

# BE26A OEM & USER manual

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## Warranty

Bernini Design SRL (hereinafter "BD") warrants that Be26A 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. BD shall return the Be26A to the buyer with the Default parameters at no extra charge. 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 Be26A 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 Be26A has not been used in accordance with the User Manual and other operating instructions, particularly if any defects are caused by misuse, improper repair attempts, or negligence in use or handling. This purchase is non-refundable.

**This equipment complies with the EMC protection requirements**



**WARNING!! High voltage is present inside the BE26A. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the grounding connection. The BE26A can start the engine at anytime. Do not work on equipment, which is controlled by the BE26A. When servicing engine disconnect the battery and disconnect the battery charger. It is recommended that warning signs be placed on equipment indicating the above.**

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## **1.0 Functional MODES**

The BE26A module is a controller for diesel-engine driven pumps for fire-fighting applications or for general purpose applications. The BE26A complies with NFPA-20 regulations. The BE26A operates in a NFPA-20 functional mode if the terminals JM5 and JM6 are open. By connecting the terminals JM5 and JM6 together, the BE26A operates in 'Engine Protection Functional Mode' (see sections 5.0 and 12.0). See table 1

TABLE 1: Functional Mode true table (see diagram in section 15.0 for wiring)

<b><u>NFPA-20 Functional Mode</u></b> (terminal JM5 and JM6 open)	<b><u>Engine Protection Functional Mode</u></b> terminal JM5 and JM6 connected together
the green LED 'NFPA-20' illuminates	the red LED 'Engine Protection' illuminates

The programmable parameters of the Be26A are described in the sections 7.0 and 8.0. The Be26A is delivered with factory setting parameters (hereinafter 'DEFAULTS'). Before using the unit, verify that the programmed parameters meet your requirements.

## **2.0 MODES of operation**

The key switch on the front panel has 3 positions 'AUTO'-'MAN'-'OFF'. In 'AUTO' mode, the Be26A starts and stops the engine according to the programmed parameters. Be26A monitors the status of the Pressure Switch (section 12.0) and Remote Test switch (section 13.0). The key of the key-switch is removable only in AUTO mode. The Be26A can operate in NFPA-20 mode (JM5-6 open), or Engine Protection Mode (JM5-6 connected together). The Be26A features 'START' and 'STOP' pushbuttons to control the engine manually. The modes of operation are remotely transmitted by means of dedicated outputs: JB2 (AUTO) and JB3 (MANUAL). External lamps or relays can be used for additional indications.

### **2.1 AUTO mode**

#### **Start cycle in NFPA-20 MODE (terminals JM5-6 open, green LED Master=ON)**

The engine starts in 'AUTO' in case of low water pressure. A pressure switch must be connected to the JC10 input. A programmable delay is provided by the parameter [0.5"] (see section 8.0). The BE26A initiates the start when the Pressure Switch opens. The engine will continue to run independently of the pressure switch status. In AUTO mode, it is possible to START the engine without delay by using a REMOTE TEST switch (input JM10). The engine stops when the contact of the REMOTE TEST switch opens. The Pressure Switch has priority over the REMOTE TEST.

#### **Stop cycle in NFPA-20 MODE**

To stop the engine, turn the KEY to OFF. The engine shuts down automatically only in case of OVERSPEED or EMERGENCY. The REMOTE TEST does not stop the engine if the pressure switch is open.

#### **Start cycle in Engine Protection MODE (JM5-6 connected together, red LED 'SLAVE'=ON)**

The engine will start in 'AUTO' if a loss of pressure occurs. To initiate an automatic engine start, a pressure switch must be connected to the JC10 input. A programmable delay is provided (parameter [0.5"], see section 8.0). The Be26A starts the engine when the Pressure Switch opens. The engine stops if the Pressure Switch closes. A programmable delay to stop the engine is provided (parameter [1.5"], see section 8.0). The REMOTE TEST can be used to start and stop the engine without delays.

## Stop cycle in Engine Protection MODE (JM5-6 connected together)

The engine stops in one of the following ways:

- Immediately, in case of ALARM (\*) (see section 5.0)
- After a delay, if the PRESSURE SWITCH (\*) closes the contacts
- Immediately, if the REMOTE TEST switch opens the contacts

(\*)Note. The BE26A can shutdown the engine according to parameters [L.07] and [I.01], as described in the section 8.0.

### **2.2 MANUAL mode**

To control the engine in manual, use the 'START' and 'STOP' pushbuttons. To select the MANUAL mode, turn the Key-Switch into MAN.

In accordance with the NFPA-20 standard, it is not possible to remove the key in MANUAL mode. The STOP button is always disabled in NFPA-20 MODE. To stop the engine, turn the key to OFF mode.

### **2.3 OFF mode**

If the key-switch is in the 'OFF' position, all operations of Be26A are inhibited, and the engine does not start. Turn the key-switch to OFF to cancel the alarms and stop the engine. In OFF mode, it is possible to program the parameters (see section 6.0). It is not possible to remove the key in OFF mode. In OFF mode, the display turns off automatically after a few seconds. To restore the display, push the [ALARM RESET] pushbutton: the display will indicate the HOUR METER.

### **2.4 TEST of the LAMPS (LED indicators)**

Turn the key to OFF. Push and hold for about 5 seconds the [ALARM RESET] pushbutton, the LEDs and DISPLAY will turn on. Release the button to turn off the indicators and display.

## **3.0 Front panel description**

The BE26A features a 3 digit display, pushbuttons, key-switch and Led indicators (see section 17.0). The display may indicate one of the following:

### **3.01 Program (hour meter)**

The display indicates the number of run hours. The resolution is 1 hour. When the count is over 999, a decimal point (on the right side of the display) will indicate that the indication has to be multiplied by 10. In order to clear the hour count, (e.g. after a replacement of the pump) push the 'STOP' and 'ALARM RESET' pushbutton simultaneously for at least 10 seconds in 'MAN' mode, until the message [dEL.] appears. If the number of running hours of the engine is over 9999 ([999.] on display) the counter will start to count from zero.

### **3.02 TIMER indications**

The display indicates the count down of the timers [0.5"] (delay to start) and [1.5"] (delay to stop, see section 8.0). The timers are programmable up to 9 minutes. The display indicates the time in the form [Minutes.Seconds].

### **3.03 Battery Alarm indications**

The display will indicate, in case of failure of the Battery set, the message [bt.1] or [bt.2]. The external low voltage relays must be connected to the JF4 and JF8 inputs (see section 4.0). The BE26A removes the message automatically if the battery returns to normal operating range.

### **3.04 Supply voltage**

To display the Vdc supply voltage, push the 'UP' and 'DOWN' pushbuttons simultaneously. In case of Low/High supply voltage, the display will blink.

### 3.05 Miscellaneous Alarm Messages

The display can indicate one of the following messages:

- [FUE]** Fuel alarm (see section 5.05)
- [FAL]** Starting alarm failure (see section 5.10)
- [dEL.]** Indicates clearing of the hour-meter (see 3.01)
- [AL 1]** Alarm1 alarm (see section 5.01)
- [O.SP]** Overspeed shutdown alarm (see section 5.02)
- [°C]** Temperature channel 1 or 2 (see sections 5.03, 5.06)
- [bt.1] [bt.2]** Battery alarm indication (see section 5.04)
- [no.b.]** Battery alarm indication (see section 5.04)
- [OIL]** Oil Pressure alarm (see section 5.08)
- [ALr]** Emergency shut down (see section 5.09)
- [ErX]** Memory failure indication (see section 5.13)
- [XX.X]** Blinking message. It indicates an alarm on the Vdc power supply (see section 5.11)

### 3.05 Miscellaneous Operating Messages


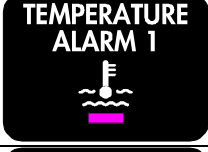

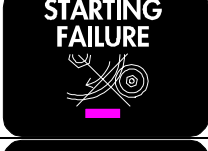


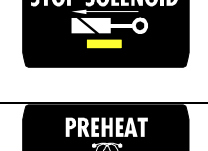

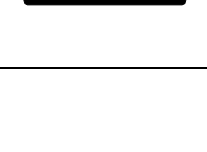
- [SAV.][Pr-][dEF]** Indicate programming functions (see section 6.0)
- [bAT.]** Indicates low power supply voltage (see section 5.11)
- [rSt]** Indicates the rest time in between the starting attempts (see parameter [7.15] in the section 8.0)
- [St 1][St 2]** Indicate the cranking cycle (see parameter [5.15] in the section 8.0)
- [StP]** Indicates the stop cycle (see parameter [3.30] in the section 8.0)
- [tSt]** Indicates the timing of the Automatic Test (see section 13.1)
- [idL]** Indicates the delay to crank the motor (see parameter [G.00] in the section 8.0)
- [uuu]** Indicates the Pre-glow (see parameter [F.00] in the section 8.0)
- [12=]** The BE26A detects a 12V battery on the power supply input (see section 5.11)
- [24=]** The BE26A detects a 24V battery on the power supply input (see section 5.11)

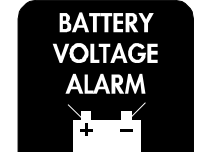
Current: Not used






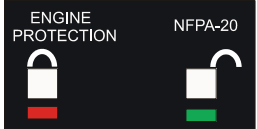
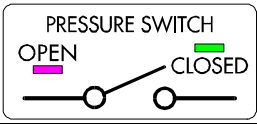

Voltage: Not used

Frequency: Not used

### 3.07 LEDs indicators

LED lamp	Description	Parameter	Terminal
	LOW OIL PRESSURE alarm (energised to ground). The input is ignored during the by-pass time (parameter [2.10]). In NFPA-20 mode the engine does not shut down. See section 5.08	[2.10] and [L.0]	In: JF9 Out: JC2/JB8 JE1-2-3
	TEMPERATURE ALARM 1 (energised to ground). It is possible to change the polarity of the contact by programming the parameter [I. 0]. In NFPA-20 mode the engine does not shut down. See section 5.03	[I.0] and [L.0]	In: JF3 Out: JC2/JB8 JE1-2-3
	TEMPERATURE ALARM 2 (energised to ground). It is possible to change the polarity of the contact by programming the parameter [I.0]. In NFPA-20 mode the engine does not shut down. See section 5.06	[I.0] and [L.0]	In: JF6 Out: JC2/JB8 JE1-2-3
	STARTING FAILURE indication. The alarm energises if the BE26A fails to fire the engine in AUTO mode of operation. See section 5.10	[5.15],[6.6] and [7.15]	Out: JC2/JB5 JE1-2-3
	ALARM 1 input (energised to ground). A 10 second by-pass delay after the engine start is provided. In NFPA-20 mode, the engine does not shut down. In Engine Protection Mode, the engine can shut down (section 8.0, [L.0] and section 5.01)	[L. 0 ]	In: JF1 Out: JC2 JE1-2-3
	Not used.		
	It illuminates during the STOP cycle. The timer is programmed in the parameter [3.30].	Parameter [3.30]	Out: JC4
	It illuminates during the PreGlow cycle only in Engine Protection Mode (parameter [F.0]). In NFPA mode the timer is inhibited.	Parameter [F.0]	Out: JC3
	This LED illuminates when the FUEL SOLENOID relay output is energised in order to allow the engine to run.		Out: JC8

Led lamp	Description	Parameter addr.	Terminal
	BATTERY VOLTAGE ALARM. Optical indication of low / high voltage power supply (terminals JI-12V or JI-24V). It indicates the failure of the Battery sets. See sections 5.11 e 5.04		In: JI12, JI24 Out: JC2 JE1-2-3

	LOW FUEL alarm. It provides an optical warning in NFPA-20 mode. In Engine Protection Mode, the engine shuts down if the alarm persists for 5 minutes; the message <b>[FUE]</b> will be displayed and the red LED 'No Fuel in the Tank' will illuminate (see below)		In: JF5  Out: JC2 JE1-2-3
	Indicates that the engine has been stopped because of a low level fuel alarm (see above) See section 5.05		
	The ENGINE RUN LED illuminates if the voltage applied to the terminals JM3 and JM4 is higher than the threshold determined by the rear trimmer (adjustable from 3 V to 14V as described in the section 11.0).		In: JM3, JM4 Out: JB1 JE4-5-6
<b>V ON</b>	Indication for the presence of the Vac auxiliary voltage (voltage sensing relay connected to the JF7 input as described in the section 5.0).		In: JF7 Out: JC2 JE1-2-3
<b>V OFF</b>	Indication for the absence of auxiliary voltage. The alarm occurs if JF7 is grounded (see section 5.07).		In: JF7, Out: JC2 JE1-2-3
<b>OVER SPEED</b>	Indicates the OVER SPEED shutdown. A speed sensing relay must be connected to the input. (see section 5.02)		In: JF2 Out: JC2 JE1-2-3
	Indication of an Emergency stop. The red LED illuminates, also, if the user pushes the front panel 'STOP' pushbutton in 'AUTO' mode (see section 5.09)		In: JF10  Out: JC2 JE1-2-3
	NOT USED		NOT USED
	The green LED 'NFPA-20' indicates the NFPA-20 mode (terminals JM5-6 opened). The red LED 'ENGINE PROTECTION MODE' indicates the Engine Protection Mode (terminals JM5-6 connected).		JM5-6
	Indication of the status of the line pressure switch: green=closed, red= open. If the switch opens, a start cycle of the engine will take place in AUTO mode of operation.	Parameters [0.5"] and [1.5"]	In: JC10
	Silences the HORN in MANUAL mode of operation. The button is inhibited in NFPA-20 mode.	Parameter [4.ct.]	In: various Out: various

#### **4.0 TERMINAL DESCRIPTION**

The section 15.0 shows the wiring diagram. The description of the terminals follows:

#### **J1 POWER SUPPLY**

The BE26A should be connected to a Battery (or Batteries) according to the following:  
12V BATTERY JI-3=12V PLUS, JI-2=MINUS (7-16Vdc)  
24V BATTERY JI-1=24V PLUS, JI-2=MINUS (15-33Vdc)

## **JF1 ALARM1**

This input must be connected to an external alarm switch. The Be26A triggers the alarm when the JF1 terminal is grounded. A time of 10 seconds is provided to bypass the alarm once the engine has started. The alarm is indicated by means of a red LED on the front panel (see section 3.07) and by means of the message [AL1] on the display. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm can shut down the engine according to the code of the parameter [L. 7] (see section 8.0). In NFPA-20 Mode, the engine cannot be shut down ([L. 0]).

## **JF2 OVERSPEED**

This input must be connected to an external speed sensitive relay. The engine shuts down immediately if the JF2 terminal is grounded. The alarm is indicated by means of a red LED on the front panel (see section 3.07). To clear the alarm turn the KEY-SWITCH in OFF. The alarm status is repeated on the static output JB4.

## **JF3 TEMPERATURE CHANNEL 1**

The Be26A triggers the alarm when the JF3 terminal input is activated according to the Temperature Switch polarity (see section 8.00 parameter [I.00]). The alarm is indicated by red LED on the front panel (see section 3.07). The contact switch is by-passed [2.10] seconds (see section 8.0) during the starting sequence. To clear the alarm turn the KEY-SWITCH in OFF. The alarm can shut down the engine according to the programming of the parameter [L. 7] (see section 8.00). In NFPA-20 Mode the engine does not shut down. The alarm status is repeated on the static output JB8.

## **JF4 BATTERY 1 FAILURE**

This input must be connected to an external sensing voltage relay to detect the failure of the first set of battery. In case of battery failure, the BE26A continues the cycle of attempts by using the second group of batteries. The alarm is indicated by means of the message [bT.1] on the display. To clear the alarm, turn the KEY-SWITCH in OFF.

## **JF5 LOW LEVEL FUEL**

This input must be connected to a level switch. The engine shuts down if the contact input remains closed for at least 5 minutes. The alarm is indicated by means of a yellow LED on the front panel (see section 3.07). When the engine shuts down, the message [FUE] will appear on the display, and the LED NO FUEL IN THE TANK will energize. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB6. In NFPA-20 mode the engine does not shut down.

## **JF6 TEMPERATURE CHANNEL 2**

The Be26A triggers the alarm when the JF6 terminal input is activated, according to the Temperature Switch polarity (see section 8.00 parameter [I.00]). The engine does not stop in NFPA-20 mode. The alarm is indicated by a red LED on the front panel (see section 3.07). During the starting sequence, the contact switch is bypassed by the parameter [2.10] (see section 8.0). To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB8.

## **JF7 AUX VAC FAILURE**

This input must be connected to an external sensing voltage relay to detect the failure of the AC supply. The alarm is indicated by two LED on the front panel (see section 3.07). To clear the alarm turn the KEY-SWITCH in OFF. The alarm does not shut down the engine.

## **JF8 BATTERY 2 FAILURE**

This input must be connected to an external sensing voltage relay able to detect the failure of the second set of battery. In case of failure of the battery set 2, the Be26A continues the cycle of attempts by using the first group of batteries. The alarm is indicated by the message [bt2] on the display. To clear the alarm, turn the KEY-SWITCH to OFF.

## **JF9 OIL PRESSURE SWITCH**



This input must be connected to a normally closed pressure switch. The Be26A triggers the alarm if the JF9 is grounded when the engine is running. The contact switch is by-passed by the parameter [2.10] (see section 8.0) during the starting sequence. The alarm is indicated by a red LED on the front panel (see section 3.07). The engine cannot be stopped in NFPA-20 mode. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB8.

#### **JF10 EMERGENCY STOP**

This input must be connected to an external emergency switch. The engine shuts down immediately, independently of the mode of operation. The Be26A triggers the alarm if the JF10 is grounded. The alarm is indicated by a red LED on the front panel (see section 3.07) and by the message [ALr] on the display. To clear the alarm turn the KEY-SWITCH in OFF.

#### **JC1 START 2 OUTPUT**

This relay output energises the START PILOT RELAY connected to the BATTERY SET 2.

#### **JC2 ALARM HORN OUTPUT**

This relay output energises in case of an alarm. An external horn should be connected to this output. To silence the horn in Engine Protection MODE, push the [ALARM-RESET] push button. To silence the HORN in NFPA-20 MODE, turn the key switch to OFF.

#### **JC3 PREGLOW OUTPUT**

This relay output energises according to the setting of the parameter [F.00]. The setting '00' inhibits the pre glow. In NFPA-20 mode, the output is always inhibited.

#### **JC4 STOP SOLENOID OUTPUT**

This output energises to stop the engine. A programmable time (see parameter [3.30]) is provided. A solenoid, energised to stop, should be connected to this output via a pilot relay. When the stop cycle is in progress, the message [STP] appears on the display.

#### **JC5 NOT USED**

#### **JC6 START 1 OUTPUT**

This output energises the START PILOT RELAY connected to the BATTERY SET 1.

#### **JC7 +V BATTERY SUPPLY**

This terminal is the positive common for the relay output contacts and must be connected to the Battery Plus.

#### **JC8 FUEL SOLENOID OUTPUT**

This relay energises the FUEL SOLENOID to run the engine via a pilot relay. The output shuts down in order to stop the engine.

#### **JC9 NOT USED**

#### **JC10 LINE PRESSURE SWITCH INPUT**

This input will be connected to a pressure switch. When the contact opens the BE26A triggers a timer (see parameter [0.5"], section 8.0). As soon as the timer expires, the BE26A will initiate the starting cycle. According to the mode of operation, (NFPA or Protection Engine Modes) the pressure switch can stop the engine (see section 12.0)

#### **JB1 ENGINE RUNNING OUTPUT**

This output energises to indicate that the engine is running. An external lamp for visual indication, or a relay for remote indication, can be connected to this output (see wiring diagram on section 15.0).

**JB2 AUTO MODE OUTPUT indication**

This static output indicates that the BE26A is in AUTO mode. An external lamp for visual indication, or a relay for remote indication, will be connected to this output (see wiring diagram in section 15.0).

**JB3 MANUAL MODE OUTPUT indication**

This static output indicates that the BE26A is in MANUAL mode. An external lamp for visual indication, or a relay for remote indication, can be connected to this output (see wiring diagram on section 15.0).

**JB4 OVERSPEED ALARM OUTPUT**

This static output energises in case of OVERSPEED alarm. An external lamp for visual indication, or a relay for remote indication, can be connected to this output (see wiring diagram on section 15.0).

**JB5 FAIL TO START INDICATION OUTPUT**

This static output indicates that the BE26A has failed to start the engine. An external lamp for visual indication, or a relay can be connected to this output (see wiring diagram on section 15.0).

**JB6 FUEL RESERVE INDICATION OUTPUT**

This static output indicates that the BE26A detected a low level in the FUEL TANK. An external lamp for visual indication, or a relay, will be connected to this output (see wiring diagram on section 15.0).

**JB7 NOT USED**

**JB8 OIL or TEMPERATURE ALARM INDICATION**

This static output indicates LOW OIL PRESSURE alarm, or HIGH TEMPERATURE alarm. An external lamp for visual indication, or a relay, can be connected to this output (see wiring diagram in section 15.0).

**JB9 NOT USED**

**JB10 +V BATTERY SUPPLY**

This terminal will be connected to the V+ supply of the BE26A (12Vdc or 24Vdc). A fuse of 500mA should be externally provided.

**JM1 D+ OUTPUT 12V**

This output provides current to supply the 12V Charger Alternator. Connect JM1 and JM3 together with the terminal D+/W.L. of the Alternator for a proper engine running indication.

**JM2 D+ OUTPUT 24V**

This output provides current for 24V Charger Alternator. Connect JM2 and JM3 together with the terminal D+/W.L. of the Alternator for a proper engine running indication.

**JM3 ENGINE RUNNING PLUS INPUT**

Connected to the D+/W.L. terminal of the Charger Alternator. If a Flywheel alternator is used, connect this terminal to one side of the generator winding. In NFPA-20 mode, a contact energised to +V battery will be connected to terminate the crank (see section 11.0).

**JM4 ENGINE RUNNING MINUS INPUT**

This input is normally connected to ground if belt driven charger alternator is used. In a Flywheel alternator is used, connect this terminal to one side of the generator winding.

### **JM5-JM6 NFPA-20 or Engine Protection Mode**

Connect the terminals JM5-6 together to select the Engine Protection Functional Mode. Leave the terminals open to obtain the NFPA-20 Mode.

See section 8.0 for the settings of the above functional modes.

### **JM7 - JM8 - JM9: Not Used**

### **JM10 REMOTE TEST INPUT**

This input should be connected to an external switch in order to test the engine in AUTO mode. The BE26A will monitor the Remote Test as follows:

#### NFPA-20 Mode:

- if the input is grounded, the BE26A starts the engine immediately
- if the input is opened, the BE26A stops the engine immediately
- in case of alarms the Engine Test will be ignored. The alarm(s) must be cancelled by operator intervention.
- during the Engine Test period, the engine will continue to run even in case of an alarm, according to TABLE 2 (see section 5.0)
- if an alarm shuts down the engine, the Pressure Switch can restart the engine automatically (except in cases of STARTING FAILURE, OVERSPEED or EMERGENCY)

#### Engine Protection Mode:

- if the input is grounded, the BE26A starts the engine immediately
- if the input is opened, the BE26A stops the engine immediately
- during the Engine Test period, the BE26A monitors the alarms according to the parameters [I.01] and [L.7] (see section 8.0)
- in case of alarms, the Engine Test will be ignored. The alarm(s) must be cancelled by operator intervention.
- if an alarm shuts down the engine, the Pressure Switch cannot restart the engine. The alarm(s) must be cancelled by operator intervention.

### **JE1-2-3 ALARM RELAY OUTPUT**

The relay energize in case of alarm. The connections of the contacts follows:

JE-1 ALARM OUTPUT n.o. contact

JE-2 ALARM OUTPUT common contact (8A-250V contact rating)

JE-3 ALARM OUTPUT n.c. contact

We recommend that you use a 3A (fast blow) fuse to protect the contacts

### **JD4-5-6 ENGINE RUNNING RELAY OUTPUT**

The relay energize when engine is running. The connections of the contacts follows:

JD-1 ALARM OUTPUT n.o. contact

JD-2 ALARM OUTPUT common contact (8A-250V contact rating)

JD-3 ALARM OUTPUT n.c. contact

We recommend that you use a 3A (fast blow) fuse to protect the contacts

## **5.0 ALARM DESCRIPTION**

If an alarm occurs, the BE26A activates the HORN (connected to the output JC2). The BE26A features a relay alarm output (JE1-2-3, see section 15.0), and JB4-JB5-JB6-JB8 static outputs. In accordance with NFPA-20 regulation or Engine Protection Modes, the BE26A can shut down the engine (see section 1.0). The following true table indicates the differences between NFPA-20 and Engine Protection Mode:

<b>NFPA-20 Functional Mode (**)</b>	<b>Engine Protection Mode</b>
Terminal JM5-JM6 not connected	Terminals JM5-JM6 connected together
The engine does not shut down in case of: -Alarm1 .....input JF1 -Low Oil Pressure .....input JF9 -High Temperature .....input JF3 JF6 -Pressure Restore.....input JC10 -Belt break.....input JM3-4	The engine can shut down (*) in case of: -Alarm1 .....input JF1 -Low Oil Pressure .....input JF9 -High Temperature .....input JF3 JF6 -Water Pressure Restore....input JC10 -Belt break.....input JM3-4

(\*) the programmable parameter [L] (section 8.0) provides options to shut down the engine. In order to cancel an alarm, wait until the end of the stop cycle, and turn the KEY to OFF. A detailed description of each alarm follows.

(\*\*) In NFPA-20 mode the engine shuts down only in case of: EMERGENCY, OVERSPEED and Fail to Start

### 5.01 ALARM 1

The alarm energises when the JF1 terminal input is grounded. The alarm will be ignored for 10 seconds from the starting of the engine. The alarm is indicated by red LED on the front panel (see 3.07) and by the message [AL.1] on the display. To clear the alarm turn the Key-switch in OFF. The alarm can shut down the engine according to parameter 'L' (see section 8.0). In NFPA-20 Mode, the engine cannot be shut down.

### 5.02 OVERSPEED

The engine shuts down immediately if the JF2 terminal input is grounded. The alarm is indicated by means of a red LED on the front panel (see 3.07), and by the message [O.SP] on the display. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB4.

### 5.03 TEMPERATURE CHANNEL 1

This alarm energises if the JF3 terminal input is activated. The alarm is indicated by a red LED on the front panel (see 3.07), the message [ °C] on the display, and by the output JB8. The contact switch is ignored during the starting sequence (parameter '2', see section 8.0). To clear the alarm, turn the Key-Switch to OFF. The alarm can shut down the engine according to parameter [L.xx] (see section 8.0). In NFPA-20 Mode, the engine cannot shut down. The polarity of the contact can be selected by the parameter [I.00] (see section 8.0).

### 5.04 BATTERY 1 - 2 FAILURE

In case of failure of the battery set 1 or 2, the BE26A indicates the message [bt.1] and [bt.2] on the display. The BE26A does not shut down the engine. If the battery returns within the operating limits The Be26A removes the message from the display.

### 5.05 LOW LEVEL FUEL

This alarm is indicated by means of a yellow LED on the front panel (see 3.07). The engine does not shut down in NFPA-20 Mode. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB6. In engine protection mode the engine shuts down after a delay of 5 minutes. The display will indicate the message [FUE], and the red LED 'NO FUEL ' will energise.

## 5.06 TEMPERATURE CHANNEL 2

This alarm energises if the JF6 is activated. The engine does not stop in NFPA-20 mode. The contact switch is by-passed by means of the parameter [2.XX] (see section 8.0) during the starting sequence. The alarm is indicated by a red LED on the front panel, (see 3.07) and by means of the message [°C] on the display. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB8. The polarity of the contact can be selected according to the parameter [I.XX] (see section 8.0).

## 5.07 AUXILIARY VAC FAILURE

This alarm indicates, by means of an external voltage relay, the failure of the AC supply. The alarm is indicated by two LEDs on the front panel (see 3.07). To clear the alarm, restore the AC supply and turn the KEY-SWITCH to OFF.

## 5.08 LOW OIL PRESSURE

This input must be connected to a normally closed pressure switch. The alarm energises if the JF9 is grounded when the engine is running. The contact switch is ignored during the starting sequence (parameter [2.XX], see section 8.0). The alarm is indicated by a red LED on the front panel (see 3.07), and by the message [OIL] on the display. The engine does not stop in NFPA-20 mode. To clear the alarm, turn the KEY-SWITCH to OFF. The alarm status is repeated on the static output JB8.

## 5.09 EMERGENCY STOP

The alarm indicates an emergency stop request from the JF10 input or from the STOP pushbutton. The engine shuts down immediately. The alarm is indicated by a red LED (Remote Stop) on the front panel (see section 3.07), and by means of the message [ALr] on the display. To clear the alarm, open the emergency contact input, and turn the KEY-SWITCH to OFF.

## 5.10 FAIL TO START

The alarm energises if the BE26A fails to start the engine. The BE26A will activate the static output JB5, the red LED 'STARTING FAILURE' and the message [FAL]. An external lamp for visual indication, or a relay for remote indication can be connected to the output JB5 (see wiring diagram in section 15.0).

## 5.11 LOW VOLTAGE POWER SUPPLY

The BE26A is powered by a DC source. When on, the BE26A detects the kind of source: 12V or 24V. Push the 'UP' and 'DOWN' pushbuttons simultaneously to display the voltage. In case the voltage falls or rises above the following limits, the display will blink.

a) 11V to 15 for 12V supply - b) 22 to 30V for 24V supply

## 5.12 CHARGER ALTERNATOR FAILURE (BELT BREAK)

The BE26A monitors the Charger Alternator in Engine Protection Mode only. The BE26A can shut down the engine according to the setting of the parameter [I.01], [I.11] (see section 8.0). The alarm is indicated by the message [bLt]. The connections for the Charger Alternator (JM1-2-3) are described in the section 4.0.

## 5.13 [ErX] Memory Error

This message may appear after the power on, if DATA corruption has occurred in the memory. The BE26A will use default parameters (factory settings) to guarantee full operation.

The value X can assume the following values:

[Er.1] – Parameter error / [Er.2] – Hours counter error / [Er3]---[Er9] – Memory failure.

To recover the memory, follow the instructions:

- 1) – remove the connection between JM5-JM6 (if connected together)
- 2) – cancel the memory as indicated in the section 6.02
- 3) – Select the Functional Mode (NFPA-20 or Engine Protection) according to your needs

## 6.0 Programming instruction

The section 7.0 lists the programmable parameters. The left digit of the display indicates the address of the parameter, and the two digits on the right side indicate the parameter value. The following table shows some examples. In NFPA-20 Mode, it is not possible to modify the parameter indicated with (^)

Display indication	Address of the parameter	Parameter setting (meaning)
[0.5"]	Parameter '0'	5 (seconds)
[4.ct.] (^)	Parameter '4'	ct. (Continuous Mode)
[L. 0] (^)	Parameter 'L'	0 (code 0)
[1.3']	Parameter '1'	3 (minutes)

### 6.01 - To enter the PROGRAM MODE use the following instructions:

- A) - turn the key-switch to 'OFF' and wait for the end of the stop cycle
- B) - press the STOP and ALARM RESET pushbuttons simultaneously until the message [Pr-] appears.
- C) - press the UP or DOWN pushbutton to select the parameter on the display.
- D) - press the STOP and UP (or DOWN) pushbuttons simultaneously to modify a parameter
- E) - turn the Key-Switch in MAN or AUTO mode: the BE26A will store the parameters; the message [SAV.] will appear on the display. If the voltage supply is <11V, the message [bAt.] will appear to indicate that it is not possible to save the parameters. If the message [ErX] appears repeat the programming (see note 3 at the end of this section).

### 6.02 Default parameters (factory settings):

The BE26A is delivered with factory programmed values (Default). To use the Defaults, use the following instructions:

- a) - turn the key-switch to the 'OFF' position, enter the programming (see 6.01)
- b) - press UP and DOWN pushbuttons simultaneously until the message [dEF.] appears (see Note1-2).
- c) - turn the Key-Switch to 'MAN' mode: the BE26A will store the parameters; the message [SAV.] will appear on the display.

**Note 1: the BE26A will use the NFPA-20 parameters if the green LED NFPA-20 is on.**

**Note 2: the BE26A will use the Engine Protection parameters if the red ENGINE PROTECTION is on.**

### 6.03 Memory reset:

To reset the memory use the following instructions:

- a) Verify that the supply voltage is over 11V; remove the power supply.
- b) Turn the key switch to OFF mode.
- c) Push and hold the 'ALARM RESET' push button. Connect the supply and wait until the messages [CAL], [MEM], [Ini] and [MEM.] appear. The sequence lasts for about 15 seconds.
- d) Release the 'ALARM RESET' push button and remove the supply for 5 seconds.
- e) Connect the power supply. If the message [Er.X] appears on the display, the BE26A should be returned for repair.
- f) Adjust the setting of the parameter according to your needs as described in the section 6.0

**7.0 Parameters table** *(In this table the factory settings are listed on the left side)*

0.5''	Delay time before starting the engine:1 to 59 seconds or 1-99 minutes			
1.ct.	Delay time before stopping the engine: 1 to 59 seconds, 1-99 minutes or c.t. (no-stop mode),			
2.10	Low Oil Pressure and Temperature Alarms bypass timing (0 to 99 seconds)			
3.30	Energised to Stop solenoid:10 to 99 seconds			
4.ct.	Alarm output control:1 to 98 seconds or continuous mode ([ct.]			
5.15	Cranking up time: 1 to20 seconds			
6. 6	Number of Starting attempts 1 to 10			
7.15	Rest time (in between the attempts) 3 to20 seconds			
8.--	9.--	Not used		
A.--	Periodic start 1-99 days	6.5'	Periodic run time 1-99 minutes	
C.--	C.--	d.--	E.--	Not used
F. 0	Pre-Glow timing 0 to 99 seconds			
G. 5.	Crank Delay 0 to15 seconds			
H.--	h.--	Not used		
1.00	Belt break enable and Temperature Switch polarity selection (see section 8.0)			
L. 0	Alarm enable programming (see section 8.0)			

**8.0 Parameters description** (The defaults of the NFPA-20 mode are indicated in the 'Display' column)



Display	Parameter	Display	Parameter
<b>0.5"</b>	<b>Delay time to start the engine</b> Default: 05 seconds 1-59seconds or 1- 99 minutes The timer starts counting when the Pressure Switch (input JC10) opens. The display shows the count down in the form [Minutes.Seconds].	<b>7. 15</b>	<b>Rest time</b> Default: 15 seconds (NFPA) Default: 05 seconds (E.P.M.) 3-20seconds Time interval between starting pulse attempts
<b>1.ct.</b>	<b>Delay time to stop the engine</b> Default: ct. (NFPA) Default: 05 seconds 1-59seconds or 1-99 minutes The timer starts counting when the Pressure Switch (input JC10) closes. The display indicates the count down in the form [Minutes.Seconds]. The setting [ct.] disables the stop of the engine when pressure restores.	<b>8.--</b>	<b>Not used</b>
<b>2.10</b>	<b>Low oil pressure and Temperature 1-2 by-pass time</b> Default: 10 seconds 0 to 99 seconds Bypass time to ignore the Low Pressure Oil input alarm.	<b>9.--</b>	<b>Not used</b>
<b>3.30</b>	<b>Energised to Stop solenoid timing</b> Default: 15 seconds 10 to 99 seconds Timer to control the "stop solenoid"	<b>A.--</b>	<b>Periodic start</b> Default: -- (inhibit) 1 to 99 days Days between periodic tests of the engine. The [--] disables the function.
<b>4.ct. (^)</b>	<b>HORN output control</b> Default: [ct.](continuous, no timeout) 1 to 98 seconds By programming the code [ct.], the alarm output resets only by using the 'ALARM RESET' button.	<b>b.5'</b>	<b>Periodic run-time</b> Default: 5 minutes 1 to 99 minutes Timer to run the engine during the periodic scheduled test.
<b>5. 15</b>	<b>Cranking up time</b> Default: 15" (NFPA) Default: 6" (E.P.F.M.) 1 to 20 seconds Enabling time for starter. The timer is reset if the engine starts before the programmed time.	<b>c.--</b>	<b>Not used</b>
<b>6. 6</b>	<b>Starting attempts</b> Default: 06 attempts (NFPA) Default: 03 attempts (E.P.F.M) 1 to 10 Number of automatic attempts during automatic start cycle	<b>C.--</b>	<b>Not used</b>

(^) NOTE: it is not possible to modify these parameters if the BE26A is in NFPA-20 functional mode (terminal JM5 and JM6 not connected together)

Display	Parameter	Display	Parameter																																				
<b>d.--</b>	<i>Not used</i>	<b>h.--</b>	<i>Not used</i>																																				
<b>E.--</b>	<i>Not used</i>	<b>I.00</b> (^^)	<p><b>Belt break enable/Temp. switch</b>  Default: 00 (NFPA)  Default: 01 (Engine Protection Mode)  00, 01, 10, 11 Code  The BE26A monitors the Temperature alarm and Belt-break alarm according to the following true table.</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Temperature Switch polarity</th> <th>Belt break alarm</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>N.O.</td> <td>Disabled</td> </tr> <tr> <td>01</td> <td>N.O.</td> <td>Enabled</td> </tr> <tr> <td>10</td> <td>N.C.</td> <td>Disabled</td> </tr> <tr> <td>11</td> <td>N.C.</td> <td>Enabled</td> </tr> </tbody> </table> <p>N.O. : Open contact when temperature is normal (no alarm).  N.C. : Closed contact when temperature is normal (no alarm).</p>	Code	Temperature Switch polarity	Belt break alarm	00	N.O.	Disabled	01	N.O.	Enabled	10	N.C.	Disabled	11	N.C.	Enabled																					
Code	Temperature Switch polarity	Belt break alarm																																					
00	N.O.	Disabled																																					
01	N.O.	Enabled																																					
10	N.C.	Disabled																																					
11	N.C.	Enabled																																					
<b>F. 0</b> (^)	<p><b>Preheat time</b>  Default: 0  0 to 99 seconds  Engine pre-heat time before cranking.</p>	<b>L. 0</b> (^)	<p><b>Shut downs selection table</b>  Default: 0 (NFPA)  Default: 7 (Engine Protection Mode)  The BE26A shuts down the engine according to the following true table. The NFPA-20 Mode forces the code to [0] (no stop, no shutdown).</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Alarm1</th> <th>Low oil Pressure Temperature</th> <th>Pressure Restore</th> </tr> </thead> <tbody> <tr> <td><b>0</b></td> <td>no stop</td> <td>no stop</td> <td>No stop</td> </tr> <tr> <td><b>1</b></td> <td><b>Stop</b></td> <td>no stop</td> <td>No stop</td> </tr> <tr> <td><b>2</b></td> <td>no stop</td> <td><b>Stop</b></td> <td>No stop</td> </tr> <tr> <td><b>3</b></td> <td><b>Stop</b></td> <td><b>Stop</b></td> <td>No stop</td> </tr> <tr> <td><b>4</b></td> <td>no stop</td> <td>no stop</td> <td><b>Stop</b></td> </tr> <tr> <td><b>5</b></td> <td><b>Stop</b></td> <td>no stop</td> <td><b>Stop</b></td> </tr> <tr> <td><b>6</b></td> <td>no stop</td> <td><b>Stop</b></td> <td><b>Stop</b></td> </tr> <tr> <td><b>7</b></td> <td><b>Stop</b></td> <td><b>Stop</b></td> <td><b>Stop</b></td> </tr> </tbody> </table> <p>*Pressure restore=pressure switch closed.</p>	Code	Alarm1	Low oil Pressure Temperature	Pressure Restore	<b>0</b>	no stop	no stop	No stop	<b>1</b>	<b>Stop</b>	no stop	No stop	<b>2</b>	no stop	<b>Stop</b>	No stop	<b>3</b>	<b>Stop</b>	<b>Stop</b>	No stop	<b>4</b>	no stop	no stop	<b>Stop</b>	<b>5</b>	<b>Stop</b>	no stop	<b>Stop</b>	<b>6</b>	no stop	<b>Stop</b>	<b>Stop</b>	<b>7</b>	<b>Stop</b>	<b>Stop</b>	<b>Stop</b>
Code	Alarm1			Low oil Pressure Temperature	Pressure Restore																																		
<b>0</b>	no stop			no stop	No stop																																		
<b>1</b>	<b>Stop</b>	no stop	No stop																																				
<b>2</b>	no stop	<b>Stop</b>	No stop																																				
<b>3</b>	<b>Stop</b>	<b>Stop</b>	No stop																																				
<b>4</b>	no stop	no stop	<b>Stop</b>																																				
<b>5</b>	<b>Stop</b>	no stop	<b>Stop</b>																																				
<b>6</b>	no stop	<b>Stop</b>	<b>Stop</b>																																				
<b>7</b>	<b>Stop</b>	<b>Stop</b>	<b>Stop</b>																																				
<b>G. 5</b>	<p><b>Cranking delay time</b>  Default: 5  0 to 15 seconds</p> <p>The BE26A energises the fuel solenoid and cranks the engine after a programmable delay, allowing the electronic controller (governor) of the Engine to power up.</p>																																						
<b>H.--</b>	<i>Not used</i>																																						

**(^)** NOTE: it is not possible to modify these parameters in NFPA-20 Mode

**(^^)** NOTE: in NFPA-20 Mode, the BE26A allows only the options [I.00] or [I.10]

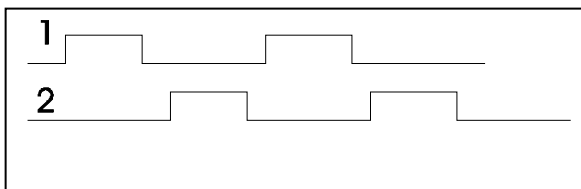
### 9.0 Starting cycle

For safety reasons, the BE26A supports two independent battery circuits. While performing several starting attempts, the BE26A switches from one battery system (from one crank motor) to another, so as not to exhaust one system too much.

Start 1 drives the electric **Start pulses are alternated until the engine has been successfully started**

motor supplied by the first battery system.

Start 2 drives the electric motor supplied by the second battery system.



### **10.0 Engine running detect**

The green LED 'RUN', indicates that the engine is running and the starter motor is disabled. The crank must be terminated when the engine reaches its ignition speed in a way to protect the starter from damage. When the engine is not running, the alternator voltage is 0V. By starting the engine, a DC current of approx. 200mA flows into the D+ terminal. The engine is not running but, a voltage of approx. 0.8 to 1.5V appears. The Voltage of the Charger Alternator rises as soon the engine begins to run due to cranking. When the engine reaches its ignition speed (crank termination moment), the alternator voltage rises to 10V-12V. The factory setting to stop the starter motor is 8V.

If the engine is running at nominal speed, the alternator voltage output is approx. 14V (28V for 24V battery systems). Section 11.0 describes how to calibrate the Crank termination.

### **11.0 Engine running Calibration**

Use the following procedure:

- A) Turn the key-switch to 'MAN' position.
- B) Turn the trimmer T1 (near the terminal JM4-5, see section 16.0) to fully c.c.w.
- C) Push the 'START' push-button until the engine starts
- D) Rotate slowly clock wise until the green LED 'RUN' on the front panel illuminates.
- E) Verify the stability of the LED light 'RUN'
- F) Stop the engine by pressing the 'STOP' button.
- G) Disconnect the FUEL SOLENOID, then push and hold the 'START' pushbutton in order to crank the engine continuously. If the LED 'RUN' illuminates during cranking, turn the rear trimmer c.c.w. until the LED turns off.
- H) Connect the fuel solenoid.
- I) Turn the key to AUTO, and start the engine using the ENGINE TEST input. Check to see that the BE26A has disconnected the starter motor properly.

**NOTE: in fire-fighting application (NFPA-20), a speed sensitive relay should be connected to the JM4-5 input. You may not use the Charger Alternator supply to detect Crank Termination.**

### **12.0 Line Pressure Switch Monitoring**

In AUTO mode, the BE26A monitors the status of the Pressure Switch (JC10 input) as follows:

#### **12.01 NFPA-20 Mode**

The status of the Pressure Switch of the water is indicated by 2 LEDs. A green LED indicates a normal condition (pressure ok) and the a red LED indicate no pressure in the system.

- If the switch remains open for at least the programmed time, (see section 8.0, parameter '0') the BE26A starts the engine.
- After starting, the engine will continue to run even if the switch closes.
- The engine will continue to run even in case of alarm (see section 5.0).
- In case of STARTING FAILURE, OVERSPEED or EMERGENCY, the engine shuts down. The alarm(s) must be cancelled manually.

#### **12.02 Engine Protection Mode:**

The status of the Pressure Switch of the water is indicated by 2 LEDs. A green LED indicates a normal condition (pressure ok) and the a red LED indicate no pressure in the system.

- If the switch remains open for at least the programmed time, (see section 8.0, parameter '0') the BE26A starts the engine

- After starting, if the switch remains close for at least the programmed time, (see section 8.0, parameter '1') the BE26A can stop the engine (see the options of the parameter 'L' in the section 8.0).
- If the engine shuts down, in case of alarm, you have to restart the engine.
- The engine can continue to run in case of alarm only if allowed by programming (see TABLE 2, section 5.0)

### **13.0 Remote test**

A switch connected to the JM10 terminal controls the start-stop cycle of the engine. External On/Off switches, level switches or timers can be connected. The engine starts and stops immediately. The TEST can be performed only in AUTO mode of operation.

#### **13.01 NFPA-20 Mode**

- If the input is grounded, the BE26A starts the engine immediately.
- If the input is opened, the BE26A stops the engine immediately.
- In case of alarms, the Engine Test will be ignored. The alarm(s) must be cancelled by operator intervention.
- During the Engine Test period, the engine will continue to run even in case of alarm according to TABLE 2 (see section 5.0).
- If an alarm shut down the engine, the Pressure Switch can restart the engine automatically (except in cases of STARTING FAILURE, OVERSPEED or EMERGENCY).

#### **13.02 Engine Protection Functional Mode:**

- If the input is grounded, the BE26A starts the engine immediately.
- If the input is opened, the BE26A stops the engine immediately.
- During the Engine Test period, the BE26A monitors the alarms according to the parameters [I.01] and [L.7] (see section 8.0).
- In case of alarms, the Engine Test will be ignored. The alarm(s) must be cancelled by operator intervention.
- If an alarm shuts down the engine, the Pressure Switch cannot restart the engine. The alarm(s) must be cancelled by operator intervention.

#### **13.1 Automatic Periodic Test**

To set-up the Automatic Periodic Test, program the parameters [A.--] and [b.5"] as indicated in the section 8.0. The parameter [A.XX ] indicates the number of days between tests, and the parameter [b.XX] indicates the number of minutes to run the engine. The timer that counts the days starts to count when the power supply is applied.

To see the count down of the timer turn the key to AUTO, and, if the engine is not running, press the ALARM RESET: the display will show the message [tSt] for a short time, and the message [DAYS.HOURS] at the end.

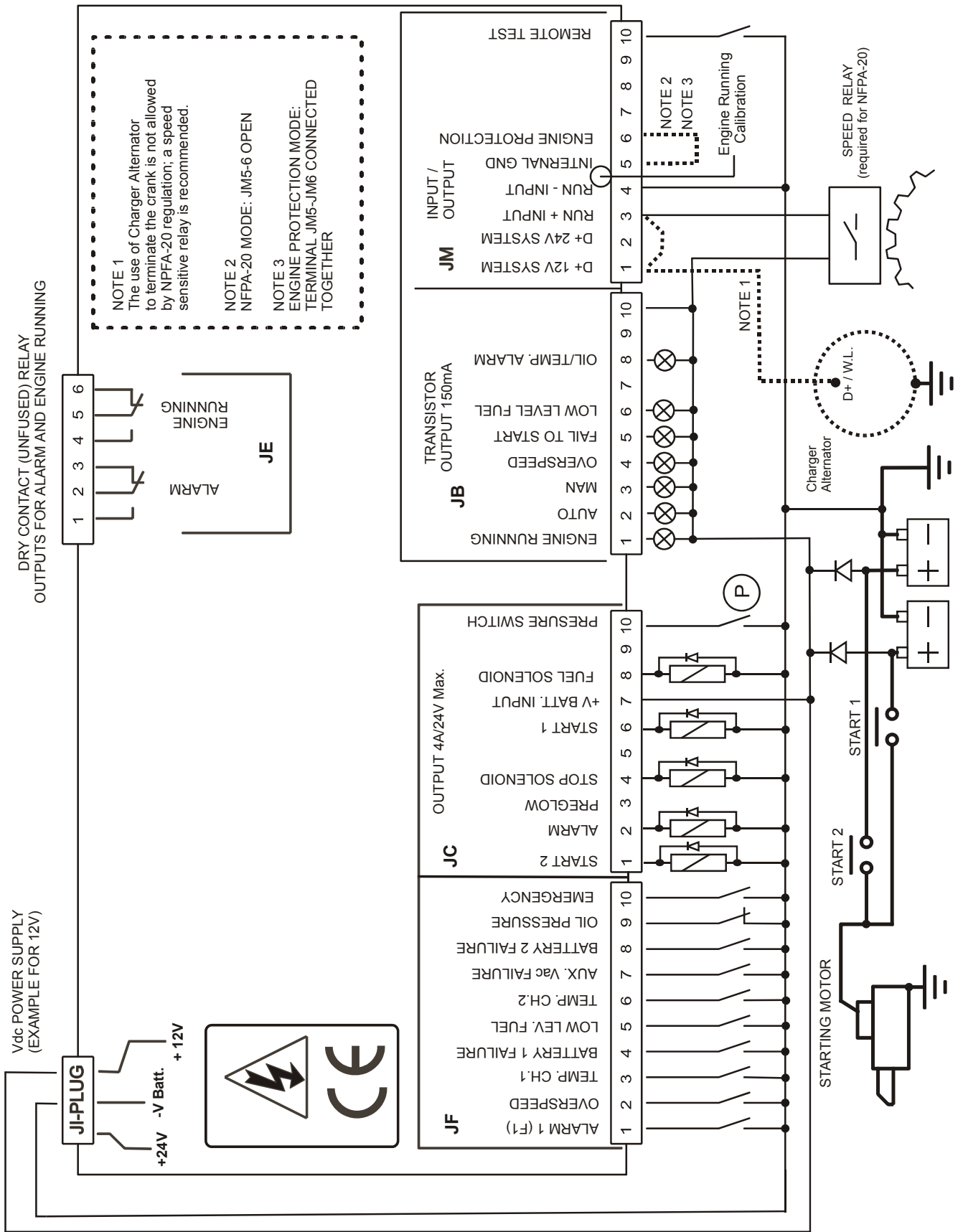
The timing accuracy is +/- 0.5% (within +/-8 min/day). If a better accuracy is required, an external clock-switch should be connected to the REMOTE TEST input.

### **14.0 General characteristics**

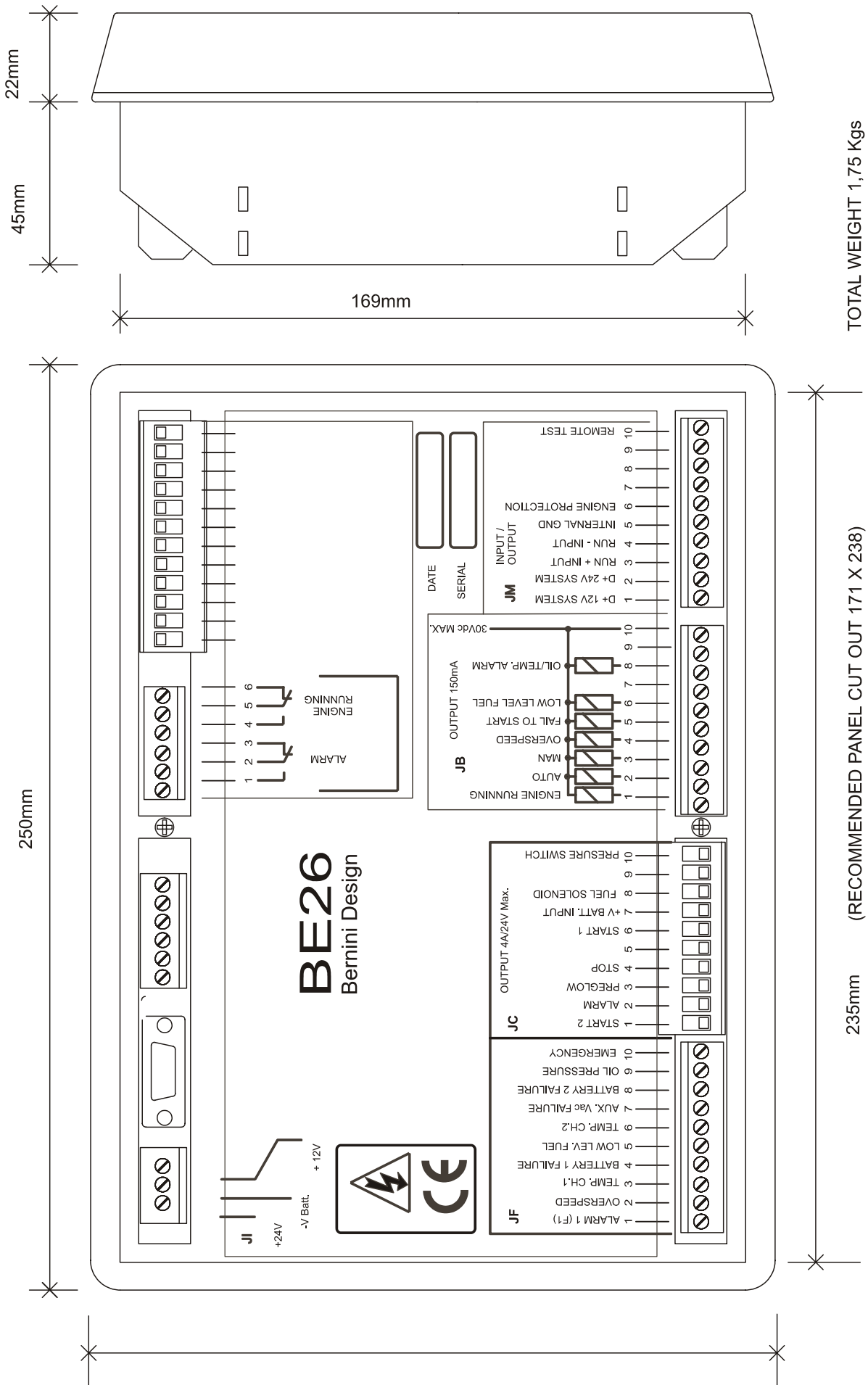
SUPPLY .....	7Vdc to 36Vdc, 40 to 150 mA
STATIC OUTPUTS .....	12,24V/150 mA
RELAY OUTPUTS .....	4A/12 to 24Vdc
DIGITAL INPUTS .....	contacts closed to ground
DYNAMO/CHARGE ALTERNATOR.....	2,5W 12Vdc or 24Vdc
DIMENSION and WEIGHT .....	250x185x67, hole: 237x171, weight:1250gr
OPERATING TEMPERATURE.....	-30°C to 70°C (R.H. 95%)
VIBRATION.....	8G @ 10ms (10-100Hz)
DISPLAY ACCURACY.....	+/- 1%, +/- 1 LSD(least significant digit)

DESIGN .....EN 50081-1-2, 50082-1-2, UNI 9490, NFPA-20, CE mark

# Section 15.0 Typical wiring diagram



Section 16.0 Rear view and dimensions



## Section 17: Front Panel view

