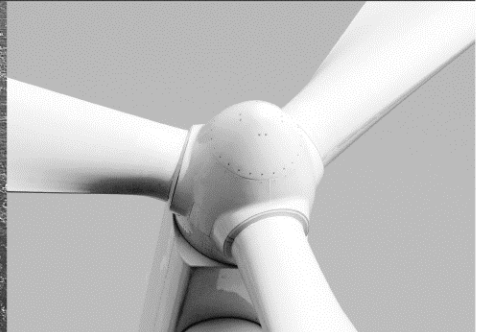
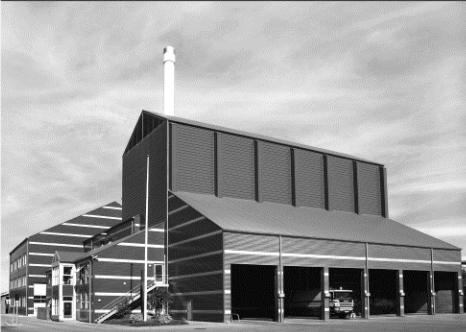




-power in control



INSTALLATION INSTRUCTIONS AND REFERENCE HANDBOOK



Remote Maintenance Box, RMB

- General product information
- Components
- Functional description
- How to set up the system
- Voltage mains measurement
- Cable and plug connection
- Generator wiring



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1. About this document

This first chapter includes general information about this Installation Instructions and Reference Handbook as a document.

Furthermore, it outlines the overall contents and structure of the document.

General purpose

This document is the Installation Instructions and Reference Handbook for DEIF's remote maintenance solution. The document describes the functions of the remote maintenance box and deals with the general purpose of the transformer maintenance.



Contents/overall structure

The document is divided into chapters, and in order to make the structure simple and easy to use, each chapter will begin from the top of a new page.

2. Warnings and legal information

This chapter includes important information about general legal issues relevant in the handling of DEIF products. Furthermore, some overall safety precautions will be introduced and recommended. Finally, the highlighted notes and warnings, which will be used throughout this handbook, are presented.

Legal information and responsibility

DEIF takes no responsibility for installation or operation of the generator set or the remote maintenance box. If there is any doubt about how to install or operate the generator set controlled by the unit, the company responsible for the installation or the operation of the set must be contacted.

The units are not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

Safety issues

Installing and operating the unit implies work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.



Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

Definitions

Throughout this document a number of notes and warnings will be presented. To ensure that these are noticed, they will be highlighted in order to separate them from the general text.

Notes



The notes provide general information which will be helpful for the reader to bear in mind.

Warnings



The warnings indicate a potentially dangerous situation which could result in death, personal injury or damaged equipment if certain guidelines are not followed.

3. General product information

The remote maintenance box is only to be applied together with an AGC-3 or AGC-4 (Automatic Genset Controller) with software versions from 3.40.0 or later and from 4.00.0 or later. The AGC is a power management controller, carrying out generator control, supervision and protection.



Communication between the RMB and AGC is established via a CANbus communication (data cable). This CANbus communication is intended for DEIF use only and cannot be connected to other external CANbus systems.

System description

DEIF has developed this remote maintenance box to comply with the demands for safe maintenance at transformer substations or other electrical installations where safe and reliable static sync (zero sync or phase lock loop) is requested, and also to enable operation in specific scenarios where it is necessary or required to have the interface/operator panel close to the connection points.

All operation is done by means of the function selector in the box. To comply with the safety requirements concerning the system, it is recommended not to carry out any manual operation via the display.

The display will show different views in each function step to give the necessary information to the operator.

Functional description

Detailed step-by-step guide of how to operate the RMB together with notes and warnings is available in the Operator's Manual of the RMB.



DEIF recommends that the operator always uses the RMB Operator's Manual, document no. 4189340730, for reference when operating the RMB – if questions should arise.

4. Components

The remote maintenance box must be robust and easy to operate. It is tested according to hand tool regulation, and therefore only mechanically robust components are used, and step-by-step selection is made by means of the selector switch.



Technical specifications are described in the data sheet of the RMB.

Display

The box contains a display, DU-2, which has the same functions as the display mounted directly on the AGC-3 or AGC-4 controlling the genset. This gives the operator the possibility to read out the same values from both displays, such as synchroscope, menus, activity texts, etc.

Turn switch

Power setpoint adjustments are made by means of a spring return selector switch to ensure that the switch returns to zero when released. To select the function, the operator uses a multi-position selector switch that is turned clockwise in sequential steps to make the generator carry out the functions indicated until it completes 360 degrees. Then the generator will stop, and it is ready for a new job cycle.



The working principle of how to operate the RMB is described in the Operator's Manual of the RMB.

Lamp and buzzer

The lamp for "Connect mains" is activated together with an internal buzzer when back synchronisation to mains is safe, according to the programmed delay, limits for phase/voltage deviation and phase window.

Voltage connection

Voltage measurements can quickly and easily be connected directly to the remote maintenance box. It is possible to have a 1- or 3-phase measurement.

Shutdown

The shutdown function is to protect the system in case of an emergency. The box can be connected and disconnected throughout the entire process without interrupting the generator.



5. How to set up the system

To carry out a remote maintenance job with an AGC-3 or AGC-4, it is necessary to have additional options added to the standard controller. In the table below, the options required as a minimum for running remote maintenance are listed. Other options may be necessary, dependent on the application.

Option	Description
AGC-3 or AGC-4	With SW versions from 3.40.0 or later and from 4.00.0 or later
E or F	Analogue controller It is not recommended to use relay regulation
EIC (H5, H6 or H7)	Engine communication
D1	Voltage regulation
H8.2 or H8.8	This is for CANbus interface between the AGC-3 or AGC-4 controller and the remote maintenance box



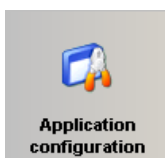
It is necessary to have extensive knowledge about the functions of the AGC controller before operating the Remote Maintenance Box.

Application configuration

It is necessary to use the plant configuration in the DEIF utility software (USW) to set up and activate the correct system. The screendumps below are taken from the USW and show how to set up the AGC-3 or AGC-4 configurations for remote maintenance.

1. Open the DEIF utility software and click the application configuration in the left column.
2. Click the icon in the top toolbar to design a new plant configuration.
3. Select "Single DG" in Plant type and select one of the four applications to be the RMB application. It is possible to name this application for easy and fast recognition.

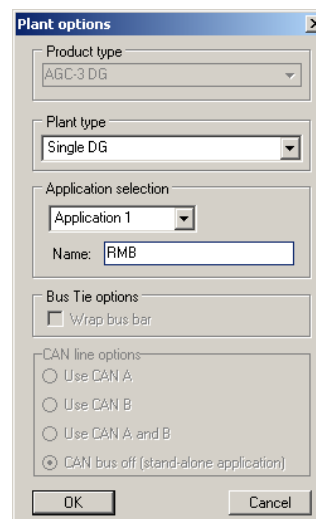
1.



2.



3.

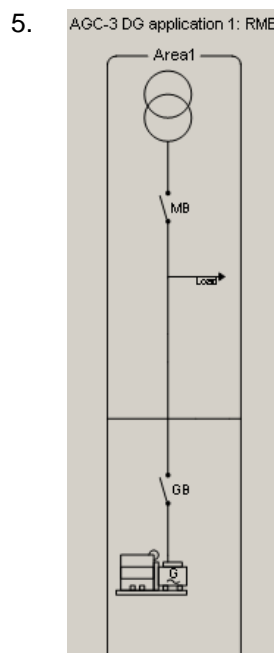
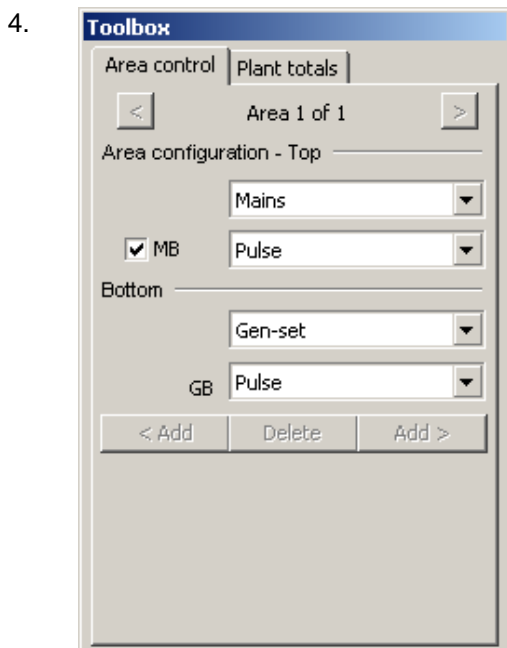


If the genset is used in more than one application, it is possible to design and save up to four different applications in the AGC. Each of the four applications can easily be enabled via input, M-logic or remote control.

4. Set up the application via the toolbox so one mains and mains breaker (MB) is available.

The MB type is not used in this application, so just select one. (In the below example, it is set to pulse). The genset breaker needs to be set according to the running application. (In the below example, it is set to pulse).

- Check that the plant configuration drawing at Area 1 is the same as the below picture.



- Write the application to the devices by clicking "Write plant configuration" in the top menu bar.
- Click "Yes" to set this application active, and click "Cancel" to distribute the application.



Via the help function in the USW, additional guidelines and examples of how to programme the unit will be available by pressing the function key [F1].

Setup of the unit without using USW

It is possible to set up the AGC-3 or AGC-4 without using the USW. This is done by following the below steps:

- Jump to menu 9180 Quick setup
- TY – select Single DG
- MA – Select Mains present
- GB – Select type of generator breaker: Pulse, Continuous or Compact
- MB – Select Pulse
- CAN – Select Off
- MODE – setup stand-alone

Setup complete will be stated in the display, and the priority in the lower right corner will no longer be visible.



It is not possible to use the Quick setup if the running application contains BTBs, dual or multiple mains or if the busbar is wrapped.

Plant mode and parameter settings

The following parameters have to be set up in the AGC-3 or AGC-4 before remote maintenance can take place.

Channel	Text	Settings	Comment
2030	Phase window	Application-dependent	Adjustment of when the lamp and buzzer will be activated
2060	Phase PID	Application-dependent	Will bring in the phase when static back synchronisation
6070	Genset mode	Remote maintenance	CAN1=H8.2 and CAN2=H8.8
7971 or 7981	CAN1 or 2 type	Beckhoff comm.	CAN1=H8.2 and CAN2=H8.8
7972 or 7982	CAN1 or 2 Baud rate	50 K	CAN1=H8.2 and CAN2=H8.8
7973 or 7983	CAN1 or 2 ID	10	Fixed ID
7051	Contr. settings PF	0.6...1	Actual mains/load value
7052	Contr. settings PF	Inductive/capacitive	Actual mains/load value

PID regulation

Two different PID regulators are used to adjust the frequency when static synchronisation is to be carried out. The following is an example of how to adjust the phase PID.

Sync	2061	Phase Kp	78	8
Sync	2062	Phase Ti	79	1,2 s
Sync	2063	Phase Td	80	0,3 s

The phase PID regulator will become active when static synchronisation is requested and the phase is inside the phase window.

The "f sync." regulator is used to bring the phase inside the window.

Sync	2041	f sync. Kp	74	5
Sync	2042	f sync. Ti	75	2 s
Sync	2043	f sync. Td	76	0 s

When the phase is outside the window the "f sync." regulator will be active, and when the phase is inside the window the phase PID regulator will be active



Additional information about adjustment of the PID regulator and how to perform static sync can be found in the AGC-3 or AGC-4 Designer's Reference Handbook.

Power factor settings

It is necessary to adjust parameters 7051 and 7052 to be as close as possible to the actual PF measured at the mains. Otherwise the frequency will drift when the generator has deloaded the mains and the fuses are removed.



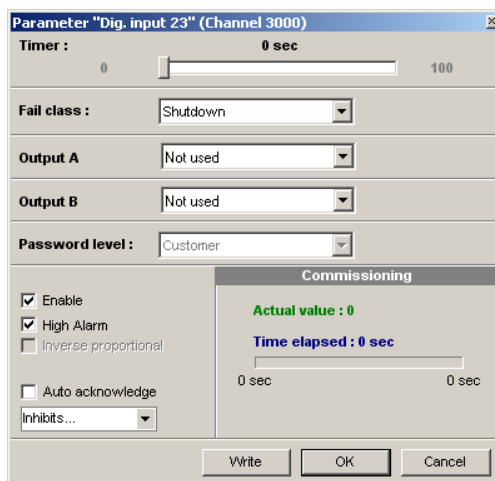
When the parameter is adjusted to the actual PF, the VAr regulation operation of the generator will become more stable.

Shutdown

It is not possible to connect the wire of the box used for shutdown in series with the AGC-3 or AGC-4 wire for the emergency stop, as this would make it impossible to remove the box without stopping the generator.

Therefore it is necessary to mount the shutdown wire from the box to a free digital input and programme this input to shut down with no delay. Remember to enable the parameter and set it to High Alarm.

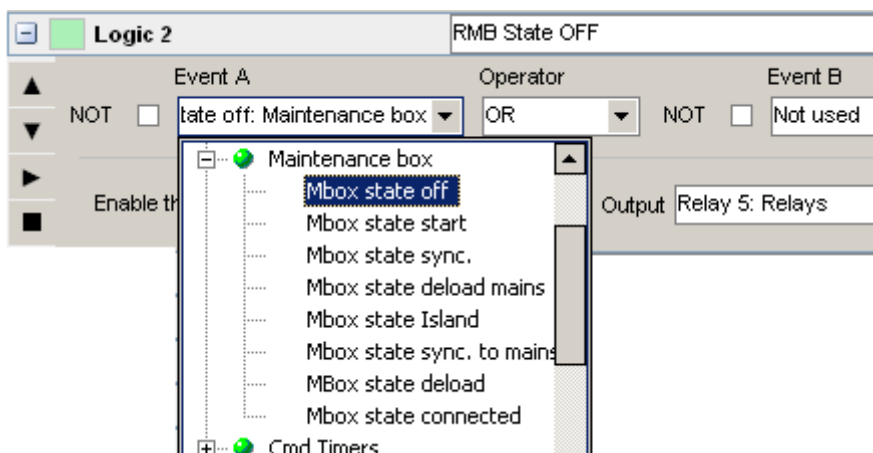
The screendump to the right is an example of how to programme a digital input to shut down the generator by using the USW.



Wiring of the shutdown stop is described in chapter 7, Cable and plug connection.

M-Logic

It is possible via the M-Logic to use the different states of the remote maintenance to enable an output. But it is not possible to overrule the already programmed function selected by means of the function selector key.



In the above example, the RMB State OFF is used as an input to activate relay 5 as an output.



If this example is used, then please remember to set relay 5 to limit relay in the parameter, otherwise it cannot be used by M-Logic.

Input from RMB

At the Input/output list in the USW it is possible to see the status of the two selector switches from the RMB, the following external digital inputs are related to the actual status of the two selector switches:

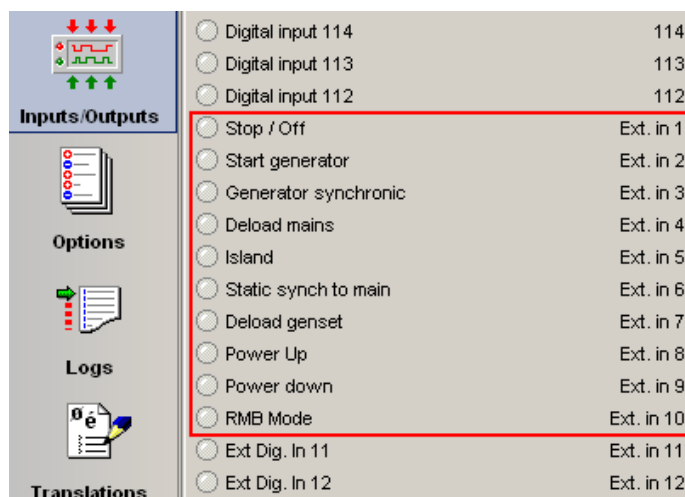
- Ext Dig. In 1 = Stop/Off
- Ext Dig. In 2 = Start generator
- Ext Dig. In 3 = Generator synchronic
- Ext Dig. In 4 = Deload mains
- Ext Dig. In 5 = Island
- Ext Dig. In 6 = Static synch to mains
- Ext Dig. In 7 = Deload genset
- Ext Dig. In 8 = Power up
- Ext Dig. In 9 = Power down
- Ext Dig. In 10 = RMB mode



It is possible to use all the external digital inputs from the RMB in M-logic.

Translation

It is possible via translation in the USW to rename the texts used in the input/output list so they correspond to the actual position of the two selector switches.



In the USW, use the search function in translation to locate each text, or use the help function [F1] for additional information regarding how to translate text.

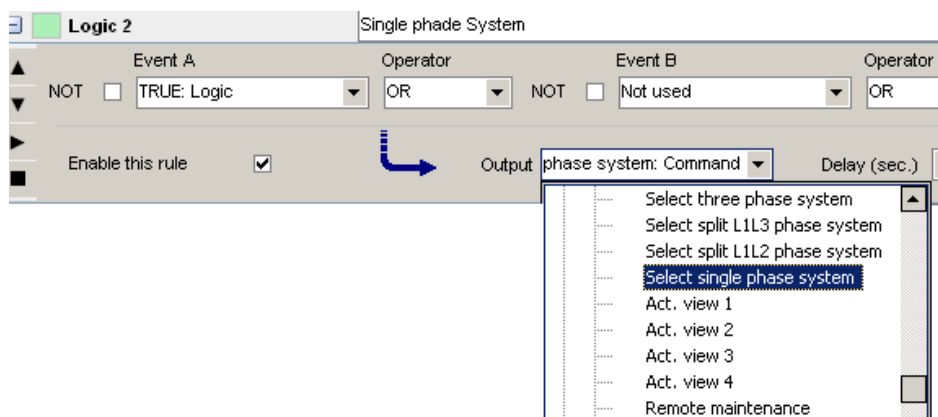
6. Voltage mains measurement

A manual connection of the voltage reference line from the mains is necessary when static synchronisation to the mains is to be carried out.



Be aware of the hazardous live currents and voltages when connecting the voltage reference line. It is the operator's responsibility to make sure that the voltage reference line is connected correctly.

Default setting for the AGC-3 and AGC-4 is three-phase measurements, but via M-logic in the USW it is possible to give an output command that enables one-phase measurement.



Additional information regarding M-logic can be found in the AGC-3 or AGC-4 M-logic application notes, or via the help file in the USW [F1].

Three-phase measurement

All three phases are connected on the remote maintenance box, which means that the synchronisation check is carried out at all three phases.



When using three-phase measurement, it is not necessary to connect the neutral, as it is calculated internally by the AGC-3 or AGC-4 controller.

Phase sequence check

When all three phases are used to measure the voltage, the AGC-3 or AGC-4 will automatically run a phase sequence check.



Additional information regarding phase sequence check can be found in the AGC-3 or AGC-4 Designer's Reference Handbook.



It is the operator's responsibility to make sure that the entire three-phase system is OK before closing the breaker or connecting the fuses.

One-phase measurement

The static synchronisation to the mains can be done by measuring one phase only, which means that the synchronisation check is only done at one phase.

Common neutral connection between generator and transformer

Only one phase and neutral are connected on the remote maintenance box to measure voltage at the mains. This can only be done if the neutral of the generator and the transformer is correctly connected, so the common measurement point is the same.



It is the operator's responsibility to make sure that the entire three-phase system is OK before closing the breaker or connecting the fuses.

No phase sequence check

When measurement is carried out with one phase and neutral only, phase sequence check is not possible. So it is strongly recommended to check the voltage across the breaker/fuse before any connection is established.



It is the operator's responsibility to make sure that the phase sequence is correct before closing the breaker or connecting the fuses.

7. Cable and plug connection

To make the system flexible and secure, the box is based on pulse detection of the buttons and switches in the box. In this way, the operator will be able to disconnect the box and maintain the system in the same function.



When the generator is running in island mode, it is possible to disconnect the RMB without stopping the generator, and when the RMB is reconnected, the communication starts automatically.

RMB connector kit (option J8)

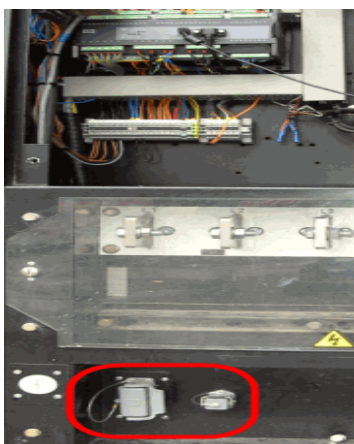
The option J8, RMB connector kit, contains:

- One display CAN cable. This cable is to be mounted in the display on the genset. The red/white and red wires are to be mounted in the plug for the data cable to the RMB.
- Two plugs to be mounted on the genset. Now you have plugs both on the genset and on the RMB for easy mounting of the extension cables that can be bought together with the RMB as option J10, J11 or J12.



Mounting of data and voltage plugs

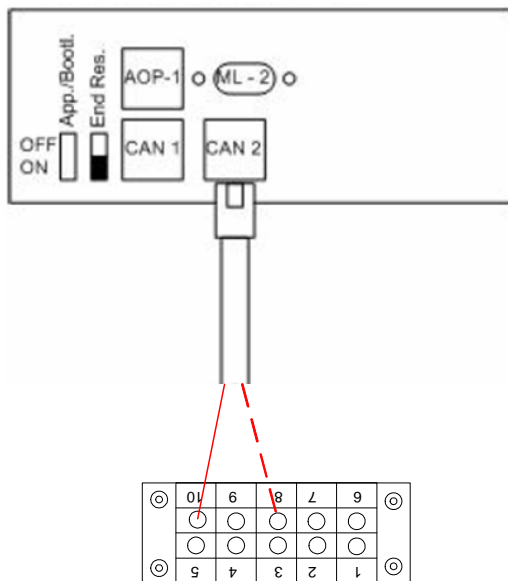
Below is an example of how the two plugs for data and voltage measurements can be mounted on the genset.



If the two plugs are mounted behind a door or hatch, make sure that enough space is available to close the door or hatch when the cables are mounted.

Wring between display and data plug

Below is an illustration of the back of the display where the CAN cable is to be mounted.








Make sure that the End Res. (resistor) at the display is set to ON, otherwise communication problems with the display in the RMB may occur.

Can ID Configuration

The CAN ID on the DU-2 can be set from 0 to 3. If it is set to zero, the CANbus communication is deactivated.

The CAN ID selection is done in the following way:

1. On the DU-2, press the left , up , and right  buttons at the same time to activate a CAN ID selection menu.
2. Select the desired CAN ID with the up  and down  buttons and press ENTER.

The CAN ID of the DU-2 has now been selected.



The DU-2 which is connected to the AGC has to have CAN ID no. 1.

Cable description

The connection between the generators' AGC-3 or AGC-4 and the remote maintenance box is split into two cables, one data cable and one voltage measurement cable.

The table below describes the wires required by the system to operate the generator from the box.

Description	Pin no. Plug	Cable wire (colour/no.)	AGC-3 or AGC-4 if option H8.8, slot #8	AGC-3 or AGC-4 if option H8.2, slot #2
Voltage measurement cable				
OLFLEXR ROBUST 210 ØLFLEX ROBUST 210, 4X1,0Q mm ²				
Voltage meas L1	1	BLACK 1	85	85
Voltage meas L2	2	BLACK 2	87	87
Voltage meas L3	3	BLACK 3	89	89
Voltage meas N	4	BLACK 4	88	88
	EARTH	GN/YL		
Data cable				
UNITRONICR BUS IBS Yv UNITRONIC BUS IBS Yv COMBI, 3X2X0,25 + 3X1,0				
	EARTH	GN/YL		
+24V DC	1	RED	1	1
0V DC	2	BLUE	2	2
Beckhoff CAN-H	3	WHITE	130 or 133 Internally connected	29 or 32 Internally connected
Beckhoff CAN-GND	4	SCREEN		
Beckhoff CAN-L	5	BROWN	128 or 131 Internally connected	31 or 34 Internally connected
Shutdown	6	GREY/PINK	Free D/I	Free D/I
Not used	7			
DU-2 CAN-H	8	GREEN	Blue or red/white cable	Blue or red/white cable
Not Used	9			
DU-2 CAN-L	10	YELLOW	Green or red cable	Green or red cable



Be aware of two cable colours, blue CAN H and green CAN L or red/white CAN H and red CAN L.



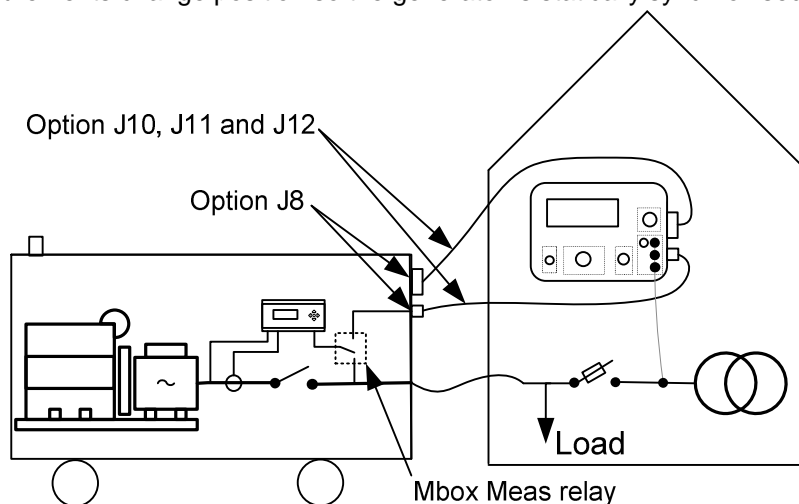
The shaded (grey) rows in the table above indicate the cable data.

Fault indication

When the two plugs are connected at the genset and the RMB is connected via the data cable if the light indicating "Connect mains" is lit when the RMB is connected, then the aux. supply is reversed, + to – and – to +, and pin 1 and 2 at the plug need to be swapped.

8. Installation instructions

When static synchronisation is to be carried out, it is recommended to mount one or two measurement relays on the generator (refer to the chapters below), enabling change of voltage measurements from the internal generator side to the mains side. This relay will ensure that the voltage measurements change position so the generator is statically synchronised to the mains.

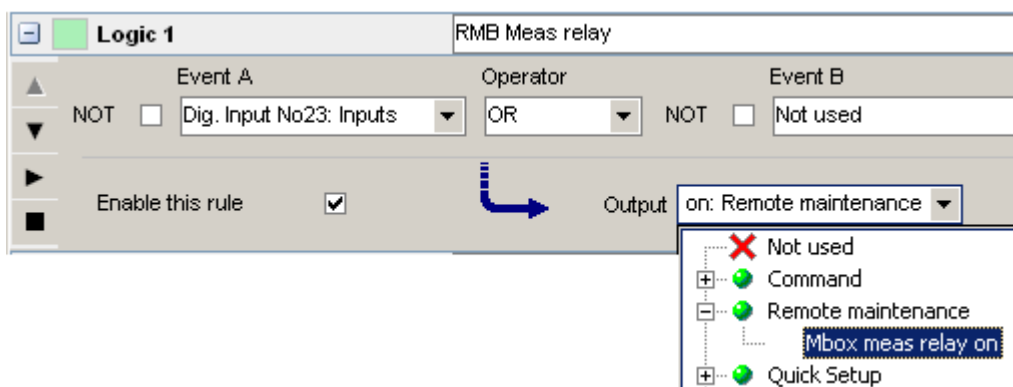


The new measurement points are shifted from the busbar to the mains to get correct measurement feedback to the remote maintenance box by a switching relay.

M-Logic

To ensure that the relay has been activated (mains is now the voltage reference point), the relay is given a feedback to the AGC-3 or AGC-4 on a free digital input. This digital input is used in M-Logic:

- Event A: Free digital input (the example below is digital input 23).
- Output: "Mbox meas relay on".



No relay available/possible

If feedback to the generator via a relay is not possible, a logic event has to be enabled via the M-logic:

- Event A: "Mbox state sync. to mains".
- Output: "Mbox meas relay on".

The screenshot shows a configuration window for 'Logic 1' with the title 'No Relay'. It features a logic rule editor with the following elements:

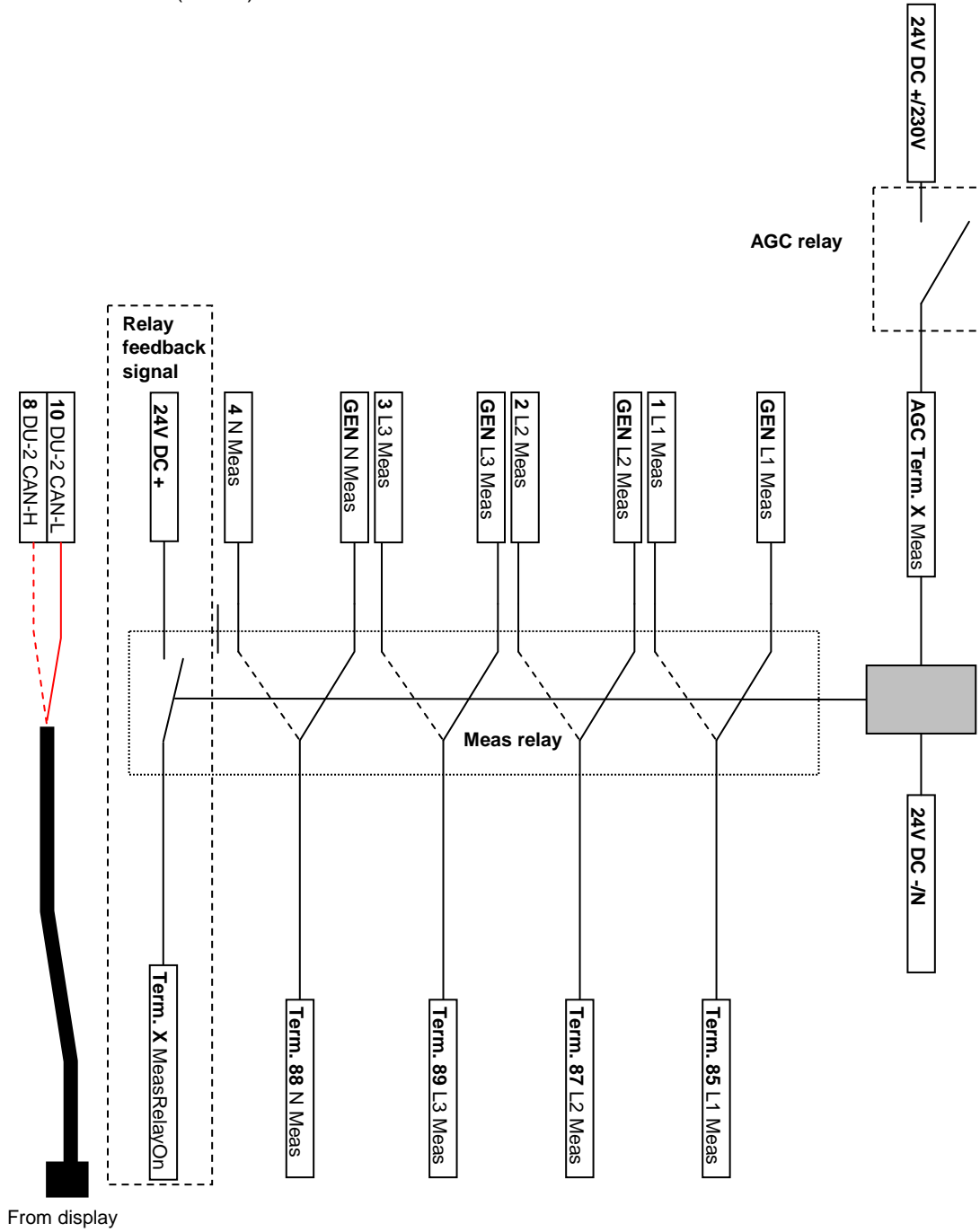
- Event A:** A dropdown menu set to 'Mbox state sync. to mains'.
- Operator:** A dropdown menu set to 'OR'.
- Event B:** A dropdown menu set to 'Not used'.
- NOT checkboxes:** Two checkboxes, one for Event A and one for Event B, both currently unchecked.
- Enable this rule:** A checkbox that is checked.
- Output:** A dropdown menu set to 'on: Remote maintenance'.
- Visuals:** A blue arrow points from the 'Enable this rule' checkbox to the 'Output' dropdown.




If no relay is used, then double-check the voltage reference before any sync to mains is performed.

One measurement relay solution

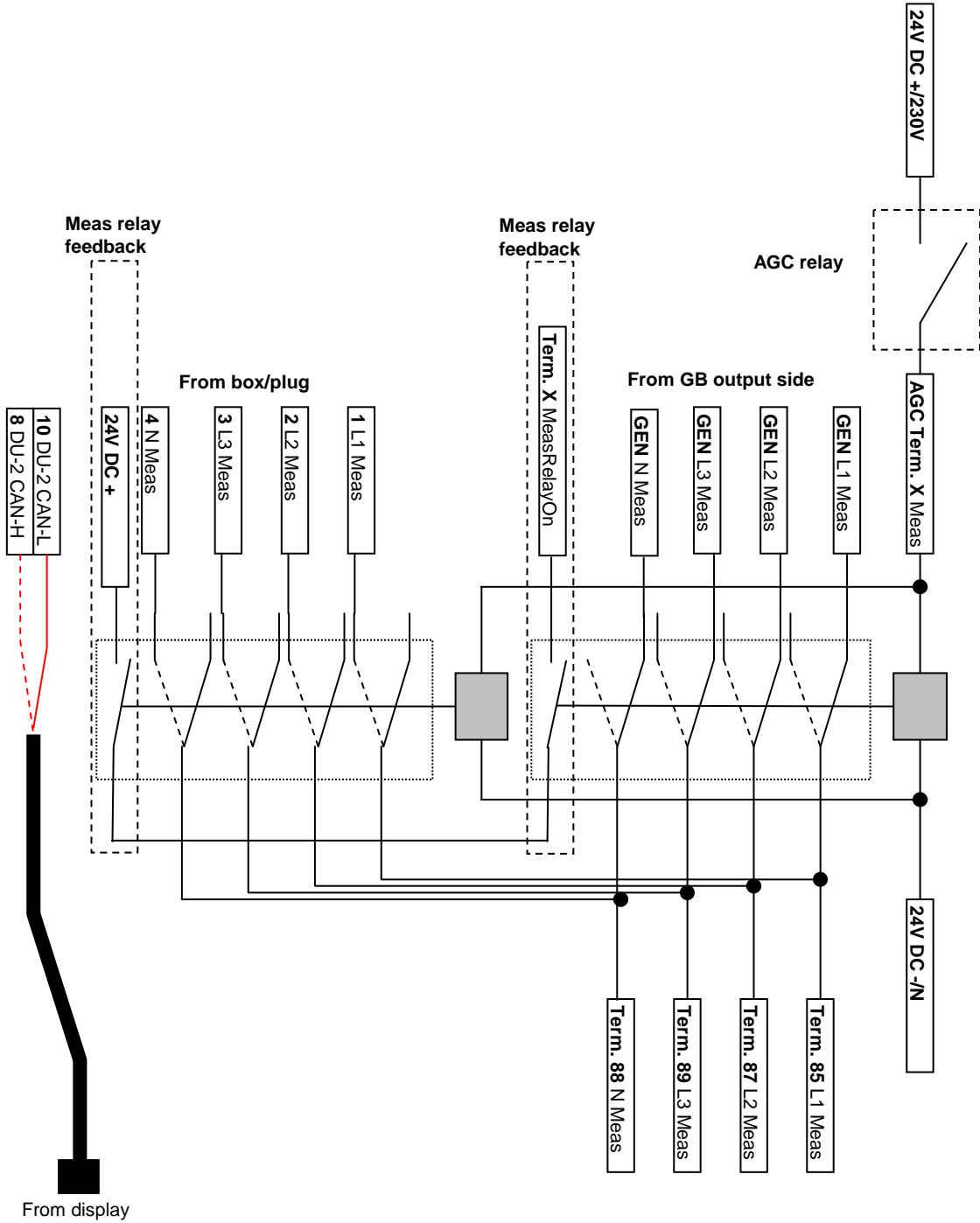
One relay is used to switch between the two voltage measurement points, generator and remote maintenance box (mains).



 **Be aware that high voltages may be present between the poles on the relay (mains/generator).**

Two measurement relay solution

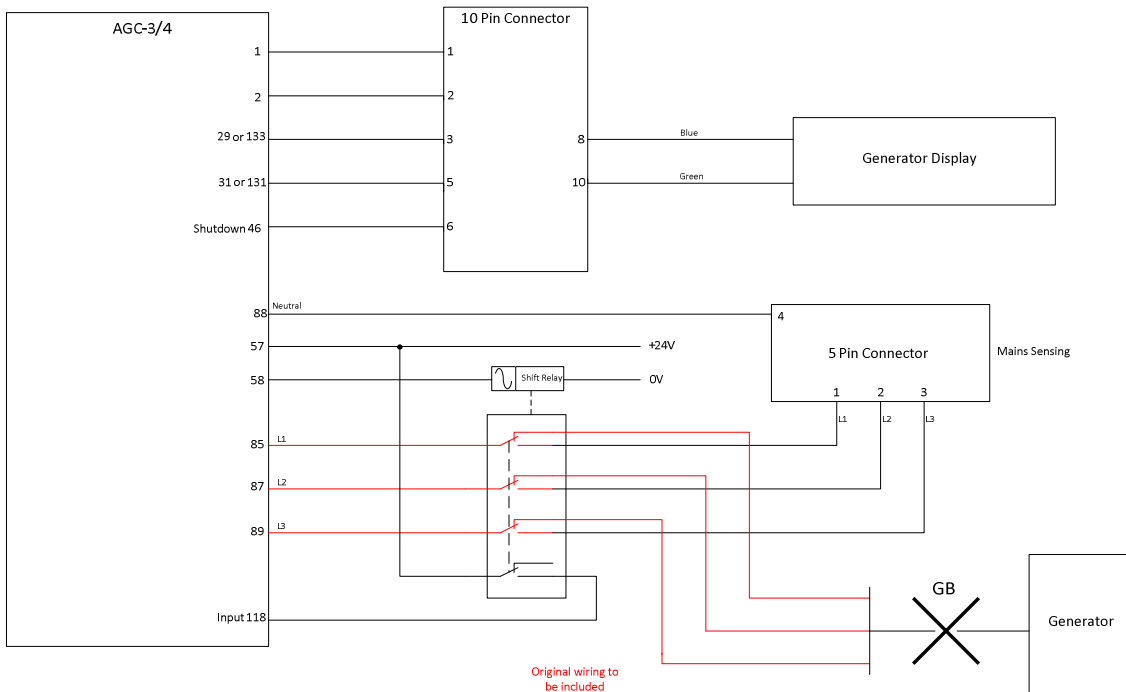
Two relays are used to switch between the two voltage measurement points, generator and remote maintenance box (mains).



Be aware that high voltages may be present between the poles on the relay (mains/generator).

Wiring example

The below single-line diagram is an example of how the two plugs (10 pin and 5 pin) can be connected to the AGC-3 or AGC-4, and also an example of how to wire up the two external relays for changing between voltage measurements.



Original wiring (in red) to be included.



Any free digital inputs or outputs of the AGC can be used to run this application.

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