



DST4600A

User's Manual

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1. General Information

The board DST4600A, included into a special electric switchboard, is able to control the automatic intervention of a generator set, to monitor it during the operation and to keep it in the best possible conditions while inactive, in order to assure a quick and safe intervention in the event of power failure. It works with both three- and single-phase systems.

1.1 Definitions

Throughout this document the word “BLOCK” is used to indicate an alarm that makes generation function impossible and causes the automatic generator shutdown with the emergency procedure (without cooling cycle).

The word “DEACTIVATION” is used to indicate an alarm that makes generation function impossible and causes the automatic generator shutdown with the normal procedure (with cooling cycle).

The word “ALARM” is used to indicate a warning that requires an operator action but doesn't require the automatic generator shutdown.

Throughout this document the words “SOFTWARE” and “FIRMWARE” are used as synonymous if they are referred to the board firmware.

Software code is reported in short format on the board back panel. It is in the form xx.yy.uu, where xx is the firmware short identified code, yy is the major version number and uu is the minor version number.

The complete SW identification number for the standard DST4600A is **EB0220008yyuu** reported in back panel as (for example) **8.00.22**.

The complete SW identification number for the DST4600A/P is **EB0220012yyuu** reported in back panel as (for example) **12.05.22**.

The complete SW identification number for the DST4600A for asynchronous engines is **EB0220029yyuu** reported in back panel as (for example) **29.07.39**.

The minor version is consistent between the two types of software (**uu** field is kept aligned).

The major version for the DST4600A/P is increased by **5** respect the standard version.

The major version for the DST4600A for asynchronous engines is increased by **7** respect the standard version.

Thus the SWs **08.00.39**, **12.05.39** and **29.07.39** share the same main features and functions.

1.2 Symbols

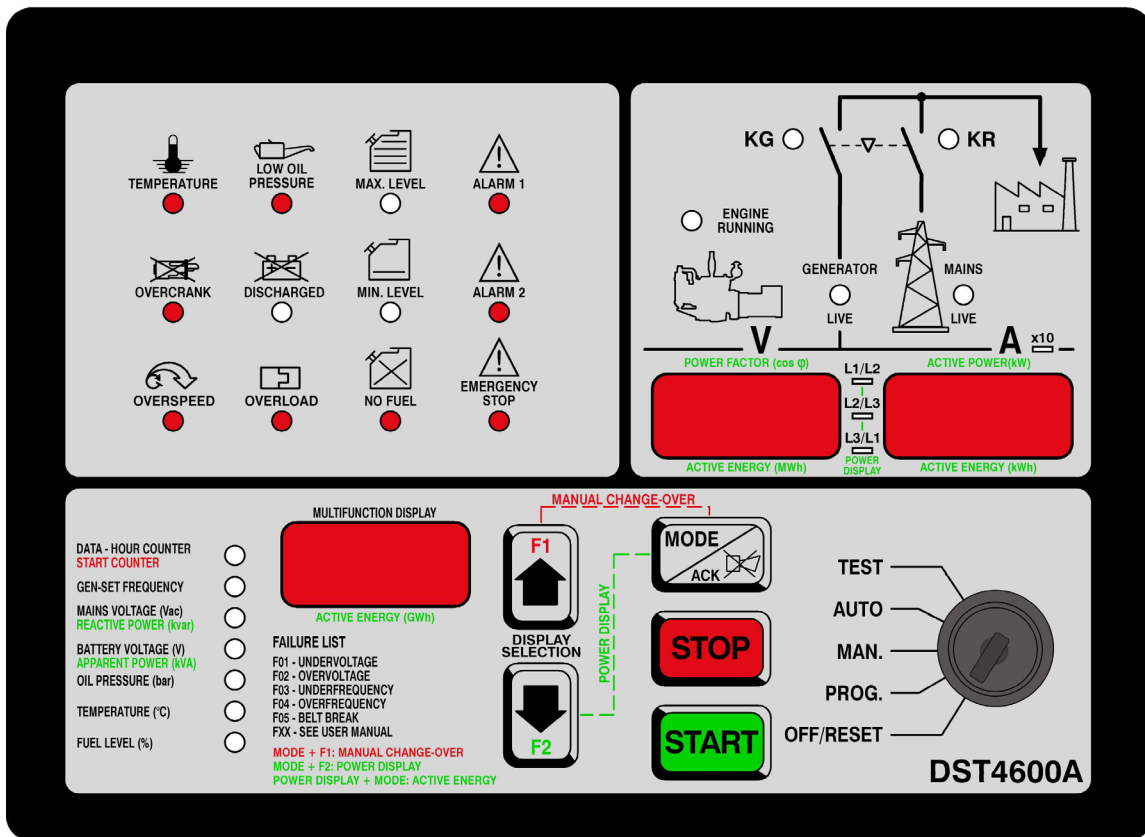
In this document a vertical bar on the right margin or a gray background indicates that the chapter or the paragraph has been amended with respect to the last document's version.

1.3 Document validity

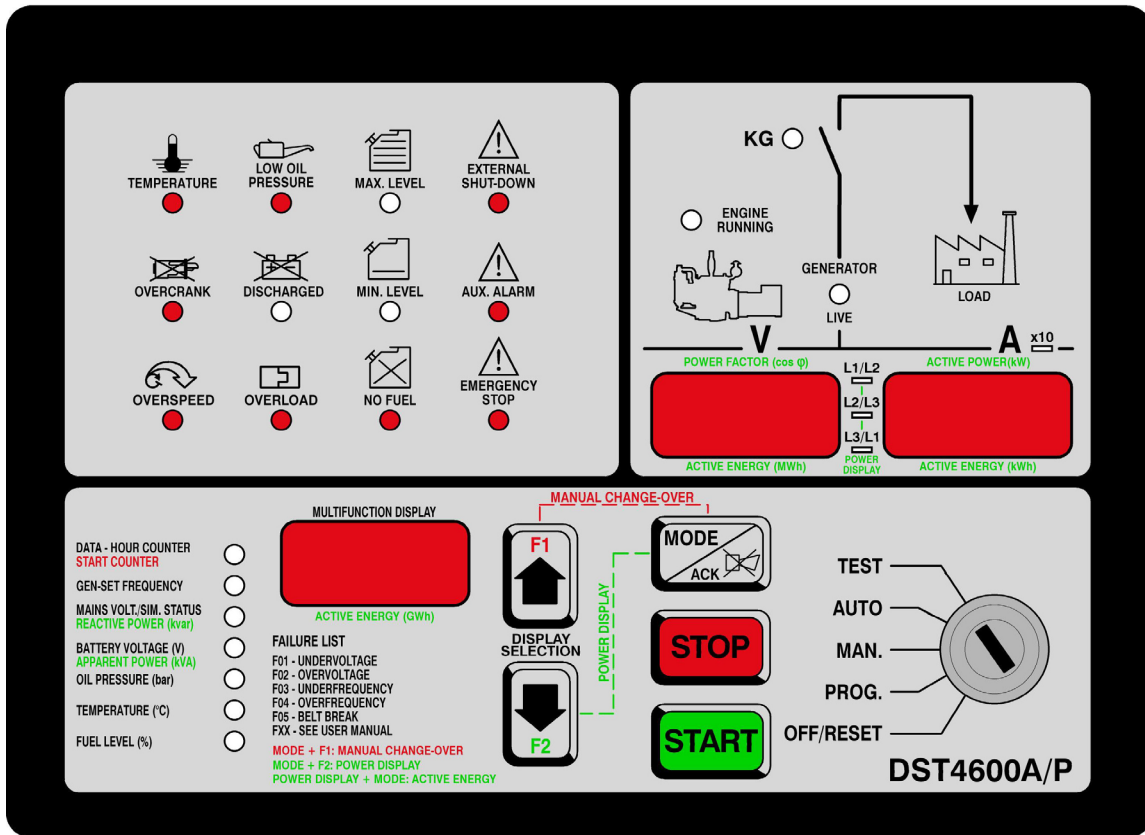
This manual is valid starting from SW **00.38** release; for previous SW release, please check manual version 09 or previous. Otherwise use this version very carefully checking document version notes on page ii.

If the SW version number is greater than this, this manual maybe nevertheless consistent; please in case check for new document release.

2. Front Panel



DST4600A and DST4600A/P front panels.



The front part of the board is made by a polycarbonate panel, oil- and solvent-resistant with the identifying symbols and inscriptions. There are two slightly different front panels. The DST4600A front panel is the standard one. The DST4600A/P front panel is used mainly for switchboard for parallel application; the boards with the DST4600A/P panel have different part number.

“/P” version assigns a special meaning to the followings signals:

- “ALARM 1” signal means “EXTERNAL SHUTDOWN”
- “ALARM 2” signal means “AUX ALARM”
- “MAINS VOLTAGE” signal means “MAINS VOLT./SIM. STATUS »

Substantially, the panel is divided into the three operational areas as described below.

2.1.1 Operating and Functions Controls Area

This area can be functionally further divided in two different areas.

2.1.1.1 **Operating area**

It corresponds to the right bottom part of the front panel. It groups all the available control units. It includes:

- A button (“START”) for the manual starting of the generator set engine. The manual start can be executed only with the key selector on MAN. This button, alone or combined with the others, can also take other meanings during some particular procedures not directly related with the management of the generator set (programming, calibration, etc.).
 - A button (“STOP”) for the manual shutdown of the generator set engine. The manual shutdown can be executed only with the key selector on MAN. By pressing this button with the key selector in other working positions (AUTO or TEST) the engine shutdown will be executed through the emergency procedure (see the faults management). This button, alone or combined with the others, can also take other meanings during some particular procedures not directly related with the management of the generator set (programming, calibration, etc.).
 - A button (bearing the symbol of a siren, from now on called “MODE / ACK”) for the faults’ acknowledgement and the consequent muting of the audible alarm and to reset the alarms, too. This button, alone or combined with other buttons, can also have other meanings.
 - Two buttons (bearing the symbols of two arrows, from now on called “F1” and “F2”) used to select what to show on the display “MULTIFUNCTION” (see par.2.1.1.2). These buttons, alone or combined with other buttons, can also have other meanings.
 - A key selector allowing to select the board’s controlling mode of the generator set’s operation: OFF/RESET - PROGRAMMING - MANUAL - AUTOMATIC – TEST. The key can be extracted only in the positions OFF/RESET and AUTOMATIC. Here follows a short description of the operating modes:
 - a) OFF/RESET: in this mode the board is on, but all the functions for the control and the running of the generator set are disabled. It is used in all the cases in which the intervention of the generator set is not required (i.e. in order to prevent unnecessary automatic interventions during the closing periods of a factory etc.) and above all as a safety position during the maintenance. Actually, when the selector is on OFF/RESET, the control device is completely disabled and therefore the generator set cannot intervene in the event of mains voltage failure. The mains contactor is forced at work therefore the users are powered by the mains (if it’s present). The monitoring of the mains status, of the engine and of the generator are anyway enabled and the indicators belonging to the “functional status and measurements” area mirror such conditions.
By switching the selector to “OFF/RESET” the following operations are executed:
 - 1) Activation of the engine shutdown sequence
 - 2) Forced control of mains power supply
 - 3) Reset of any stored fault causing the generator set shutdown
- When the board is in the “OFF/RESET” mode the direct current consumption is reduced to a minimum since the displays show only a central dash, while all the signals are off except the indicator “KR” (turned on, only for SW type 08) as well as the indicators “ENGINE RUNNING”, “GENERATOR LIVE” and “MAINS LIVE” showing respectively the engine, the generator and the mains status (normally only the indicator “MAINS LIVE” is turned on).

- b) PROG. (PROGRAMMING): in this mode the board behaves exactly as in the “OFF/RESET” mode but with the opportunity to view and/or change the value of the parameters configuring the operating sequences of the generator set (see par. **Errore. L'origine riferimento non è stata trovata.** for the programming procedure and par. 5 for the operating sequence).
- c) MAN. (MANUAL): in this mode the board is set to manage the manual running of the generator set. In short:
 - 1) The procedures for the manual starting and shutdown of the engine are enabled, while those for the automatic starting and shutdown of the engine are disabled (therefore the board will never automatically start the engine).
 - 2) It is possible to manual operate the power changeover on the generator set through an explicit command of the operator (if the generator is ready to supply, of course). In MAN, the board will never execute such switching automatically.

When the selector is switched on “MAN”, the engine keeps its status (running/dead).

- d) AUTO (AUTOMATIC): this is the normal operating mode of the board. In this mode the engine is automatically started/stopped in case of mains failure or at regular intervals to keep it efficient. In the same way, the power changeover is automatically switched on mains or on the generator according to their status.
Warning: when the selector is on this mode any maintenance of the generator set and/or on the electric switchboard is forbidden.
- e) TEST: this mode allows starting the generator set keeping all the functions for the management of the changeover as in the AUTOMATIC mode. By switching the selector on TEST, a series of starting attempts will be executed (automatically, the operator will not have to press “START”), **independently** from the mains status. In the same way, by quitting the TEST mode (for the AUTOMATIC mode), if the mains is present the engine will stop (with the usual cooling cycle). Normally, in the TEST mode the users are switched on the mains. They can be switched on the generator set (if it is ready to supply) only in the following two cases:
 - 1) Mains failure
 - 2) Explicit command of the operator (in order to test the entire system, not only the generator set).

For the SW version **12** (/P boards), KG is activated in the TEST mode if the generator is ready to supply power. It can be deactivated by manual command.

2.1.1.2 Functions Area

In this area is located a digital display (called display “MULTIFUNCTION”) showing the measurements of various quantities that can be selected through the buttons “F1” and “F2” and indicated to the operator through the corresponding indicators.

The available quantities are:

- “DATA – HOURS COUNT / START COUNTER”: by selecting this function the display “MULTIFUNCTION” normally shows the number of operating hours of the generator set engine. The hours count doesn’t consider if the users are connected to the generator but the condition of engine running only. By keeping pressed the button “MODE / ACK”, you can view the number of starts of the engine (the number refers to the performed starts, not to the start attempts). As soon as “MODE / ACK” is released the engine’s operating hours can be viewed again. The corresponding indicator is turned on when the display shows the engine’s operating hours, while it flashes when the number of starting attempts is viewed. If the number of starts of the operating hours exceeds 999, the number is divided by 10 and displayed with a decimal point on the right digit. It is possible to program (through the parameter P50) a number of operating hours for the engine after which maintenance has to be carried out. When the hour-counter reaches or exceeds such parameter (NB: it is set by tens of hours) in order to signal the maintenance request the number of operating hours will flash alternatively to the message “SER” (with the selector on MAN, AUTO and TEST the function to view the operating hours is automatically selected after 60 seconds without pressing any button). This condition stays until the hour-counter is reset or until the value of the Parameter P50 is changed (by increasing it or by forcing it to 0). Both the counters are reset with a common operation (they cannot be reset separately):
 - By pressing the “F1” and “F2” select the “DATA – HOURS COUNT / START COUNTER” function
 - Switch the key selector to OFF_RESET.
 - Press at the same time “MODE / ACK” and “STOP” for 5 seconds. After 5 seconds the counters will be reset. The display does not indicate the reset in any way; therefore the operator has to count the 5 seconds.

There is another hour counter. It cannot be cleared in any way. Its value is not shown on the DST4600A front panel, but can be read by the serial port.

- “GEN-SET FREQUENCY”: when this function is selected, the display “MULTIFUNCTION” shows the frequency measured on the phase L1 (terminal 63) of the generator (in Hz with a decimal).
- “MAINS VOLTAGE (Vac) / (MAINS VOLT./SIM STATUS) / REACTIVE POWER (kvar)”: when this function is selected, the display “MULTIFUNCTION” shows one of the phase-to-phase voltages measured by the board, according with the status of the indicators “L1/L2”, “L2/L3” and “L3/L1” located between the displays “A” and “V”:

-	Indicator	“L1/L2”	turned	on:	phase	R-S
-	Indicator	“L2/L3”	turned	on:	phase	S-T
-	Indicator	“L3/L1”	turned	on:	phase	T-R

If the board is programmed not to use the internal mains sensor, display shows “---”. If the board is programmed to use the internal mains sensor and the input “MAINS SIMULATION” (terminal 24) is enabled, the indicator “MAINS VOLTAGE (Vac) / REACTIVE POWER (kvar)” flashes. If the board is supplied with the power measurement option and if the displays “V” and “A” are showing the active power and the power factor (POWER DISPLAY FUNCTION), the display “MULTIFUNCTION” shows the reactive power (in this case, the measure could blink if at least one of the

current measure circuits of the board is saturated, that means that the current is higher than the TA nominal value).

- “BATTERY VOLTAGE (V) / APPARENT POWER (kVA)”: when this function is selected, the display “MULTIFUNCTION” indicates the voltage measured on the battery (terminals 47-48 or 49-48) (in Volts with a decimal). If POWER DISPLAY FUNCTION is active, the display indicates the apparent power (in this case, the measure could blink if at least one of the current measure circuits of the board is saturated, that means that the current is higher than the TA nominal value).
- “OIL PRESSURE (bar)”: when this function is selected, the display “MULTIFUNCTION” shows the engine’s oil pressure measured on the analogue sensor (terminal 42) (in Bars with a decimal). If the sensor isn’t configured (P47=0), the display will show three dashes (“---”).
- “TEMPERATURE (°C)”: when this function is selected, the display “MULTIFUNCTION” shows the cooling water temperature measured on the analogue sensor (terminal 43) (in °C). If the sensor isn’t configured (P46=0), the display shows three dashes (“---”).
- “FUEL LEVEL (%)”: when this function is selected, the display “MULTIFUNCTION” shows the fuel level in the tank measured on the analogue sensor (terminal 45) (percentage). If the sensor isn’t configured (P48=0), the display will show three dashes (“---”).

Under particular conditions, during the operation the display “MULTIFUNCTION” can show messages having no relation with the selected function. In this situation, all indicators related to display “MULTIFUNCTION” are turned off. In detail, the messages are the following:

- “STA” during a starting attempt, that is when the output “START” (terminal 20) is activated.
- “PRE” during the preheating phase preceding the starting attempt in diesel engines, that is when the “PREHEAT OUTPUT” (“AUX OUTPUT 1”, terminal 15) is activated.
- “SER” signals that the generator set requires field service maintenance.
- “F01” in presence of the deactivation for generator’s voltage under the minimum threshold (“UNDERVOLTAGE”).
- “F02” in presence of the block for generator’s voltage over the maximum threshold (“OVERVOLTAGE”).
- “F03” in presence of the deactivation for generator’s frequency under the minimum threshold (“UNDERFREQUENCY”).
- “F04” in presence of the block for generator’s frequency over the maximum threshold (“OVERFREQUENCY”).
- “F05” in presence of block for belt break (“BELT BREAK”).
- “F06” in presence of block for maximum current supplied by the generator (“OVERCURRENT”).
- “F07” in presence of block for “STOP” pressed in the AUTOMATIC or in the TEST mode.
- “F08” in presence of block for operating condition not reached.
- “F09” in presence of alarm for data error in the non-volatile memory
- “ F10” in presence of alarm from “INPUT ‘B’” (terminal 13)

- “F11” in presence of block for “ENERGY INVERSION”
- “F12” in presence of block for “INHIBITION OF THE GENERATOR SET USE”
- “F13” in presence of alarm “KR CLOSE FAILURE”
- “F14” in presence of alarm “KG CLOSE FAILURE”
- “F16” in presence of alarm “SHORT CIRCUIT”
- “F21” in presence of block for “SHUTDOWN FAILURE”
- “F40” if the “engine in threshold” signal is missing while KR is closed (for asynchronous engine version only)
- “F49” in presence of alarm for “MAX POWER”
- “F50” in presence of block for “BOARD FAULT”

During the shutdown cycle the display “MULTIFUNCTION” alternates, every two seconds, the message “STO” with the message it would display if the shutdown cycle was not in progress.

2.1.2 Operating Conditions and Measurements Area

In this area (right top of the front panel) is displayed the status of the generator set and of the mains. The following signals are provided:

- Indicators “KG” and “KR” (green): indicate the status of the contactors managing the power changeover. The indicator “KR” is not present for SW type 12 (/P boards). If the green indicator is turned on the corresponding external connected contactor is closed. The external connected contactors can never be both closed, while they can be both open during the switching. The default configuration shows the KG and KR command status, not the actual status. However it is possible to configure the board to use two inputs to monitor the status:
 - “INPUT A” (terminal 14) for KG status
 - “INPUT C” (EXTERNAL OVERSPEED default configuration) (terminal 12) for KR status

Connect the proper terminal to ground when KG or KR is activated.

When this function is enabled the indicators “KG” and “KR” work in a different way:

- OFF: the contactor is open
- ON: the contactor is closed
- Flashing at 50% duty cycle: the contactor is open but the command is on
- Flashing at 90% ON: the contactor is closed but the command is off
- Indicator “ENGINE RUNNING” (green): it indicates the status of the engine of the generator set. It takes the following meanings:
 - Turned off: engine shut down
 - Flashing: engine cooling (this condition occurs only in the AUTOMATIC mode).
 - Turned on: engine running

- Indicator “GENERATOR LIVE” (green): it indicates the status of the generator set. It takes the following meanings:
 - Turned off: the generator doesn't produce any voltage.
 - Flashing: The generator is living but some of the parameters (voltages on one or more phases or frequency) are not within the programmed tolerance limits, therefore the users cannot be switched on it.
 - Turned on: The generator is living and all its parameters are within the programmed tolerance limits, therefore it is possible to switch the users on it.
- “MAINS LIVE” indicator (green): It indicates the mains status. It takes the following meanings:
 - Turned off: mains failure.
 - Flashing: the mains is present but the voltage on one or more phases is not within the limits of the programmed tolerance thresholds, therefore if the users are currently switched on the generator, they will have to stay on it.
 - Turned on: the mains is present and within the programmed tolerance limits, therefore the users can be switched on it.

NB: the board has an input (“MAINS SIMULATION”, terminal 24) that can be used to inhibit the automatic operation of the genset. If this digital input is activated, independently from what has been acquired with the mains sensor, the engine is not automatically started.

Furthermore, there are two digital displays (each of them having 3 digits) to show the electric quantities measured on the generator. The left display (**called display “V”**) shows the generator's voltages (phase-to-phase for three-phase systems, phase-to-neutral for single-phase systems) Volts. The right one (**called display “A”**) shows the phase currents in Amperes. The view format changes according to the set TA ratio (P17):

- P17 < 10: the currents are displayed with two decimals
- P17 >=10 and <100: the currents are displayed with one decimal
- P17 >=100: the currents are displayed without any decimal. If the current measurement exceeds 999 Ampere, it is displayed divided by 10 and the indicator “X10” (yellow), located over the display “A” turns on.

If the current measured (in the board side of TA) is higher then 5 Amperes, the display “A” blinks to indicate lower measure precision.

If the board is supplied with the power measurement option it is possible to view the power factor (indicated by “POWER FACTOR (cos ϕ)”) on the display “V” and the active power (indicated by “ACTIVE POWER (kW)”) on the display “A” (POWER DISPLAY FUNCTION). Furthermore, it is possible to view the energy meter (kWh on the display “A” and MWh on the display “V”). All these measures will blink if at least one of the current measurement circuits of the board is saturated (see description at the previous paragraph).

Three yellow indicators (called “L1/L2”, “L2/L3” and “L3/L1”) located between the two displays are also present. They indicate to which phase the measurements displayed in any moment refer. On single-phase systems the voltage and the current of the only present phase are always displayed, therefore the indicator “L1/L2” is always turned on, while the “L2/L3” and “L3/L1” are always off. On three-phase systems, the three phases are periodically alternated every 4 seconds on the displays and the indicators “L1/L2”, “L2/L3” and “L3/L1” show the current phase. However, it is possible to force the display of one phase only even on three-phase systems by pressing at the same time the buttons “F1” and “F2” when the displays

show the quantities relating to the phase one intends to force: the phases scanning will be interrupted and will start again when the two buttons “F1” and “F2” will be pressed at the same time again.

2.1.3 Faults Area

This area (top left of the front panel) contains all the indicators for the generator set's common faults. Here follows a short description of the indicators, for a more detailed description of all the faults, see paragraph 6. At the fault acquisition, the corresponding indicator flashes, by pressing the “MODE / ACK” button it stops flashing to indicate that the operator acknowledge it.

- Indicator “TEMPERATURE” (red): it indicates the alarm or block status due to the high cooling water temperature. The indicator flashes at a different speed to indicate an alarm (more quickly) or a block (more slowly, as for all other blocks). It can be acquired from:
 - Digital input “WATER WARNING” (terminal 10)
 - Digital input “WATER. ALARM” (terminal 09)
 - Analogue input “TEMPERATURE” (terminal 43)
- Indicator “LOW OIL PRESSURE” (red): it indicates the alarm or block status due to the low oil pressure of the engine. The indicator flashes at a different speed to indicate an alarm (more quickly) or a block (more slowly, as for all other blocks). It can be acquired from:
 - Digital input “OIL WARNING” (terminal 08)
 - Digital input “OIL P. ALARM” (terminal 07)
 - Analogue input “OIL PRESSURE” (terminal 42)
- Indicator “MAX LEVEL” (yellow): It indicates the alarm status due to the maximum fuel level in the tank. It can be acquired from:
 - Digital input “HIGH LEVEL FUEL” (terminal 04)
 - Analogue input “FUEL LEVEL” (terminal 45)
- Indicator “ALARM1” (“EXTERNAL SHUTDOWN”) (red): it indicates the non-masked general block status. It can be acquired from:
 - Digital input “ALARM 1” (terminal 01)
- Indicator “OVERCRANK” (red): It indicates the block status due to a failure in the automatic start of the engine. It is produced by the operating sequence in the AUTOMATIC mode.
- Indicator “DISCHARGED” (yellow) it indicates the alarm status due to the charge level of the starting battery of the generator set. Such battery also powers the board DST4600A. The alarm is produced if the battery voltage exceeds the tolerance limits:
 - 11.8 ... 15 V (for nominal voltage of 12 V battery)
 - 23.2 ... 30 V (for nominal voltage of 24 V battery)
- Indicator “MIN LEVEL” (yellow): it indicates the alarm status due to the minimum fuel level in the tank. It can be acquired from:
 - Digital input “LOW LEVEL FUEL” (terminal 05)
 - Analogue input “FUEL LEVEL” (terminal 45)

- Indicator “ALARM2” (“AUX. ALARM”) (red): it indicates the masked generic block status. It can be acquired from:
 - Digital input “ALARM 2” (terminal 02)
- Indicator “OVERSPEED” (red): it indicates that the engine is running too fast and it could damage the alternator or the engine itself. It can be acquired from:
 - Digital input “OVERSPEED” (“INPUT C” terminal 12)
 - Generator’s frequency exceeding the set threshold (parameter P21)
- Indicator “OVERLOAD” (red): it indicates a system overload. It can only be acquired from:
 - Digital input “OVERLOAD” (terminal 11)
- Indicator “NO FUEL” (red): it indicates the block due to the end of the fuel in the tank. It can be acquired from:
 - Digital input “FUEL END” (terminal 06)
 - Analogue input “FUEL LEVEL” (terminal 45)
- Indicator “EMERGENCY STOP” (red): it indicates the block that follows the pressing of the emergency button. It can be acquired from:
 - Digital input “EMERGENCY STOP” (terminal 03). NB: the block is enabled when the digital input is not activated.

3. Start Initialization

As soon as the board is powered it executes the following operations:

- Lamp Test: during this phase it turns on all the indicators in the front panel and it shows 888 (with the decimal points turned on) on the three displays. This operation lasts two seconds and allows the identification of any failure in the front panel that could involve visual signaling of a fault.
- It checks if it has to execute the CALIBRATION procedure. To request the execution of such procedure press “MODE / ACK” while turning the board on (see par. **Errore. L'origine riferimento non è stata trovata.**). In this phase all the indicators on the front panel are turned off as well as the displays “V” and “A”, while the display “MULTIFUNCTION” shows three question marks (this procedure can be made only by trained operator using proper measurement systems).
- Display the software level. The display “MULTIFUNCTION” shows the message “REL” (release). The display “V” shows the main version; the display “A” shows the secondary version. For instance, for a software level 1.23 the display “V” will indicate “1” and the display “A” will indicate “23”. In this phase all the indicators on the front panel are turned off. This phase lasts one second.

In the event of data errors in the non-volatile memory, the display “MULTIFUNCTION” shows, in place of “REL” the message:

- “INI” if the non-volatile memory doesn’t contain any data
- “F09” if the non-volatile memory contains mistaken data

After the execution of the above-mentioned operations, the board starts executing the work sequences, according to the position of the key selector.

4. Faults

During the operation of the generator set (but even when it is not running) some faults may occur. The faults can be divided into three categories according to the way they affect the generator set:

- **Alarms:** faults that are not immediately dangerous for the generator set and for its load, and that therefore allow the generator set to keep on working. They require an operator's intervention otherwise they could cause a more dangerous fault.
- **Deactivations:** these faults are more dangerous for the load that needs to be switched immediately on the mains (even if there's a mains failure) but they aren't immediately dangerous for the generator set and/or for the operator: the generator set will have to be stopped in any case but it can be stopped with the standard procedure (cooling cycle, etc.).
- **Blocks:** these faults can damage the generator set and sometimes the load, too. When they are activated, the load is immediately switched on the mains (even if there's a mains failure) and the engine is stopped through the emergency procedure (without the cooling cycle).

Any fault can be activated only if the key selector is on MAN, AUTO or TEST.

The alarms can always be activated. There may be more than one alarm at the same time.

The deactivation can be activated if in the moment the cause occurs no deactivation or block is present, while one or more alarms can be present. There cannot be two deactivation at the same time.

The blocks can be activated only if in the moment the cause occurs no other block is present, while deactivation and/or alarms can be present. As a principle, there cannot be two blocks at the same time, but actually, the blocks "NO FUEL", "EMERGENCY STOP" and "MANUAL STOP IN AUTO" are an exception since they can be activated even in presence of other blocks.

When a fault occurs, whatever be its category, the audible alarm is activated ("ALARM OUTPUT", terminal 16) as well as the corresponding visual signal. Such signal can be an indicator on the front panel (fault area) or a message "FXX" on the display "MULTIFUNCTION". In the case of an indicator it flashes.

The audible alarm stays active for the time programmed through the parameter P54 than it turns off automatically (if P54 is equal to 999 the siren does never turn off automatically, if P54 is equal to 0 the siren never turns on), while the visual signal keeps on flashing until the operator doesn't "recognize" it.

The "recognition" involves the pressing of "MODE / ACK". As a consequence, the signal stops flashing and stays turned on and the audible alarm (if still active) is disabled.

Once the operator has recognized the alarms, they are automatically cancelled by DST4600A when the corresponding cause ceases to exist. If the alarm is cancelled, the visual signal turns off, too.

While the blocks and deactivation can be cancelled only by switching the key selector to "OFF/RESET".

4.1 List of Fxx Codes

Code	Description
F01	Generator's voltage under the minimum threshold (block)
F02	Generator's voltage over the maximum threshold (block)
F03	Generator's frequency under the minimum threshold (block)
F04	Generator's frequency over the maximum threshold (block)
F05	Belt break (block)
F06	Generator's current over the maximum current (block)
F07	Stop button pressed in automatic (block)
F08	Operating speed not reached (block)
F09	Error in the non-volatile memory (warning)
F10	Alarm from "INPUT B" (terminal 13) (warning)
F11	Energy inversion (block)
F12	Inhibition of generator set use (block)
F13	KR close failure (warning)
F14	KG close failure (warning)
F16	Short-circuit
F21	Shutdown failure (block)
F40	Engine not in thresholds when KG closed (only for asynchronous engine version)
F49	Max power (warning)
F50	Board failure (block)

4.2 Alarms

4.2.1 Low oil pressure

4.2.1.1 From digital input

Disabling	Bit 2 of Parameter P39 = 0
Conditions to activate it	Engine running from the time set through the parameter P31 Digital input "OIL WARNING" (terminal 08) shorted to ground Fuel solenoid activated. Not existent in asynchronous engine version
Filter time	2 seconds
Visual signal	Quick flashing of the indicator "LOW OIL PRESSURE"

4.2.1.2 From Analogue Input

Disabling	Parameter P47 = 0 and/or parameter P25 = 0
Conditions to activate it	Engine running from the time set through the parameter P31 Pressure detected by the analogue input "OIL PRESSURE" (terminal 42) lower or equal to the threshold set through the parameter P25 Fuel solenoid activated.
Filter time	2 seconds
Visual signal	Quick flashing of the indicator "LOW OIL PRESSURE"

4.2.2 High Cooling Water Temperature

4.2.2.1 From Digital Input

Disabling	Bit 0 of the Parameter P39 = 0
Conditions for its activation	Fuel solenoid closed (output "FUEL SOLENOID", terminal 22 enabled) Digital input "TEMP. WARNING" (terminal 10) shorted to ground
Filter time	2 seconds
Visual signal	Quick flashing of the indicator "TEMPERATURE"

4.2.2.2 From Analogue Input

Disabling	Parameter P46 = 0 and/or P26 parameter = max
Conditions for its activation	Fuel solenoid closed ("FUEL SOLENOID" output, terminal 22 enabled) Temperature detected from the analogue input "TEMPERATURE" (terminal 43) over or equal to the threshold set through the parameter P26
Filter time	2 seconds
Visual signal	Quick flashing of the indicator "TEMPERATURE "

4.2.3 Starting Battery Fault

Disabling	Bit 7 of the Parameter P49 = 0
Conditions for its activation	Starting not in progress (output "START", terminal 20 not enabled) Battery voltage under 11.8 (or 23.2) V or battery voltage over 15 (or 30) V
Filter time	40 seconds
Visual signal	Slow flashing of the indicator "DISCHARGED"

4.2.4 Minimum Fuel Level in the Tank

4.2.4.1 From Digital Input

Disabling	Bit 6 of the Parameter P39 = 0
Conditions for its activation	Digital input "LOW LEVEL FUEL" (terminal 05) shorted to ground
Filter time	2 seconds
Visual signal	Slow flashing of the indicator "MIN LEVEL"

4.2.4.2 From Analogue Input

Disabling	Parameter P48 =0 and/or parameter P33 = 0
Conditions for its activation	Level detected from the analogue input "FUEL LEVEL" (terminal 45) under or equal to the threshold set through the parameters P33
Filter time	2 seconds
Visual signal	Slow flashing of the indicator "MIN LEVEL"

4.2.5 Maximum Fuel Level in the Tank

4.2.5.1 From Digital Input

Disabling	Bit 6 of the parameter P39 = 0
Conditions for its activation	Digital input "HIGH LEVEL FUEL" (terminal 04) shorted to ground
Filter time	2 seconds
Visual signal	Slow flashing of the indicator "MAX LEVEL"

4.2.5.2 From Analogue Input

Disabling	Parameter P48 =0 and/or parameter P27 = max
Conditions for its activation	Level detected from the "FUEL LEVEL" analogue input (terminal 45) over or equal to the threshold set through the parameter P27
Filter time	2 seconds
Visual signal	Indicator "MAX LEVEL" slowly flashing

4.2.6 Auxiliary Alarm

Disabling	Bit 4 of the Parameter P49 = 0
Conditions for its activation	Digital "INPUT B" (terminal 13) shorted to ground
Filter time	Time set through the parameter P40
Visual signal	Message "F10" on the display "MULTIFUNCTION"

4.2.7 KR close failure

Disabling	P75 = 0
Conditions for its activation	AUTO o TEST mode. Bit 1 of parameter P61 = 1 (KR status connected to INPUT C). KR command active.
Filter time	Time set through the parameter P75
Visual signal	Message "F13" on the display "MULTIFUNCTION"

Starting from revision 08.00.24 (not available for /P version and for asynchronous engine version). Setting bit 5 of P61 at 1, it is activated a function that switch the load to Generator set, keeping it running, in case of F13 alarm.

Starting from revision 08.00.38, this block may be masked if mains is not present by using bit one of parameter P79.

4.2.8 KG close failure

Disabling	P75 = 0
Conditions for its activation	AUTO o TEST mode. Bit 0 of parameter P61 = 1 (KG status connected to INPUT A). KG command active.
Filter time	Time set through the parameter P75
Visual signal	Message "F14" on the display "MULTIFUNCTION"

Starting from revision 08.00.24.

4.2.9 Max power

Disabling	Board without power measure option, otherwise Parameter P56 = 0 Parameter P58 = 0 Parameter P56 >= P58 Bit 7 of parameter P61 = 0
Conditions for its activation	Active power higher than P58 threshold (see paragraph 7.6.2)
Filter time	Time set through the parameter P59
Visual signal	Message "F49" on the display "MULTIFUNCTION"

This warning is present only from software release EB02200080037.

4.3 Deactivations

4.3.1 Generator's Voltage Under Minimum Threshold ("UNDERVOLTAGE")

Disabling	Parameter P13 = 0
Conditions for its activation	No deactivation No block Engine running Generator already in the operating window from starting. Shutdown cycle not in progress Fuel solenoid activated With selector on MAN, generator set contactor closed Generator's voltage under the threshold set through the parameter P13 at least on one phase Not existent in asynchronous engine version
Filter time	Time set through the parameter P24
Visual signal	Message "F01" on the display "MULTIFUNCTION"

4.3.2 Generator's Frequency Under the Minimum Threshold ("UNDERFREQUENCY")

Disabling	Parameter P11 = 0
Conditions for its activation	No deactivation No block Engine running Generator already in the window from starting. Shutdown cycle not in progress Fuel solenoid activated With selector on MAN, generator set contactor closed Generator's frequency under the threshold set through the parameter P11 Not existent in asynchronous engine version
Filter time	Time set through the parameter P23
Visual signal	Message "F03" on the display "MULTIFUNCTION"

4.4 Blocks

4.4.1 Emergency STOP

Disabling	Cannot be disabled
Conditions for its activation	"EMERGENCY STOP" input, terminal 03 open
Filter time	0.5 seconds
Visual signal	Indicator "EMERGENCY STOP" slowly flashing

4.4.2 Manual Stop in AUTO

Disabling	Cannot be disabled
Conditions for its activation	Key selector on AUTO or TEST STOP button pressed o external STOP command
Filter time	0 seconds (immediate)
Visual signal	Message "F07" on the display "MULTIFUNCTION"

4.4.3 Fuel END

4.4.3.1 *Digital input*

Disabling	Bit 5 of the Parameter P39 = 0
Conditions for its activation	"FUEL END" digital input (terminal 06) shorted to ground
Filter time	20 seconds
Visual signal	Indicator "NO FUEL" slowly flashing

4.4.3.2 *From Analogue Input*

Disabling	Parameter P48 = 0 and/or parameter P28 = 0
Conditions for its activation	Level detected from "FUEL LEVEL" (terminal 45) less or equal than the threshold set by means parameter P28
Filter time	20 seconds
Visual signal	Indicator "NO FUEL" slowly flashing

4.4.4 Low Oil Pressure

4.4.4.1 *From Digital Input*

Disabling	Bit 3 of the Parameter P39 = 0
Conditions for its activation	No block Engine running from the time set through the Parameter P31 Fuel solenoid activated "OIL P. ALARM" digital input (terminal 07) shorted to ground
Filter time	2 seconds
Visual signal	Indicator "LOW OIL PRESSURE" slowly flashing

4.4.4.2 From Analogue Input

Disabling	Parameter P47 = 0 and/or parameter P34 = 0
Conditions for its activation	No block Engine running from the time set through the parameter P31 Fuel solenoid activated Pressure detected from the "OIL PRESSURE" analogue input (terminal 42) under or equal to the threshold set through the parameter P34
Filter time	2 seconds
Visual signal	Indicator "LOW OIL PRESSURE" slowly flashing

4.4.5 High Cooling Water Temperature

4.4.5.1 From Digital Input

Disabling	Bit 1 Parameter P39 = 0
Conditions for its activation	No block Fuel solenoid closed ("FUEL SOLENOID output, terminal 22 enabled) "TEMPERAT. ALARM" digital input (terminal 09) shorted to ground
Filter time	2 seconds
Visual signal	Indicator "TEMPERATURE" slowly flashing

4.4.5.2 From Analogue Input

Disabling	Parameter P46 = 0 and/or parameter P35 = 0
Conditions for its activation	No block Fuel solenoid closed ("FUEL SOLENOID output, terminal 22 enabled) Temperature detected from the "TEMPERATURE" analogue input (terminal 43) over or equal to the threshold set through the parameter P35
Filter time	2 seconds
Visual signal	Indicator "TEMPERATURE" slowly flashing

4.4.6 Non-masked Auxiliary Block

Disabling	Bit 0 of the Parameter P49 = 0
Conditions for its activation	No block "ALARM 1" digital input (terminal 01) enabled
Filter time	Time set through the parameter P40
Visual signal	"ALARM 1" indicator slowly flashing

4.4.7 Masked Auxiliary Block

Disabling	Bit 1 of the Parameter P49 = 0
Conditions for its activation	No block Engine running from the time set through the Parameter P31 Fuel solenoid activated "ALARM 2" digital input (terminal 02) shorted to ground
Filter time	Starting from SW version 08.00.22 this value is set by parameter P.65. In the old version this time was set through the parameter P40
Visual signal	"ALARM 2" ("AUX ALARM") indicator slowly flashing

4.4.8 Generator's Voltage Over the Maximum Threshold ("OVERVOLTAGE")

Disabling	Parameter P14 = max
Conditions for its activation	No block Engine Running Fuel solenoid activated Generator's voltage over the threshold set through the parameter P14 at least on one phase Not existent in asynchronous engine version.
Filter time	Time set through the parameter P24
Visual signal	Message "F02" on the display "MULTIFUNCTION"

4.4.9 Generator's Frequency Over the Maximum Threshold ("OVERFREQUENCY")

Disabling	Parameter P12 = max
Conditions for its activation	No block Engine running Fuel solenoid activated Generator's frequency over the threshold set through the parameter P12 Not existent in asynchronous engine version.
Filter time	Time set through the parameter P23
Visual signal	Message "F04" on the display "MULTIFUNCTION"

4.4.10 Engine Over speed

4.4.10.1 From Digital Input

Disabling	Bit 3 of the Parameter P49 = 0 and bit 1 of the parameter P61=0
Conditions for its activation	No block "OVERSPEED" digital input ("INPUT C" terminal 12) shorted to ground. If the VOLVO engine EDC function is enabled (bit 3 of P61, starting from SW release 08.00.21), the engine must be in running state.
Filter time	0.5 seconds
Visual signal	"OVERSPEED" indicator slowly flashing

4.4.10.2 From Frequency

Disabling	P21 parameter = max
Conditions for its activation	No block Generator's Frequency over the threshold set through the parameter P21 Not existent on asynchronous engine version.
Filter time	0.5 seconds
Visual signal	"OVERSPEED" indicator slowly flashing

4.4.11 Overload

4.4.11.1 From Digital Input ("OVERLOAD")

Disabling	Bit 2 of the Parameter P49 = 0
Conditions for its activation	No block "OVERLOAD" digital input (terminal 11) shorted to ground
Filter time	Time set through the parameter P40. Starting from 08.00.23 version, a fixed time of 1.5 second is added to the set value.
Visual signal	"OVERLOAD" indicator slowly flashing

Starting from revision 08.00.38, this block may be configured as a “deactivation” by using bit 0 of parameter P79.

4.4.11.2 From Current (“OVERCURRENT”)

Disabling	Parameter P16 = 0 and/or P17=0
Conditions for its activation	No block Engine running Generator’s frequency in window Current over the threshold set through the Parameter P16 at least on one phase
Filter time	4 seconds if P76 is 0, otherwise the time depends on the amount of over-current and on the value of P76.
Visual signal	Message “F06” on the display “MULTIFUNCTION”

Starting from revision 08.00.38, this block may be configured as a “deactivation” by using bit 0 of parameter P79.

4.4.12 Short circuit

Disabling	Parameter P16 = 0 and/or P17=0 and/or P76=0
Conditions for its activation	No block Engine running Generator’s frequency in window Current over the threshold set through the Parameter P77
Filter time	Immediate until revision EB02200080036, parameter P78 from revision EB02200080037
Visual signal	Message “F16” on the display “MULTIFUNCTION”

This BLOCK is available from the SW release 08.00.33. Starting from revision 08.00.38, this block may be configured as a “deactivation” by using bit 0 of parameter P79.

4.4.13 Belt Break

Disabling	Bit 7 of the Parameter P39 = 0
Conditions for its activation	No block Engine running Shutdown cycle not in progress Voltage measured at the D+WL input (terminals 39-40) under the threshold of 8 (or 16) V.
Filter time	20 seconds
Visual signal	Message “F05” on the display “MULTIFUNCTION”

4.4.14 Operating Speed not reached

Disabling	Cannot be disabled
Conditions for its activation	No block Selector on AUTO or TEST Engine running Fuel solenoid activated The generator doesn’t get in operating window (for two seconds) within the time limit set through the parameter P32 from the engine start.
Filter time	Immediate
Visual signal	Message “F08” on the display “MULTIFUNCTION”

4.4.15 “OVERCRANK”

Disabling	Cannot be disabled
Conditions for its activation	No block Selector on AUTO or TEST Engine not running after P10 starting attempts
Filter time	Immediate
Visual signal	“OVERCRANK” indicator slowly flashing

4.4.16 Hardware fault

Disabling	Cannot be disabled.
Conditions for its activation	No block Detected hardware fault on generator voltage measurement.
Filter time	Immediate
Visual signal	Message “F50” on the display “MULTIFUNCTION”

4.4.17 Shutdown Failure

Disabling	From revision 00.00.40 by setting bit 4 of P79 to 0
Conditions for its activation	Shutdown cycle in progress Engine still running after the time limit set through the parameter P09
Filter time	Immediate
Visual signal	Message “F21” on the display “MULTIFUNCTION”

4.4.18 Energy Inversion

Disabling	Parameter P52 = 0 and/or Parameter P53 = 0
Conditions for its activation	No block Board configured for power measurement Active power with negative sign and over the P52 threshold for the P53 time
Filter time	Immediate
Visual signal	Message “F11” on the display “MULTIFUNCTION”

4.4.19 Inhibition of the generator set Use

Disabling	Cannot be disabled
Conditions for its activation	Inhibition activated by serial line or SMS
Filter time	Immediate
Visual signal	Message “F12” on the display “MULTIFUNCTION”

4.4.20 Engine not in thresholds when KG closed

Disabling	Cannot be disabled
Conditions for its activation	No block Engine running Fuel solenoid activated Shutdown cycle not in progress KG closed “Engine in threshold” input not active for at least 0.5 sec.
Filter time	Immediate
Visual signal	Message “F40” on the display “MULTIFUNCTION”

5. Operating Sequence

5.1 Definitions

5.1.1 Mains Voltages Status

Parameters for the mains management:

- P01: intervention threshold for minimum mains voltage (V)
- P02: Hysteresis (%)
- P04: generator set intervention delay for mains voltage failure (s)
- P05: Mains restoration delay (closing mains contactor from mains present) (s)
- P15: intervention threshold for maximum mains voltage (V)

Three thresholds are defined in the mains voltage management:

- “Alive” mains threshold: $P01 + (((P01 * P02) / 100) / 2)$
- “Dead” mains threshold: $P01 - (((P01 * P02) / 100) / 2)$
- “OVERVOLTAGE” threshold: P15

Mains is considered “alive” if the voltage on all the existing phases is over of the “alive” mains threshold. It is considered “dead” if the voltage on at least one phase is under the “dead” mains threshold. If no phase is under the “dead” mains threshold but at least one of them is under the “alive” mains threshold, the mains keeps the dead/alive status it previously had (hysteresis). If the voltage on at least one phase is over the “OVERVOLTAGE” threshold, the mains is considered “alive out of window”. Of course the parameter P15 must be over the “alive” mains threshold.

In addition, there is the digital input “MAINS SIMULATION” (terminal 24). When such input is enabled, the board wait for time T2 is elapsed before mains is considered “present”. Furthermore, if the board is set to work with an external mains sensor (using only the “MAINS SIMULATION” input and ignoring the mains voltages), when the input “MAINS SIMULATION” is not enabled the mains is immediately considered “absent”. Depending on the SW versions, the delay times related to this input are different.

- Starting from SW version 08.00.22 the parameters P66 and P67 are used to set the Generator set intervention and shutdown on “MAIN SIMULATION” deactivation and activation
- Starting from SW version 08.00.09 to SW revision 08.00.21 the same parameters used for the delay of the mains control are used (P.04 and P05).
- Before 08.00.09 version there were no delay time related to this function.

4 status are defined in the mains management:

- Absent: “dead” or “alive out of window” from a period of time over or equal to T1 (“MAINS LIVE” indicator turned off)
- Restoring: “alive in window” from a period of time under T2 (“MAINS LIVE” indicator flashing)

- Present: “alive in window” from a period of time over or equal to T2 (“MAINS LIVE” indicator turned on)
- Outgoing: “dead” or “alive out of window” from a period of time under T1 (“MAINS LIVE” indicator flashing)

The T1 and T2 times change according to the position of the key selector and if the engine is running or dead:

SELECTOR	ENGINE	T1	T2
AUTO-TEST	Dead	P04	P05 ¹
MAN-PROG-OFF	Dead	P04	0 s
AUTO-TEST	Running (operating speed)	2 s	P05
MAN ²	Running (operating speed)	2 s	0 s

As you can see, the transitional mains failure is cancelled (2 seconds) with the engine running. In such conditions, as soon as a mains failure occurs, if the selector is on AUTO the users are switched on the generator.

In the same way, the transitional mains restoring is cancelled (0 seconds) only if the selector is in OFF-PROG-MAN, to avoid the engine starting or the users’ switching on the generator set if going back to AUTO during the mains restoring.

5.1.2 Generator’s Voltages Status

Parameters used in the generator management:

- P02: hysteresis (%)
- P03: recognition threshold for generator’s voltage presence (V)
- P11: protection threshold for minimum generator’s frequency (Hz)
- P12: protection threshold for maximum generator’s frequency (Hz)
- P13: protection threshold for minimum generator’s voltage (Hz)
- P14: protection threshold for maximum generator’s voltage (Hz)

Six thresholds are defined in the generator management:

- “Alive” generator threshold: $P03 + ((P03 * P02) / 100) / 2$
- “Dead” generator threshold: $P03 - ((P03 * P02) / 100) / 2$
- “UNDERFREQUENCY” threshold: P11
- “OVERFREQUENCY” threshold: P12
- “UNDERVOLTAGE” threshold: P13
- “OVERVOLTAGE” threshold: P14

¹ Unusual case: in AUTO mode the engine is dead during the transitional mains restoration only in the event of starting failure.

² With selector on OFF-PROG the engine is not running.

The generator is considered “alive” if the voltage on all the existing phases is over the “alive” generator threshold. It is considered “dead” if the voltage on at least one of the phases is under the “dead” generator threshold. If no phase is under the “dead” generator threshold but at least one phase is under the “alive” generator threshold, the generator keeps the previous dead/alive status (hysteresis).

If the voltage on at least one of the phases is over the “OVERVOLTAGE” threshold, the generator is considered “alive out of window”. Of course, the parameter P14 must be set in order to be over the “alive” mains threshold.

If the voltage on at least one of the phases is under the “UNDERVOLTAGE” threshold, the generator is considered “alive out of window”. Of course, the P13 parameter must be set in order to be over the “alive” mains threshold and over the parameter P14.

If the generator’s frequency is over the “OVERFREQUENCY” threshold, the generator is considered “alive out of window”.

If the generator is alive but its frequency is under the “UNDERFREQUENCY” threshold, the generator is considered “alive out of window”. Of course, the parameter P11 must be under the parameter P12.

4 status are defined in the generator management:

- Absent: “dead” or “alive out of window” from a period of time over or equal to T1
- Restoring: “alive in window” from a period of time under T2
- Present: “alive in window” from a period of time over or equal to T2
- Outgoing: “dead” or “alive out of window” from a period of time under T1

T1 is a fix time of 2 seconds³.

T2 is a fix time of 0.5 seconds.

5.1.3 Engine Status

5.1.3.1 *Definition of Engine Running*

The engine is defined as “running” if **at least one** of the following requirements is met:

- Generator’s frequency over the threshold specified through the parameter P42 (only if enabled with bit 6 of the parameter P49)
- Voltage on all the generator’s phases less than 80 V (not configurable). Starting from version 08.00.23, is used the value of P03 (the default value is changed to 80V).
- Voltage at the D+WL input (terminals 39..40) over the threshold (10 or 20 V according to the nominal voltage of the battery), only if enabled with bit 4 of the parameter P39.

³ On the DST4600A board this time act only if the generator set contactor is open. If it is closed, wait until the alarms management starts the F01.F04 alarm and then execute the emergency stop cycle.

5.1.3.2 Definition of Dead Engine

The engine is defined as “dead” if all the following requirements are met for at least five seconds:

- Generator’s frequency under the threshold specified by the parameter P43 (only if enabled with bit 6 of the parameter P49)
- Voltage on at least one generator’s phases less than 80 V (not configurable). Starting from version 08.00.23, is used the value of P03 (the default value is changed to 80V).
- Voltage at the D+WL input (terminals 39..40) under the threshold (3 or 6 V according to the nominal voltage of the battery), only if enabled with bit 4 of the parameter P39.

5.1.3.3 Starting Request

It is a series of many conditions. The most important one is the absence of any block or deactivation. The remaining conditions depend on the key selector status:

MAN

- a) “START” button pressed.

AUTO

- a) Mains status “Absent” (and no “MAINS SIMULATION”)
- b) “REMOTE TEST” digital input (terminal 46) enabled
- c) Periodical Test (if configured through the parameters P18 and P19)
- d) Starting command from RS232 serial line

TEST

- a) No condition (must always start the engine in TEST mode)

OFF and PROG

- a) No condition (must never start the engine in TEST mode)

5.1.3.4 Stop Requests

The immediate stop request is given by at least one of the following conditions:

- a) STOP button
- b) Presence of any block.
- c) Selector on OFF or on PROG
- d) Request from serial line or SMS.

The request of stop with cooling cycle is given by at least one of the following conditions:

- a) Selector on AUTO and no starting request
- b) Selector on AUTO or TEST and presence of a deactivation

5.2 Shutdown System

The control board can be set to work with engines equipped with an excitation shutdown system (usually electromagnet with control on the engine stop lever or electro-valve interrupting the fuel supply), or dropout shutdown ones (standard versions - usually N.C. fuel supply electro-valve or electro-magnet unlocking the engine stopping condition).

In the first case (EXCITATION SHUTDOWN), the stopping control “STOP SOLENOID” (terminal 18) is activated for the time set with the parameter P09. If the VOLVO engine EDC function is enabled (bit 3 of P.61) is enabled, the “STOP SOLENOID” is driven for a fixed time of 2 seconds. The command is activated at the beginning of the shutdown phase, stays active for all the set duration and is disabled at the end of the same period.

In the second case (DROP-OUT SHUTDOWN), the stopping command takes the meaning of permission to the engine's running, “FUEL SOLENOID” (terminal 22) is activated with the engine starting command and stays active until the beginning of the stopping command.

5.3 Sequence in “MAN” mode

In the MANUAL mode the board DST4600A can receive the engine start/shutdown commands and those for the power changeover from the buttons located on the front panel.

5.3.1 Entering the MANUAL mode

When the selector is brought to MANUAL the following operations are executed:

- Keeping of the contactors status. From revision 00.00.39, it is possible to configure the board for switch to mains (bit 2 of P79 parameter).
- If the engine is being started it is stopped.
- If a STOP cycle is in progress it is completed.
- If the engine is cooling, such phase is cancelled and the engine is kept running.
- The engine is kept running (if it was already running).

5.3.2 Engine Starting

To start the generator set in the MANUAL mode press the START button and keep it pressed until the engine is running. The START button is not accepted in presence of deactivation and/or blocks. As a response to this command the board execute the following operations:

1. It enables the “FUEL SOLENOID” output (terminal 22). Such output is automatically removed during the stop cycles or if for 20 seconds the engine is dead.
2. It disables the “STOP SOLENOID” output (terminal 18) (it should already disabled except if the starting request occurs during a stop cycle), used for the dropout shutdown. If engine is already running, the procedure stops here.
3. If the preheat function for diesel engines is enabled, it activates the “AUX OUTPUT 1” (terminal15) for the time set with the parameter P20 (if such time is equal to 0 the preheat function is disabled). In this phase the display “MULTIFUNCTION” shows the message “PRE”. At the end of this phase it disable the output and passes to the phase 4 (until SW version 08.00.11 the output “FUEL SOLENOID” were activated only at the end of this phase).

4. It enables the "START" output (terminal 20) controlling the generator set starter. The output is kept enabled until the release of the "START" button or until the engine running recognition. In this phase the display "MULTIFUNCTION" shows the message "STA".

For the MANUAL mode no start failure signal is foreseen.

The activation sequence is always: "FUEL SOLENOID" (terminal 22), "AUX OUTPUT 1" (PREHEAT OUTPUT) (terminal 15) and then "START" (terminal 20). Thus, it is possible to use this feature to drive an auxiliary output that requires to be activated before the actual start command (use parameter P38 to configure the delay time).

5.3.3 Engine Shutdown

To stop the engine in the MANUAL mode press the STOP button. Unlike for the DST4600, it is not necessary to keep the STOP button pressed until the shutdown has taken place: simply press it for a second and the board execute a complete shutdown cycle. That is, it disables the "FUEL SOLENOID" output and it enables the "STOP SOLENOID" one (terminal 18) for the time set with the parameter P09 (if it is enabled the VOLVO engine EDC this time is fixed and of 2 seconds).

The MANUAL mode doesn't foresee any shutdown failure block, except for the automatic shutdown cycles following blocks or deactivation.

5.3.4 Power Change-over

Normally, with the board in the MANUAL mode the users are switched on the mains. Only if the engine is running, if the generator is "present" and the delay before the supply has passed - P06 (or if the temperature exceeds the minimum threshold set with P55), the operator has the opportunity to switch them on the generator. To do that, press at the same time "MODE / ACK" and "F1" for one second (such combination is highlighted on the front panel of the board with the indication "MANUAL CHANGE-OVER". This command works as "toggle", that is, if the operator gives again the order the users are again switched on the mains.

When the users are switched on the generator set, they are automatically switched on the mains if the generator gets "absent" or in presence of deactivations and/or blocks.

5.4 Sequence in "AUTO" mode

The control sequence of the generator set in the AUTOMATIC mode develops as follows:

1. Start requests wait (typically mains failure)
2. Generator set starting attempts
3. Generator presence wait
4. Delay before supply the power
5. Switching users on the generator
6. No start requests wait
7. Users' switching on the mains
8. Engine cooling cycle
9. Engine shutdown cycle.

5.4.1 Start Requests Wait

In this phase the engine is dead. The board waits until the mains get “absent” or for at least one of the other start requests (see par.5.1.1).

5.4.2 Engine Starting Attempts.

The board tries to start automatically the engine. The number of starting attempts to execute can be programmed through the parameter P10. If, after those attempts, the engine doesn't start, the start failure block is activated (“OVERCRANK”). Furthermore, the duration of the starting impulse can be set (parameter P08) as well as the delay between two attempts (parameter P38).

For each attempt the following operation are executed:

1. The “FUEL SOLENOID” output (terminal 22) is enabled. Such output is automatically removed during shutdown cycles or when the engine is dead for 20 seconds.
2. The “STOP SOLENOID” output (terminal 18), used for the excitation shutdown, is disabled (it should already be disabled unless the starting request occurs during a stop cycle). If the engine is already running, the procedure stops here.
3. If the preheat function for diesel engines is enabled the “AUX OUTPUT 1” (terminal 15) is enabled for the time set with the parameter P20 (if such time is equal to 0 the preheat function is disabled). In this phase the display “MULTIFUNCTION” shows the message “PRE”. At the end of this phase the output is disabled passing to phase 2.
4. The “START” output (terminal 20) controlling the generator set starter, is enabled. The output is kept for the time set with the parameter P08 or until the engine running recognition. In this phase the display “MULTIFUNCTION” shows the message “STA”. If the engine gets started phase 6 will follow, otherwise phase 5 will follow (unless the starting attempts have ended,
5. The “START” output is disabled and there's a wait for with the duration set with the parameter P38 During this phase the preheat function for diesel engines is enabled, as well as the “AUX OUTPUT 1” (terminal15) and the display “MULTIFUNCTION” shows the message “PRE”.
6. Engine running.

The activation sequence is always: “FUEL SOLENOID” (terminal 22), “AUX OUTPUT 1” (PREHEAT OUTPUT) (terminal 15) and then “START” (terminal 20). Thus, it is possible to use this feature to drive an auxiliary output that requires to be activated before the actual start command (use parameter P38 to configure the delay time).

Starting from SW version 08.00.12, the activation sequence is always: “FUEL SOLENOID” (terminal 22), “AUX OUTPUT 1” (PREHEAT OUTPUT) (terminal 15) and then “START” (terminal 20). Thus, it is possible to use this feature to drive an auxiliary output that requires to be activated before the actual start command (use parameter P38 to configure the delay time). This sequence is valid also in manual mode.

Starting from SW version 08.00.38, the activation sequence is subjected to the engine stopped or the shut down cycle completed conditions.

5.4.3 Generator Waiting

In this phase there's a wait until the generator reaches the operating speed, that is, when the voltages on all the phases and the frequency are within the programmed thresholds (see par. 5.1.2). If this doesn't take place within the time set with the parameter P32, the block "operating speed not reached" (F08) is activated and the engine will be stopped. In this phase, if the voltage or the frequency exceeds the maximum thresholds, the corresponding blocks are activated (F02 and F04).

5.4.4 Delay before supply the power

This phase is just a wait to allow the lubrication and the heating of the generator set before connecting it to the users. The following phase takes place as soon as one of the following requirements is met:

- After the time set with the parameter P06 has passed since the generator is in window.
- If the temperature analogue sensor exists, if a minimum threshold for the supply permission has been set (P55 different from 0) and if the temperature is over such threshold.

In this phase the blocks and deactivations F01, F02, F03 and F04 are enabled, while the block F08 is disabled.

5.4.5 Switching users on the Generator

In sequential order there are:

- Opening of mains contactor (closed contact at terminals 60-61)
- Change-over wait (set through parameter P22)
- Closing of generator set contactor (closed contact at terminals 57-58)

Please, consider that the status of each contactor cannot be inverted from the prior command before the time set through the parameter P41 is elapsed from the last command.

5.4.6 No start requests wait

The boards waits until the mains gets "present" and all the other start requests get off (see par.5.1.1). Further, the arising of new faults of the generator set is checked.

5.4.7 Switching users to Mains

In sequential order there are:

- Opening of the generator set contactor (closed contact at terminals 58-59)
- Change-over wait (set through parameter P22)
- Closing of mains contactor (closed contact at terminals 61-62)

Please, consider that the status of each contactor cannot be inverted from the prior command before the time set through the parameter P41 is lapsed from the last command.

5.4.8 Engine Cooling Cycle

The engine is kept running after the users' switching on the mains for a time programmable through the parameter P07. The reason is that the engine cools more quickly by running without supplying then shutting it down.

5.4.9 Engine Shutdown Cycle

The shutdown cycle is the following:

- "FUEL SOLENOID" output (terminal 22) disabled
- "STOP SOLENOID" output (terminal 18) enabled
- Wait set through parameter P09
- "STOP SOLENOID" output (terminal 18) disabled. If the VOLVO engine EDC function is enabled (bit 3 of P61), the solenoid is driven only for two seconds but the board waits in any case until P09 is elapsed.

At the end of the cycle, if the engine is still running, the shutdown failure block ("F21") is activated (anyway the STOP SOLENOID output will not be enabled).

Up to revision 08.00.38, the automatic shut down cycle could be aborted if a new start request arises. In some situations, this caused a false F01 or F03 blocks. So, from revision 08.00.39 a new start request can be processed only when the engine is stopped or when the shutdown cycle is terminated.

5.5 Sequence in "TEST" mode

The sequence in the TEST mode is fundamentally the same of that in the AUTOMATIC mode, with the following differences:

- The engine is started in any case, independently from the start requests.
- The users' switching normally is executed only in case of mains failure. The operator can force it with the same procedure used in the MANUAL mode.
- The engine is never stopped automatically, except for blocks and/or deactivations.

Therefore, the TEST mode can be used to test accurately the generator set without disconnecting the users from the mains, but at the same time assuring the users' power supply from the generator set in case of mains failure.

6. Power Measurement

The board is able to execute the true r.m.s measurements on the generator' voltages and currents as well as the active, reactive, apparent power and power factor measurements of the system when it is powered by the generator. In addition, it manages an energy meter for the power supplied by the generator set.

If the option is present, the generator voltages' and currents' true r.m.s. are displayed in the place of the corresponding values measured in the standard version, that is on the displays "V" and "A".

To view the powers press at the same time "MODE / ACK" and "F2" (this combination is highlighted on the front panel of the board with the indication "MODE + F2": POWER DISPLAY"). In this conditions the " L1/L2", "L2/L3" "L3/L1" are all of them turned on and the display "V" shows the power factor, while the display "A" shows the active power. Further, if through the buttons "F1" and "F2" you choose the "MAINS VOLTAGE (Vac) / REACTIVE POWER (kvar)" function, the display "MULTIFUNCTION" shows the reactive power, if you choose the "BATTERY VOLTAGE (V) / APPARENT POWER (kVA)" function, it shows the apparent power.

By pressing again the buttons "F2" and "MODE / ACK" at the same time, you'll go back to the indications of the generator and mains voltages and of the generator current.

6.1 Power Factor

The value indicated by the display "V" is the system's total power factor. It cannot be viewed for each single phase. It is displayed with two decimals.

The eventual negative sign associated to this quantity indicates the energy inversion status. This status also refers to the whole system: if one of the phases was in energy inversion, probably it wouldn't be indicated since globally the system would still supply (NB: actually, it never occurs: if there's an energy inversion, it is present on all the phases).

Further, through the power factor some information on the type of load, inductive or capacitive is given to the operator. This information is provided using the decimal point of the least significant digit of the power factor: when is turned on the load is a capacitive one.

In the place of the power factor are displayed three dashes when its value makes no sense, that is in the absence of any current (dead engine or frequency not in window). Furthermore, if the total active power is too low (under 10% of the system's maximum power), the power factor is forced to one, since its measurement for low current value gets too imprecise.

6.2 Active Power

The active power (the system's total one) is displayed in kW on the display "A" (message "ACTIVE POWER (kW) over the display. If less than 100 kW is displayed with a decimal, if over 1000 kW is displayed in tens of kW, with the indicator "X10" turned on. It is always displayed in module: its sign (that would provide the true information of energy inversion) is associated to the power factor for display problems: if it was displayed associated to the active power one resolution digit would be lost, while by displaying it associated to the power factor it replaces the initial zero (actually the power factor is never 1.00 but always 0.xx). This introduces only a small rounding of the power factor: if it was 1.00 in energy inversion, instead of -1.00 it was displayed as - .99.

6.3 Reactive Power

The reactive power (the system's total one) is displayed in kvar on the display "MULTIFUNCTION" if the "MAINS VOLTAGE (Vac) / REACTIVE POWER (kvar)" function is selected. If under 100 kvar it is displayed with a decimal, if over 1000 kvar it is displayed in tens of kvar, by turning on the decimal point of the less significant digit to indicate that the value has to be multiplied by 10. It is displayed with its sign, replacing the most significant digit.

6.4 Apparent Power

The apparent power (the system's total one) is displayed in kVA on the display "MULTIFUNCTION", if the function "BATTERY VOLTAGE (V) / APPARENT POWER (kVA)" is selected. If less than 100 kVA it is displayed with a decimal, if over 1000 kVA it is displayed in tens of kVA, by turning on the indicator "X10". It is, by definition, always positive, therefore there's no problem for the display of its sign.

6.5 Energy Meter

The energy meter managed by DST4600A counts the energy supplied by the generator set. It has an internal resolution under 100 Wh but it is displayed in kWh. It is updated every second. It is displayed alternatively to the powers by pressing "MODE / ACK" (this procedure is indicated on the front panel of the board with the indication "POWER DISPLAY + MODE: ACTIVE ENERGY"). It uses the displays as follows:

- Display "A": kWh (indicated by "ACTIVE ENERGY (kWh)")
- Display "V": MWh (indicated by "ACTIVE ENERGY (MWh)")
- Display "MULTIFUNCTION": GWh (indicated by "ACTIVE ENERGY (GWh)", only two digits, the third one is fix "E")

If the energy counter exceeds 8 digits (100 GWh), it is saturated to 99.999.999 but is displayed with the decimal point of the less significant digit turned on, to indicate the saturation condition.

The energy counter can be reset. The reset procedure is the following one:

- By pressing the "F1" and "F2" select the "DATA – HOURS COUNT / START COUNTER" function
- Switch the key selector to OFF_RESET.
- Press at the same time "MODE / ACK" and "START" for 5 seconds. After 5 seconds the counters will be reset. The display does not indicate the reset in any way; therefore the operator has to count the 5 seconds.

The procedure is similar to the other counter reset procedure. The only difference is in the used pushbutton: "START" instead of "STOP". Until the SW version 08.00.11 the energy meter counter were cleared only together with the hour-counter and with the start-counter.

6.6 Connection caution

Be sure that all the TA share the same phase connected to ground and check for the correct phase connection. Otherwise the power measures will be wrong and it'll possible that the board will issue a reverse power alarm.

As a rule, connect terminal 50, 52 and 54 to ground and check that all the TA has the same phase connected to the ground. Then, if the measured power factor is negative, reverse all the TA connection.

Moreover, be sure that TA connections meet the generator phases connection (i.e. TA1 must measures L1 current etc.). Otherwise the power measurement will be wrong.

There is no problem about phase rotation direction. The board will recognize if it is clockwise or counter clockwise and will automatically set-up for correct power measurement.

7. Auxiliary Functions

7.1 Automatic recovery from KR close failure

Starting from 08.00.24 version, it is possible to avoid black-out due to KR failure. In case of such failure the user power line remains unsupplied if the grid is present. Using this function is possible to guarantee power availability at user level.

To use this function the system must be configured as following:

- Connect to "INPUT C" (terminal 12) a signal from KR that will be close to GROUND when KR is close.
- Enable KR status monitoring at level board setting to 1 bit 1 of P61.
- Enable F13 alarm (warning) setting a value greater than 0 for P75.
- Enable the automatic recovery function setting to 1 bit 5 of P61.
- Set AUTO or TEST mode.

Working with this configuration, if the board doesn't acknowledge KR closed, after P75 time, issues a "F13" alarm.

If bit 5 of P61 is set, the board interrupts cooling down sequence or, if engine is not running, starts the engine and make the Generator set supplying users.

At this point the board doesn't connect the load to the mains (even if it's acknowledged) until operator performs an appropriate action:

- Up to software release 08.00.24, this operation consists in pressing the key "MODE/ACK" one time.
- Up to software release 08.00.25 this operation consists in pressing the key "MODE/ACK" twice (the first pressure to switch off the horn).
- From software release 08.00.26 this operation consists in setting the MAN mode, manually make the mains supplying users and then set the AUTO mode again.

After these operations, if the board doesn't acknowledge KR closed, the alarm "F13" is issued again and the procedure is repeated.

Starting from SW release 08.00.35, the function has been modified in order to inhibit the engine start (caused by this alarm) if the input “MAINS SIMULATION” (terminal 24) is active and if the board is configured to use the internal mains sensor. In this case, in fact, the “MAINS SIMULATION” is used as “inhibition for automatic intervention”: thus, even this automatic intervention have to be inhibited. If the board doesn’t measure the mains, this input is used as an external mains sensor and so it cannot inhibit this automatic intervention (because it is in case of mains presence that the alarm F13 causes the engine to start).

Starting from revision 08.00.38, this block may be masked if mains is not present, by using bit 1 of parameter P79. This mask is useful in plants where the mains breaker is powered by the mains itself. In this situation, when the mains become unavailable, the board immediately acquires the breaker open status. The board needs a lot of seconds in order to start the engine and to close the load on the genset, and so the condition of breaker open while the command is for closure remains for a lot of time. This condition causes the alarm “F13” to be raised. But if the alarm is masked when mains is not present, this false alarm is not raised.

7.2 Automatic Periodical Test

Please see par. 7.7.4

7.3 Fuel Pump

You can set the board to control a fuel pump for the automatic filling of the tank. The function can be used only if the fuel level analogue sensor exists. You have to set the two operating threshold:

- P29: fuel level threshold under which the pump is started.
- P30: fuel level threshold over which the pump is stopped.

The function is enabled if the parameters P29, P30 and P48 are all different from 0 and P29 is lower than P30

7.4 Remote Test

With the board in AUTOMATIC mode you can force the generator set start using the “REMOTE TEST” digital input (terminal 46). Until the input stays enabled, the generator set is on (except for deactivations and/or blocks). If in this phase it occurs a mains failure, the users are switched on the generator.

7.5 Remote Signals

The following remote signals can be sent:

- “ENGINE RUNNING” (terminal 25): this output is enabled when the engine is running.
- “GENERAL ALARM” (terminal 26): this output is enabled if at least one alarm is present.
- “TRIP ALARM” (terminal 27): this output is enabled if at least a deactivation or a block is present.
- “FUEL ALARM” (terminal 28): this output is enabled if at least one fuel failure is present:
 - Minimum fuel level alarm
 - Maximum fuel level alarm
 - Fuel end block

- “ENGINE ALARM” (terminal 29): this output is enabled if at least one fault in the engine is present:
 - High water temperature alarm
 - Low oil pressure alarm
 - Low battery voltage alarm
 - Shutdown failure alarm
 - Aux. Alarm (“F10”) – starting from SW 08.00.12
 - High water temperature block
 - Low oil pressure block
 - Start failure block
 - Non-masked auxiliary block (ALARM1)
 - Masked auxiliary block (ALARM2)
 - Emergency stop
 - Belt break
 - Shutdown failure block (“F21”)
- “SPEED ALARM” (terminal 30): this output is enabled if at least one fault relating to the engine’s speed is present:
 - High engine speed block (“OVERSPEED”)
 - High generator frequency block (“F04, OVERFREQUENCY”)
 - Low generator frequency deactivation (“F03, UNDERFREQUENCY”)
 - Energy inversion block (“F12”)
- “GENERATOR ALARM” (terminal 31): this output is enabled if at least one fault regarding the generator is present:
 - Current overload block (“F06, OVERCURRENT”)
 - Contact overload block (“OVERLOAD”)
 - High generator voltage block (“F02, OVERVOLTAGE”)
 - Low generator voltage deactivation (“F01, UNDERVOLTAGE”)
 - Max power warning (“F49, MAX POWER”)
- “OFF-PROG-MAN” (terminal 32): this output is enabled only if the key selector is on AUTO or on TEST
- “OFF SELECTION” (terminal 33): this output is enabled only if the key selector is on MAN, AUTO or TEST

Further, you can send the remote signals of the single blocks, deactivations and alarms through the serial interface with the RS 232C device.

From the software release 08.00.25 is it possible to order as option the second serial port of DST4600A board. It is then possible to connect to this serial port one expansion board provided with 32 digital outputs or 16 outputs and 16 inputs. The outputs can be used as additional remote signals. See document EAAN0022, release 03 or successive.

7.6 LOW POWER or MAX POWER signaling

By using parameters from P56 to P59, it is possible to configure the board for taking some actions related to the active power of the system. These parameters configure two power thresholds and the related filter time. Outside the zone defined by the thresholds (P56 and P58), the board takes some actions. Till to the revision EB02200080036 it could only signal the low power status. From the revision EB02200080037, it can alternatively signal the maximum power status. This function is disabled in the following situations (whatever is the action selected):

- P56 = 0
- P58 = 0
- P56 >= P58

To select an action, you have to operate with the bit 7 of parameter P61. If not set, the board will signal the low power status, if set the board will signal the maximum power status. This is true from revision EB02200080037, for the previous revisions the only action was the low power signaling.

The signal is performed by a digital output ("OUTPUT 1", terminal 37). The next two paragraphs describe the available actions in details.

7.6.1 Low load status signal.

It is possible to use this feature to stop/start one or more external generator connected in parallel. To use this function the following condition shall be met:

- The board must be configured for POWER MEASUREMENT
- Input "INPUT A" (terminal 14) must be configured to acquire the KG actual status (bit 1 parameter P61=1).
- "INPUT A" must be acquire the KG actual status
- Parameters P56 and P58 must have values greater than 0 and P58 must be greater than P56.
- Bit 7 of parameter P61 must be set to 0 from revision EB02200080037).

This function uses also the parameter P60, in addition to those described in the previous paragraph.

Operational procedure:

1. Generator set not supplying: "OUTPUT 1" is not activated (floating, open circuit). On "INPUT A" (KG status) activation (ground shorted) becomes step 2.

2. Until P60 time is elapsed, "OUTPUT 1" is still not activated. During P60 time, on "INPUT A" deactivation the procedure returns toward step 1, otherwise, at the end, switches to step 3.
3. "OUTPUT 1" is driven based on the measured active power:
 - a) Supplied active power less than P56 threshold throughout P57 time: "OUTPUT 1" is activated.
 - b) Supplied active power greater than P58 threshold throughout P59 time: "OUTPUT 1" is deactivated.
 - c) If the supplied power value is in the range between P56 and P58 values, "OUTPUT 1" status is not changed from the actual status.

If "INPUT A" is deactivated (KG open) the procedure switches to step 1.

NB: this function assumes that the loads are applied to the generators before the time specified by parameter P60 is elapsed. If not, the board assumes to be in a low-load situation and then can deactivate other generators. When the loads will be applied, in the best situation the other generators will be restarted. In the worst situation this generator will be stopped for over-current.

7.6.2 Maximum power.

This function is used to have a visible and acoustic signal of the maximum power status. It can be used also for automatically disconnect some of the less important loads from the generator, in order to continue to work in the normal conditions.

If the active power is higher than P58 threshold consecutively for P59 time, the maximum power status is set and so the "OUTPUT 1" output and the "F49" warning are activated.

If the active power is lower than P56 threshold consecutively for the P57 time, the maximum power status is reset and so the "OUTPUT 1" output and the "F49" warning are deactivated (the "F49" warning is still present on the DST4600A panel if not acknowledged).

If the active power is between the P56 and P58 thresholds, the maximum power status and the "OUTPUT 1" output and the "F49" warning are not modified.

The "OUTPUT 1" output can be connected to a circuit breaker for automatically disconnect the less important loads. If it is connected to a changeover circuit, the board automatically re-connect the less important loads when the active power back into its nominal range.

Comparing the maximum power signal function to the low power signal function, there are the following differences:

- Parameter P60 is not used (and so the function is always enabled).
- The genset breaker status is not used (and so is not necessary to connect it).
- The "F49" warning is activated
- The "OUTPUT 1" output is controlled in the opposite way than in low load function: it is activated if power is greater than P58, while in the low power function it is activated if the power is lower than P56.

7.7 Real Time Clock option

Starting from SW revision 08.00.24, it is possible to install in DST4600A boards a Real Time Clock option (RTC). The option is equipped by a lithium battery that let the watch running also without supply. The expected duration of the battery is quite 10 years.

RTC has a full time/date management set of function (hours, minutes, seconds, day, month, year and day of the week).

RTC let the board implements the following function:

- Permanent storing of events alongside date and time.
- Automatic periodical test of generator set at preset time and days of the week.
- Time Lock of Generator set operation at preset time and days of the week.

7.7.1 How to display Time and Date of RTC

If the option is installed and in OFF/RESET mode, pressing STOP pushbutton the RTC display mode is entered.

The displays will show hours:

- Display “F”: hours (00-23)
- Display “V”: minutes (00-59)
- Display “A”: seconds (00-59)

Pressing “F1” or “F2” the mode will change to date:

- Display “F”: day (01-31)
- Display “V”: month (01-12)
- Display “A”: year (00-99)

This mode is outlined by the light on of the dot at the least significant digit of the displays.

Pressing again “F1” and “F2” the mode will revert to hour.

Pressing STOP again the RTC display mode is exit.

From SW release 08.00.35, the displays are blinking if the RTC date/time is not reliable (and so is required that the operator set the correct date/time).

7.7.2 Setting time and date

Once in RTC display mode (see previous paragraph), pressing “MODE/ACK” the RTC setting mode is entered.

Display “F” will show one of the following messages, while display “A” will show the proper value:

- “SEC”: seconds (valid value 0 through 59)
- “MIN”: minutes (valid value 0 through 59)
- “HOU”: hours (valid value 0 through 23)
- “DAT”: day of month (valid value 1 through 31)
- “DAY”: day of week (valid value 0 through 6, 0 is Sunday)
- “MON”: month (valid value 1 through 12)
- “YEA”: year (valid value 00 through 99)

Using “F1” and “F2” pushbuttons it is possible to select the variable to change.

To change a value, work as in programming mode (press “MODE/ACK”, lamp L1/L2 will turn off, L2/L1 will turn on, modify using “F1” and “F2” and then press again “MODE/ACK” to exit change mode).

The modified value needs to be explicitly stored.

If you press “START” the modified value will be stored, pressing “STOP” the new values will be discarded. In both cases the RTC setting mode is exited.

Remember to set the DAY OF WEEK value because it is required for a correct function of some features of RTC option.

7.7.3 Storing time/date into Data Record databases

Please see par. **Errore. L'origine riferimento non è stata trovata.**

7.7.4 Automatic Periodical Test

If your board is equipped by RTC option, it is possible to use two different modes to carry out the periodical test: one based on the RTC value and the other based on elapsed time (standard mode).

7.7.4.1 *RTC based periodical test*

To activate this function it is required to:

- Set P73, configuring the time of begin of the test;
- Set P74, configuring the day of the week when carry out the test (see par. **Errore. L'origine riferimento non è stata trovata.**)
- Set P19, configuring the duration of the test.

If P74 is greater than zero (RTC periodical test enabled), the standard periodical test mode is disabled even if P18 is greater than zero.

7.7.4.2 Standard mode periodical test

You can periodically test the operation of the generator set by programming two parameters that allow activating the test sequence on the basis of elapsed time. In particular:

- The parameter P18 determines the cyclical starting period of the generator set.
- The parameter P19 determines the duration of the test operation of the generator set.

If during the programming you change the value P18 the period count will restart from zero in the moment in which you'll exit the PROGRAMMING procedure.

The automatic periodical test is disabled if at least one of the two parameters is equal to zero or if RTC based periodical test is enabled.

If RTC option is not installed it is possible to use only Standard mode periodical test procedure.

7.7.5 Generator set Time Lock function

From 08.00.24 SW version and with RTC option installed it is possible to enable the function of the Generator set on time and day bases.

This function let you prevent the start of the engine when emergency supply is not required; otherwise you can use this function to start and stop the Generator set at needed time.

Three parameters are to be set to enable this function:

- P70: time at which the operation in AUTO mode is enabled;
- P71: time at which the operation in AUTO mode is disabled;
- P72: days of the week when the operation is to be enabled;
- P61: bit 4 to enable this function.

It is possible to configure only one set of enable time and one set of enable days.

If P70 is equal to P71 the Generator set will be enabled 24 hours at day but only during the days enabled by P72.

When the system is in Time Lock, the display "V" and "A" together will show the message "DISABL".

8. Differences between DST4600A and DST4600A/P

Starting from SW revision 08.00.22, the software is no more the same for the two version of the board. The correspondent SW version for the DST4600A/P is 12.05.22.

8.1.1 ALARM2 input for PARALLEL FAULT

The input function is specialized for the parallel fault condition.

The only difference between DST4600A and DST4600A/P is the default of the P65 (ALARM2 (terminal 02) filter time): for DST4600A/P is 180s instead of 1s.

8.1.2 KR management

Now DST4600A/P boards use KR as status for MAINS ALIVE.

Enabling the internal MAINS VOLTAGE sensor and connecting the GRID line to the R-S-T input terminal, KR will be deactivated if the MAINS is OK, and otherwise it will be activated.

If the internal MAINS VOLTAGE sensor is disabled, KR will be always in deactivated status.

The “MAINS SIMULATION” input (terminal 24) will never interfere on KR status.

8.1.3 KG management in test operation

DST4600A/P boards will drive activated KG during test operation when the Generator set will be ready to supply.

This feature is valid for all type of test operation.

The operator can manually deactivate KG.

8.1.4 “MAINS SIMULATION” delay time

Boards with the new SW version use P66 and P67 values as delay time related to the “MAINS SIMULATION” input status change.

DST4600A has default values of 0 for both P66 and P67.

DST4600A/P has default value of 2s for P66 and 30s for P67.

8.2 Differences with DST4600A/P for asynchronous engines

Starting from SW revision 08.00.39, the software is no more the same for the asynchronous engine version of the board. The correspondent SW version is 29.07.39. This software is built over the DST4600A/P software. This paragraph shows the differences between this new software and the DST4600A/P one.

8.2.1 Generator frequency and voltages

The board measures the generator frequency and voltages and shows them on the panel. But it does not use them for any protection and for engine running/stopped detection.

8.2.2 Terminal 8 function

In the standard version, this terminal acquires the low oil pressure alarm. In this version, it acquires the engine running status, and so the low oil pressure alarm is disabled.

8.2.3 Terminal 10 function

In the standard version, this terminal acquires the high water temperature alarm. In this version, it acquires the “engine in threshold” status, and so the high water temperature alarm is disabled.

8.2.4 “Engine not in threshold with KG closed” alarm

Only for this version, the board can activate a block (“F40”) when the KG is closed and the signal on terminal 10 becomes inactive, with a fixed filter delay of 0.5 seconds.

9. References

9.1 SMS Protocol for Boards DST4600A and REMOTE SIGNALS

Document: EAAS0015

Revision: 01 or later

9.2 DTS4600-PC Communication Protocol

Document: EAAS0006

Revision: 01 or later

9.3 ModBus protocol implementation for SICES equipment

Document: EAAS0016

Revision: 03 or later

9.4 Remote signal operating manual

Document: EAAS0022



Revision: 03 or later

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