



## Be2K – PLUS

AMF + ATS + Engine Controller  
Sales bulletin B2KPLUS-V1.00  
[www.bernini-design.com](http://www.bernini-design.com)

### Summary

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### 1.0 Description

The Be2K-PLUS is a 3-phase A.M.F / A.T.S. controller / Generator controller and monitoring system. Its programming runs quickly, and all parameters, alarms and operating functions are indicated by means of a high-performance 128X64 graphic display capable of operating in a temperature range between -30°C and +70°C. The Be2K-PLUS interfaces with resistive-sensors, 4-20 mA /0-10 Transmitters and a magnetic Pick-up (or 'W'). Measurements including Vac, Aac, Vdc, kVA, kVar, kW, Energy, Pf, Hz, hour count, R.p.m., Oil Pressure, Engine Temperature, Auxiliary Temperatures (Ambient & Canopy), Battery Vdc (Telecom system), Battery Vdc (Engine) and Fuel Level. A Windows XP © compatible remote monitoring and control software program is also provided. The Be2K-PLUS is SAE-J1939 compatible and provides RS485 and RS232 interfaces. Be2k-Plus interfaces with GSM-GPRS modems and complies with NFPA-110 / NFPA-99 specifications.

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### 2.0 State-of-the-art Innovative features

- *Ideal for Dual-Genset standby applications for Industry & Telecom*
- *RS485, CAN-BUS J1939 , RS232, TCP-IP protocol, interfaces with Modem*
- *200 Events Log history tagged by a Real Time Clock, Excel (©) file report*
- *Monitoring of Vdc sources for Telecom & Renewable Energy Applications*
- *12-digit Led-Display and 128x64 Graphic (-30°/+70°) Organic Display*
- *Interfaces with Resistive sensors, 0-10V, 0-5V or 4-20mA Transmitters*
- *Indicates kVA, kVAr, kW, PF, Aac, Vac, Hz and kWh-meter & h-meter*
- *Indicates all Engine parameters and monitors the Ambient Temperature*
- *30 Options for each programmable input & 71 Options for each Output*
- *High quality manufacturing, 72-hour dynamic burn-in, 3-Year warranty*

### 3.0 Programmable Inputs

The Be-2k PLUS features 10 digital inputs and 5 analog inputs. Five digital inputs can be configured normally closed or open with the following options:

OPTIONS		
Disable input	Remote LOCK	KG feedback
Immediate Stop	Generator simulation	Idle Speed
Bypass and Stop	Mains Simulation	Engine Test
Cooling and Stop	Remote LEDs test	Genset test
Bypass + Cooling + Stop	Remote Acknowledge	KM Control
Warning only	Display Control ↑	KM Control
Bypass and Warning	Display Control ↓	Overload
Remote Manual Mode	Display Control ←	Reserve Generator
Remote Auto Mode	Display Control →	Master Generator
Remote Off Mode	KG feedback	NFPA Test Led

The 5 analog inputs, can be programmed with a 6-point response curve or by a function 4-20 mA,0-5V or 0-10V.

### 4.0 Programmable Outputs

The Be-2k PLUS features 14 outputs. Five outputs can be configured as follows:

OPTIONS	
The Output is disabled	Panel Stop Shutdown
Under Speed Shutdown	<b>Common Input Alarm</b>
Over Speed Shutdown	Presence of Nominal Mains Parameters
Pick-up Failure Warning	Presence of Nominal Generator Voltage
<b>Common Speed Alarms</b>	Mains Failure Timing
Under Frequency Shutdown	Mains Restore Timing
Over Frequency Shutdown	KG Contactor of the GENERATOR Closed
Over Current Shutdown	KM Contactor of the MAINS Closed
Over Current Warning	Crank Delay (Start Warning)
Over KVA, KW Warning or Shutdown	Pre-glow ACTIVATED
Minimum KW Warning	PURGE (gas engine valve control)
Maximum KW Warning	Engine Running Status
Phase Sequence Error Shutdown	Cooling Timing
Reverse Power Shutdown	Warm up Timing
Over/Under Voltage Shutdown	RENT Warning(<48h )/Shutdown (Expired)
Overload (input JF4) Shutdown	BE2K-PLUS in OFF MODE (Status)
Alternator Failure Shutdown	BE2K-PLUS in MANUAL MODE (Status)
<b>Common Generator Alarms</b>	BE2K-PLUS in AUTO MODE (Status)
Low Oil Pressure Warning or Sensor Failure	BE2K-PLUS in TEST MODE (Status)
Low Oil Pressure Shutdown (Sensor/Switch)	BE2K-PLUS in LOCK MODE (Status)
<b>Common Oil Pressure Alarms</b>	Automatic Periodic Test
High Temperature 1 Shutdown	Fail To START Shutdown
High Temperature 2 Shutdown	Fail To STOP Shutdown
High – Low Temperature Warning (Sensor)	Engine Belt Break Shutdown
<b>Common Temperature Alarms</b>	Indication of Parameter Error warning
High – Low Battery Voltage Warning	Idle Engine
No Fuel in Tank Shutdown	Clock Error or Periodic Test Error
Low Level Fuel Warning	Lube Pump
Fuel Reserve Warning	<b>ECU Enable</b>
High Fuel Warning	CAN-BUS RED LAMP
Fuel Sensor Failure Warning	CAN-BUS YELLOW LAMP
Fuel Pump (to fill the TANK)	CAN-BUS Communication Failure
<b>Common Fuel Alarms / Sensor Failure</b>	Control for Reserve Generator
Maintenance SERVICE 1,2 and 3	Monitoring of VDC source (for Autostart Control)
Alarm 1: Shutdown / Warning	Monitoring of AUX. Temperature (for Autostart Control)
Alarm 2: Shutdown / Warning	
Auxiliary Alarm 1-2-3-4-5: Shutdown / Warning	

## 5.0 Display features

The Be-2K PLUS features 3 high-luminosity displays of-4 digits each, to indicate the following:

**- Voltage of each phase of the Generator - Current L1-L2-L3 (generator)**

The Be-2K PLUS features a graphic OLED display able to indicate the following:

**- Electrical measurements                      - Engine parameters / measurements**  
**- Menu and sub Menu                              - Programming**  
**- Alarms & Log Events                              - Miscellaneous parameters**

## 5.1 Display: alarm indications

The Be2k-plus monitors the following alarms:

OVER/UNDER FREQUENCY (SD) OVER/UNDER VOLTAGE (SD)  ALTERNATOR FAILURE (SD)  OVERLOAD (W)+(SD) OVER CURRENT (W)+(SD) SHORT CIRCUIT (SD)  PHASE SEQUENCE (SD) EARTH FAULT (SD)  MAX / MIN KW WARNING  OVER KVA SHUTDOWN  REVERSE POWER (SD)  OVER/UNDER SPEED (SD) PICK UP FAILURE (SD)  MAINS FAILURE CONTACTORS ALARM (W) KM / KG FAILURE	LOW OIL PRESSURE (W)+(SD)  OIL SENDER FAILURE (W)  HIGH OIL TEMPERATURE (W)+(SD) HIGH CANOPY TEMPERATURE (W)+(SD) HIGH-LOW COOLANT TEMPERATURE (W)+(SD) TEMPERATURE SENDER FAILURE (W)  REMOTE EMERGENCY (SD) LOCAL EMERGENCY (SD)  ALARM 1 (SD) ALARM 2 (SD) ALARM INPUT 1-2-3-4-5 (W)+(SD)  FAIL TO STOP (SD) FAIL TO START (SD) BELT BREAK (SD)  REMOTE LOCK (SD)  RENT WARNING RENT SHUTDOWN	MAINTENANCE 1-2 WARNING MAINTENANCE 3 SHUTDOWN  FUEL RESERVE (W)+(SD) NO FUEL SHUTDOWN PUMP TIMEOUT (W) HIGH / LOW FUEL WARNING FUEL SENSOR FAILURE (W)  LOW BATTERY V (W) HIGH BATTERY V (W)  CLOCK ERROR (W) PARAMETER ERROR (W)  SYSTEM NOT IN AUTO (W)  CAN-BUS ERROR (W)+(SD) CAN-BUS ALARM (W)+(SD)  PERIODIC TEST ERROR (W)
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**note: (W) stands for Warning and (SD) stands for SHUTDOWN**

## 5.2 Display: Menu & Measurements

The Be2k-plus indicates the following:

<b>MAIN MENU</b> MEASUREMENTS ALARM STATUS PROGRAMMING DISPLAY & LANGUAGE SERVICE & MAINTENANCE CLOCK SETTINGS  <b>MEASUREMENTS</b> GENERATOR MAINS POWER & ENERGY ENGINE & FUEL ALARM STATUS LOG EVENTS  <b>MISCELLANEOUS</b> RENT CONTRACT REAL TIME CLOCK SERVICE STATUS PERIODIC TEST	<b>PARAMETERS MENU</b> RESTORE DEFAULT CHANGE PASSWORD CALIBRATION CLEAR ENERGY COUNTER CLEAR MEMORY CLEAR EVENTS  MAINS CONTROL GENERATOR CONTROL ENGINE PARAMETERS SPEED PARAMETERS  FUEL LEVEL SETTINGS OIL PRESSURE SETTINGS TEMPERATURE SETTINGS FUEL SENSOR  INPUTS & OUTPUTS CAN-BUS SETTINGS COMMUNICATIONS SETTINGS	<b>MEASUREMENTS</b> MAINS VOLTAGES / Hz CONTACTOR STATUS PHASE SEQUENCE  POWER FACTOR, KVar GENERATOR VOLTAGES / Hz GENERATOR CURRENT GENERATOR POWER KW-KVA ENERGY COUNTER kWh  AMBIENT TEMPERATURE COOLANT TEMPERATURE CANOPY TEMPERATURE OIL TEMPERATURE  OIL PRESSURE ENGINE SPEED FUEL LEVEL CHARGER ALTERNATOR (V) BATTERY VOLTAGE STARTINGS COUNT CAN-BUS DATA
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## 6.0 Pushbuttons features

The Be2K-PLUS features 13 membrane pushbuttons used for the following tasks :

Push buttons	Notes
[START-ON] [STOP-OFF]	Are used to Start-Stop the Engine or programming
[1] - [0] - [1]	Control the status of the contactors
[MAN] [OFF] [AUTO-TEST]	Select the operating modes
[RIGHT] [LEFT] [ UP ] [DOWM]	Are used to control the display or programming
[ACK-F1]	It silences the horn

## 7.0 Speed detect

The Be-2K PLUS detects the speed of the engine from one of the following sources:

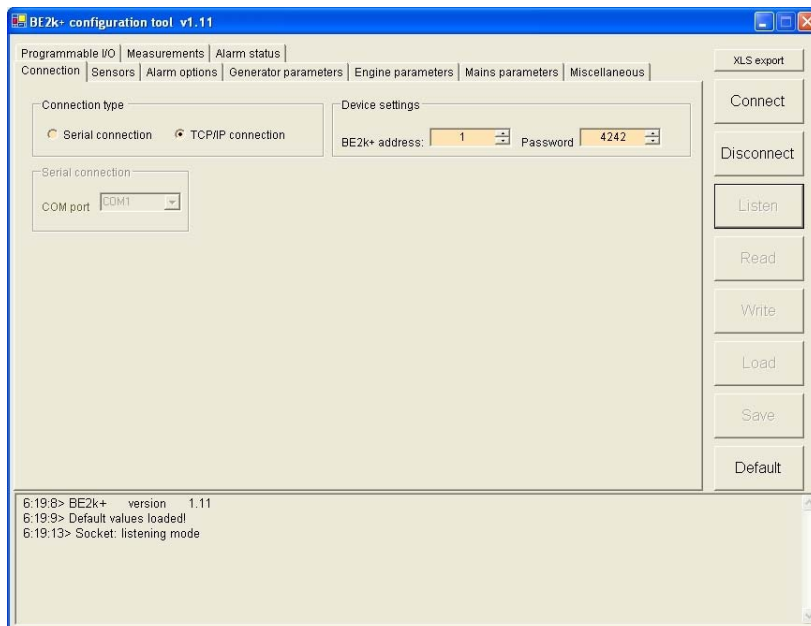
Pick-up	It interfaces with magnetic pick-up (0-10 KHz)
W (charger Alternator)	It interfaces with 'W' analogue signal of the charger alternator (0,1 up to 30.0 Teeth and 30 up to 500 teeth)
Generator	It detects the speed from the frequency of the Generator
CAN BUS	It detects the speed from J1939 ECU

## 8.0 LED indicators

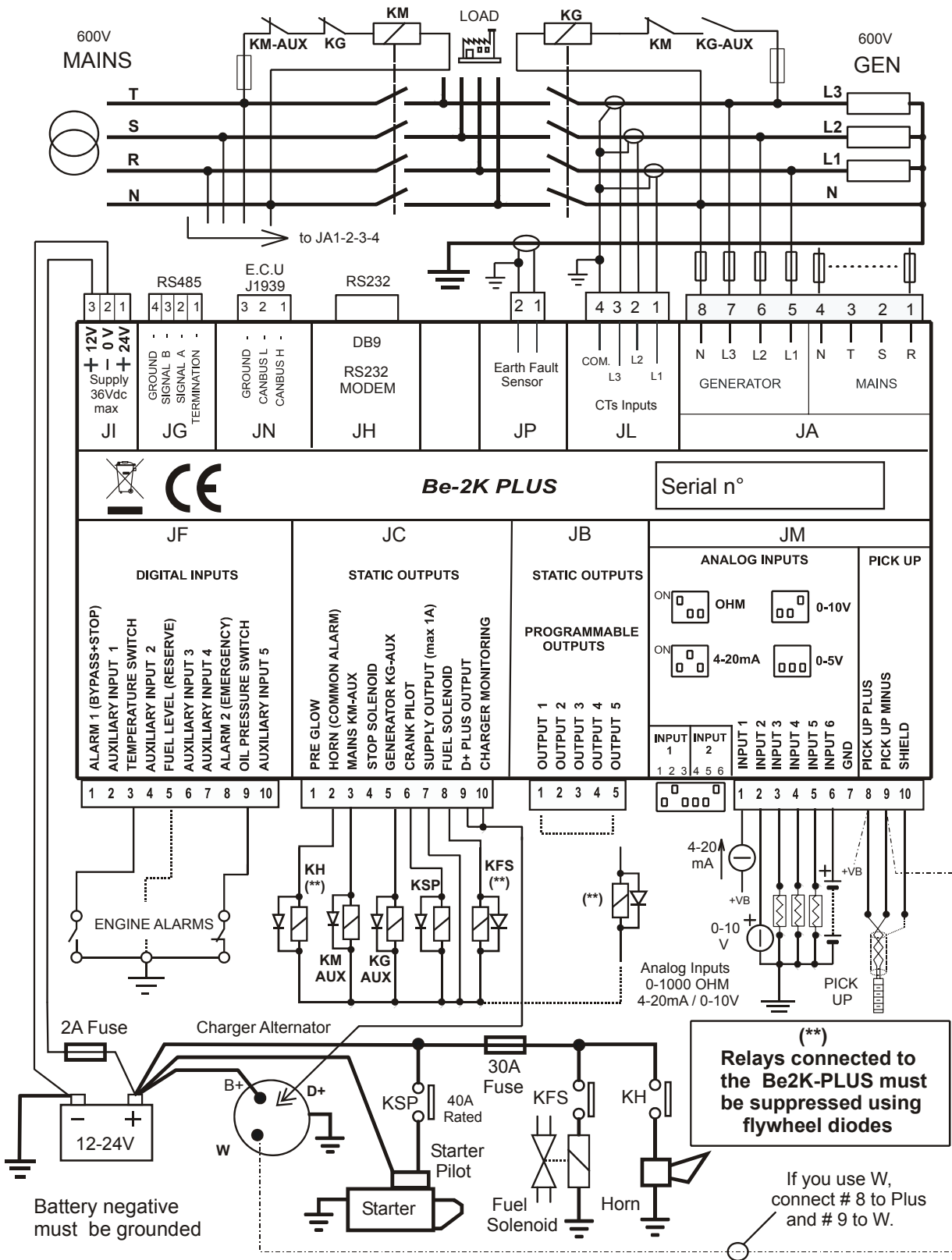
LEDs	Notes
1 Green indicator	Indicates that the engine is running
6 Green indicator	Indicate operating modes and the status of the contactors
1 Yellow indicator	Indicates the presence of a Warning
2 Yellow indicator	Indicate Voltage or Current selection on the DISPLAY
5 Red indicators	Indicate Oil-Temperature-Fuel-Generator-Emergency shut down

## 9.0 Serial communications

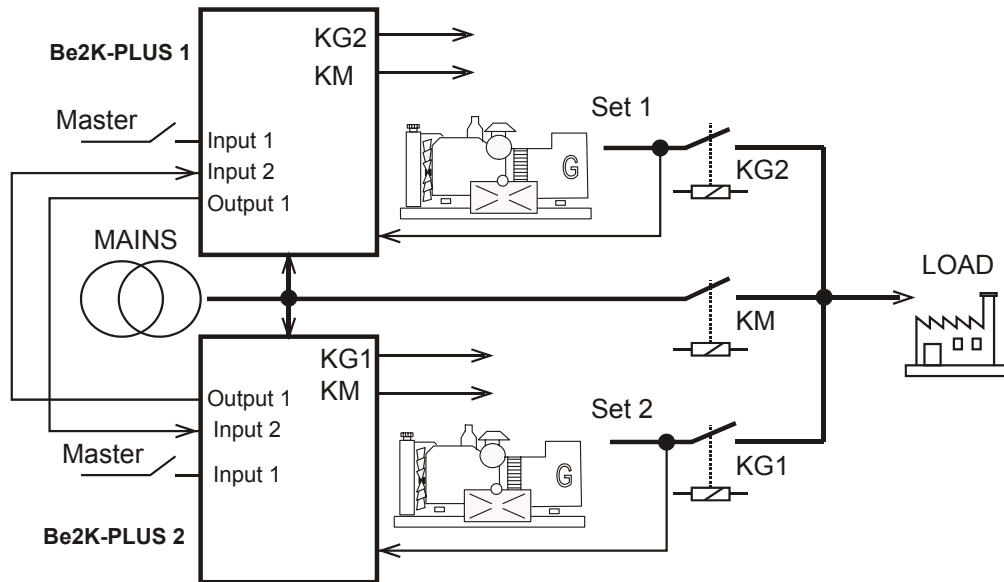
The Be-2K PLUS features an RS485 & RS232 serial interface. The protocol MODBUS provides an easy way to interface with other equipment. Software running on the XP operating system is available. The software, running on PC, can generate .XLS compatible files and allows Wireless TCP-IP data communications (an external GPRS modem is required).



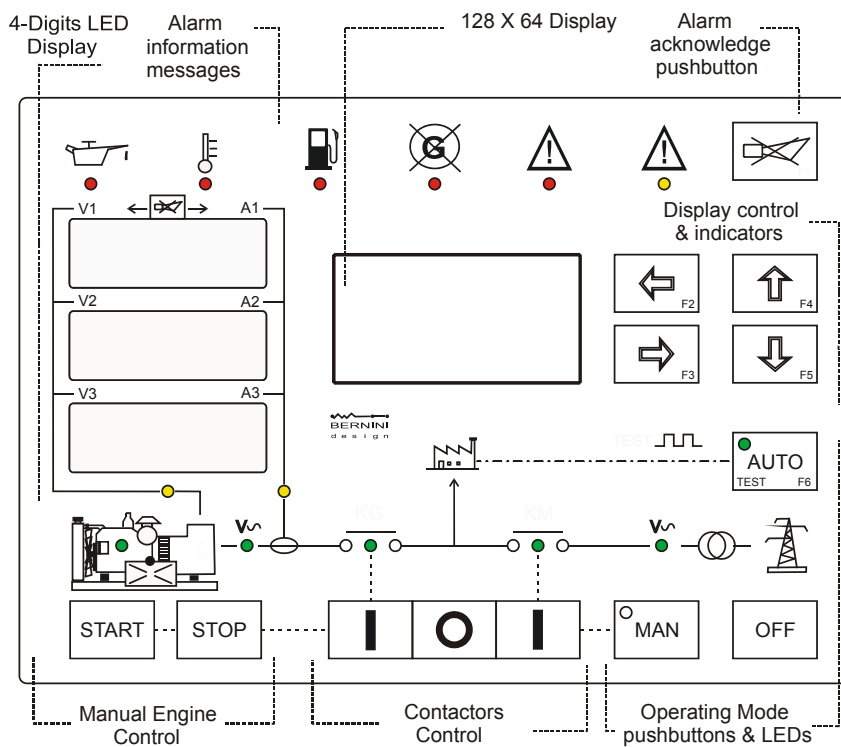
### 10.0 Application wiring diagram



### 10.1 Dual Genset application



### Section 11.0 Front Fascia



## 12.0 Programmable Parameters Table

<p><b><u>MAINS MONITORING</u></b></p> <ul style="list-style-type: none"> <li>-Mains Failure timing</li> <li>-Mains Breaker timing</li> <li>-Mains Restore timing</li> <li>-Contactors changeover timing</li> <li>-Over voltage &amp; delay</li> <li>-Under voltage &amp; delay</li> <li>-Under Hz limit &amp; delay</li> <li>-Over Hz limit &amp; delay</li> <li>-Phase Sequence monitoring</li> <li>-Phase Mode</li> <li>-PT ratio</li> </ul>	<p><b><u>ENGINE</u></b></p> <ul style="list-style-type: none"> <li>-Crank delay</li> <li>-Crank time</li> <li>-Rest time</li> <li>-Crank attempts</li> <li>-Pre-glow time</li> <li>-Pre-lube time</li> <li>-Pre-glow mode</li> <li>-Warm up time</li> <li>-Cooling down time</li> <li>-Stop Solenoid time</li> <li>-Crank termination Vdc</li> <li>-Belt break setting</li> <li>-Charger Failure</li> <li>-Crank termination Vdc</li> <li>-Crank termination Vac</li> <li>-Crank termination Hz</li> <li>-Crank termination CAN-BUS</li> <li>-Low Oil pressure warning / shut down</li> <li>-High Temperature warning / shut down</li> <li>-Low Temperature warning</li> <li>-Gas Purge</li> <li>-Idle Speed</li> <li>-Alarms bypass timing</li> <li>-Fail to stop enable</li> </ul>	<p><b><u>CLOCK &amp; TEST</u></b></p> <ul style="list-style-type: none"> <li>-Clock (Date)</li> <li>-Clock (Time)</li> <li>-Periodic Test enable</li> <li>-Test &amp; Date</li> <li>-Test &amp; time</li> <li>-Date &amp; Options</li> </ul>								
<p><b><u>AUTOSTART CONTROL</u></b></p>		<p><b><u>FUEL CONTROL</u></b></p> <ul style="list-style-type: none"> <li>-Low Fuel Warning %</li> <li>-High Fuel Warning %</li> <li>-Pump Start %</li> <li>-Pump Stop %</li> <li>-No Fuel bypass</li> <li>-Fuel Reserve</li> <li>-Delay settings</li> </ul>								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">VDC High limit</td> <td style="width: 50%; padding: 2px;">Temperature High</td> </tr> <tr> <td style="padding: 2px;">VDC Low limit</td> <td style="padding: 2px;">Temperature Low</td> </tr> <tr> <td style="padding: 2px;">MAINS failure</td> <td style="padding: 2px;">Remote Controls</td> </tr> <tr> <td style="padding: 2px;">Periodic Test</td> <td style="padding: 2px;">Exerciser</td> </tr> </table>	VDC High limit	Temperature High	VDC Low limit	Temperature Low	MAINS failure	Remote Controls	Periodic Test	Exerciser	<ul style="list-style-type: none"> <li>-Tooth count</li> <li>-Under Speed &amp; bypass delay</li> <li>-Over Speed &amp; bypass delay</li> <li>-Droop settings</li> </ul>	<p><b><u>OIL PRESSURE SENSOR</u></b></p> <p>Warning / Shutdown OHM / BAR 4-20mA, 0-5V, 0-10V, N.O. or N.C.</p>
VDC High limit	Temperature High									
VDC Low limit	Temperature Low									
MAINS failure	Remote Controls									
Periodic Test	Exerciser									
<p><b><u>GENERATOR</u></b></p> <ul style="list-style-type: none"> <li>-Under voltage &amp; delay</li> <li>-Over voltage &amp; delay</li> <li>-Under Frequency &amp; delay</li> <li>-Over Frequency &amp; delay</li> <li>-Warning current &amp; delay</li> <li>-Over current &amp; delay</li> <li>-Short Circuit &amp; delay</li> <li>-Max KW Warning &amp; delay</li> <li>-Min KW Warning &amp; delay</li> <li>-Over KVA Shutdown &amp; delay</li> <li>-Reverse power settings &amp; delay</li> <li>-Alternator failure settings</li> <li>-Alternator Poles</li> <li>-Earth Fault setting</li> <li>-Contactor Control</li> <li>-Phase sequence monitoring</li> <li>-Phase Mode</li> <li>-CT size</li> <li>-PT ratio</li> </ul>	<p><b><u>MISCELLANEOUS</u></b></p> <ul style="list-style-type: none"> <li>-EJP time</li> <li>-Test timeout</li> <li>-Maintenance 1 setting</li> <li>-Maintenance 2 setting</li> <li>-Maintenance 3 setting</li> <li>-NFPA - 110 Level 1&amp;2</li> <li>-RENT CONTRACT</li> <li>-Horn Timeout</li> <li>-Hour Counter set</li> <li>-Periodic Test</li> <li>-In field Calibration</li> </ul>	<p><b><u>FUEL SENSOR</u></b></p> <p>Warning / Shutdown</p> <p>OHM / %, 4-20mA, 0-5V, 0-10V, N.O. &amp; N.C.</p>								
<p><b><u>PROGRAMMABLE INPUTS</u></b></p> <p>30 options for each of the 5 inputs</p>		<p><b><u>3-TEMPERATURE INPUTS</u></b></p> <p>Warning / Shutdown</p> <p>OHM / °C 4-20mA, 0-5V, 0-10V, N.O. or N.C.</p>								
<p><b><u>PROGRAMMABLE OUTPUTS</u></b></p> <p>71 options for each of the 5 outputs</p>		<p><b><u>COMMUNICATION SETTINGS</u></b></p> <ul style="list-style-type: none"> <li>-Modem settings</li> <li>-Phone book programming</li> <li>-SMS editing</li> <li>-Rs485-MODBUS</li> <li>-Rs232 settings</li> </ul>	<p><b><u>SECURITY SETTINGS</u></b></p> <ul style="list-style-type: none"> <li>-Passwords</li> <li>-Calibration</li> <li>-Memory</li> <li>-Default settings</li> </ul>							
<p><b><u>CAN BUS SETTING</u></b></p> <p>Setting for Engine manufacturer and Can-bus options</p>										

## 13.0 Characteristics

- Supply Voltage: 5.5-36Vdc (120mA)
- Dimensions: 250X185X67(mm)
- Weight: 1400 gr.,
- Static Outputs: 300mA/100Vdc
- Digital Inputs: -100 / +100Vdc
- Charger Alternator: up to 36Vdc
- Rated Vac Max: 600Vac. Rated Aac Max: 7Aac
- Cut-out: 171mm X 239mm, indoor-outdoor operation
- Vibration: 40mm/sec.
- Operating / Storage Temperature: -30 / +70°C
- Humidity: 5% up to 95% non-condensing

Be-2K PLUS Design: 89/336 EEC, 89/392 EEC, 73/23 EEC, 93/68 EEC, IEC 68-2-6 Certification: CE

## 14.0 Front panel view

