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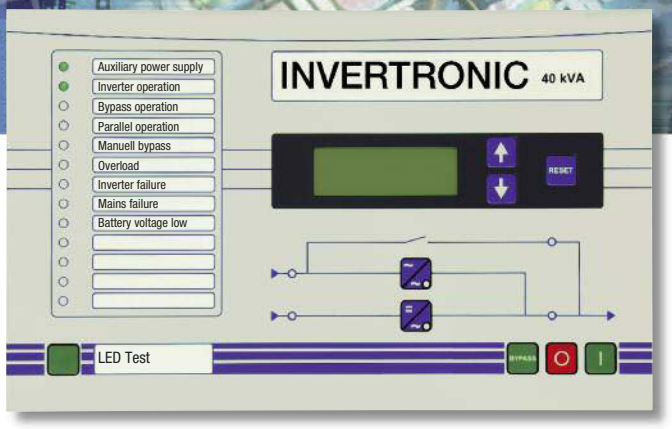
World Class Power Solutions



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.

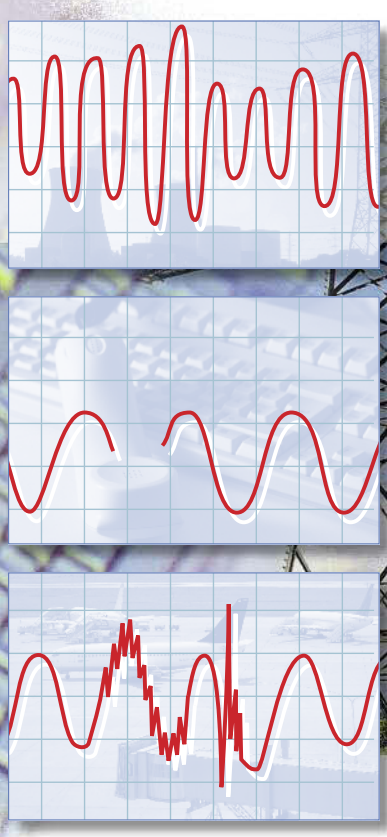


Fig. 1: Possible Irregularities

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
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

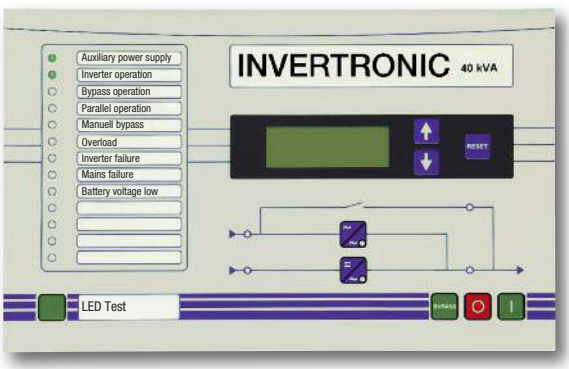
Front Panel
The operation of the inverter is made by a plastic foil key-board with 6 keys, 2 three coloured and 4 single coloured LED's. There is a mimic diagram on the operating section. The operating condition and any operational disturbances are represented by the multi colour LED's.

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



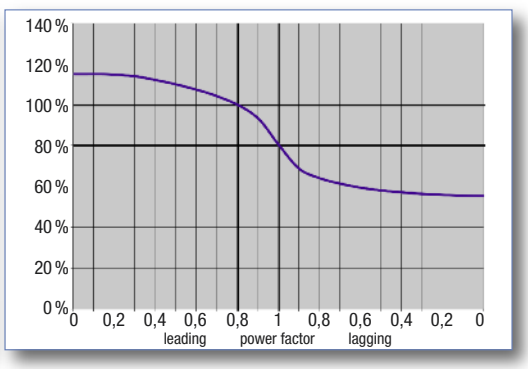


Fig. 5: Available inverter apparent output power depending on power factor

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:										
- static		± 1 %								
- dynamic		± 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:		
- 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:												
- 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:												
- 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
Generel data

Generel 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: 10 and 20 kVA inverter 30 to 200 kVA inverter		 convection colled Forced cooling with redundant, speed controlled fans located in air inlet
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 programable), additional RS232 and RS485 interfaces (additional options on request)

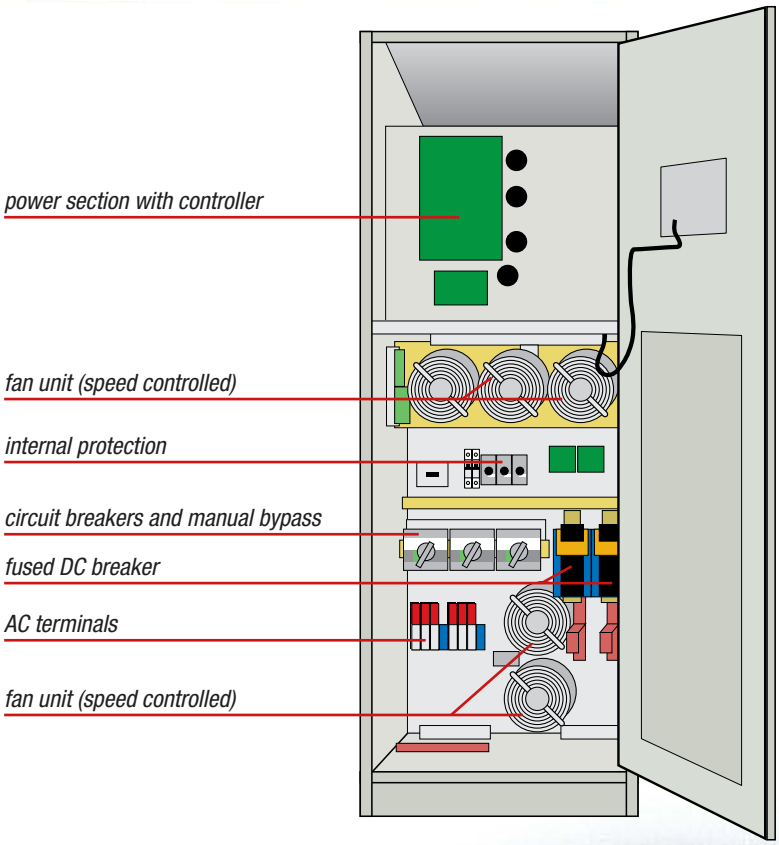


Fig. 6: INVERTRONIC 50 kVA, internal view

INVERTRONIC with static bypass
an uninterrupptible 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 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.

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