



BPower

BGSE Group Power Technology 40 to 90kVA with optional 28VDC



When aircraft are parked at airport terminal stands with their engines shut down they require a reliable and controlled supply of 400Hz power at 115/200V to be supplied from an external source. This power supplies the aircraft on-board electrical systems while the aircraft remains at the terminal.

Since normal airport power grids supply 50Hz or 60Hz it is necessary to provide a frequency converter to convert the supply to 400Hz. Frequency conversion can take place local to the aircraft stand, known as point-of-use (PoU), or in a centralized location from which the power can be distributed to a number of stands, known as a fixed ground power system (FGP).

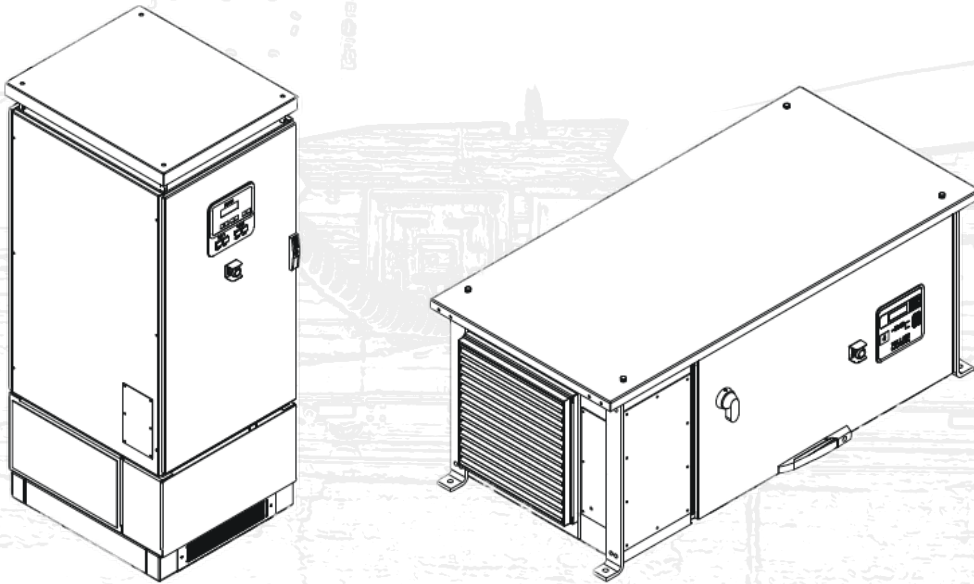
Some special aircraft loads require a 28V DC supply in parallel with the 400Hz supply. Some smaller aircrafts are operated solely on 28V DC. To avoid the need to provide two independent GPUs, one with 400Hz and the other with 28V DC, the BGSE 40 to 90kVA can be equipped with an additional 28V DC output option. This option is directly connected to the second 400Hz output of the converter and has its own voltage regulation. It can be operated stand alone, or in parallel to the standard 400Hz output.

The compact cabinet design for the B Power 40 to 90kVA power is a very compact, low noise construction and offers two different installation possibilities. In the upright (vertical) position the cabinet is suitable for apron and hangar installations. The horizontal position gives a perfect fit on a trailer. If needed, the cabinet can be easily rearranged.



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The frequency converter is designed to accept a 3-phase mains supply of 4-wire 400V or 480V $\pm 10\%$ at 50 or 60Hz $\pm 5\%$. Depending on the local standards the frequency converters input can be equipped with an input isolator to disconnect the unit from the mains. There is a filter at the input to the converter which limits the electrical emissions (RFI) back to the mains, thereby ensuring that the equipment meets the general EMI directives. Secondary supplies to feed control circuits, switched via Q100 (T211 and A211), are also connected at the frequency converter input.



The digital electronics commonly found today in this field provide the ideal conditions for the use of powerful monitoring and diagnostics systems. All important data, such as voltages, currents, frequencies, power levels and power factors, as well as the operational status, warning and fault messages logged in an event memory, can be read into a master PC via a serial interface.

In addition, the B Power, which uses completely digital systems, can incorporate further diagnostic tools, such as logic analyzers and digital storage oscilloscopes. These enables all the signals used in

the BPower - to be examined and evaluated via the Internet. As a result, true remote diagnostics are achieved, which considerably reduces possible down times and increases the availability.

The converter unit can be equipped with an RS 485 interface for a central monitoring station / controller and optionally with a modem interface (RS 232) for remote diagnostics. Provision is made for a fault alarm printer to be connected to the modem interface.

The Control Panel gives the user a comprehensive status indication of the frequency converter. The LEDs on the mimic display show the status of each logical section of the converter, displaying green, yellow or red, and flashing or steady state to show various normal, available, warning and abnormal states of the converter. The push buttons allow the user to switch the unit on and off. With the push buttons "UP arrow" and "DOWN arrow", input and output voltage, and input and output current will be displayed for each phase. Additionally, frequency and load also appear on display.

For remote indication, six potential-free contacts (change-over type) are provided on the customer interface card, which can be programmed on the control panel for operational and fault signals as required. Fault alarms are capable of being connected via potential-free contacts to the central building monitoring. The individual fault alarms are freely programmable.

The System Controller Board handles the master system control function. Control commands from the control panel (CP) are transmitted to this controller, evaluated and converted into the appropriate actions. Current operating parameters (measured values etc.) are also evaluated by the System Controller Board and sent back to the CP, to displays them via the LC Display.



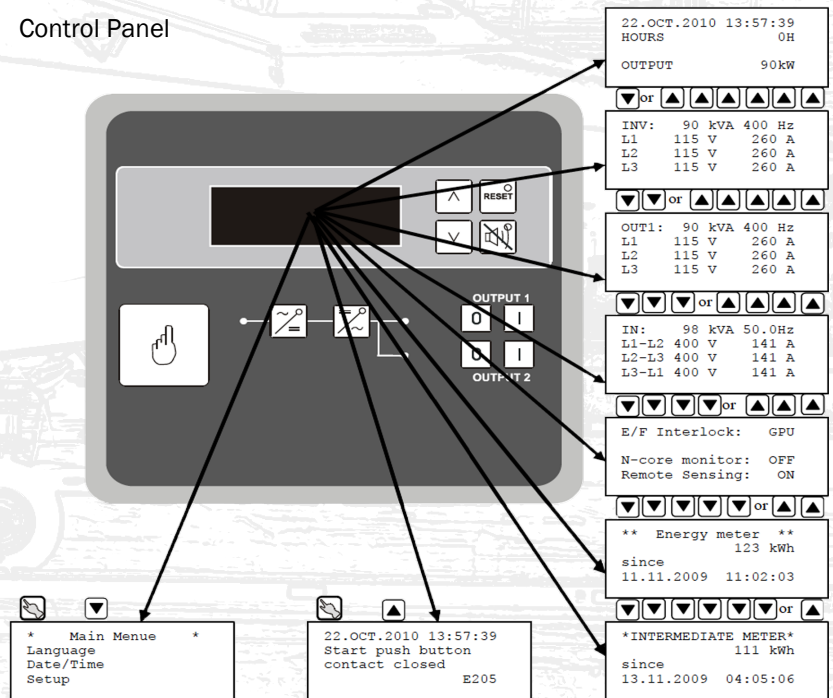
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The following values are not only measured and displayed, but are also monitored for deviations from the specification:

- Input under & over-voltage
- Input under & over-frequency
- Input phase rotation
- Input overload
- Output under & over-voltage (AC and DC)
- Output under & over-frequency (AC)
- Output phase rotation (AC)
- Output overload (AC and DC)
- Over-temperature

BGSE frequency converters have a voltage drop compensation available as a standard feature. It is called BGSE I-Boost compensation. The I-Boost senses the current flow just prior to the output contactor of the units and automatically adjusts the output voltage throughout the full output kVA and power factor rated range to accommodate the wire characteristics installed. This I-Boost system uses software and current transformers to provide the voltage drop compensation automatically. The 28V DC Option has a separate I-Boost compensation.

Control Panel



The Mimic Display on the Control Panel gives the user a quick and comprehensive status indication of the frequency converter. Each of the following main functions of the frequency converter has an LED associated with it on the mimic diagram:

Operator control panel with:

Buttons for:

- “on” – “off” for switching on/off output 1 and 2
- “arrow up” and “arrow down” key for displaying operating data on the LC display, paging up and down through the event directory
- “Hand” key for switching over the display indications
- “reset” failure indication “Horn off” to silence audible alarm

LEDs for:

- Input (ready = yellow; on = green; malfunction = red)
- Rectifier (ready = yellow; on = green; malfunction = red)
- Inverter (ready = yellow; on = green; malfunction = red)
- Output1 (on = green; off = off)
- Output2 (on = green; off = off)
- Alarm/Reset (no alarm = off; alarm = red)
- Horn (normal = off; Horn off = red)

LC display for: Plain language fault display display of current operating data voltage, current, frequency, power, etc.

| | 40 | 40 | 60 | 60 | 90 | 90 |
|---|--|--|--|--|--|--|
| Input data | | | | | | |
| Nominal voltage 3ph | 400 V ±15% | 480 V ±15% | 400 V ±15% | 480 V ±15% | 400 V ±15% | 480 V ±15% |
| Nominal frequency | 50 Hz -5% - 60 Hz +5% | 50 Hz -5% - 60 Hz +5% | 50 Hz -5% - 60 Hz +5% | 50 Hz -5% - 60 Hz +5% | 50 Hz -5% - 60 Hz +5% | 50 Hz -5% - 60 Hz +5% |
| Input power at | | | | | | |
| 100% load pf 0.8 | 35 kVA | 35 kVA | 53 kVA | 53 kVA | 77 kVA | 77 kVA |
| 100% load pf 0.9 | 39 kVA | 39 kVA | 58 kVA | 58 kVA | 86 kVA | 86 kVA |
| 100% load pf 1 | 44 kVA | 44 kVA | 66 kVA | 66 kVA | 98 kVA | 98 kVA |
| Input current at | | | | | | |
| 100% load pf 0.8 | 51 A | 46 A | 78 A | 64 A | 111 A | 93 A |
| 100% load pf 0.9 | 56 A | 48 A | 84 A | 70 A | 125 A | 104 A |
| 100% load pf 1 | 64 A | 53 A | 95 A | 80 A | 141 A | 118 A |
| Distortion factor | | | | | | |
| At 100% | < 5% | < 5% | < 5% | 5,2 | < 5% | < 5% |
| At 50% | < 8% | < 8% | < 8% | 7,9 | < 8% | < 8% |
| At 25% | < 12% | < 12% | < 12% | 14% | < 12% | < 12% |
| Input power factor (load range 10 to 100%) | unity (1) | unity (1) | unity (1) | unity (1) | unity (1) | unity (1) |
| Inrush current | | | | | | |
| recommended pre-tuning 100% load pf 0,9 | non 63 A | non 50 A | non 100 A | non 80A | non 125 A | non 125 A |
| Output data | | | | | | |
| Continuous output power (pf 0.8 - 1) | 40 kVA | 40 kVA | 60 kVA | 60 kVA | 90 kVA* | 90 kVA* |
| Nominal voltage 3ph | 200/115 V | 200/115 V | 200/115 V | 200/115 V | 200/115 V | 200/115 V |
| Nominal current | 116 A | 116 A | 173 A | 173 A | 260 A | 260 A |
| Output frequency | 400 Hz ±0.1% | 400 Hz ±0.1% | 400 Hz ±0.1% | 400 Hz ±0.1% | 400 Hz ±0.1% | 400 Hz ±0.1% |
| Power Factor | 0,61 - 0,95c | 0,61 - 0,95c | 0,61 - 0,95c | 0,61 - 0,95c | 0,61 - 0,95c | 0,61 - 0,95c |
| Voltage characteristics: | | | | | | |
| – static | ±1% | ±1% | ±1% | ±1% | ±1% | ±1% |
| – dynamic | MIL-Std. 704F, Fig. 3 | MIL-Std. 704F, Fig. 3 | MIL-Std. 704F, Fig. 4 | MIL-Std. 704F, Fig. 4 | MIL-Std. 704F, Fig. 5 | MIL-Std. 704F, Fig. 5 |
| Recovery time (100% load step) | < 50 ms | < 50 ms | < 50 ms | < 50 ms | < 50 ms | < 50 ms |
| Distortion factor (linear load) | 2.3% | 2.3% | < 1,5 | < 1,5 | < 1% | < 1,5% |
| Waveform | Sinusoidal | Sinusoidal | Sinusoidal | Sinusoidal | Sinusoidal | Sinusoidal |
| Crest factor | 1,414 ± 3% | 1,414 ± 3% | 1,414 ± 3% | 1,414 ± 3% | 1,414 ± 3% | 1,414 ± 3% |
| voltage modulation | < 1% | < 1% | < 1% | < 1% | < 1% | < 1% |
| Phase angle symmetry | | | | | | |
| balanced load | 120° ± 1.5° | 120° ± 1.5° | 120° ± 1.5° | 120° ± 1.5° | 120° ± 1.5° | 120° ± 1.5° |
| 30% unbalanced load | 120° ± 3° | 120° ± 3° | 120° ± 3° | 120° ± 3° | 120° ± 3° | 120° ± 3° |
| Voltage symmetry | | | | | | |
| – with balanced load | ±1% | ±1% | ±1% | ±1% | ±1% | ±1% |
| – with 100% unbalanced load | ±3% | ±3% | ±3% | ±3% | ±3% | ±3% |
| Voltage adjustment range | | | | | | |
| Overload capability 20% for 10min 50% for 30sec 300% for 3 sec | | | | | | |
| Output data 28V DC | | | | | | |
| Continuous output power | 16,8 kW | 16,8 kW | 16,8 kW | 16,8 kW | 16,8 kW | 16,8 kW |
| Nominal voltage DC | 28 V | 28 V | 28 V | 28 V | 28 V | 28 V |
| Nominal current | 600 A | 600 A | 600 A | 600 A | 600 A | 600 A |
| Output frequency | DC | DC | DC | DC | DC | DC |
| Voltage characteristics: | | | | | | |
| – static | ±1% | ±1% | ±1% | ±1% | ±1% | ±1% |
| – dynamic | MIL-Std. 704F, Fig. 13 | MIL-Std. 704F, Fig. 13 | MIL-Std. 704F, Fig. 13 | MIL-Std. 704F, Fig. 13 | MIL-Std. 704F, Fig. 13 | MIL-Std. 704F, Fig. 13 |
| Recovery time (100% load step) | < 200ms | < 200ms | < 200ms | < 200ms | < 200ms | < 200ms |
| voltage ripple | < 1 V rms | < 1 V rms | < 1 V rms | < 1 V rms | < 1 V rms | < 1 V rms |
| Voltage adjustment range | | | | | | |
| Overload capability 720A for 10min 900A for 30sec 2300A up to 10 sec | | | | | | |
| General data | | | | | | |
| Total efficiency | | | | | | |
| 25% pf 0.8 | 83,9 | 78,9 | 90 | 86,7 | 89,4 | 85,7 |
| 50% pf 0.8 | 91,4 | 88,1 | 93,6 | 91 | 94,1 | 91,9 |
| 100% pf 0.8 | 92,6 | 91,2 | 93,5 | 92,7 | 94,2 | 93,4 |
| Maximum losses | 3.6 kW | 3.6 kW | 3.7 kW | 4.1 kW | 4.9 kW | 5.4 kW |
| Stand by losses | < 50W | < 50W | < 50W | < 50W | < 50W | < 50W |
| Losses at | | | | | | |
| 100% pf 0.8 | 2,6 | 3,2 | 3,3 | 3,7 | 4,4 | 5,1 |
| Audible noise | | | | | | |
| Temperature range | 0 – +55 °C / +32 – +131 °F (indoor version) | 0 – +55 °C / +32 – +131 °F (indoor version) | 0 – +55 °C / +32 – +131 °F (indoor version) | 0 – +55 °C / +32 – +131 °F (indoor version) | 0 – +55 °C / +32 – +131 °F (indoor version) | 0 – +55 °C / +32 – +131 °F (indoor version) |
| | -20 – +55 °C / -4 – +131 °F (outdoor version) | -20 – +55 °C / -4 – +131 °F (outdoor version) | -20 – +55 °C / -4 – +131 °F (outdoor version) | -20 – +55 °C / -4 – +131 °F (outdoor version) | -20 – +55 °C / -4 – +131 °F (outdoor version) | -20 – +55 °C / -4 – +131 °F (outdoor version) |
| Humidity (without condensation) | | | | | | |
| max. 95% | max. 95% | max. 95% | max. 95% | max. 95% | max. 95% | max. 95% |
| Dimensions: | | | | | | |
| – upright installation | | | | | | |
| Width mm / inch | 605 / 28.8 | 605 / 28.8 | 605 / 28.8 | 605 / 28.8 | 605 / 28.8 | 605 / 28.8 |
| Depth mm / inch | 715 / 28.1 | 715 / 28.1 | 715 / 28.1 | 715 / 28.1 | 715 / 28.1 | 715 / 28.1 |
| Height mm / inch | 1601 / 63 | 1601 / 63 | 1601 / 63 | 1601 / 63 | 1601 / 63 | 1601 / 63 |
| – horizontal installation (over all) | | | | | | |
| Width mm / inch | 1562 / 61.5 | 1562 / 61.5 | 1562 / 61.5 | 1562 / 61.5 | 1562 / 61.5 | 1562 / 61.5 |
| Depth mm / inch | 772 / 30 | 772 / 30 | 772 / 30 | 772 / 30 | 772 / 30 | 772 / 30 |
| Height mm / inch | 670 / 26.4 | 670 / 26.4 | 670 / 26.4 | 670 / 26.4 | 670 / 26.4 | 670 / 26.4 |
| Weight kg / lbs: | 460 / 1014 | 460 / 1014 | 495 / 1091 | 495 / 1091 | 540 / 1190 | 540 / 1190 |
| Floor loading kg/m² / lbs/ft²: | 1063 / 215 | 1063 / 215 | 1144 / 231 | 1144 / 231 | 1248 / 252 | 1248 / 252 |
| Paint finish / treatment (phosphatized, primed and powder sprayed) | | | | | | |
| RAL 7035 | RAL 7035 | RAL 7035 | RAL 7035 | RAL 7035 | RAL 7035 | RAL 7035 |
| Protection type | | | | | | |
| IP54 (outdoor) | IP54 (outdoor) | IP54 (outdoor) | IP54 (outdoor) | IP54 (outdoor) | IP54 (outdoor) | IP54 (outdoor) |

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Power

The surfaces are primed and finished with 2 top coats. Unless otherwise specified, color or finishes are manufacturer’s standard.

Color of exposed surfaces of frequency converters installed on passenger loading bridges shall match the adjacent surfaces of such bridges.

Type of cabinet: modified Rittal series

- Material: Metal steel sheet, 2.0 mm, mounting tray: 3.0 mm
- Surface: dip primed and powder sprayed; RAL 7035
- Mounting tray: zinc coated
- Ingress protection: IP 43 for indoor use IP 54 for outdoor use

