BE 23 OEM's Manual *English version V4.xx 14 January 2003*

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Warranty
Bernini Design SRL (hereinafter "BD") warrants that BE23 shall be free from defect in material or workmanship for a period of 3 years from the BD delivery date. BD shall - at its option - repair or replace the product without charge. The BD shall return the BE23 to the buyer with the default parameters with no charge. Anyway, it is not possible to refund the purchase price of the product to the buyer. The buyer shall furnish sufficient information on any alleged defects in the product so as to enable BD to determine their cause and existence. If the BE23 is not defective, or the product is defective for reason other than covered by this warranty, the buyer will be charged accordingly. This warranty shall not apply if the BE23 has not been used in accordance with the User Manual and other operating instruction, and in particular to any defects caused by misuse, improper repair attempts, negligence in use or handling.

This equipment complies with the EMC protection requirements CE

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Be23 OEM's INSTRUCTION MANUAL

Important Note: because of a continuous product policy improvement, the information mentioned by this instruction manual are subject to change without notice.

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WARNING:
This unit is not user serviceable and should be returned to Bernini-Design Company for service and repair. Any alterations to the internal circuits will invalidate the warranty.

1.00 SETUP PROCEDURES

The following procedures provide an operational checkout as a means of verifying Be23 operation. The procedures 1.01 and 1.02 are reserved to qualified personnel only. After these preliminary operations the operator, can put the Be23 to normal use as described in sections 2.00 (MANUAL) and 3.00 (AUTO). The section 16.00 describes the Front Panel details.

1.01Initial Setting

WARNING: TO AVOID PERSONAL INJURY THE FOLLOWING OPERATIONS ARE TO BE CARRIED OUT BY QUALIFIED PERSONNEL ONLY.

a)-Initial condition: all terminals are not connected and the engine is not running.
b)-Connect the supply plug (#33=plus to 12V battery system #35 if a 24V battery system is used, and #34 = minus) to the battery of the engine. The allowed voltage range to operate the Be23 is from 7 Vdc to 33 Vdc. The battery minus must be grounded only at the side of the engine. It is dangerous to ground the minus wire of the Be23 supply in multiple sites: different ground potential may destroy the Be23 unit. As soon as the power supply is applied, the Be23 performs an internal test and turns on all LEDs and display for 3 seconds. On the display the version of the internal software (for example [1.32]) appears temporarily and then, the message [12 =] or [24 =] indicating the size of the connected battery.
Any failure during the cycle will produce a permanent '[Err]' message on the display (section 6.16). If no errors are detected, one decimal point will finally be displayed in the LSD (Least Significant Digit).
c)- Operate the pushbuttons of the front panel to read the parameters and check the settings (see Section 5.02).

1.02 Wiring Installation Guidelines

a)-Unplug the supply connector in order to turn off the Be23 unit.
b)-Before connecting the input terminals #17 to #23, make sure that all contact switches are in the normal operational mode. Oil pressure input must be connected to a 'closed contact' switch and the rest of the terminals wired to a contact that matches the programmed action (normally open/closed , section 5.02F)
c)-Test each output load before connecting the wires. As soon as you are sure that the solenoids and relays are working properly, you may commence the connection to the terminals #25 to #32.
d)- Connect the sender terminals #13 to #16 (check with an OHM-meter the resistance of the sensor. The allowed range is 8 OHM to 483 OHM (5.02H).
e)- Connect the 'Alternator Control' terminal #8 to the W.L. and place a proper connection for 12V (#8 and #9 to W.L./D+) or 24V (#7 and #8 to W.L./D+).
f)- Connect the Current Transformer to the #5 and #6 terminal inputs (the 'S1' output of the C.T. must be grounded on C.T. side).
g)- Connect the pick-Up.
h)- The last connection has to be the GENERATOR connector plug (#N, #L1, #L2, #L3).
NOTE: make sure that wire connections to a removable terminal block are securely fastened and that there are no wire stands exposed
i)- To operate the Be23 connect the 3-poles supply plug (#33, #34 and #35). The display will show, in sequence, the software version in a 3-digit form **[1.32]** and the detected battery **[12=]**V (or **[24 =]**V). Finally, the BE23 will be placed in 'OFF'/'MAN' or 'AUTO' operating mode according to the parameter [Opt.2] (section 17.00).

2.00 USER INTERFACE

2.01 Display and Push Buttons

The Be23 front panel features 8 push buttons (section 16.0) and 4-digit displays made of 7-segment LEDs. In 'MANUAL' and 'AUTO' operating modes, by means of the **[^]** or **[v]** pushbuttons, it is possible to select one of the following menus: **'Alarm'**, **'Program'**, **'Power'**, **'V/A/Hz/h'**, **'Engine'**.
By means of the **[<]** and **[>]** push buttons the user browses the menu contents. In 'OFF' operating mode the BE23 allows programming and calibration (Sections 5.06 and 12.00).

2.02 Solid State Lamps

The Be23 has solid-state lamps made of coloured LEDs (Light Emission Diode). The front panel has 7 'ALARM' red LEDs, 1 [AUTO-MAN] green LED and 4 'Menu Select' yellow LEDs.

3.00 'MANUAL' OPERATING INSTRUCTIONS

NOTE: according to the setting of the parameter [OPt.2] the Be23 can enter directly the 'MANUAL' operating mode (see section 17.0, v3.00: [OPt.2]=[1]).

3.01 Be23 Initial Set Up (Be23 goes in 'OFF' operating mode: [OPt.2]=[0] see ***NOTE1***)
- Push **[START-ON]** push button for at least 2 secs: the 'LAMP TEST' will take place. After the test, the [AUTO-MAN] green LED does not illuminate indicating the 'MANUAL' operating mode. The display menu will be automatically placed in 'Engine' mode in a way to show 4 dashes (indicate stand-by). Now the user can select:
- to put the Be23 in 'OFF' by means of the **[STOP-OFF]** pushbutton (section 3.05).
- to put the Be23 in 'AUTO' by pushing **[AUTO-MAN]** pushbutton (see Section 4.02).
- to START and STOP the set by using **[START-ON]** and **[STOP-OFF]** push buttons (see sections 2.02, 2.03).
- to browse the 5 menus of the display (see Section 5.00).

NOTE1: the version 4.04 allows, for means of the parameter [OPt.2], the automatic selection of the operating mode after the Power on sequence (see section 17.00/v3.00).

3.02 Manual START (Be23 it is already in 'MANUAL' operating mode)
-Push the **[START]** pushbutton (see section 16.0) until engine start is obtained. To enable this cycle the alarm memory must be empty. The alarms are indicated by means of red LEDs. To clear the alarms, press the **[STOP-OFF]** pushbutton and then repeat step 3.01 (see section 6.00). If a 'STOP cycle' is engaged, wait for the end of the 'STOP' timing or push again **[STOP-OFF]** pushbutton in order to reset the Stop cycle.
The message '**[Sta]**' is displayed in the 'Engine' menu during the Crank cycle.
The Be23 has many ways to detect the moment to disconnect the 'STARTER' as explained in section 7.07.
The yellow LED 'Engine' flashes if one source of 'Engine running' signal is recognized. Further action on the **[START-ON]** push button will be ignored.
If the 'PREHEAT' function is programmed, the '**[HEAt]**' message will appear on the display during the PREHEAT cycle. The fuel solenoid is automatically disabled if the engine does not start properly within 20 seconds (e.g. the user pushes the **[START]** pushbutton too shortly). In 'MANUAL' operating mode all alarms are monitored except 'UNDER FREQUENCY' and 'UNDER VOLTAGE'.

3.03 Manual Stop
- Push the **[STOP-OFF]** pushbutton (see section 16.0 for Front Panel details) until the message '**[StOP]**' appears on the 'Engine' menu display.
The FUEL SOLENOID (output #25) is disabled and, at the same time, the 'STOP SOLENOID' (output #31) energises for the programmed time (**[StOP]** in Section 5.02A). At the end of the 'STOP' cycle, a further action on the **[STOP-OFF]** pushbutton will turn the Be23 in the 'OFF' operating mode.
The 'OFF' operating mode is a low power condition indicated by means of a decimal point on the right side of the display.

3.04 Load Control
-In Manual-mode the electrical load is normally transferred to the Mains independently of the status of the Mains. In application where the contactors are not used (e.g. not 'stand by' wiring) the user can connect the electrical Load to the Generator by means of a manually controlled circuit breaker. In this case the 'UNDER FREQUENCY' and 'UNDER VOLTAGE' protections are not operative (enabled only in 'AUTO'). A good safe practice is to use the 'AUTO' operating mode. In this way, an external contactor protects the Load and the Generating-set in all conditions (output #28).

3.05 'OFF' Operating Mode
-This mode is indicated by means of a decimal point on the right side of the display. This mode is always obtained by the action on the **[STOP-OFF]** push button (section 16 for Front Panel details).

4.00 AUTO OPERATING INSTRUCTIONS
NOTE: according to the setting of the parameter [OPt.2], the Be23 can enter directly the 'AUTOMATIC' operating mode (see section 17.0, v3.00: [OPt.2]=[2]).

4.01 Be23 Set Up ***(Be23 is in 'OFF'operating mode, [OPt.2]=[0])***
Press **[START-ON]** pushbutton (see section 16.0) for at least 2 secs: the 'LAMP TEST' will take place and, at the end, the LED 'AUTO/MAN' will not be illuminated ('MANUAL' mode). The display menu will be automatically placed in 'Engine' mode to show the operating messages.

4.02 AUTO Operating Mode Selection
Push **[AUTO-MAN]** for 1 sec at least (section 16.0 for Front Panel details). The green LED, on the top of the push button, will light as confirmation of the 'AUTO' mode. The Start and Stop of the engine will depend on the status of the REMOTE START input (#20) and the 'AMF input 2' (#22, programmable **[n.o]** or **[n.c.]**).
If one or more alarms are present, the Be23 inhibits the transition 'MAN' to 'AUTO'. All alarms have to be recognized and cleared before selecting the 'AUTO' operating mode. If the alarm memory is not empty, the red 'Alarm' LED flashes slowly or one of the red LED alarms energizes.

4.03 Using a Remote Start Feature
When the 'REMOTE START' (#20) contact closes, the Be23 starts the engine and will transfer the load to the Generating-set by means of the contactor output (#28). The Generating-set stops if the 'REMOTE START' contact opens.
For the timings of the automatic sequences see the Section 8.00 and 5.02.

4.04 Using the 'A.M.F. Input 2'

The user can start and stop the Generating-set by closing the 'A.M.F. input 2' (terminal #22) to the battery minus. This input over-rides the 'REMOTE START' and includes the timers 'START after DELAY' (**[t.on]**), 'WARM-UP'(**[t.GEn]**), 'COOLING DOWN TIME' (**[COOL]**) and 'STOP after DELAY' (**[t.OFF]**). Examples of 'AMF Input 2' input follow. Be23 allows contact programming (normally closed or open) of the 'AMF input 2' (section 5.02F).

EXAMPLE 1: **Automatic Mains Failure**

In this case, the 'AMF input 2'(#22) is connected to an external Mains Failure Relay. If the input is activated, the engine starts after the [t.on] time. The contactor of the Generator will be enabled after the **[t.GEn]** time. If the 'AMF input 2' contact opens, the contactor of the Generating-set is disabled after the **[t.OFF]** time and the engine stops after the **[COOL]** time. In this way, the Generating-set operates in Stand-By. One of the two programmable outputs [Out1](#29) and [Out2] (#30) (section 5.02E) may be used to drive the contactor of the Mains. The output #28 is used to drive the contactor of the Generating-set.

EXAMPLE 2: **Pump Set Control**

In applications where the Generating-set supplies electricity to an electric pump, it is recommended the use of the 'AMFinput 2'(#22) to an external Level / Pressure switch. The timers **[t.on]** and **[t.OFF]** control the delay time to start and stop the Generating-set.

4.05 Alarm Monitoring in 'AUTO'

In 'AUTO' operating mode, all alarms are monitored. The alarms stop the engine immediately or after a programmable cooling down time **[COOL]**. These details are explained in Section 6.00.
If during the **[COOL]** time, the user puts the Be23 in the 'MANUAL' operating mode without waiting for the automatic 'STOP cycle', the engine will continue to run until a complete cooling down timing has expired. The reset of the alarms are accepted only if the engine is not running (e.g. the yellow LED 'Engine' is not flashing). Further details are in Section 6.00.

4.06 Stop the Generating-set in 'AUTO'

In any moment the user can stop the Generating-set by the following:
- A- Put the Be23 in 'MAN' operating mode and stop the engine by means of the **[STOP-OFF]** pushbutton.
- B- Push the **[STOP-OFF]** pushbutton directly in the 'AUTO' operating mode. The Be23 energises the alarm 'EXT' (section 5.05A).
- C- Connect the 'External Stop Input 3' (input #18) to the battery minus.The Be23 energises the alarm 'EXT' (section 5.05A).
The Be23 stops automatically the engine if the 'REMOTE START' and 'A.M.F. INPUT2' inputs return to normal status ('A.M.F. INPUT2' allows normally closed or normally opened contacts according to the **[In 2]** setting, section 5.02F).

5.00 'DISPLAY MENU' FEATURES.

Using the **[^]** and **[v]** push buttons (see section 16.0 for Front Panel details) it is possible to select one of the following menus: **'Alarm'**,**' Engine'**, **'Program'**, **'Power'** and **'V/A/Hz/h'**. The menus are indicated by means of five yellow LEDs. A detailed description of each menu follows.

5.01 ENGINE menu

The yellow LED 'Engine' **(note[*])** enables the display to show operating-messages and measurements of the engine. By using **[<]** and **[>]** pushbuttons, the user can select:

[- - - -] see note **[**]**

[rPM]- Engine Speed indication up to 4000 R.P.M.

[OIL]- Oil Pressure indication up to 20.0 Bar.

[tEmP]- Engine Temperature indication up to 200 °C.

[bAtt]- Battery Voltage measurement up to 33.0 Vdc.

[FUEL]- Tank Fuel Level indication, percentage information. If the sender is not selected as input (section 5.02F) two dashes will be displayed.

Every time that the **[<]** or **[>]** pushbuttons come pressed, the display shows for a short time, the name of the parameter (example **[bAtt]**) and then, the value of the parameter (example **[12.9]**). If in doubt, the name of the parameter is displayed again if the **[ACK]** pushbutton is pressed and held.

note **[*]**

The yellow LED 'Engine' is used also to indicate the 'Engine Running Status'. The yellow light, in this case, flashes (see section 7.07 to find out more).

note **[**]** The first position of the display can show one of the following operating messages. The BE23 updates the message automatically.

[- - - -] Be23 is in Standby.

[t. on] The 'AMF Input 2' input is activated and the timer [t.on] is counting

[t.OFF] The 'AMF Input 2' is released and the timer [t.OFF] is counting.

[COOL] The contactor has been opened and the timer [COOL] is counting.

[StOP] The engine is stopping and Be23 counts the 'Energized to Stop Solenoid' time.

[HEAt] The Be23 is counting the 'Preheat /Glow' time.

[TgEn] Indication of Warm Up time delay before closing the contactor.

[StA] This message informs that the Start output is energised to start the engine.

[LOAd] This message informs that the output of the contactor is closed.

5.02 'PROGRAM' menu

The list of the programmable parameters with a brief description follows. The first symbol, indicated within the square brackets, is the message that appears on the display. The second symbol indicates the factory default (value programmed in factory).It is possible to scan all parameters by using the **[<]** and **[>]** pushbuttons (see section 16.0 for Front Panel details). Anytime, the parameter name is displayed using the **[ACK]** pushbutton . The programming instructions are explained in Section 5.06.

5.02A Engine miscellaneous timing:

[Horn] ..... [20"] Alarm Output Enable: 5-59 seconds and 1-15 minutes. Over the 15 minutes the code '**[cont]**' allows only manual reset of the bell (output#27), the user must press the **[ACK]** push button to reset the alarm output.

[t. on]..... [10"] Generating-set START DELAY: 1–59 seconds and 1-15 minutes. This timer delays the start when the 'A.M.F. input 2' is activated.

[t.OFF] ..... [10"] Generating-set STOP DELAY: 1–59 seconds and 1-15 minutes. This timer delays the stop when the 'A.M.F. input 2' returns in stand by.

[COOL]..... [10"] Engine Cooling Down Time: 0-59 seconds and 1-15 minutes. This delay allows the cooling of the Generator-set.

[StOP]..... [10"] Energized to Stop Solenoid: 10-59 seconds and 1-15 minutes. Timer to control the Stop-solenoid (output #31).

[HEAt].....[0"] Glow Enable, Preheat: 0-59 seconds and 1-15 minutes. Timer to control the Pre-Glow (output #32). The code [0] disables the timer.

[t.GEn] ..... [10"] Warm up: 0-59 seconds and 1-15 minutes. This timing allows the warm up of the Generating-set before closing the contactor.

5.02B Generating-set miscellaneous protections and settings:

[Ct r]..... [500] Current Transformer Size: 0Aac up to 2000A/5A (10Aac step) and 2000 to 9900 (100Aac step).

[Hi I]..... [---] Over Current Set Point: [---]= monitoring is disabled,10Aac to 2000 Aac (step of 10Ac) and 2000Aac to 9900 Aac (step of 100Aac) .

[Lo U] ..... [200] Under Voltage: 0-999Vac ([---] =monitoring disabled).

[Hi U]..... [420] Over Voltage: 0-999Vac.

[PHAS]..... [3 Ph] Phase Selection: 3 phase (N-L1-L2-L3) or single phase (N-L1).

[VAc.r]..... [1] Voltage Reading Factor X1 or X2.

[Hi P] ..... [---] kVA Setting: [---]=monitoring disabled and 10KVA to 9900KVA

5.02C Speed and Frequency settings

[LoFr]..... [45] Under Frequency: [---],1-99Hz ([---] = monitoring disabled)

[HiFr] ..... [55] Over Frequency: 0-98Hz, [---] ([---] = monitoring disabled)

[LoSP]..... [---] Under Speed R.P.M.: [---],10-4000 ([---] = monitoring disabled)

[HiSP] ..... [---] Over Speed R.P.M.: 10-3900, [---] ([---] = monitoring disabled)

[CrSP]..... [300] Engine Crank Disconnect: 300 R.P.M. to 800 R.P.M.

[Pic. r] ..... [---] Pick-Up: 1 up to 500 teeth ([---] = reading and monitoring are disabled)

5.02D Engine warning settings

[LoPr] ..... [---] Oil Pressure Warning 0.1-20.0 Bar (the code '[---]' inhibits the display and the alarm control)

[Hi°C]..... [---] Temperature Warning 0-199 °C (the code '[---]' inhibits the display and the alarm control)

5.02E Programmable Outputs

[Out1] ..... [0] 'Output 1'(#29) control: code 0 to 14 (see the available option below)

[Out2] ..... [0] 'Output 2'(#30) control: code 0 to 14 (see the available option below)

It is possible to program one of the following codes for each output. The output energises when the engine shuts down. The outputs return to normal state when the alarm comes cancelled.

[0] None (factory default)
[1] Be23 is in 'AUTO' operating mode [*] NOTE
[2] Engine Running Status flag [*] NOTE
[3] Pre-alarm Oil/Temperature warning
[4] Oil Pressure switch alarm, engine shut down
[5] 'Temperature Input 1' switch alarm, engine shut down
[6] Battery voltage alarm Hi/Lo warning
[7] Fuel pre-alarm/alarm warning and shut down
[8] 'External Stop 3' input, engine shut down
[9] Speed alarms/Hz alarms, engine shut down
[10] Generator Voltage alarms, engine shut down
[11] Overload alarms, engine shut down
[12] Fail to Start, engine shut down
[13] Belt break alarm, engine shut down
[14] Control of the Mains contactor (software version 4.04 and beyond, see section 17.0)

[*] NOTE: these outputs are automatically updated.

5.02F Programmable Inputs

[In 1][n.o.][n.c.] 'Temperature Input1' switch polarity: normally open (the engine shuts down if the contact closes) or normally closed (the engine shuts down if the contact opens).

[In 2][n.o.][n.c.] 'A.M.F input 2' switch polarity: normally open (the engine starts if the contact closes) or normally closed (the engine starts if the contact opens).

[In 3][n.o.][n.c.] 'External Stop Input 3'switch polarity: normally open (the engine shuts down if the contact closes) or normally closed (the engine shuts down if the contact opens)

[In 4][n.o.][n.c.][FUEL] 'Auxiliary Alarm Input 4' Switch Action: normally open (the engine shuts down if the contact closes) or normally closed (the engine shuts down if the contact opens). If the code **[FUEL]** is selected, the BE23 monitors the Fuel Level warning and enables the reading of the Fuel level.

[FUEL] [- - -] Low fuel level warning setting 1% to 25%. The code **'[--]'** disables the warning.

5.02G Fuel Sender Interface

[F 00] 00% Fuel Level Calibration point Ohm: **[320]** (7 Ohm to 483 Ohm)
[F 25] 25% Fuel Level Calibration point Ohm: **[200]** (7 Ohm to 483 Ohm)
[F 50] 50% Fuel Level Calibration point Ohm: **[110]** (7 Ohm to 483 Ohm)
[F100] 100% Fuel Level Calibration point Ohm: **[007]** (7 Ohm to 483 Ohm)

Note: the Ohm values must be within the allowed range (7-483 Ohm). Other values may be arranged with an external resistors series/parallel combination. The reference levels 0%,25%, 50% and 100% are fixed.

5.02H Pressure Sender Interface

Be23 features relationship between 'Bar' (up to 20.0) and 'Ohm' (up to 483) up to six points. In brackets the display default values and messages are indicated:

Message	Meaning	Value	Message	Meaning	Value(*)
[**r1 P**]	Ohm	[**10**]	[**P 1**]	Bar	[**0**]
[**r2 P**]	Ohm	[**51**]	[**P 2**]	Bar	[**2**]
[**r3 P**]	Ohm	[**86**]	[**P 3**]	Bar	[**4**]
[**r4 P**]	Ohm	[**122**]	[**P 4**]	Bar	[**6**]
[**r5 P**]	Ohm	[**152**]	[**P 5**]	Bar	[**8**]
[**r6 P**]	Ohm	[**180**]	[**P 6**]	Bar	[**10**]

5.02I Temperature Sender Interface

Be23 features a Six-point relationship between Temperature and Ohm values. The OHM values must be within 8 to 483 Ohm. Other values may be arranged with a resistors series/parallel external combination. Temperature range: 0°C up to 200°C.

Message	Meaning	Value	Message	Meaning	Value
[**r1 t**]	Ohm	[**19**]	[**t 1**]	°C	[**128**]
[**r2 t**]	Ohm	[**26**]	[**t 2**]	°C	[**115**]
[**r3 t**]	Ohm	[**95**]	[**t 3**]	°C	[**70**]
[**r4 t**]	Ohm	[**287**]	[**t 4**]	°C	[**40**]
[**r5 t**]	Ohm	[**287**]	[**t 5**]	°C	[**40**]
[**r6 t**]	Ohm	[**287**]	[**t 6**]	°C	[**40**]

5.03 'POWER' Menu

Using **[<]** and **[>]** pushbuttons, the display changes the measurement and shows the name of the parameter momentarily. By pressing the [ACK] pushbutton the name of the parameter stays on the display. The list of the parametrs follows: ' APPARENT POWER' **[UA]** (0 to 9990 kVA), ACTIVE POWER **[Act.P]** (0 to 9990 kVA), REACTIVE POWER **[UAr]** (0 to 9990 kVA) and POWER FACTOR **[PF]** (0.0 to1.0)**.**

5.04 'V/A/Hz/h' Menu

This menu shows the following parameters: **[U Ac]**, **[Curr]**, **[FrEq]** and **[Hour]**. The selection is made by means of the **[<]** and **[>]** pushbuttons and the BE23 indicates the name of the parameter (for example **[Hour]**). Then the display shows the value of the parameter (for example **[1234]** hours). Anytime, by pressing the [ACK] pushbutton, the display shows the name of the parameter (for example **[Hour]**).
The description of the parameters follows.

[U Ac] The 3-phase voltages are multiplexed on the display by means of horizontal dashes in the left digit of the display as below described:
Top dash: phase 'L1'to 'L2' in a range 80Vac to 500Vac.(or 1000Vac according to[Vac.r])
Middle dash: phase 'L2' to 'L3' (range as above indicated).
Bottom dash: phase 'L1' to 'L3' (range as above indicated).

NOTE: If the single phase selection is made (parameter **[PHAS]** in section 5.02B), the display shows the L1-N voltage.

[Curr] The display of the current allows 4-digit measurements up to 9990Aac.

[FrEq] The 'Frequency' has 0,1 Hz resolution (00.0 to 99.9Hz).

[Hour] The 'Hour Meter' can record up to 9999 hours. The display is updated every hour. The internal memory updates every 5 minutes.

5.05 'ALARM' Menu

This menu lists the alarm messages (see also section 6.00). If one alarm energizes, the red 'Alarm' Led will flash continuously. The Led stops to flash if the alarm comes cleared.

[**Hi I**] High Current shut down
[**Hi P**] Apparent Power shut down
[**Lo Pr**] Low Oil Pressure warning
[**F Pr**] Pressure Sender warning
[**Hi °C**] Temperature warning
[**F °C**] Temperature Sender Failure warning
[**Hi Fr**] High Frequency shut down
[**Lo Fr**] Under Frequency shut down
[**F AL**] Alternator Failure shut down
[**bELt**] Belt Break shut down
[**F Pi**] Pick Up Failure.
[**F Cr**] Fail To Start shut down
[**Lo U**] Under Voltage shut down
[**Hi U**] High Voltage shut down
[**Lo SP**] Under Speed shut down
[**FUEL**] Low Level Fuel Warning.
[**In 4**] 'Auxiliary Alarm Input 4' Shut Down .

5.06 Programming Instruction

1)- Select the 'OFF' operating mode by pressing the **[STOP-OFF]** pushbutton until the front panel turns off (only an illuminated dot appears on the right side of the display).
2)- Remove the rear plastic cover.
3)- Move dip-switch1 to an 'ON' position.
4)- Press the **[ACK]** pushbutton and hold.
5)- Press the **[>]** pushbutton and hold until the message **[ProG]** appears on the display.
6)- When the yellow 'Program' LED illuminates, the Be23 is ready for programming
7)- Press the **[<]** or **[>]** pushbuttons to select the parameter (see section 5.02)
8)- Press simultaneously **[ACK]** and **[^]** or **[v]** to modify the parameter.
9)- To select other parameters repeat step 7).
10)- To save the setting(s) press the **[ACK]** and hold the button, press the **[STOP-OFF]** pushbutton until the message **[SaVE]** appears.
11)- The message **[Good]**(*NOTE1) confirms the saving procedure.
12)- The BE23 enters automatically in 'OFF' operating mode.

Before using the Be23 it is recommended to:
- A - *disconnect the power supply for a few seconds*
- B - *move DIP-SWITCH 1 to 'OFF' to inhibit programming attempts*
- C - *connect the power supply and enter in 'MANUAL' operating mode*
- D - *select the 'PROGRAM' menu and check the programmed parameters.*

(*NOTE1): if the message **[Err]** appears on the display, it is recommended to repeat step 10). If the problem persists, the Be23 is faulty and must be returned for repair.

5.07 Re-programming Default settings

The parameters of the BE23 are factory programmed with default settings (see section 5.02). In order to recall the original programming, push simultaneously the **[^]** and **[v]** pushbuttons for at least 2 seconds. The display will flash once to confirm that the recall action has been successfully made. *To save the defaults follows steps 10) and 11) as indicated in section 5.07.* The BE23 allows the re-programming only in 'PROGRAM' operating mode (see section 5.07).

Before using the Be23 it is recommended to:
- A - *disconnect the power supply for a few second.*
- B - *connect the power supply.*
- C - *enter in 'MANUAL' operating mode.*
- D - *select the 'PROGRAM' menu and check the programmed parameters.*
- E - *move DIP-SWITCH 1 to 'OFF' to inhibit programming attempts.*

5.08 ALARM LEDs

The following alarms are indicated by means of red LEDs on the front panel:

- **Oil Pressure** (switch source JB-17)
- **Engine Temperature** (switch source JB-21)
- **Battery Voltage**, High or Low (supply source JA33-34-35)
- **Fuel Level** (switch source JB-19)
- **External Stop** (switch source JB18)
- **Over Speed** (Pick Up source JG10-11-12)

The section 6.0 describes the details of each alarm.

6.00 ALARM DESCRIPTION

The alarms are indicated by means of red LED (section 16.0 for Front Panel details) and messages in the 'Alarm' menu of the display (refer to Section 5.05). Be23 activates the 'ALARM' output #27 and the 'Output 1'(#29)/'Output 2'(#30) according to the settings described in section 5.02E.
The red LED flashes until the operator presses the **[ACK]** (acknowledge) push button and then stays lit. The 'ALARM' output (#27) is de-energized by the **[ACK]** pushbutton or by means of the '**[Horn]**' timer. If the code **'[cont]'** is programmed in the **'[Horn]'** timer, the 'ALARM' output does not switch off automatically.
The display **[message]**, the 'Output 1'/'Output 2'and the LEDs are cleared only by means of the **[STOP-OFF]** pushbutton. It is possible to clear the alarm(s) only if the engine is not running (e.g. the 'Engine' yellow LED is not flashing).
The alarms input connected to switches are energized to ground (Section 15.00 for wiring diagram). The switch polarity (Normally Closed or Normally Open) is programmable except for the Oil Pressure Switch (input#17), Remote Start (input#20) and Fuel Level switch (input #19). These details are explained in section 5.02.The following sections describe all alarms and warnings.

6.01 Oil Pressure Warning (SENDER) and Shut Down (SWITCH)

- Sender terminals: #13/#14. Pressure switch: #17 (only normally closed)
- Oil Pressure Warning setting: **[LoPr]** (analogue sender 8-483 OHM)
- Alarm outputs/programming: #27, #29 and #30/**[Out1][Out2]** options **[3]** and **[4]**
- The shut down of the engine is indicated by means of a red LED (only by switch).
- Alarm messages:'**[F Pr]**'for Sensor Failure and '**[LoPr]**' for Low Oil Pressure warning
- A 10 second delay time is provided to filter out false alarms

6.02 Temperature Warning and Shut Down
- Sender terminals: #15/#16. and #21 Temperature switch: input #21
- Programmable Temperature Warning setting:**[Hi°C]** (analogue sender 8-483 OHM)
- 'Temperature Input 1' allows normally open or closed contacts according to **[In 1]**
- Alarm outputs /programming: #27, #29 and #30/**[Out1][Out2]** option **[3]** or **[5]**
- BE23 provides a red 'TEMPERATURE' LED to indicate engine Shut Down (input switch)
- Engine can shut Down after a Cooling Down Time (section 17, OPt.1=0, OPt.1=0)
- A delay time of 10 seconds filters out false alarms
- Messages in the 'Alarm' menu: '**[Hi °C]**' for Temperature alarm and '**[F °C]**' for Sender failure are provided.

6.03 Fail to Start Shut Down
- The BE23 shuts down the engine if all attempts to start the engine have failed
- Number of attempts: 5 (The software upgrade 4.xx allows programmable attempts)
- Maximum crank time: 5 sec (The software upgrade 4.xx allows programmable crank)
- Rest time: 5 sec (The software upgrade 4.xx allows programmable crank)
- Alarm outputs/programming: #27, #29 and #30/**[Out1][Out2]** option **[12]**
- Fail to Start shuts down only in 'AUTO' operating mode
- Message in the 'Alarm' menu: **[F Cr]**
- Further information on 'Engine Running' in Section 7.07

6.04 Battery Voltage Warning
- This alarm is indicated by means of a red LED near to a Battery symbol.
- Alarm settings for 12V Battery system: <11.8V (low) and >15 V (high)
- Alarm settings for 24V Battery system: <23.6V (low) and >30V (high)
- The fault condition must persist for at least 60 seconds
- Alarm outputs/programming: #27, #29 and #30/**[Out1][Out2]** option **[6]**

6.05 'External Stop Input 3' Shut Down
- The input terminal #18 allows n.o./n.c. contact according to **[In 3]**
- Alarm outputs/programming: #27, #29 and #30 /**[Out1][Out2]** option **[8]**
- BE23 provides a Red lamp LED on front panel indicating 'EXT.'
- The engine shuts down without a cooling down time.
- The alarm is energised, also, by the **[STOP-OFF]** pushbutton (Section 4.06)

6.06 Over/Under Speed Shut Down and Pick Up Failure Warning
- The Be23 monitors continuously the signal of the Pick Up speed sensor if a valid number of teeth is inserted in the [Pic.r] parameter.
- The alarms setting are the parameters **[LoSP]**, **[HiSP]** and **[Pi r]** (section 5.02C).
- Over Speed shut down delay: 1 second.
- Under Speed alarm delay: 5 seconds (the engine stops after cooling down time **[COOL]**).
- Under Speed is disabled in 'Manual' operating mode.
- Alarm outputs/programming: #27, #29 and #30 /**[Out1][Out2]** option**[9]**.
- Red lamp LED on front panel is provided to indicate 'Over Speed'.
- The message **[Lo SP]** in the 'Alarm' menu indicates the under speed alarm.
- If the Pick Up fails, the message **[F Pi]** is provided.

6.07 Under/Over Frequency Shut Down
- The settings are programmable: **[LoFr]**,**[HiFr]** (see Section 5.02C)
- Delays: 6 seconds for Under Frequency and 5 seconds for Over Frequency
- Alarm outputs/programming: #27, #29 and #30 /**[Out1][Out2]** option **[9]**
- Under frequency protection is enabled only in 'AUTO' operating mode
- The messages **[Lo Fr]** for Under Frequency and **[Hi Fr]** for Over Frequency are provided
- The engine stops after cooling down time only for Under Frequency alarm.

6.08 Low Fuel Level PreAlarm and Shut Down
- The BE23 shuts down the engine if the switch closes for more than 5 minutes (input#19).
- Alarm outputs/programming: #27, #29 and #30 /**[Out1][Out2]** option **[7]**
- A red LED lamp on front facia indicating 'FUEL' is provided.

6.09 Low Fuel Level Warning
- The alarm setting is percentage programming: [**FUEL] ([22] for example)**
- Message in the 'Alarm' menu: **[FUEL]**
- Alarm bypass: 30 seconds. Connection terminal: #23
- Alarm output connections and programming: #27, #29 and #30 /**[Out1][Out2]** option **[7]**
- If the input #23 is used as Fuel Sender input, the 'Auxiliary Alarm input 4' function is not allowed. The selection is made on the parameter [In 4] as explained in Section 5.02.

6.10 Over Power 'kVA' Shut Down
- The setting is programmable: **[Hi P]** (section 5.02B)
- Alarm delay: 30 seconds
- kVA alarm outputs/programming: #27, #29 and #30 /**[Out1][Out2]** option **[11]**
- If the system is in 'AUTO' mode, the cooling down time **[COOL]** is included.
- Alarm message in the 'Alarm' menu: **[Hi P]**

6.11 Over Current Shut Down
- The setting is programmable: **[Hi I]** (section 5.02B)
- Alarm delay: 6 seconds
- Alarm outputs/programming: #27, #29 and #30/**[Out1][Out2]** option **[11]**
- If the system is in 'AUTO' the Be23 includes the programmable cooling down time **[COOL]**
- Alarm message in the 'Alarm' menu: **[Hi I]**

6.12 Over/Under Voltage Shut Down
- The settings are programmable: **[Lo U] [Hi U]** (Section 5.02B)
- Alarm delay: 6 seconds
- Alarm outputs/programming: #27, #29 and #30 /**[Out1][Out2]** option **[10]**
- Under Voltage shuts down the engine only if the contactor output is energised
- 'Alarm' menu messages: **[Hi U]** and **[Lo U]**
- A Cooling Down Time is inserted for Under Voltage shut down: **[COOL]**

6.13 Belt Failure Shut Down
- This alarm monitors the Charger Alternator input terminal #8
- Alarm outputs/programming: #27, #29 and #30/**[Out1][Out2]** option **[13]**
- Alarm delay: 15 seconds
- 'Alarm' menu message: **[bELt]**

6.14 Generator Failure Shut Down
- This alarm stops the engine if the Voltage of the Alternator is not able to reach the programmed setting **[Lo U]** (see section 5.02B) within 150 seconds from the engine starting moment.
- This alarm is monitored in 'MAN' and 'AUTO' operating modes
- Alarm outputs/programming: #27, #29 and #30/**[Out1][Out2]** option **[10]**
- 'Alarm' menu message: **[F AL]**

6.15 'Auxiliary Alarm Input 4' Shut Down
- 'Auxiliary Alarm Input 4' shut down message: [**In 4]**
- 'Auxiliary Alarm Input 4' terminal connection: #23
- 'Auxiliary alarm input 4'switch configurable to be normally open or closed contacts: **[In 4]**
- Static alarms/programming: #27, #29 and #30/**[Out1][Out2]** option **[8]**
- If the terminal #23 is configured to interface switch input, the Fuel Level Measurement function is not allowed. The selection is made in the parameter **[In 4]** as explained in Section 5.02F.

6.16 Memory 'Err' Message
This message indicates the failure of the saving procedure. The user must follow the steps:
- A - Push the **[ACK]** push button to clear the alarm
- B - Enter the programming mode as described in section 5.06
- C - Verify all parameters setting
- D - Save the settings as described in section 5.06
- E - If the error message persists, return the Be23 to the factory for repair

7.00 GENERAL SPECIFICATIONS
Supply Voltage: 7Vdc to 33Vdc, **Reverse polarity**: permitted for unlimited time
Supply Ripple: 15% up 65 Hz, Over Voltage: 50V / 60 seconds at 40 deg. C
Power Supply Protection: internal 300mA thermal fuse
Supply Current Consumption: 50 mA up to 150mA maximum
Supply Threshold to Reset the System: 6,5V for 5 seconds
Data retention: Non-Volatile memory
Serial Interface: standard RS232C plug in module
Dimensions: 96mm X 96mm X 120mm (includes connectors and rear cover)
Panel Cut-out: 92mm X 92mm, operation Outdoor/Indoor
Operating Temperature range: -30 deg C to +65 deg C
Operating Humidity Range: 5% up to 95% non-condensing
Weight: 350 gr., **Vibration**: 40mm/sec
General Design: 89/336 EEC, 89/392 EEC, 73/23 EEC, 93/68 EEC, IEC 68-2-6
Certification: CE (laboratory report available upon request)

7.01 Static Outputs Characteristics
Output Current: 200mA Short Circuit Proof
Output Voltage: Battery Voltage minus 1.5V, positive Logic
Voltage Suppression: external rectifiers are recommended
Output designation: #29 Output 1, #30 Output 2, #27 Alarm, #25 Fuel Solenoid, #32 Preheat (Glow), #31 Stop Solenoid, #26 Start Output (Crank Cycle) and #28 Generator Set Contactor.

7.02 Generator Voltage Input Characteristics

Generator Input Voltage: 500Vac
Maximum allowed Voltage: 750Vac continuously
Over voltage: 4KVac phase to phase, phase to neutral
Insulation to ground: 2KVac / 300 seconds
Input impedance: 4 Mega Ohm
Connection 3 Phases: N-L1-L2-L3 (N-L1 for single Phase)
Terminal: N (#1) L1 (#2), L2 (#3), L3 (#4)
Permitted Distortion: 25%.Reading Ratio: x1, x2
Display range: 80Vac up to 1000Vac. Accuracy: +/- (2%+ 3digits)

7.03 Current Transformer Input Characteristics

Current Transformer Size: 50/5Aac up to 9900/5Aac
Maximum Current: 8Aac for 10 second
Connection terminals: (#5, #6). Permitted Distortion: 25%
Internal resistance: 0.05 Ohm
Display range: 50A to 9900A. Accuracy: +/- (2%+ 3digits)

7.04 Digital Input Characteristics

Open circuit voltage: 10Vdc (12V supply), 22Vdc (24V supply)
Closed circuit current: 15mAdc maximum
Over voltage: 250V/10mS. Software Filtering: 500mS
Cable length: 30 meters maximum (size 1,5 square mm)
Input designation: #19 Fuel Level Alarm, #20 Remote Start, #18 'External Stop Input 3', #23 Input 2/Fuel Sender (see 7.12), #22 'A.M.F. Input 2', #21 'Temperature Input 1' and #17 Oil Pressure Switch

7.05 Oil Pressure Analogue Input Characteristics

Resistance range: 8 ohm to 483 Ohm, Pressure range up to 20.0 Bar
Maximum cable resistance: 0,5 Ohm.
Relationship: 6 points (computer down-load or local programming)
Connection: #13 and #14. Grounding connection: #14
Maximum sensor current: 4 mA. Open Sensor Voltage: 10 Vdc max

7.06 Temperature Analogue Input Characteristics

Resistance range: 8 ohm to 483 Ohm, Temperature range up 200°C
Cable resistance: 0,3 Ohm max
Relationship: 6 points (computer down-load or local programming)
Connection: #15 and #16. Maximum sensor current: 4 mA
Open Sensor Voltage: 10 Vdc max. Over Voltage protection: 100Vdc

7.07 Engine Running Characteristics

Be23 has many sources to detect the point to disconnect the 'STARTER':
- A - The OIL Pressure is over 3 Bar (only if a setting is programmed in [LoPr.])
- B - One of the 3 Phases (L1 L2 or L3) measurements is over 90Vac.
- C - Battery charger input (#8) voltage is over 8Vdc.
- D - Pick Up R.P.M. measurement is over the parameter [HiCr]
- E - Generator Set frequency is over 20Hz.
Each source must persist for at least 2 seconds. The yellow LED 'Engine' flashes if one of the above conditions are recognized to be true. Any attempts to start the engine will be inhibited. The yellow LED 'Engine 'will stop to flash when the engine stops.

7.08 Pick Up Input Characteristics
Be23 provides programmable parameters: [Pi r], [LoSP], [HiSP] and [HiCr]
Alarm messages on the front panel: [LoSP], [F Pi] and 'Over Speed' LED.
Pick Up sensitivity: 1 V rms. Maximum Voltage Input: 30Vac.(Max frequency 10kHz)
Flywheel Teeth Programming: up to 500 (parameter [Pi r])

7.09 Fuel Level Analogue Input Characteristics
Sensor Input: 8 Ohm to 483 Ohm
Four Points Sensor Programmable Relationship: 0%, 25%, 50% and 99%
Maximum sensor current: 4mA. Open Sensor Voltage: 10Vdc max
Over Voltage protection: 100Vdc

7.10 Charger Alternator Monitoring
Operating Voltage up 33Vdc. Over voltage: 100V / 20mS
Reverse polarity permitted for unlimited time
Threshold: 8Vdc (12V) and 16Vdc (24V) (self detection 12v or 24v).
Excitation Power: max 3W. Designation terminals: #7/8 (W.L. or D+).

8.00 TIMERS
The software governing the Be23 includes timers. The list of the programmable Timers is described in section 5.02. The non-programmable specialized counters/timers are indicated in the section 6.00. Check the section 17.0 (Software Upgrade) to find out the latest software version.

9.00 WIRING DIAGRAM
The wiring diagram is shown in section 15.00.

10.00 SERIAL INTERFACE / MONITORING SOFTWARE
By means of a serial interface it is possible to download all configuration parameters. A full communication is provided to transfer alarms and measurements. The software runs under WINDOWS operating system. The complete description is included in a TXT file.

11.00 TROUBLE-SHOOTING
WARNING: THE FOLLOWING INDICATIONS ARE TO BE CARRIED OUT BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY ACTION SPECIFIED IN THIS 11.00 SECTION.

WARNING: **This unit is not user serviceable and should be returned to Bernini-Design Company for service and repair. Any alterations to the internal circuits will invalidate the warranty.**

11.01 Be23 LEDs does not illuminate
-Check the power supply.
-The supply plug is not properly connected.
-The female plug has internal contacts in trouble.

11.02 Be23 presents all LEDs or some of them illuminated with very low intensity
-Same as 11.01 and, in addition the serial interface cable sources a small current able to light few LED's but not enough to start the microprocessor.
-Fault of the minus battery voltage line: the supply circuit is energizes by means of the parasitic current of the static outputs.

11.03 The reading of the Battery voltage is not stable.
-The Battery minus is not properly grounded.
-The battery charger utilizes the be23 supply wires (is not allowed).
-See 11.01 and 11.02.
-The supply voltage is less than 7 Vdc.

11.04 The reading of the Generator Set Current is not stable or incorrect
-The current transformer (CT) is not grounded.
-Check the polarity of the S1 and S2 terminals.
-Check for external A-meters: they must be connected in series not in parallel.
-Check the size of the CT.
-The supply voltage is less than 7 Vdc

11.05 The Generator Set voltage or frequency is unstable.
-Check for the wiring and the voltage of the neutral line.
-Check for different load combinations, probably there is high level of distortion.
-The supply voltage is near 7 Vdc.

11.06 The measurement of the 'POWER' is incorrect.
-Check the polarity of the Current Transformer.
-Check the grounding of the Current Transformer.

11.07 The Be23 does not STARTS/STOPS the Engine.
-Check the voltage of the output #26 and #31(if lower than Vbatt-2V there is an overload condition).
-Disconnect the output terminal and check the resistance of the Load.
-Check for the maximum rating of the load: maximum 300 mA.
-Check if the configuration matches the engine characteristics (preheat for example)
-The supply voltage is lower than 7 Vdc.

11.08 The Engine stops without reason after few seconds or minutes.
-Check the alarm on front panel or the message on the display.
-Test the voltage of the fuel solenoid output #24.
-The supply voltage is less than 7 Vdc.

11.09 One or more inputs do not energize the Be23.
-Check the wiring of the switch or the switch polarity (n.o. or n.c.).
-Connect the suspected input to ground directly by means of a jumper.
-The supply voltage is less than 7 Vdc.

11.10 Be23 does not enter the 'AUTO' operating mode.
Check if there is an alarm or a message in the front panel (red LED's). The procedure is to clear the alarm by means of [ACK] and 'OFF' push buttons.

12.00 MEASUREMENTS and CALIBRATION

Be23 features the calibration of the analogue measurements. To enter the procedure push the **[ACK]** pushbutton during the power on sequence (the same moment you apply the power supply). The Be23 will confirm the 'Calibrating Mode' by means the message '**[CaL]**' on the display. The following measurements are displayed on the Be23 **(*)**:

- **[L1]** phase L1-N (Volts)
- **[L2]** phase L2-N (Volts)
- **[L3]** phase L3-N (Volts)
- **[Curr]** Generator Set current (Ampere)
- **[bAtt]** battery voltage (Volts)
- **[OIL]** Oil Pressure measurement (Bar)
- **[°C]** Engine Temperature measurement (Centigrade)
- **[FUEL]** Fuel Level measurement (%)

The selection of the parameter is made by means of the **[<]** and **[>]** pushbuttons. The correction of the measure is made by means of the **[^]** and **[v]** pushbuttons. If in doubt, the name of the parameter is obtained on the display by pushing the **[ACK]** pushbutton. In order to have a good calibration, it is recommended to connect a source of stable signal or reference.
To save the new calibration press **[ACK]** (keep pushed) and then **[STOP-OFF]** push buttons until the messages '**[SaVE]**' and '**[GOOd]**' appear.
To return to normal use disconnect the supply and after a few seconds connect the supply to turn on Be23 (as described in Section 2.00 and 3.00). It is a good practice to check the calibrated measurement(s).

(*) If in doubt, it is recommended to use the factory calibration by pressing the **[^]** and **[v]** pushbuttons simultaneously for 2 seconds: a short display turn-off will confirm the use of the default calibration parameters.

12.01 Hour Meter Resetting

The procedure to clear the count of the Hour Meter is as follows.

a) -Remove the rear cover and Set the Dip-Switch 1 in program mode ('On' position).
b) -Enter in the Manual operating mode (see sections 2.00 or 3.00).
c) -Select, by means of the **[^]** and **[v]** pushbuttons the **[Hour]** mode display.
d) -Push simultaneously the **[ACK]** and **[<]** pushbuttons for 5" at least.
e) -A short display turn-off will confirm the clearing of the counter.
f) -Set the Dip-Switch 1 to 'OFF', re-apply the rear cover and return to a normal operating mode (see 2.00 or 3.00) .

13.00 DEFINITION OF TERMS

CHARGER ALTERNATOR : refers to the Generator for charging the starting battery set.
ALTERNATOR (Generator) is the rotating machine able to supply power for the user load.
ANALOGUE SENDER: any variable resistor proportional to the physical phenomena.
FUEL SOLENOID: electric valve energized to open the fuel flow.
BELT BREAK: refers to the transmission belt failure.
LED, LED's: solid-state lamp.
LOAD: all electrical equipment able to absorb energy from the Generator.
PUSH BUTTON: touch type push button on the Be23 front panel.
SERIAL INTERFACE: if not otherwise stated, the serial interface is RS232C.
STOP SOLENOID: electromagnet energized to stop the engine.

14.0 TERMINAL DESCRIPTION

Terminal Connection	Function	Terminal Description	Electrical Specification Section:	Further information on Section 5.xx and 6.xx
1 JC	Input	Generator Neutral Line Voltage	7.02	Vac Reading Ratio Over/Under Voltage Over/Under Frequency Generator Failure 3Phase/Single Phase
2 JC	Input	Generator Phase L1 Voltage	7.02	
3 JC	Input	Generator Phase L2 Voltage	7.02	
4 JC	Input	Generator Phase L3 Voltage	7.02	
5 JD	Input	Generator Phase L1 Current, S1 side	7.03	CT's Ratio Over Current Over kVA
6 JD	Input	Generator Phase L1 Current, S2 side	7.03	
7 JG	Output	Exciting Current W.L./24V (120mA)	7.10	Charger Failure Engine Running Battery Alarm Belt Break
8 JG	Input	Charger Alternator Monitoring	7.10	
9 JG	Output	Exciting Current W.L./12V (200mA)	7.10	
10 JG	Ground	Pick Up Shield	7.08	Over/Under Speed Pick Up Ratio Crank Disconnect Pick Up Failure
11 JG	Input	Pick Up Signal High	7.08	
12 JG	Input	Pick Up Signal Low	7.08	
13 JB2	Input	Oil Sender, ground Reference	7.05	Oil Pressure Warning Sender Relationship Sender Failure
14 JB2	Input	Oil Sender, Signal High	7.05	
15 JB2	Input	Temperature Sender, ground Ref.	7.06	Temperature Warning Sender Relationship Sender Failure
16 JB2	Input	Temperature Sender, Signal High	7.06	
17 JB1	Input	Oil Pressure Switch	7.04	Engine Shut Down
18 JB1	Input	'External Stop Input 3'	7.04	Engine Shut Down n.c./n.o. choice
19 JB1	Input	Fuel Level Switch Warning	7.04	Warning/Shutdown
20 JB1	Input	Remote Start	7.04	Engine Control
21 JB1	Input	'Temperature Switch Input 1'	7.04	Engine Shut Down n.c. /n.o. choice
22 JB1	Input	'A.M.F. input 2'	7.04	Delayed Start / Stop n.c. /n.o. choice
23 JB1	Input	Input 4 (Fuel Level Indication)	7.04,7.09	Warning /Shut Down n.c. /n.o. choice Sender Relationship

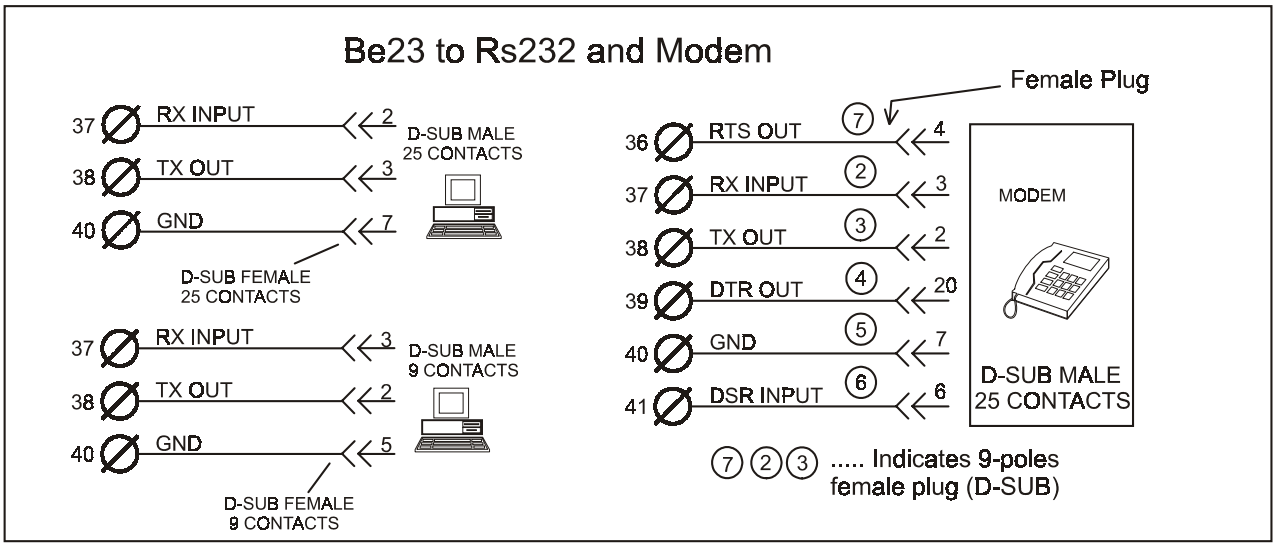
24 JB1	-----	No Connection	-----	------
25 JF	Output	Fuel Solenoid	7.01	Engine and Generating Set Automation: Preheat Timing Stop Solenoid Timing Horn Timing Cooling Timing Warm-Up timing Programmable Alarm Outputs
26 JF	Output	Start (Crank Pilot)	7.01	
27 JF	Output	Alarm- Horn	7.01	
28 JFb	Output	Generator Contactor	7.01	
29 JF	Output	Output '1'	7.01	
30 JF	Output	Output '2'	7.01	
31 JF	Output	Stop Solenoid	7.01	
32 JF	Output	Preheat	7.01	
33 JA	Input	+12Vdc Supply	7.00	Supply Battery Voltage Monitor
34 JA	Ground	Battery Minus	7.00	
35 JA	Input	+24Vdc Supply	7.00	
36 JL	Output	Request To Send	10.00	RS232 interface
37 JL	Input	Receive Data	10.00	
38 JL	Output	Transmit Data	10.00	
39 JL	Output	Data Terminal Ready	10.00	
40 JL	Ground	Ground Reference	10.00	
41 JL	Input	Data Set Ready	10.00	

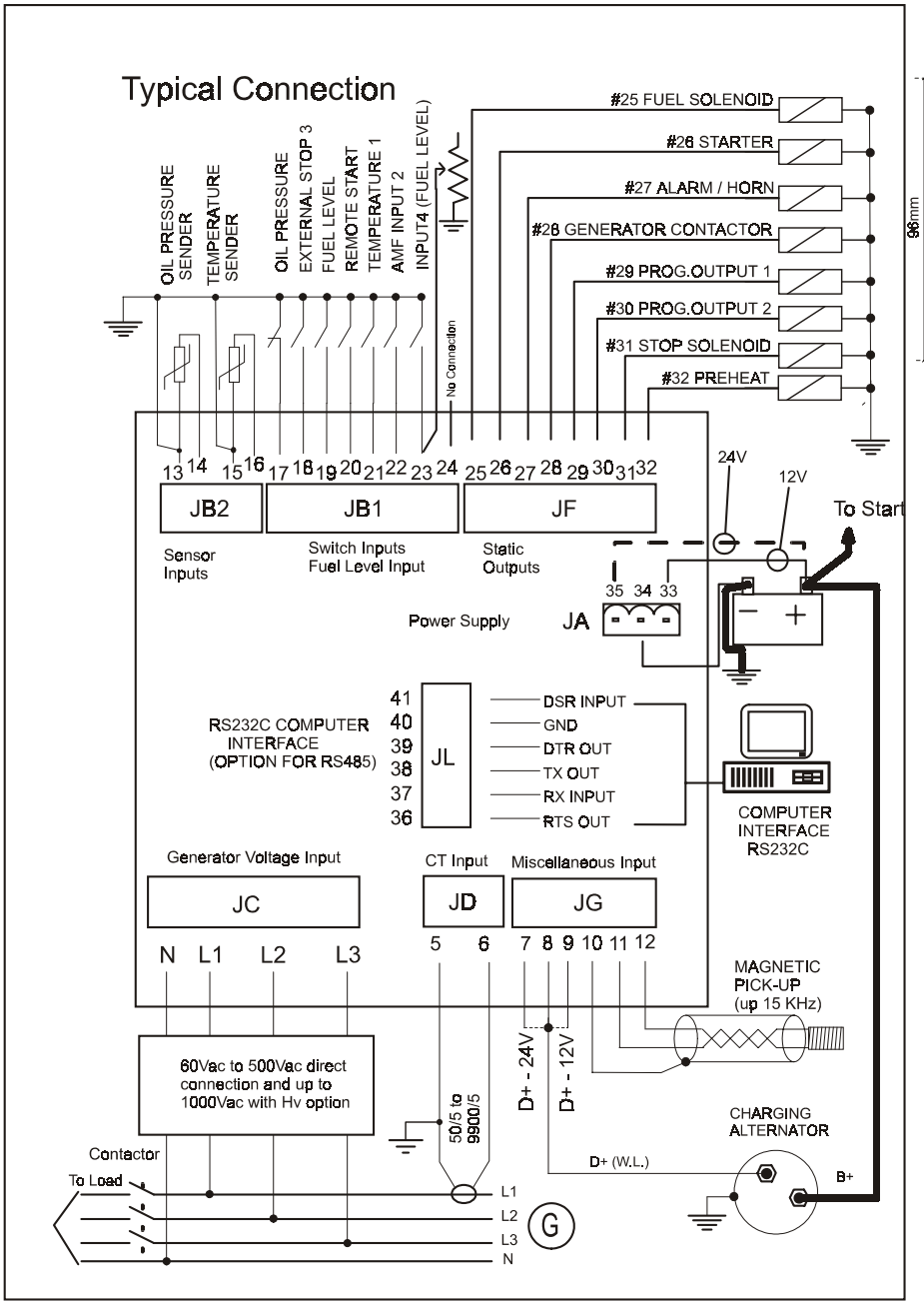
14.1 CONNECTORS and PLUGS

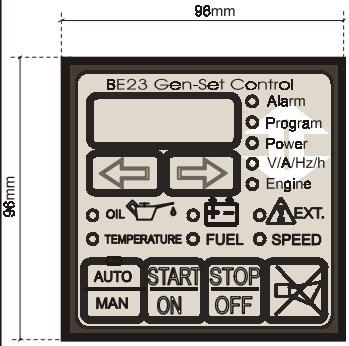
Be23 uses male-female connectors as follows:

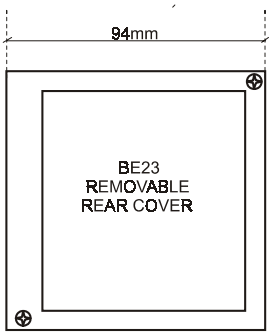
CONNECTOR		WEIDMULLER (socket blocks)	
		Type	Catalog number
JA	3-poles	Female 157136	BLZ 5.00/3 SN OR
JB1	8-poles	Female169025	BLZF 3.5/8 SN OR
JB2	4-poles	Female 169021	BLZF 3.5/4 SN OR
JC	6-poles	Female 157139	BLZ 5.00/6 SN OR
JD	2-poles	Female 157135	BLZ 5.00/2 SN OR
JF	8-poles	Female169025	BLZF 3.5/8 SN OR
JG	6-poles	Female 169023	BLZF 3.5/6 SN OR
JL	6-poles	Female 169023	BLZF 3.5/6 SN OR

15.00 Rear view, Dimensions and Connections

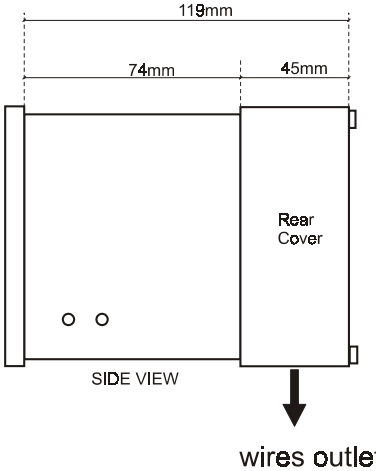






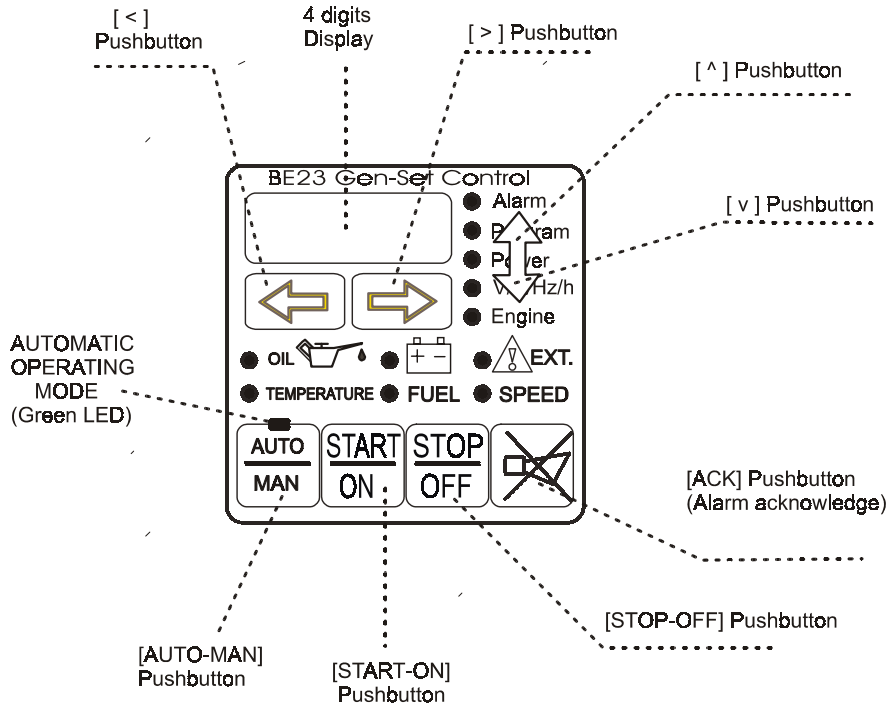


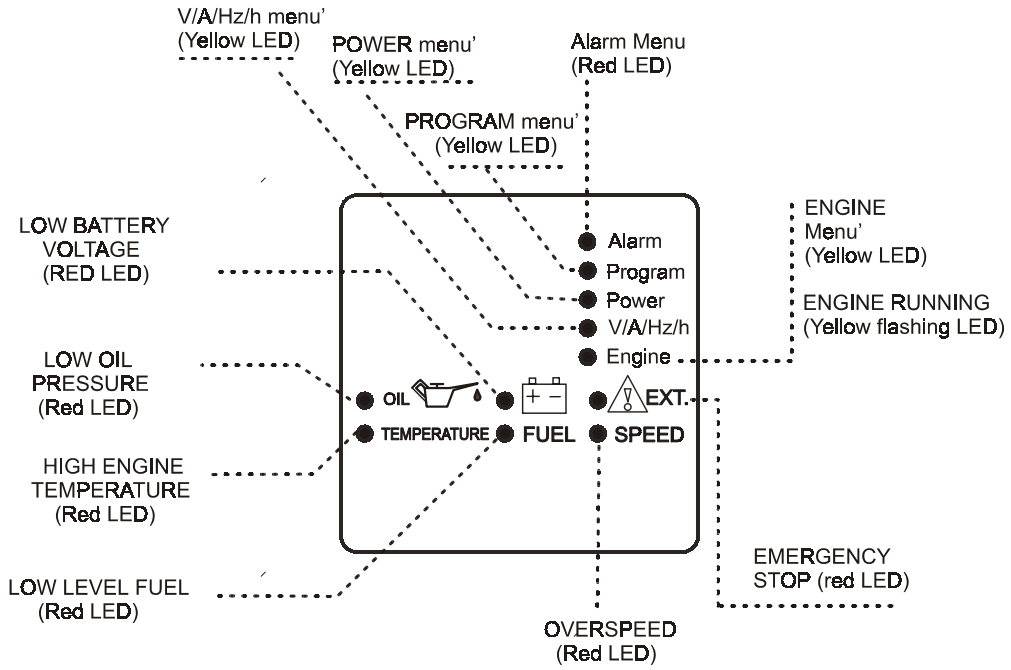
Recommended Panel Cut-out :
91mm(+/-0.5)x91mm(+/-0.5)



wires outlet

Section 16.0 : FRONT PANEL DESCRIPTION





CE

17.0 SOFTWARE UPGRADE (DECEMBER 2001)

- 1.34: average calculation has been introduced in the display of the Power Factor
- 2.00: it is possible to start and stop the Generating Set by using Remote Computer Control
- 2.01: small problem in the alarm clearing sequence has been solved
- 2.02: additional filtering improvement on the measurement circuits
- 3.00 - OPERATING MODE OPTIONS AFTER POWER ON (MAY 2002)

This 3.00 version features the following programmable OPTIONS. The factory settings are compatible with the previous software versions.

[OPt.1] **[0]** The Cooling Down Time is excluded if the engine shuts down in case of high temperature (input JB21).
[1] (Factory Default) The Cooling Down Time is added if the engine shuts down in case of high temperature (input JB21).

[OPt.2] **[0] (Factory Default)** After the Power On sequence the BE23 comes in 'OFF' operating mode.
[1] After the Power On sequence the BE23 comes in 'MANUAL' operating mode.
[2] After the Power On sequence the BE23 comes in 'AUTO' operating mode.

NOTE: the above parameters are placed in the list of the programmable parameters after the [FUEL] parameter

- 4.00 - PROGRAMMABLE STARTING PARAMETERS (JUNE 2002)

[Att] ..... **[5] (Default=5)** Number of attempts to start the engine:1-10.
[CrAn]..... **[5] (Default=5)** Maximum insertion time of the starting motor:1-10 seconds
[rESt]..... **[5] (Default=5)** Pause time between starting pulses: 1-10 seconds.

NOTE: the above parameters are placed in the list of the programmable parameters after the [OPt.2] parameter

- 4.04 - A.M.F. (Automatic Mains Failure) FEATURES (JUNE 2002)

[Out1] / [Out2] **[14]** The option [14] has been introduced. This option allows the control of the Mains contactor. This output must be connected to an external relay. The relay drives the Mains contactor by means of the normally closed contacts. A 2 second delay is included between operations of the two contactors. It is absolutely recommended the use electric-interlock between contactors. The option 14 is enabled only in 'AUTO' operating mode and it is controlled by the 'AMF input 2' input terminal. The polarity of the switch input is programmed on parameter [In 2] (see section 5.02)

BE23 SOFTWARE and WINDOWS SOFTWARE TRUTH TABLE	
BE23 SOFTWARE	VISUAL BASIC WINDOWS 95-98-2000
Be23 1.34	BE23W 1.xx
Be23 2.00, 2.01, 2.02	BE23W 2.04
Be23 3.00	BE23W 3.xx
Be23 4.xx	BE23W 4.xx

NOTE: 'XX' any number 0 up to 99

- 4.05 - 4.06 - 'A.M.F. input 2' bug (DECEMBER 2002) (The BE23 was behaved in erroneous way during repeated operations of function AMF2).

- 4.07 - C.T. Size (JANUARY 2003). This software allows to display a decimal point for the Current and Power measurements if the size of the Current Transformer is lower than 100/5Aac.