

Manual / Handling  
**BEQ<sup>®</sup> Inverter/UPS**  
BEQ 1100-S01



## Contact Information

### Telephone

031-340 02 30

### Order / Sales

[order@milleteknik.se](mailto:order@milleteknik.se)

### Support

[support@milleteknik.se](mailto:support@milleteknik.se)

### Service

[service@milleteknik.se](mailto:service@milleteknik.se)

### Customer Information & Other Errands

[info@milleteknik.se](mailto:info@milleteknik.se)

## SIMPLICITY AND RELIABILITY

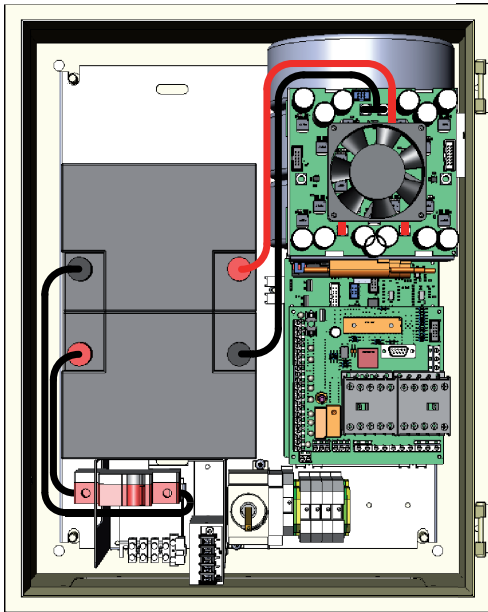
BEQ inverters are designed with the latest switching technology and microprocessor monitoring:

- Highest efficiency and operational reliability.
- Well-protected with isolation switch, battery circuit breakers, protection against over-temp., overload, and short-circuiting.
- Complete self-test including advanced battery test.

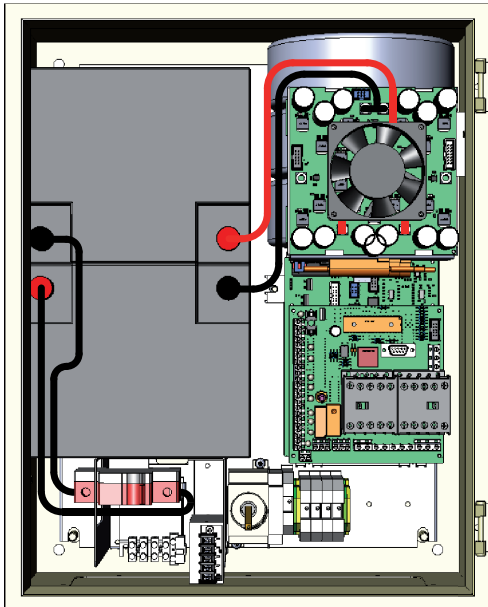
The units are installation- and service-friendly:

- Compact volume.
- External wall mounts are included, for set-up without even having to open the housing.
- Module design. All of the electronics on one cartridge. Ready if needs be for simple service.

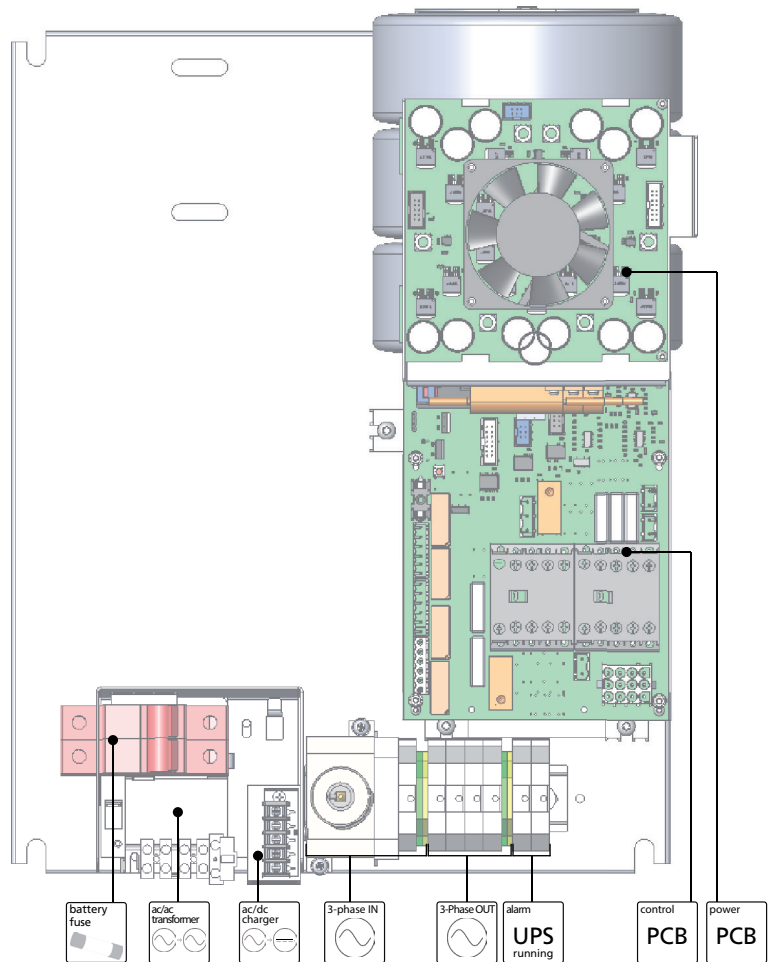
## OVERVIEW UPS/INVERTER



BEQ 1100-S01/ 28Ah



BEQ 1100-S01 / 45Ah

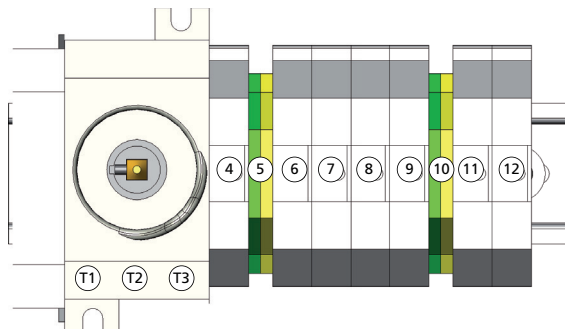


## CONNECTING

### INCOMING CABLE, INPUT

Connect (according to the picture here);

- Incoming mains first phase, "PHASE 1 – L1 IN", to conn. block T1 on isolation switch,
- Incoming mains second phase, "PHASE 2 – L2 IN", to conn. block T2 on isolation switch
- Incoming mains third phase, "PHASE 3 – L3 IN", to conn. block T3 on isolation switch,
- (- Incoming zero, "ZERO – N IN", to conn. block no. 4.)
- Protective ground, "PROTECTIVE GROUND", to conn. block no. 5.



### OUTGOING CABLE, OUTPUT:

Connect (according to picture here, cables ready for connection of port motor load);

- Outgoing first phase, "PHASE 1 – U1 OUT", to conn. block no. 6,
- Outgoing second phase, "PHASE 2 – V1 OUT", to conn. block no. 7,
- Outgoing third phase, "PHASE 3 – W1 OUT", to conn. block no. 8
- (- Outgoing neutral, "ZERO – N OUT", to conn. block no. 9.)
- Protective ground, "PROTECTIVE GROUND", to conn. block no. 10.

N.B! Neutral doesn't have to be connected.

## CONNECTING ALARM

### Connect alarm "BATTERY",

Alarm activated when aged battery is detected at self test. Alarm given on terminal block ALARM:BATTERY

Alarm - relay contact between NO & CO, max 48V / 5A

### Connect summation alarm "UPS / CHARGER",

Alarm at incorrect charging voltage (over- or under-voltage) or non-functional inverter (detects all three phases), over temperature and overload given on terminal block "UPS/CHARGER".

Alarm - relay contact between NO & CO, max 48V / 5A

### Connect alarm "MAINS FAILURE",

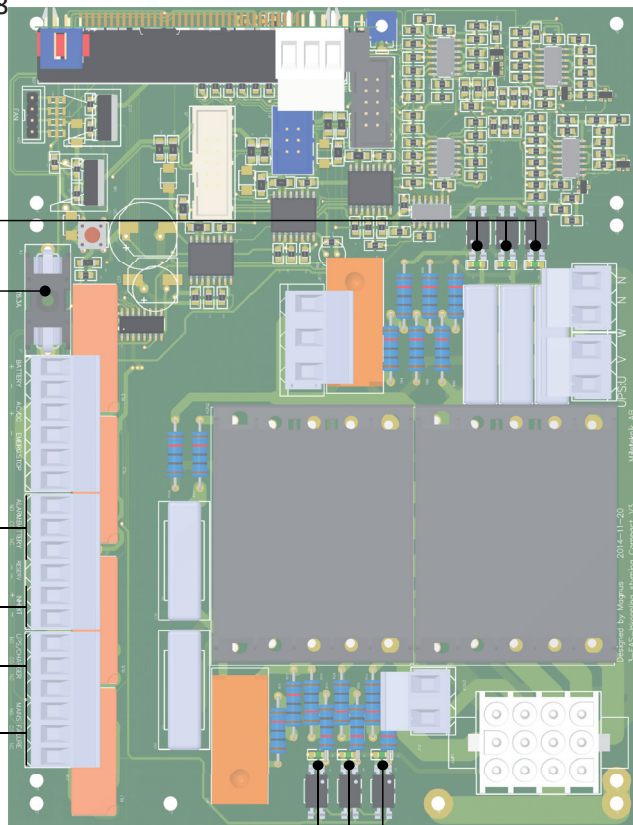
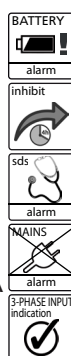
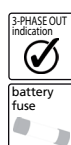
Alarm for Mains failure to terminal block "MAINS FAILURE";

Alarm - relay contact between NO & CO, max 48V / 5A

### Connect UPS alarm, (UPS running),

Alarm when UPS is in operation (Mains failure) to DIN rail block 11 & 12.

Alarm - relay contact between NO & CO, max 230V / 5A



## LOAD DISCONNECTING SWITCH, INCOMING MAINS

For utmost safety, always disconnect from the mains before installation and service.

**Connect load disconnecting switch (circuit breaker) on the incoming cable from the mains.**

Put it in an easily accessible place and mark it clearly. With a load disconnecting switch installed, incoming voltage can easily be switched off during service and function tests.

## STARTING UP

1. Turn the isolation switch to "0" and open the housing.
2. Connect the in- and outgoing cables and the alarm.
3. Connect the batteries by setting the batteries' double circuit breakers to the "1 – ON" position.
4. Close the housing and turn the isolation switch to "1".
5. Connect mains. The system starts up by itself and by a constant green LED "MAINS" on the front panel it indicates proper function.
6. Temporarily disconnect mains voltage to make sure the inverter works (connected load continues to be run).
7. Reconnect mains voltage.

## INSTRUCTIONS FOR CARE

The unit is maintenance-free when installed in a room-temperature, indoor environment +15°C-+25°C. However, the batteries should be changed after 6-9 years in order to maintain high guaranteed safety. When in an increased/decreased temperature environment +5°C-+15°C / +25°C-+30°C, the batteries will age at twice the rate. Even colder or warmer ambient temperatures mean that the entire UPS-function is at risk!

## REPLACING THE BATTERY

1. Turn the isolation switch to "0" and open the housing. Ingoing phases/voltage are switched off. The inverter is set to active stop position
2. For safety's sake, also disconnect the mains voltage.
3. Disconnect the batteries by setting battery circuit breakers to "0 – OFF".
4. Remove battery cables, battery clamps and change batteries. Be careful! Don't let the batteries short circuit! Take careful note of the orientation of the batteries (the battery poles +/-) and the assembly of the battery cables.
5. Connect the battery cables to the new batteries with the correct polarity. Be careful! Don't let the batteries short circuit!
6. Set battery circuit breakers to "1 – ON".
7. Close the housing and turn the isolation switch to "1".
8. Connect the mains again if it was disconnected.
9. Wait 10 seconds, during which the inverter does a start-up self-test, until the LED "MAINS" on the front panel, light up constant green.
10. Temporarily disconnect the mains voltage to make sure the inverter works (the connected charge continues to be run).
11. Reconnect mains voltage.

## DIMENSIONING

Select the size of the connected load so that the total amount and high start up current is maximally as large as the inverter's maximum rated power (W), preferably less, partly to reach safety margins, partly to compensate for losses in connections/cables and the load, which means more real power use from the inverter than indicated rated power of the load. Also check for max power at start-up and intermittent loads (such as usually the case with doors) so that it doesn't rise above the indicated max – acute – start power of the inverter. Back-up operation of load should take place within an hour of the occurrence of mains failure, since the inverter uses no-load power that successively empties the batteries (see under "Inverter" below).

## FUNCTIONS

### INVERTER

BEQ inverter is an Off-line UPS that goes in and replaces supply from the mains when a mains failure (including phase fault) occurs, until all three phases return (or the batteries become completely discharged). Reconnection time is about 100ms. The inverter replaces the mains sine voltage with a current-limiting sine voltage during battery operation. The inverter is especially designed for optimal (acute) operation of 3-phase motors.

**Please note!** When phase fault/mains failure occurs on the input mains, the inverter starts directly and draws ca 30W even unloaded. Connected load should therefore start up within an hour of the occurrence of the phase fault/mains failure in order for there to be battery power left.

### BATTERIES

The batteries are valve-regulated, maintenance-free 10-12 year batteries, especially designed for use in backup power. The life span of the batteries is less than indicated and recommended interval of replacing is 6-9 years. Circuit breaker on battery plus protects against possible internal short-circuiting. The batteries are protected from overload by the inverter by means of electronic current limitation. The batteries are protected against damaging over-discharge so that all current consumption ceases when the battery voltage falls below 18V (deep discharge protection). Only mains voltage and consequently current from the battery charger cancels the deep discharge protection. The batteries are also protected from overcharging by being disconnected from charging current, by which the batteries are protected against "boiling".

### BATTERY CHARGER

The batteries are charged to 27,3V final voltage during current limitation in order to achieve optimal lifetime at room temperature +20°C-+25°C. The charger is protected against over-current and short-circuiting and also protects the batteries from overcharging/high charging current.

### PROTECTION UPS-STANDARD 62040-1-1

Electronic current limitation and over-temperature protection as well as automatic shut-off upon short-circuiting of the connected load after 3-5 seconds according to UPS-STANDARD EN62040-1-1. The inverter is therefore protected against short-circuiting!

However, the mains voltage may not be connected to the inverter's ground or outlets, conn. blocks 6, 7, 8 and 9!!!

### SELF-TEST SYSTEM

Included as standard in the unit is a SelfTestSystem that continually monitors all of the system's functions:

#### 1. Battery charging error.

- Under-voltage is indicated only if the charger for charged batteries doesn't provide the right charge voltage and not when the batteries are recharged after mains failure. The alarm is indicated with LED "CHARGING ERROR" on the front panel at the same time the "UPS/CHARGER" alarm is set. AG.U is shown on the display. Upon over-voltage, charging is disconnected from the batteries to avoid "boiling" them. When over-voltage occurs, with LED "CHARGING ERROR" on the front panel at the same time the "UPS/CHARGER" alarm is set. AG.O is shown on the display.

#### 2. Alarm for aged battery.

The batteries' capacity or aging is tested regularly (each week). When a test shows that the current battery capacity has sunk to 50-80% of original capacity, an alarm is activated to warn that the batteries need to be changed. The reliability of the back-up power is hereby tested according to the dimensioning demands of lifetime in battery operation. Batteries that have lost 20% or more of their capacity are ageing at an accelerating rate and should therefore be changed. This limit is the definition of what is estimated to be the battery's lifespan. When the alarm for aged battery is activated, LED "BATTERY ERROR" on the front panel is lit and at the same time the "BATTERY" alarm is set.

#### 3. UPS-error.

While also testing battery ageing, the SelfTestSystem also test-runs the inverter to make sure that it works. That way, the inverter gives back-up power to the load when it is needed. When there is something wrong with the inverter, the LED "UPS ERROR" is lit and "UPS/CHARGER" alarm is set.

## ALARM / STATUS INDICATION FRONT PANEL

### ALARM "UPS/CHARGER"

Alarm is activated when the following occur:

#### 1. Incorrect charging voltage (under- or over-voltage);

a/ Under-voltage. Charging control is made every 45 minutes, when connected to mains voltage. The battery charging is disconnected (<1 sec.) and if the system voltage falls below 26.7VDC an alarm is activated on potential-free relay contact, LED "CHARGING ERROR" is lit and the display shows AG.U  
b/ Over-voltage. If the system voltage exceeds 27.9VDC, the charging is immediately disconnected and alarm is activated on potential-free relay contact, LED "CHARGING ERROR" is lit and display shows AG.O

#### 2. Over temperature

If the temperature near the electronics, in UPS mode, exceed 60 degrees Celsius the UPS will automatically shut down to avoid temperature related damages.  
LED "OVER TEMP" is lit on the front panel and the display shows Ot

#### 3. Over current

If the power outtake, for any reason, in UPS-mode, should exceed 2.4kW the UPS will automatically shut down to avoid high current related damages.  
LED "OVER CURRENT" is lit on the front panel and the display shows OC

#### 4. Inverter test (fault)

Each week the inverter is test-run along with the battery test over internal load corresponding to the provided maximum operational load of the system. If the inverter does not provide enough output voltage on all three phases LED "UPS ERROR" is lit on the front panel and the display shows U.Er

#### 5. Phase fault INPUT / Phase fault OUTPUT

If the UPS should detect a phase fault on one or multiple input, and in UPS mode, output phases the LED "UPS ERROR" is lit on the front panel.

At detection in MAINS operation the UPS will automatically start up to secure sufficient power to the connected load

Alarm - contact NO & CO on terminal block "UPS/CHARGER".

### ALARM "BATTERY"

Alarm is set if the batteries show a, 20-50% or greater, loss of battery capacity compared to a new battery at the weekly self test. The batteries should then be replaced.

At alarm the LED "BATTERY ERROR" is lit on the front panel.

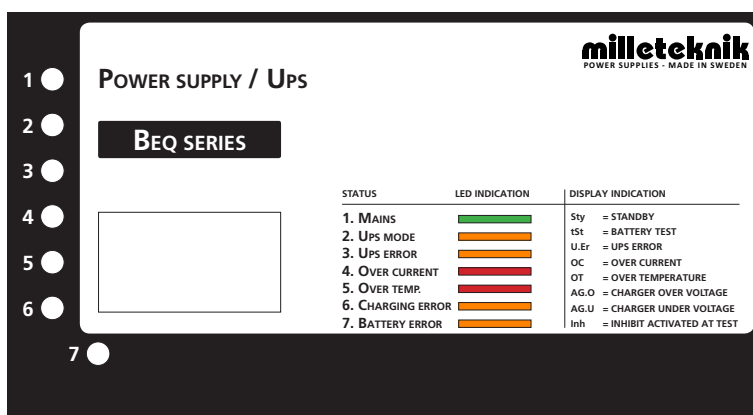
Alarm - contact NO & CO on terminal block "ALARM:BATTERY".

### ALARM "MAINS FAILURE"

At normal operation the LED "MAINS" is constantly lit green. At Mains failure the UPS starts in UPS mode and the LED "MAINS" go off and the LED "UPS MODE" is lit.

Alarm - contact NO & CO on terminal block "MAINS FAILURE".

### FRONT PANEL AND INDICATIONS:



DISPLAY  
StY

tSt

U.Er

OC

OT

AG.O

AG.U

Inh

#### EXPLANATION

- **standby**, in combination with LED 1, system in normal operation, no errors found
- system makes its weekly **test** on inverter and batteries..
- **UPS Error**, if the inverter, under any condition, shouldn't give sufficient output voltage, either at weekly test or Mains failure
- **over current**, output power > 2,4kW
- **over temperature**, temperature at electronics > 60°C
- charging voltage > 27,9VDC
- charging voltage < 26,7VDC
- **Inhibit** input was activated during weekly inverter test.

#### LED

1. "MAINS"

2. "UPS MODE"

3. "UPS ERROR"

4. "OVER CURRENT"

5. "OVER TEMP"

6. "CHARGING ERROR"

7. "BATTERY ERROR"

#### EXPLANATION

- lit constantly green when UPS is in normal operation and no errors / error tendencies found.
- lits orange at Mains failure and the inverter is in UPS mode.
- lits orange when, in Mains operation on input, or, in UPS mode on output, one or multiple phases are lost.
- lits red when output load, in UPS mode, exceeds 2.4kW. The inverter is automatically shut down
- blinks red when the inverter is close to the temperature limit, 60°C.
- lits red when the temperature limit, 60°C, is reached. The inverter is automatically shut down
- lits orange when the charging voltage exceeds 27.9VDC or is below 26.7VDC.
- lits orange when the batteries, after a weekly self test, shows a loss of 20-50% of original capacity.

## TECHNICAL DATA

**400V input voltage:** 400V -15%, +20% in mains op.  
Mains current: charger max 0,3A + load

**400V output voltage:** 400V -15% in battery operation,  
Voltage form: 3-Phase sinusoidal voltage  
Efficiency: ca 90 %  
No load power c.a: 30W  
BEQ 1100-S01

|                                 |               |
|---------------------------------|---------------|
| Model:                          | BEQ 1100-S01  |
| Max operational effect (sinus): | 1100W         |
| Max start effect (sinus):       | 3kVA          |
| Battery capacity (24V):         | 28 / 45 Ah    |
| Charging current :              | 1A            |
| Dimensions (h*w*d):             | 500*400*250mm |
| Weight exkl batteries:          | 35 kg         |

### Batteri:

Battery type/lifetime: Maintenance-free, valve-regulated lead batteries, 10-12 years at 25°C.  
US12-28H (28 Ah)  
US12-45 (45Ah)  
No of batteries: 2 pcs.

### Battery charging:

Constant voltage: I / U acc. to DIN 41773  
Current limitation.

### Protection:

Curr. Lim. electronic: About 300% of rated capacity.  
Short-circuit protection: Shutdown within 5 sec upon major overload/short-circuiting according to UPS EN-62040-1-1 standard. Restart when mains voltage returns (in battery operation).  
Over-discharge Prot: Battery pole voltage <18 Volt.  
Overcharge protection: Disconnection of charging voltage upon overcharge.  
Circuit breaker: Batteryplus is protected by a fuse.  
Isolation switch: When housing is opened, the knob on the door must be turned to "0", which disconnects the input phases.  
Ground fault switch: Can be installed on outlet (extra protection option according to EN50091-1-1).  
Tested: Pending

### Self-test:

Battery charging: Continuous monitoring of battery charger.  
Battery ageing: Automatic test-loading of batteries, weekly, during high, acute discharging current to verify battery ageing. Alarm when the battery has lost 20%-50% of the capacity originally labeled.  
Function: Test load on the UPS to check on its functioning and sufficient output voltage on all three phases.

### Alarm:

Alarm "MAINS FAILURE:

Alarm BATTERY:

Alarm, "UPS/CHARGER"

Alarm UPS running:

### Status(indication):

Alarm:

### LEDs, housing front

LED "MAINS":  
"UPS MODE"  
"UPS ERROR"  
"OVER CURRENT"  
"OVER TEMP."  
"CHARGING ERROR"  
"BATTERY ERROR"

Alarm directly at Mains failure

Alarm at aged battery that should be changed  
Internal error; Incorrect charging voltage (over- or under-voltage), non-functional inverter, over temperature or over current  
Indicates that UPS is in operation. (Mains failure)

All alarms occur on potential-free relay-switching contacts

Mains connected  
UPS mode  
UPS error  
Over current in UPS-mode  
Over temp. in UPS mode  
Charging error (batteries)  
Battery error - aged batteries

### Physical conditions:

Ambient temperature:

Encasing, density:  
Mounting:

15-25°C (20-25°C for optimal Self-test batteries).  
SARELcase, IP54  
Provided wall mounts.

## **Milleteknik AB**

Ögärdesvägen 8B, 433 30 PARTILLE  
Tel. 031-34 00 230 • Fax. 031-34 00 239  
info@milleteknik.se • [www.milleteknik.se](http://www.milleteknik.se)

