallel thyristor block. It can be activated manually with a push button, in order to test the change-over. The change-over from inverter to the mains and back takes place in a synchronised operation without a break.

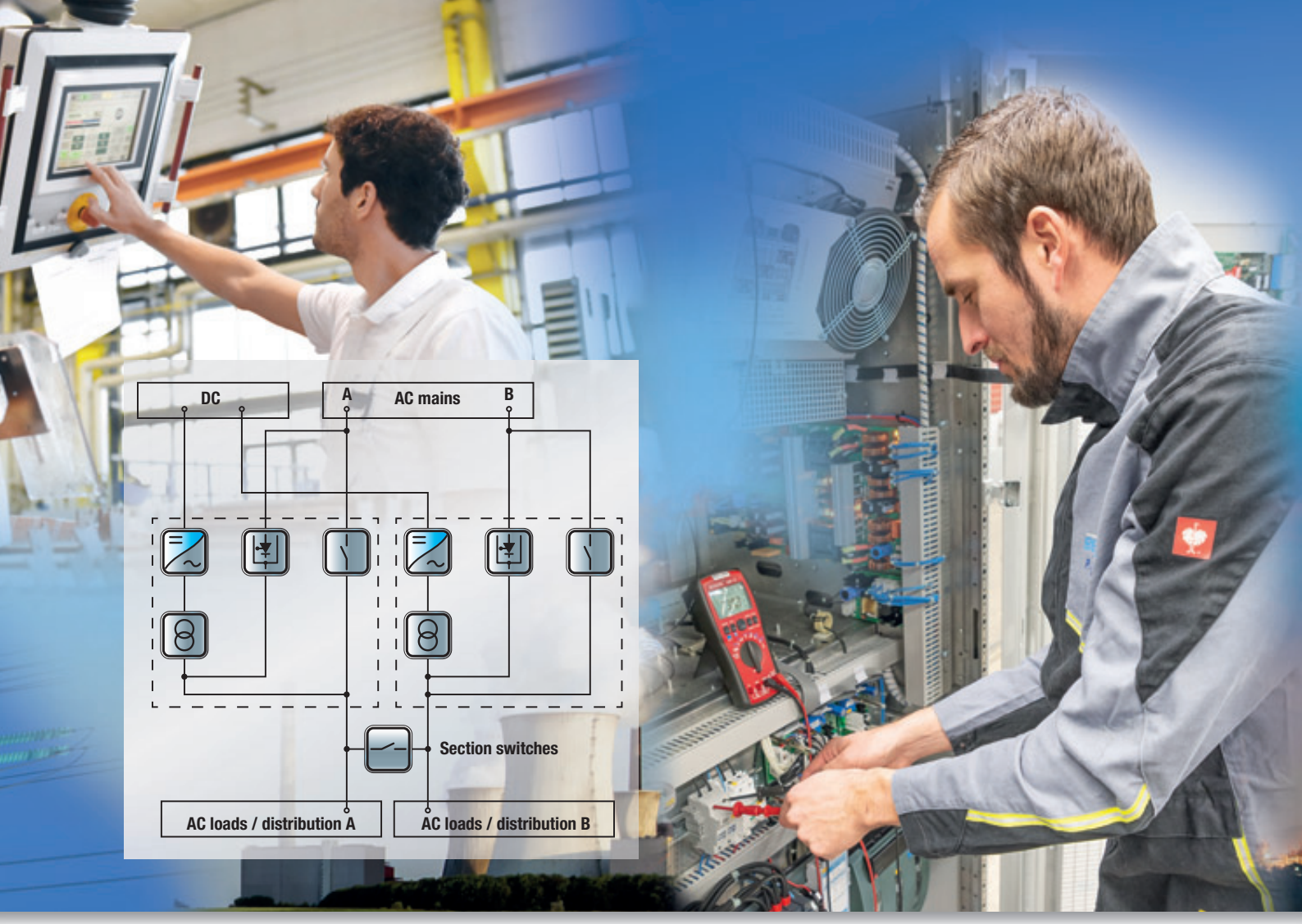


Fig. 3: Supply of power to two bus bars (A+B). Coupling can be brought about without having to switch over to bypass mode.

Flexible, safe and scalable – for the toughest industrial demands

Internal manual bypass
Each inverter is equipped with a maintenance bypass with manually operated switch. When operated, the Inverter is completely disconnected from the load. The supply to the load is now directly from the mains via the manual bypass.

Parallel Operation
For redundancy or increased output power, up to eight INVERTRONIC units can be connected in parallel, operating in an active load-sharing mode.

Half load parallel operation is achieved using two separate bus bars, connected with a coupling switch. The state of the coupling switch is relayed to the microprocessor, via an auxiliary contact.

Straightforward coupling without using bypass mode
INVERTRONIC power inverters use section switches directly and without having to switch over to bypass mode. The switching process is controlled by corresponding logic, thus dispensing with the need for complex switching routines. All consumers remain isolated from the public grid and receive a continuous supply of the best quality of power.

Option
For power plant applications where higher than normal fault clearing current is required, it is possible to specify an option for 7 x I nominal system output. Depending on the output power, a bigger cabinet may be required.

Reliability is sustained continuously – thanks to proactive 360° services

Because you can rely on a BENNING power inverter, you can consequently opt for a high-quality product from a worldwide leader in AC and DC power supply manufacturers. This means that you can expect a reliable, globally aligned service structure which provides the optimum support for your requirements.

That's the best way for you to gear up for the challenges of today and the opportunities of tomorrow.

www.benning-services.com

360°
pro-active Service

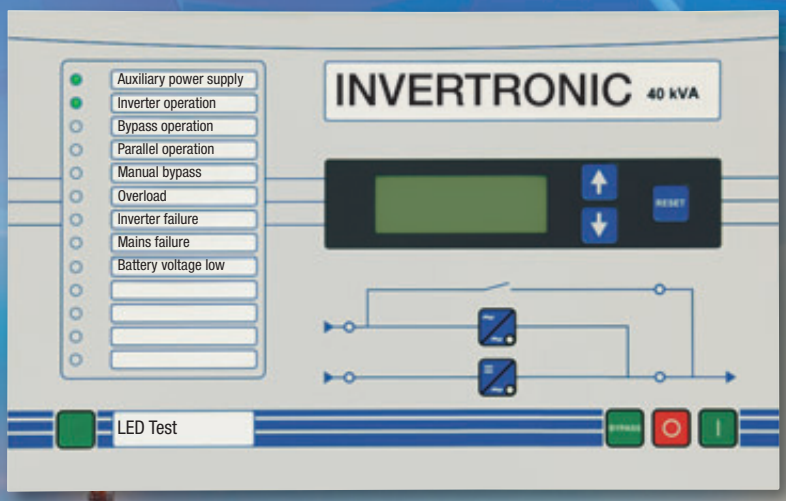


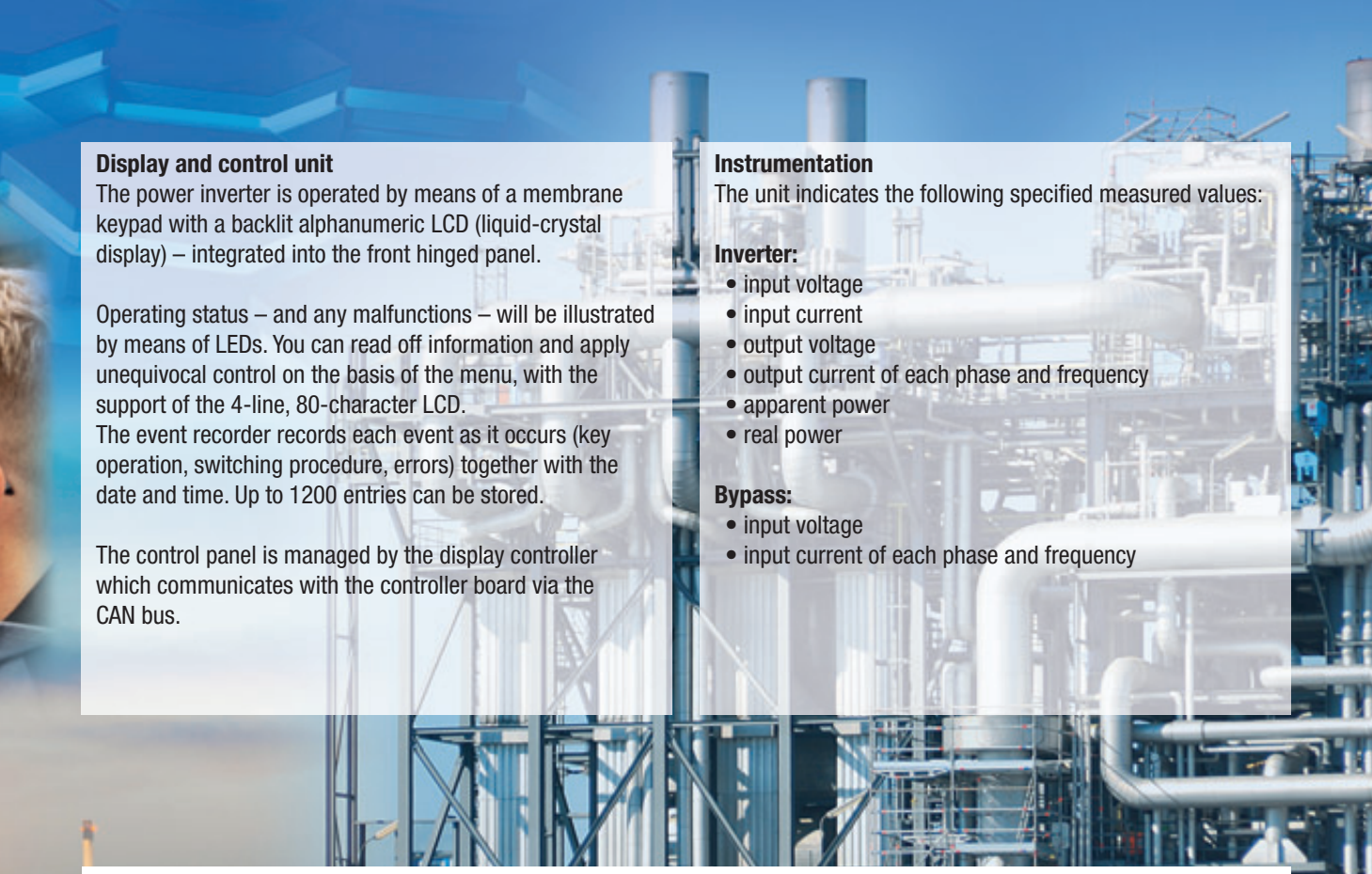
Fig. 4: On the display & control unit on the front panel, you will find function and fault-warning LEDs, control switches and a mimic diagram.

Technical Data

INVERTRONIC 3ph													
Ratings*[1] (cosφ = 0.8)	[kVA]	10	20	30	40	50	60	80	100	120	140	160	200
Ratings*[1] (cosφ = 1.0)	[kW]	8	16	24	32	40	48	64	80	96	112	128	160
Operating temperature		0 … 40 °C (derating at higher temp.)											
Relative humidity		5 … 95 % (non condensing)											
Noise level		< 65 dBA (depending on rating)											
Protection kind		IP20 (others on request)											
Altitude above sea level		1000 m (without derating)											
Cable entry		bottom (top on request)											
Color		RAL 7035 (others on request)											
Cooling		redundant forced ventilated											
Classification		VFI-SS-111 (as per IEC / EN 62040-3)											
Standards													
Safety		IEC / EN 62040-1, IEC / EN 60950-1											
EMC		IEC / EN 62040-2											
Performance		IEC / EN 62040-3											
Input													
Voltage		110 V / 125 V / 220 V / 240 V											
Voltage tolerance		-15 % … +25 % (depending on configuration)											
Inrush current		< I Nom											
Output (power inverter mode)													
Voltage		208 V / 380 V / 400 V / 415 V / 480 V (others on request)											
Voltage tolerance (static)		± 1 %											
Frequency tolerance		± 0.1 %											
Distortion THDu		linear load: ≤ 1 %											
Efficiency		up to 96 % (depending on configuration)											
Overload inverter		200 % for 3 s, 150 % for 60 s, 125 % for 10 min											
Overload bypass		1000 % for 100 ms, 150 % for 10 min											
Short circuit behavior inverter		up to 350 % for 3 sec											
Short circuit behavior bypass		1000 % for 100 ms											
Transformer		isolation transformer											
Battery													
Nominal voltage		110 V / 125 V											
		220 V / 240 V											

(*[1] higher ratings on request)

Specifications are subject to change without notice.



Display and control unit
The power inverter is operated by means of a membrane keypad with a backlit alphanumeric LCD (liquid-crystal display) – integrated into the front hinged panel.

Operating status – and any malfunctions – will be illustrated by means of LEDs. You can read off information and apply unequivocal control on the basis of the menu, with the support of the 4-line, 80-character LCD.
The event recorder records each event as it occurs (key operation, switching procedure, errors) together with the date and time. Up to 1200 entries can be stored.

The control panel is managed by the display controller which communicates with the controller board via the CAN bus.

Instrumentation
The unit indicates the following specified measured values:

Inverter:
- input voltage
- input current
- output voltage
- output current of each phase and frequency
- apparent power
- real power

Bypass:
- input voltage
- input current of each phase and frequency

Technical Data

INVERTRONIC 1ph													
Ratings (cosφ = 0.8)	[kVA]	10	20	30	40	50	60	80	100	120	140	160	200
Ratings (cosφ = 1.0)	[kW]	8	16	24	32	40	48	64	80	96	112	128	160
Operating temperature		0 … 40 °C (derating at higher temp.)											
Relative humidity		5 … 95 % (non condensing)											
Noise level		< 65 dBA (depending on rating)											
Protection kind		IP20 (others on request)											
Altitude above sea level		1000 m (without derating)											
Cable entry		bottom (top on request)											
Color		RAL 7035 (others on request)											
Cooling		redundant forced ventilated											
Classification		VFI-SS-111 (as per IEC / EN 62040-3)											
Standards													
Safety		IEC / EN 62040-1, IEC / EN 60950-1											
EMC		IEC / EN 62040-2											
Performance		IEC / EN 62040-3											
Input													
Input voltage		110 V / 125 V / 220 V / 240 V											
Voltage tolerance		-15 % … +25 % (depending on configuration)											
Inrush current		< I Nom											
Output (power inverter mode)													
Voltage		120 V / 220 V / 230 V / 240 V (others on request)											
Voltage tolerance (static)		± 1 %											
Frequency tolerance		± 0.1 %											
Distortion THDu		linear load: ≤ 1 %											
Efficiency		up to 95 % (depending on configuration)											
Overload inverter		200 % for 3 s, 150 % for 60 s, 125 % for 10 min											
Overload bypass		500 % for 100 ms, 150 % for 10 min											
Short circuit behavior inverter		up to 300 % for 3 sec											
Short circuit behavior bypass		500 % for 100 ms											
Transformer		isolation transformer											
Battery													
Nominal voltage		110 V / 125 V											
		220 V / 240 V											

Specifications are subject to change without notice.

INVERTRONIC:
Flexible, safe and scalable

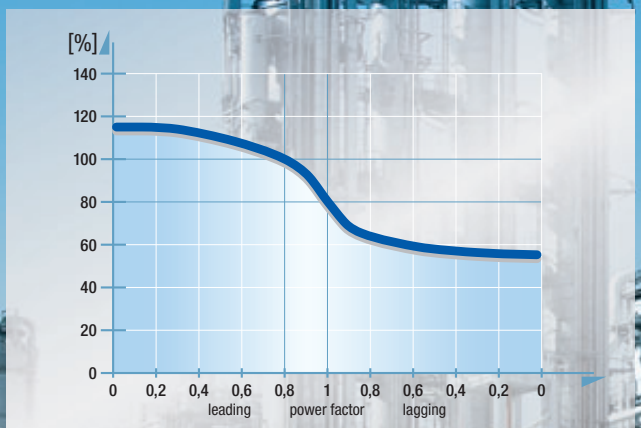


Fig. 5: Available inverter apparent output power depending on power factor

Fig. 6: INVERTRONIC Inverter, 400 V - 40 kVA

Function & Design

In normal operation the consumer is supplied by the inverter and output transformer route.

The static inverter not only has the task of supplying the connected consumers continuously and without interruption, but beyond that to also provide a clear improvement of the voltage and frequency quality in relation to the normal system.

Thanks to the control characteristics of the INVERTRONIC power inverter range, any dynamic deviations in voltage are very low, even in the event of major variations in load.

Thanks to the use of the latest technology in IGBT output semiconductors, the INVERTRONIC range is more than a match for the highest requirements in terms of power supply reliability, with the added bonus of being particularly cost-effective.

All of the rectifier and EUE functions are controlled, regulated and monitored with the highest reliability, thanks to a combination of 16-bit microcontrollers and leading-edge power output electronics.

An EUE (static switch) and a service bypass switch are provided.

Inverter

The inverter power block changes DC voltage into a sinusoidal AC voltage with constant amplitude and stable frequency.
The output voltage is independent of line disturbances or power failures.
The unit works with an IGBT inverter bridge with pulse width modulation having a high efficiency in the partial load range as well as achieving a low distortion factor at non linear load.

In the event of mains interruption or failure, the battery connected to the DC input is brought in automatically and without interruption to supply current. If the battery becomes discharged this is reported. If the battery discharge limit is exceeded, the installation automatically turns off and a warning is given shortly before the discharged voltage limit is reached.

Automatic change-over of the load to the bypass mains or a suitable spare installation occurs if the supply from the inverter falls outside the preset tolerances.

www.benninguk.com • www.benning.us

www.benning.de

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
OOO «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
Assesteenweg 65
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
Tel.: +420 / 3 26 72 10 03
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 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

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

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.
Korczunkowa 30
05-503 GLOSKÓW
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
OOO 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.
Šenkvická 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
19 Mayıs Mah. Kürkçü Sokak No:16/A
34736 KOZYATAGI
KADIKÖY / ISTANBUL
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

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

784335.11 GB 02/2022 paus Design & Medien, Bocholt Subject to alterations. Printed on chlorine free paper.

BENNING