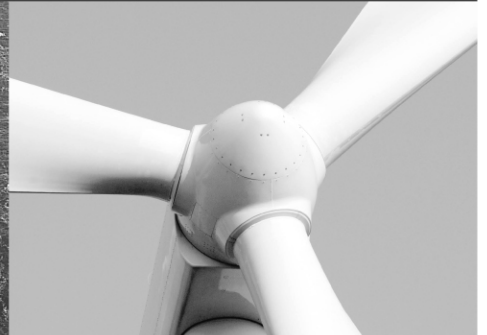




-power in control



Delomatic 4 DM-4 Land/DM-4 Marine



Alarm Handling Part 2, chapter 13



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13. Alarm handling

The alarm handler is a software function, which handles all alarms registered by the DM-4 system.

The alarm handler may be activated by:

- External alarm signals
- Internal DGU system supervision
- Internal generator set supervision
- Internal PMS supervision

The alarm handler will examine every registered alarm, activate the designated alarm sequence and display the corresponding alarm message. For more information about the significance of a specific alarm message, refer to the chapter **ALARM LIST**.

When a new alarm is registered:

- **"ALARM"** LED will start flashing red
- Alarm message will be displayed at the DU
- Alarm sequence will be carried out.

Display of alarms

Alarm messages concerning a specific generator set (DGU) will be displayed on the corresponding DU.

Alarm messages concerning common PMS functions will only be displayed on the corresponding DU for the Main PMS DGU. (Refer to the chapter ALARM LIST for details regarding alarms).



Alarm types

The alarm handler distinguishes between system alarms and PMS alarms.

System alarms (system supervision)

A system alarm indicates a failure, which may prevent the DGU from operating as expected. A system alarm may be caused by communication error, power supply failure or input/output error and similar.

(For more information on how to handle a system alarm, refer to the paragraph *GENERATOR SET SUPERVISION* or the paragraph *SERVICE GUIDE*.)

PMS alarms

A PMS alarm may be considered to be caused by a "normal" event, meaning that the Delomatic 4 system is fully operational and handling the event(s) as expected.

Alarm sequences

The alarm sequences are designed to take appropriate action according to the severity of the event that caused the alarm.

The Delomatic 4 system is implemented with several alarm sequences:


- Warning
- Generator/circuit breaker block
- Pre-warning/safety stop
- Protection (trip of circuit breaker)
- Short-circuit
- Shutdown
- Protection TB trip
- EMG shutdown

Warning

The purpose of the warning sequence is to inform the operator of "nice to know" events. The DM-4 system will not take any action, but only display an alarm message.

Warning sequence functions will

- make the red "**ALARM**" LED flash
- display the designated alarm message on the DU
- activate the horn output (optional)
- set one of the alarm type outputs (SYSTEM or PMS).

The operator is able to reset the horn output by pressing the reset horn  push-button (optional). This will not have any influence on the further alarm handling.

Generator/Circuit Breaker block

The generator block alarm sequence is used for blocking of any further automatic functions which will lead to connection of the generator set/shaft generator if a situation (electrical or mechanical) occurs, due to which it is inadmissible to connect the generator set/shaft generator to the busbar.

Generator/circuit breaker block sequence common functions will

- carry out the warning sequence
- block all automatic functions that will lead to a connection of the generator
- block for closing of the generator breaker in question.

Additional to the common functions, the generator block sequence will

- transfer the PMS start command to the next standby DGU in case a start of an additional genset is needed.

Pre-warning/safety stop

The pre-warning/safety stop sequence is used to carry out a previous intervention and stop a faulty engine, instead of waiting until a critical condition becomes fatal for the engine.

Furthermore, the pre-warning/safety stop alarm sequence can prevent a possible blackout situation at the busbar, because it disconnects and stops the faulty generator set **before** a shutdown occurs on a running generator set.

If a pre-warning/safety stop sequence is activated, the following will happen depending on the situation:

- The available power of the remaining connected generators allows for disconnection of the faulty genset:

The faulty genset is disconnected and stopped **without** starting up any standby genset.

If the PMS plant mode is AUTO..n and no MAX..n mode restriction has been selected, a standby genset may be started up and connected according to the chosen start priority due to load-dependent start, depending on the chosen set point for load-dependent start. If no standby genset is available, no further action will be carried out.

- The available power of the remaining connected generators **does not** allow for disconnection of the faulty genset:

According to the chosen start priority, a standby genset is started up and connected before the faulty genset is disconnected and stopped.

If no standby genset is available, no further action will be carried out. The faulty genset **is not** disconnected and stopped.

Note that in case of different nominal capacity of the generators that are available to the power management system, more standby generators may be started up and connected in order to substitute the faulty generator.

When sufficient available power is measured at the busbar, the faulty generator set is disconnected and stopped according to normal stop sequence, including cooling down time.

The automatic start/stop functions are not active in SEMI-AUTO mode. Only alarm messages are given.

The pre-warning/safety stop sequence functions will

- carry out the warning sequence (alarm message causing the situation)
- transmit a PMS start command to the next standby generator set(s), if needed due to busbar load
- connect the next standby generator set(s) to the busbar, if needed due to busbar load
- display alarm "Safety stop" on the PMS display unit for the faulty generator set
- disconnect and stop the faulty generator set according to normal stop sequence, including cooling down time
- block for a new start of the faulty generator set
- carry out the blocking alarm sequence.

If the DGU with the faulty generator set is not ready for PMS stop, the alarm message "Safety stop" is not displayed and the generator set is not stopped either.

Protection (Trip of generator circuit breaker)

The circuit breaker trip sequence is carried out in order to protect the system from critical electrical conditions on the busbar, or to protect the busbar from critical electrical conditions in the generator set.

The breaker trip sequence common functions will

- immediately open the breaker
- disconnect the non-essential load groups (NEL)
- carry out the warning sequence
- block for a reconnection of the breaker until the alarm is acknowledged.

Additional to the common functions, the breaker trip sequence will

- transfer the PMS start command to the next standby DGU in case a start of an additional genset is needed.

An active trip of breaker alarm sequence is indicated by

- A red "**CB ON**" LED on the DU.

Protection (Trip of bus tie breaker)

The circuit breaker trip sequence is carried out in order to protect the system from critical electrical conditions on the busbar and to separate the busbar into several sections, preventing faults to spread to the entire busbar system. Conditions for trip of the bus tie breaker are measured by the SCM card controlling the bus tie breaker.

The breaker trip sequence common functions will

- immediately open the breaker
- carry out the warning sequence
- block for a reconnection of the breaker until the alarm is acknowledged.

An active trip of breaker alarm sequence is indicated by

- A red "**TB ON**" LED on the AOP.

Short-circuit trip of circuit breaker

The circuit breaker trip sequence is carried out in order to protect the system/generator from critical electrical/mechanical conditions related to the short-circuit.

The breaker trip sequence common functions will

- immediately open the breaker
- disconnect the non-essential load groups (NEL)
- carry out the warning sequence
- block for a reconnection of the breaker until the alarm is acknowledged.

By a short-circuit, the blackout start sequence is not performed. This is to protect the electrical/mechanical system.

An active trip of breaker alarm sequence is indicated by

- A red **"CB ON"** LED on the DU.

Shutdown

The shutdown alarm sequence may be carried out when a fatal condition has occurred in the generator set.

The shutdown sequence functions will

- immediately open the generator breaker
- shut the engine down immediately after disconnecting the breaker from the busbar
- disconnect the non-essential load groups (NEL)
- carry out the warning sequence
- transmit a PMS start command to the next standby generator set
- block for a new start of the defective generator set until the alarm is acknowledged.

Protection TB trip

The tie breaker trip sequence is carried out in order to protect the system from critical electrical conditions on the busbar, or to protect other busbar sections from critical electrical conditions in the generator set. Conditions for trip of the bus tie breaker are measured by the SCM card controlling the generator breaker.

The breaker trip sequence common functions will

- immediately open the breaker
- carry out the warning sequence
- block for a reconnection of the breaker until the alarm is acknowledged.

An active trip of breaker alarm sequence is indicated by

- A red **"TB ON"** LED on the AOP.

EMG Shutdown

The EMG shutdown alarm sequence may be carried out when a fatal condition has occurred in the generator set. The alarm sequence will be carried out even if the generator set is selected for emergency generator operational mode.

The EMG shutdown sequence functions will






- immediately open the generator breaker
- shut the engine down immediately after disconnecting the breaker from the busbar
- disconnect the non-essential load groups (NEL)
- carry out the warning sequence
- block for a new start of the defective generator set until the alarm is acknowledged.

Alarm registration

All alarm messages are registered and stored in the alarm stack with statement of

- alarm ID no.
- alarm text
- status as an unacknowledged or acknowledged alarm.

Alarm stack

The alarm handler stores all registered alarm messages in chronological order (as registered by the DM-4) in the alarm stack. The received alarms will be stored with the first (oldest) alarm at the top of the stack. If more than one alarm is active, it is possible to toggle through the alarm list by using the  or  push-buttons on the display. The alarm information window displays one alarm at a time and whether or not it is acknowledged. If it is unacknowledged, press the  push-button (with the cursor on ACK) to acknowledge it. Use the  or  push-buttons to step through the alarm list.

Alarm ID no.


Every alarm in the DM-4 is identified by an alarm identification number ID which will be displayed at the DU together with an alarm text. The alarm identification number is used for a positive identification of alarms, for example when corresponding with a DEIF service engineer. In the example below, the alarm for COM. ERROR DGU 2 is identified by the ID no. 472.

Alarm identification number ID




First – Last alarm

The first alarm status is designated to the first alarm received by the DM-4.

To display the first alarm in the alarm stack, press the  push-button on the DU when the underline is active for "FIRST".

Some events may cause a chain reaction of further events, each generating an alarm. The first alarm status may indicate which event was the original.

The alarm handler software is executed sequentially, which means that the status of the internal alarm signals is examined once in every programme scan. If the DM-4 receives several internal alarm signals within one programme scan, the alarm signal which was "scanned" first will be designated with the first alarm status.

To display the latest registered alarm in the alarm stack, press the  push-button on the DU when the underline is active for "LAST".

Acknowledgement of alarms

Any alarm registered by the DM-4 system must be acknowledged by the operator in order to reset the action taken by the alarm sequence.


At the same time, the operator becomes aware of any occurring abnormal events, even though the condition that caused the alarm may have disappeared as a result of the action taken by the DM-4 alarm sequence.

Every unacknowledged alarm is identified by

- "ALARM" LED flashing red
- the UN-ACK status line in the display.



The UN-ACK status line in the display

An active alarm is acknowledged by pressing the  push-button on the DU when the underline is active for "ACK".

Acknowledgement of a still active alarm is confirmed by the following status line in the display:



The ACK status line in the display The ACK must have an active underline when acknowledging

When only acknowledged alarms are present in the alarm stack,

- the **"ALARM"** LED will turn to a steady red light.

Acknowledgement of active alarms

An active alarm means that the condition(s) that caused the alarm is (are) still present.

When the alarm condition(s) for an alarm with acknowledged status disappear(s), the alarm message will be removed from the alarm stack, and any action made by the alarm sequence is disabled.

Acknowledgement of inactive alarms

An inactive alarm means that the condition(s) that caused the alarm has (have) disappeared before acknowledgement of the alarm. The acknowledgement of an inactive alarm will remove the alarm message from the alarm stack and disable any actions taken by the alarm sequence.

An empty alarm stack

When there are no unacknowledged alarms and no more active alarms,

- the **"ALARM"** LED will be turned off
- the **alarm output(s)** will be deactivated (PMS or DGU alarm outputs).

DEIF A/S reserves the right to change any of the above.