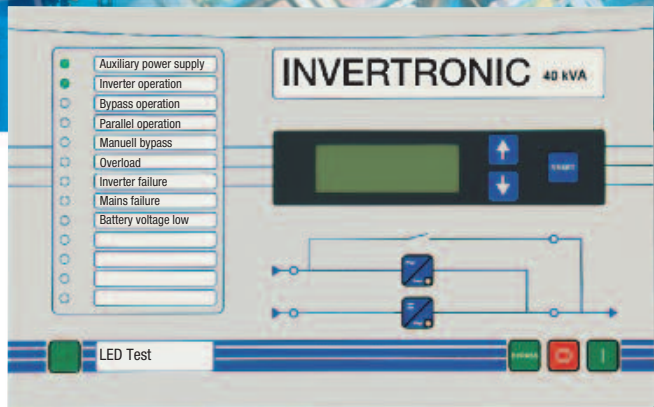


World Class Power Solutions



**Single and three phase
inverters**

INVERTRONIC Range





INVERTRONIC

disposed for highest security

General

The requirement for power supply reliability is growing, due to the increasing application of information and data carrier systems, text processing, automated production processes and complex data networks.

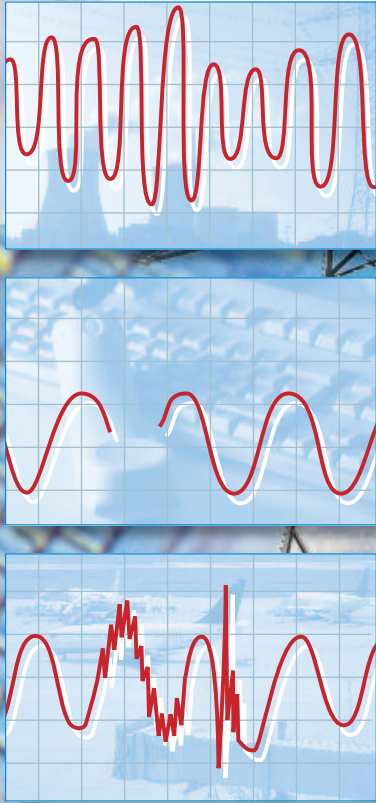


Fig. 1: Possible Irregularities



Fig. 2: INVERTRONIC Inverter

Irregularities due to loading of the public power supply by major users, peak-time use or by lightning strikes cannot be avoided.

The result is:

Mains voltage breaks, spikes and transients. (Fig. 1)

Static inverters are being installed increasingly for loads who require AC voltages unaffected by interference on the mains e.g.

- Data processing installations
- Process control computers
- Air safety installations
- Signalling, alarm systems
- Telecommunication systems
- Power- and Substations

Design

The exceptional characteristics of this inverter series results in very small dynamic voltage deviations even in the case of one hundred percent load changes.

A combination of a 16-bit micro-controller and the latest power electronic is responsible for controlling and monitoring of all inverter and static switch functions with highest reliability. A static switch and a manual bypass switch are integrated in the unit.

In the front of the cabinet there is a plastic foil keyboard with 6 keys, 2 three coloured and 4 single coloured LED's and a mimic diagram.

INVERTRONIC with static bypass an uninterruptible power supply

Function

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

Inverter

The inverter power block changes DC voltage into a 3-phase 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.

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 μ P 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 every case 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.



INVERTRONIC

multi utilities

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.

Instrumentation

A background-lit 4 x 20 alphanumeric liquid Crystal display (LCD), which is operated by push buttons, is built into the front door. This 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

An event recorder stores each occurring event (push button operation, switching events and error) with date and time. Up to 1199 entries can be stored.



Fig. 3: INVERTRONIC 50 kVA, interior view

Front Panel

The operation of the inverter is made by a plastic foil keyboard with 6 keys, 2 three coloured and 4 single coloured LED's. There is a mimic diagram on the operating section. The operating condition and any operational disturbances are represented by the multi colour LED's.

There is a 4-line, 80-digit LC display in the operating section for reading information and/or for clear guidance by the menu. Control of the operating section takes place via the display controller, which communicates over the CAN bus with the controller board.

In addition, the most important operating and fault signals are indicated by 13 single LED's.

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.

Option

For power plant applications where higher than normal fault clearing current is required, it is possible to specify an option for 4 x I nominal system output. Depending on the output power, a bigger cabinet may be required.

Fig. 4: Front Panel INVERTRONIC

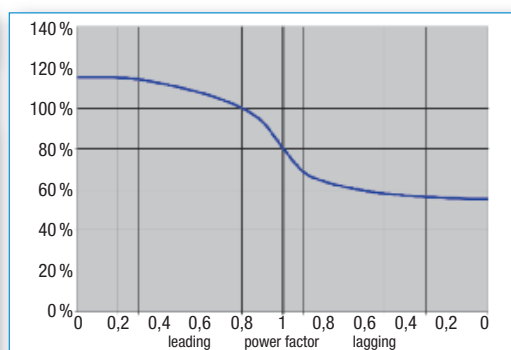
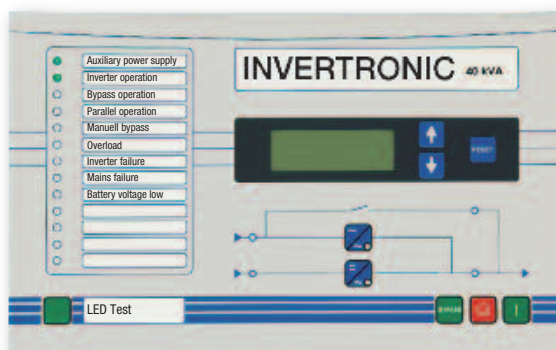


Fig. 5: Available inverter apparent output power depending on power factor



INVERTRONIC

all-purpose

Technical Data

Single phase inverter INVERTRONIC Range - DIN Type: G 220 E 230/...../2 rfg-WEG....

Nominal output power at cos. phi 0,8: [kVA] 10 20 30 40 50 60 80 100 120

Inverter input

Input voltage:	[V]	220									
Input voltage range:	[%]	- 15 to + 20									
Permitted overlaid AC:	[%]	< 5 eff.									
AC current feedback on DC input:	[%]	< 10 eff.									
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									
Voltage tolerance:		± 1 % ± 4 % for 100 % load change									
Regulation time:	[msec]	≤ 10									
Nominal output current each phase:	[A]	43	86	130	173	217	260	347	434	521	
Non-linear load:		Crestfaktor ≤ 3									
Motor load:		100 % permitted (note inrush current)									
Overload behaviour:		50 % for 60 sec. 25 % for 10 min. 10 % for 20 min.									
Short-circuit behaviour:		Short circuit proof									
Short circuit current:		3 x I-nom for 3 sec.									
Output frequency:	[Hz]	50 (60) ± 0,1 % quartz or mains synchronised									
Synchronisation range:	[Hz]	50 (60) ± 3 %									
Wave form:		Sine wave									
Distortion factor (acc. EN 62040):	[%]	≤ 0,5 with linear load ≤ 5 with non linear load									

Static bypass

Overload behaviour:		150 % for 10 min. 500 % for 100 msec.									
Transfer time:		< 1 (uninterruptible)									
- at inverter failure	[msec]	< 1 (uninterruptible)									
- at overload or manual activation	[msec]	< 1 (uninterruptible)									

Dimensions:										
- Height	[mm]	2000 (2200*)			2000 (2200*)			2000 (2200*)		
- Width	[mm]	800			800			1600		
- Depth	[mm]	600			800			800		

(* 2200 mm height is also possible)

INVERTRONIC

all-purpose

Technical Data

Three Phase Inverter INVERTRONIC Range - DIN Type: G 220 D 400/...../2 rfg-WDG....

Nominal output power at cos. phi 0,8:	[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 overlaid AC:	[%]	< 5 eff.										
AC current feedback on DC input:	[%]	< 5 eff.										
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										
Voltage tolerance:		± 1 % ± 4 % for 100 % load change ± 2 % at 100 % of centre load										
- static		± 1 %										
- dynamic		± 4 % for 100 % load change										
- asymmetric load		± 2 % at 100 % of centre load										
Regulation time:	[msec]	≤ 10										
Nominal output current each phase:	[A]	14,4	28,8	43,3	57,8	72,2	86,7	115	144	172	230	288
Non-linear load:		Crestfaktor ≤ 3										
Motor load:		100 % permitted (note inrush current)										
Overload behaviour:		50 % for 60 sec. 25 % for 10 min. 10 % for 20 min.										
Short-circuit behaviour:		Short circuit proof										
Short circuit current:		single phase 3,5 x I-nom for 3 sec.; three phase 2 x I-nom for 3 sec.										
Output frequency:	[Hz]	50 (60) ± 0,1 % quartz or mains synchronised										
Synchronisation range:	[Hz]	50 (60) ± 3 %										
Wave form:		Sine wave										
Distortion factor (acc. EN 62040):	[%]	≤ 1 with linear load ≤ 5 with non linear load										

Static bypass

Overload behaviour:		150 % for 10 min. 1000 % for 100 msec.										
Transfer time:		< 1 (uninterruptible)										
- at inverter failure	[msec]	< 1 (uninterruptible)										
- at overload or manual activation	[msec]	< 1 (uninterruptible)										

Abmessungen:												
- Height	[mm]	2000 (2200*)					2000 (2200*)			2200		
- Width	[mm]	800					800			1600		
- Depth	[mm]	600					800			800		

(* 2200 mm height is also possible)

INVERTRONIC

General data

General datas for WEG and WDG

Radio interference:		In accordance EN 50091-2
Transducer:		1 x 0 respectively 4 to 20 mA free programmble
Relay outputs:		6 x volt free change over contacts
Interfaces:		1 x RS232 and RS485, each with MODBus protocol
Permitted power factor:		0,0 ind. - 0,0 cap., for deviations of cos phi 0,8 ind. power reduction is needed only via 1 to the cap. range (see figure 5)
Noise level with 1 m distance:	[dB(A)]	app. 65
Cooling:		convection colled Forced cooling with redundant, speed controlled fans located in air inlet
10 and 20 kVA inverter		
30 to 200 kVA inverter		
Permitted ambient temp.:	[°C]	0 to + 40
Permitted climatic data:		temperate climate
Humidity class:		Class F, DIN 40040
Permitted installation height at nominal load:	[m]	1000 above sea level
Protection degree:		IP 20 in accordance DIN 40050
Painting:		RAL 7035, structural paint
Other options e.g.:		Profibus DP interface connected to RS232, Bypass transformer (additional cabinet), higher protection IP, 6 additional alarm relay contacts (free programmable), additional RS232 and RS485 interfaces (additional options on request)

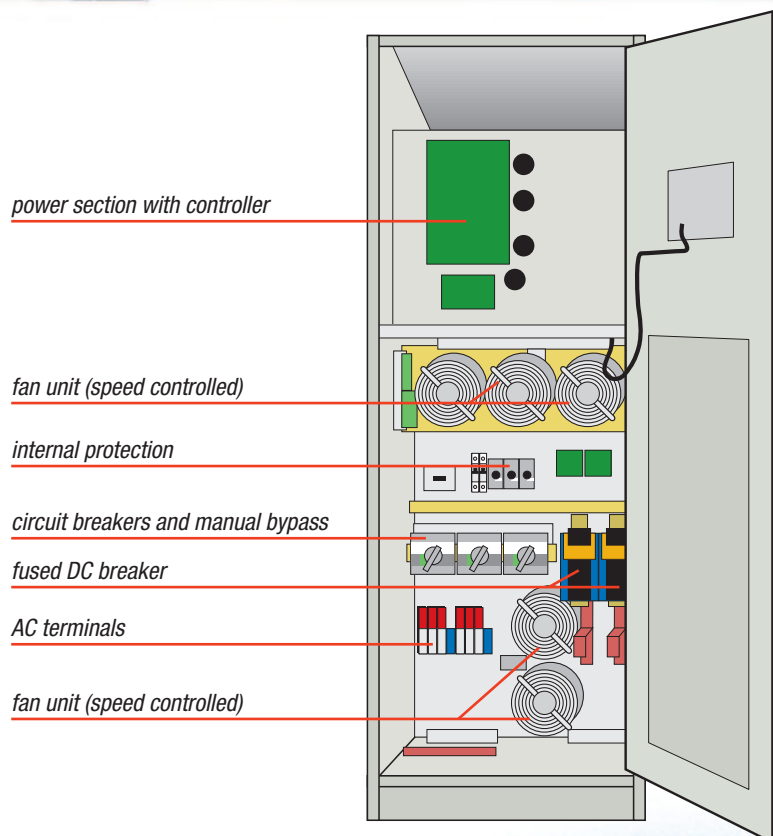


Fig. 6: INVERTRONIC 50 kVA, internal view



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

IOOO BENNING
ul. Belorusskaya, 51-25
224025, BREST, REPUBLIK BELARUS
Tel.: +375 (0) 1 62 / 97 47 82
Fax: +375 (0) 1 62 / 29 33 77
E-mail: info@benning.brest.by

Belgium

Benning Belgium
Power Electronics
Z. 2 Essenestraat 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 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 / 93 297
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 / 6 15 56 85 88
Fax: +86 (0) 10 / 6 15 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

Serbia

Benning Power Electronics doo
Srbija
Kornelija Stankovića 19
11000 BEOGRAD
Tel.: +381 (0) 11 / 3 44 20 73
Fax: +381 (0) 60 / 4 34 80 05
E-mail: info@benning.co.rs

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

Turkey

Benning GmbH
Türkiye İrtibat Bürosu
Can Sokak No: 7/B
34742-KOZYATAĞI
Kadıköy/İstanbul - Turkey
Tel.: +90 (0) 2 16 / 4 45 71 46
Fax: +90 (0) 2 16 / 4 45 71 47
E-mail: b.dinler@benning.de

Ukraine

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

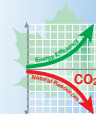
U.S.A.

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

ISO
9001

ISO
14001

SCC



BENNING