DEIF

-power in control

CE

MULTI-LINE 2
DESCRIPTION OF OPTIONS

Option T1
Critical power

- Description of option
- Functional description

DEIF A/S · Frisenborgvej 33 · DK-7800 Skive
Tel.: +45 9614 9614 · Fax: +45 9614 9615
info@deif.com · www.deif.com

Document no.: 4189340765C
SW version:

1. Delimitation

1.1 Scope of option T1

1.1.1 Scope of option

This description of options covers the following products:

AGC-4	SW version 4.21.x or later
AGC 200	SW version 4.21.x or later
USW	3.33 or later

2. General information

2.1 Warnings, legal information and safety

2.1.1 Warnings and notes

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

Warnings

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

Notes

Notes provide general information, which will be helpful for the reader to bear in mind.

2.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.

The Multi-line 2 unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

2.1.3 Safety issues

Installing and operating the Multi-line 2 unit may imply 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.

2.1.4 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.

2.1.5 Factory settings

The Multi-line 2 unit is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the engine/generator set in question. Precautions must be taken to check the settings before running the engine/generator set.

3. Description of option

3.1 Option T1

3.1.1 General description

The option T1 is a software option and therefore not related to any hardware apart from the standard-installed hardware. The option T1 is related to the power management application only, and therefore it only makes sense in case either the option G4, G5 or G8 is present.

The critical power option consists of:

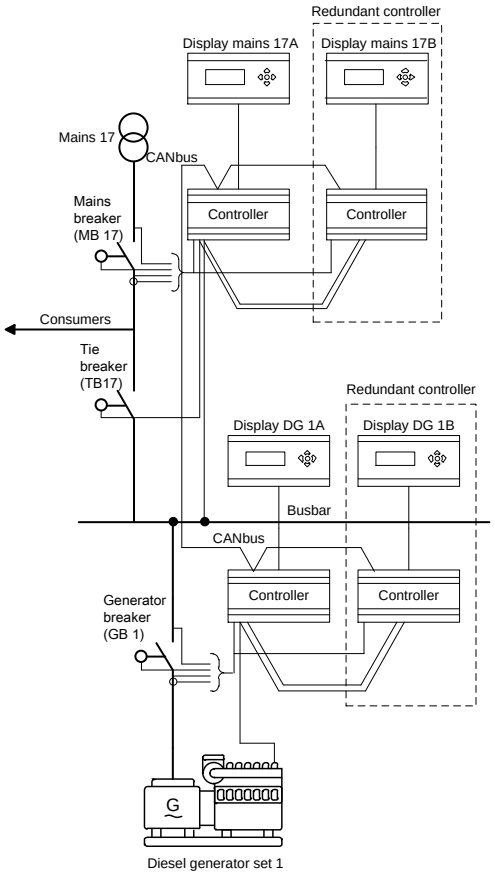
- Redundancy controller
- Short-circuit limitation

Redundancy controller:
allows a redundant controller to operate in hot standby with the master controller and to assume control even in engine running conditions if a problem occurs on the master (hot standby). The redundant controller is connected to the PM CAN line at all times.

All breaker- and engine-related commands are suppressed. Alarms are not suppressed in general. A new "Redundant" status has been added to the inhibit attribute list in the redundant controller. Only the "Breaker externally tripped" alarms are inhibited as default in case a unit has redundant status.

To run an application with redundancy, each controller in the system must have the option T1, critical power; even the controllers without redundancy.

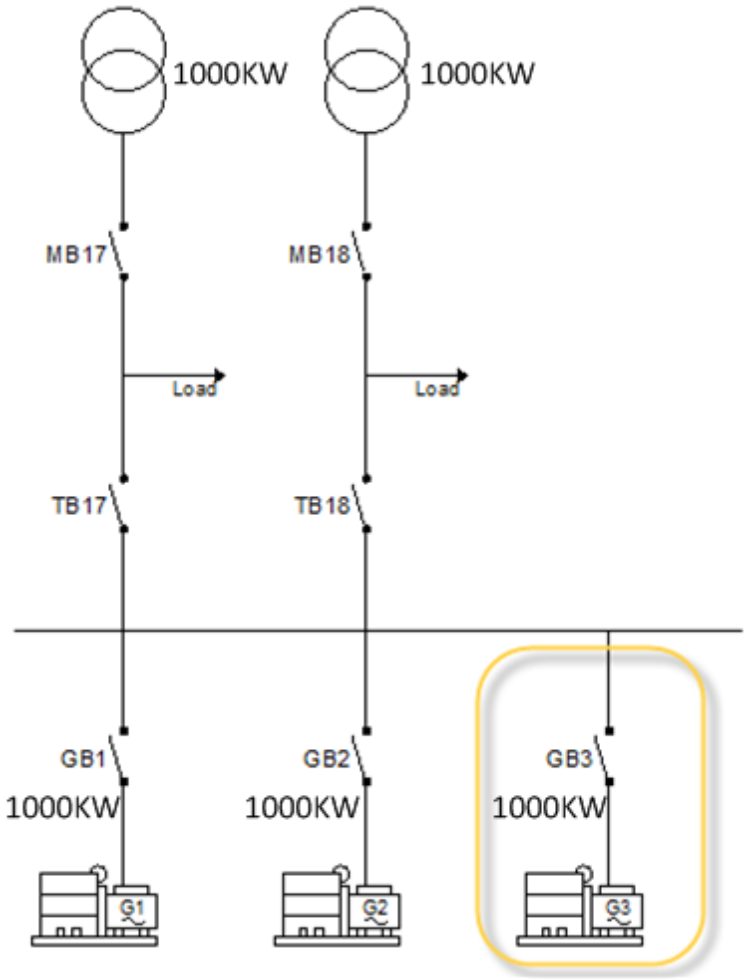
A diagram of a critical power setup is shown below.


Redundant controller
Display mains 17A
Display mains 17B
Mains 17
CANbus
Mains breaker (MB 17)
Controller
Controller
Consumers
Tie breaker (TB17)
Redundant controller
Display DG 1A
Display DG 1B
Busbar
CANbus
Controller
Controller
Generator breaker (GB 1)
G
Diesel generator set 1

3.1.2 Short-circuit limitation

This function can be used especially for applications in the low voltage range (400 V) where short-circuit currents of the transformers and generators are high. They can easily exceed the rated values of the breakers.

These applications are often critical and called, N+1 systems. The N+1 option ensures that an extra emergency generator is always available. "N" represents the number of emergency generators required to deliver the necessary amount of power for the critical application. The "+1" refers to one extra emergency generator.



To run a power management application with short-circuit limitation, each controller in the system must have the option T1, critical power.

4. Functional description

4.1 Redundant controller setups

4.1.1 General description

In general, two different types of redundant controller approaches exist:

- **Single master**
  One controller is preferred as master over the other
- **Multi master**
  No controller is preferred as master over the other

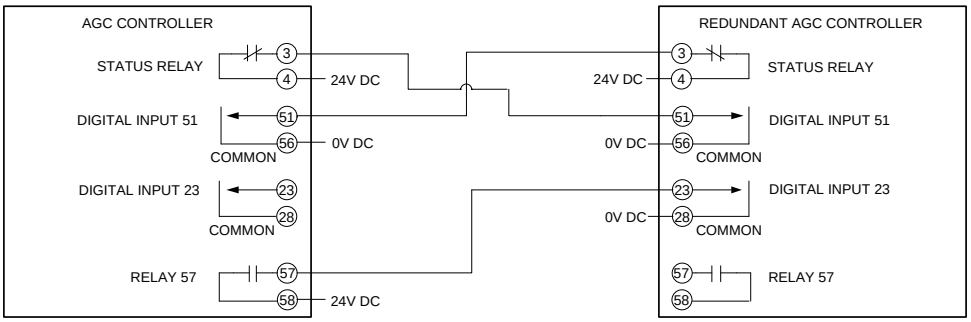
The transition from master to redundant controller can be done with the generator operating, even in load sharing operation. To enable this, the speed and voltage control must be done using relay control, interfacing directly to a GOV and AVR that accepts this type of control, or using an electronic potentiometer (EPQ96-2) for conversion of the signal. This is to prevent any load or speed jumps during transition.

Pulse breakers are necessary to avoid breakers tripping during transition.

4.1.2 Single master

Wiring

The diagram below is illustrative, the inputs and outputs can be changed.



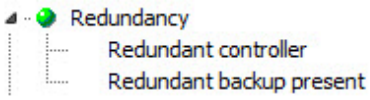
Relays and digital inputs for this function must be placed within this terminal range: 1-28 or 43-64.

The connections between the status relay and input 51 on both controllers are used to indicate the status of controllers for the application supervision.

The connection between relay 57 and input 23 is to determine which controller has the control. With this wiring, the controller on the left side with the relay output will be the preferred controller.

Redundancy functions in M-Logic
Whether a controller is redundant or not is set up via M-Logic.

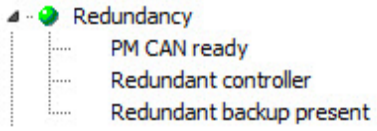
Commands



Redundant controller command forces the unit into standby mode, where commands for breakers and the engine are suppressed.

Redundant backup present command indicates that a redundant unit is present to take over for this unit in case of malfunction. The status is presented on the USW supervision page.

Events



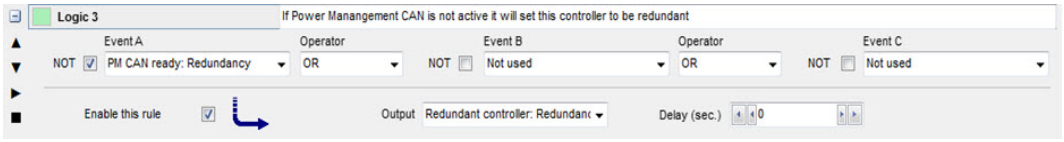
PM CAN ready is added to indicate when a preferred master unit is ready to regain master status from the redundant unit after power up.

Redundant controller is to indicate that the controller is in redundant status.

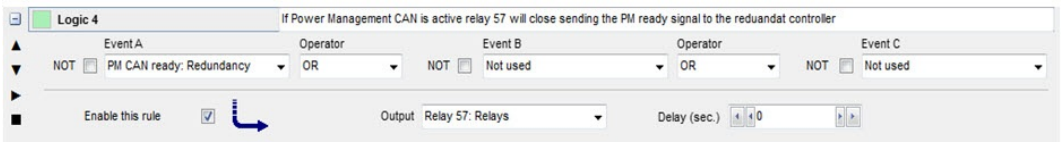
Redundant backup present controller is to indicate that a redundant controller is present.

M-Logic example
A proposed M-Logic sequence is presented below for the single master application.

M-Logic in the preferred AGC controller:

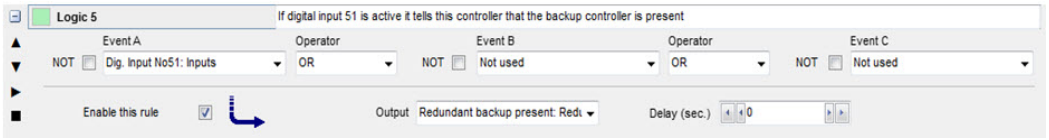


The line above keeps the preferred controller in standby mode when powering up, to prepare the CAN communication, and does not interrupt control of the redundant unit until the preferred controller is ready for operation.



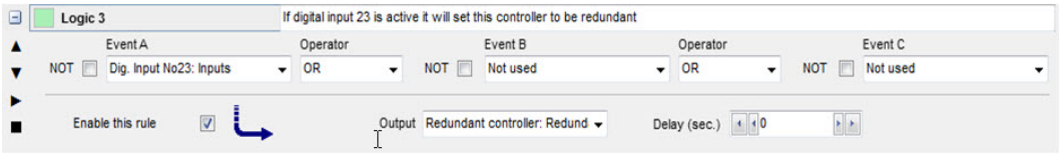
When power management CAN is ready for operation, the preferred controller requests control, putting the redundant unit in standby mode.

Remember to change relay 57 to limit relay so it is accessible to M-Logic. This is done in parameter 5110.

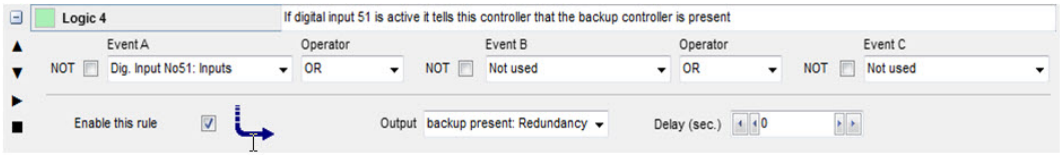


This line is used in application supervision to indicate that a backup unit is present.

M-Logic in the redundant AGC controller:



When the preferred controller is fully operational, this input is activated to hold the redundant controller in standby mode.

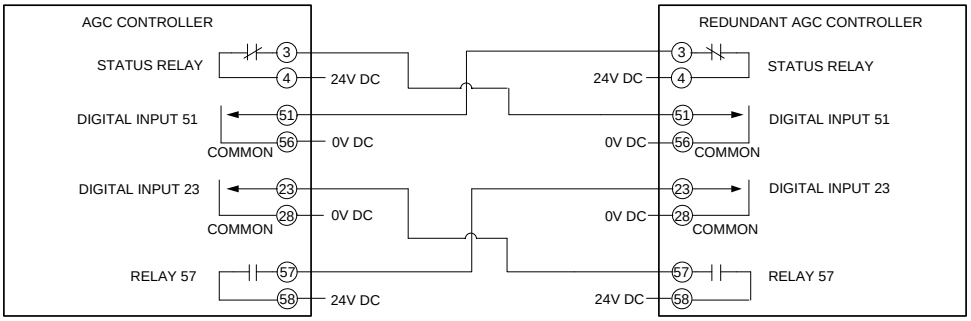


This line is used in application supervision to indicate that a backup unit is present.

4.1.3 Multi master

Wiring

The diagram below is illustrative, the inputs and outputs can be changed.



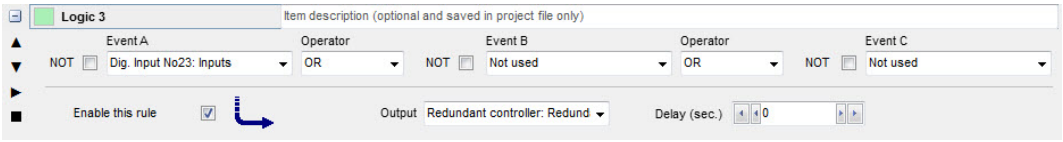
Relays and digital inputs for this function must be placed within this terminal range: 1-28 or 43-64.

The connections between the status relay and input 51 on both controllers are used to indicate the status of controllers for the application supervision.

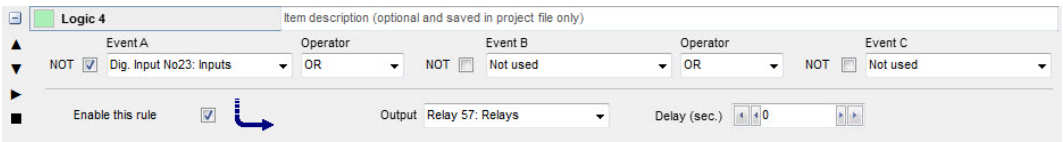
The connection between relay 57 and input 23 on both controllers is to determine which controller has the control. In this case, both controllers have the opportunity to be masters.

Redundancy functions in M-Logic

A proposed M-Logic sequence is presented below for the multi master application. In this setup, the M-Logic lines for the controllers can be almost identical.

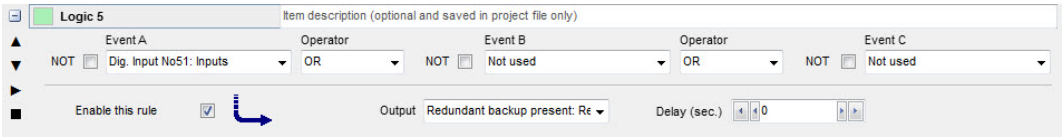


Both controllers will have this line saying that if input 23 is active, then this controller is redundant. When both controllers are powered up at the same time, it would be the first one ready that will set the opposite controller to be redundant.



Both controllers will have this line saying that if input 23 is **not** active and thus is the controller that has control, it sets the opposite controller in redundant mode with output 57. One of the controllers will need a small delay on relay output 57 to avoid timing issues when both controllers are powered up at the same time.

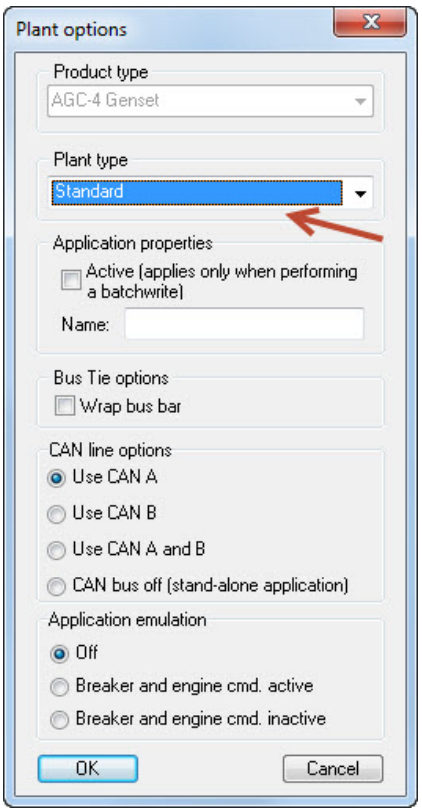
Remember to change relay 57 to limit relay so it is accessible to M-Logic. This is done in parameter 5110.



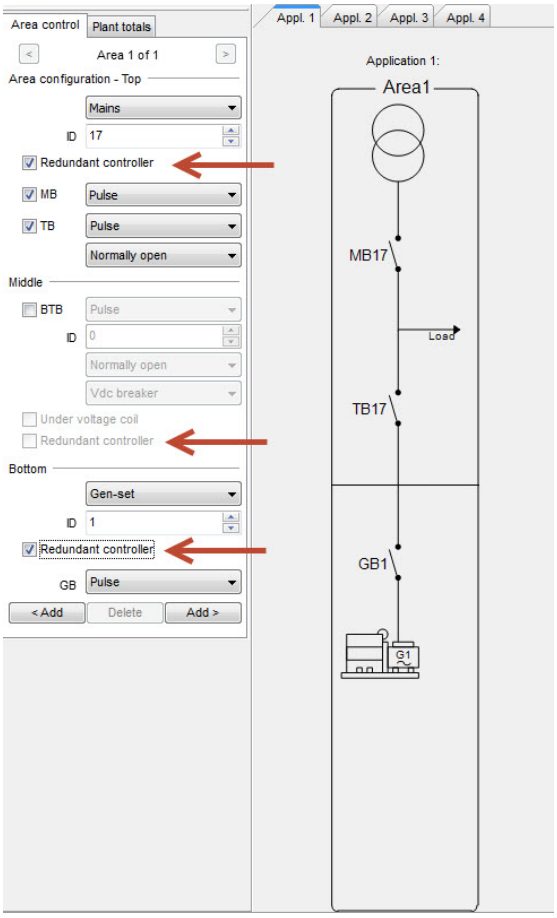
This line is also used in both controllers to indicate that a backup controller is present in application supervision.

4.1.4 Application configuration

Besides M-Logic configuration, the application has to be configured correctly to operate with a redundant controller. The plant type has to be standard as shown below:



When configuring the plant, in the area control, a check box is available to set the redundant controller on each of the three levels (AGC Mains, AGC Bus Tie and AGC Genset). The redundancy can be chosen independently in the different levels. The controllers that are redundant to each other must have the same internal ID on the PM CAN line (parameter 7530). It is not possible to broadcast applications from a redundant controller.



It is recommended to set the internal ID on all controllers before mounting the CAN lines.

To be able to run an application with redundancy, each controller in the system must have the option T1, critical power; even the controllers without a redundant controller connected.

4.1.5 Application supervision

Before the application supervision can see the redundant controllers, it is necessary to set up each controller as described below. This is done in identifiers and is necessary to make the supervision work properly. These settings have no effect on the performance of the redundancy; it is only for visual purposes in the supervision.

To have full visibility over the redundant controllers in the supervision, either the option N (TCP/IP) or the option H2 (Modbus) is needed.

Identifiers

On both controllers, identifiers must be set up.

Each controller must have the information below:

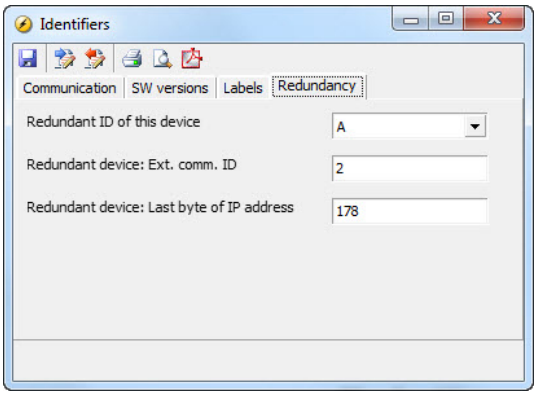
- Redundant ID of this device
  This is the ID letter you want to assign the controller you are configuring

- Redundant device: Ext. comm. ID
  This is the ext. communication ID from the redundant controller

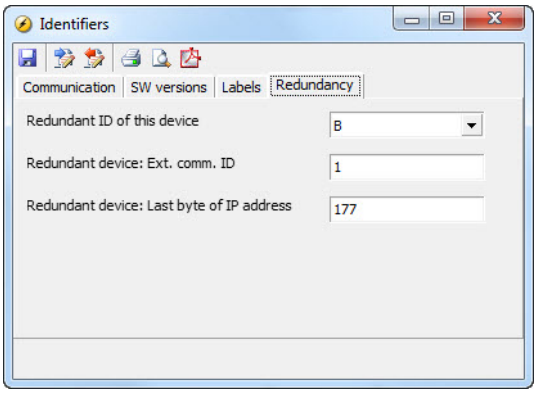
- Redundant device: Last byte of IP address
  This is the last byte of the IP address from the redundant controller 192.168.2.XXX

Example:

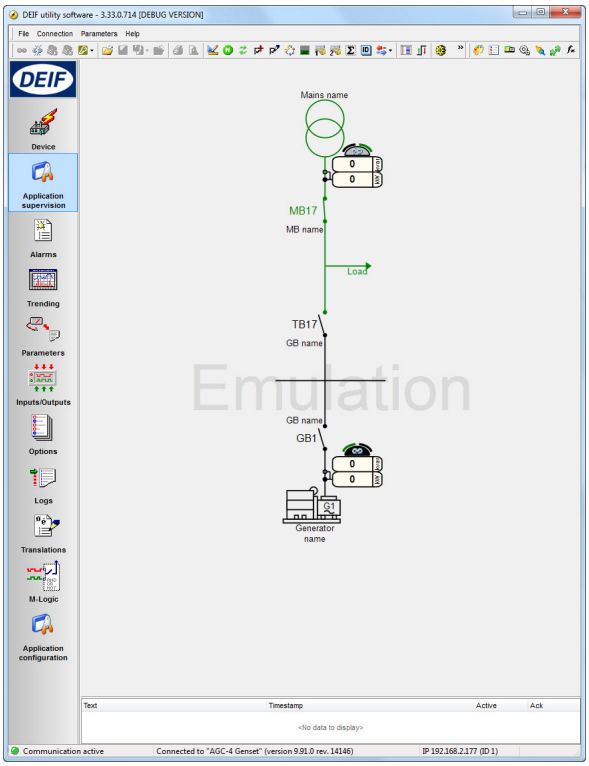
AGC controller **A**:
Ext. comm. ID: **1**
IP address: 192.168.2.**177**



Redundant AGC controller **B**:
Ext. comm. ID: **2**
IP address: 192.168.2.**178**



When the settings are done, the application supervision will look like this.

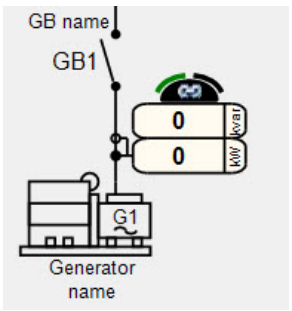


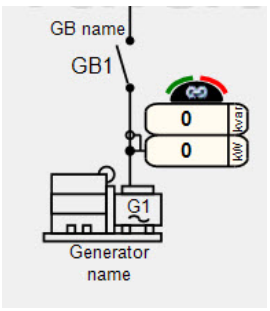
In the above setup, there is redundancy on both mains and DG level.

The redundancy status is indicated by the two arcs above the connect symbol. The left arc indicates status of the controller assigned with the letter A, and the right arc indicates status of the controller assigned with the letter B.

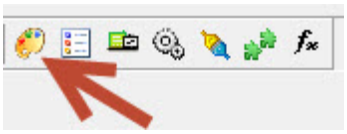
An arc can have three different status assigned with default colours:

1. Green indicates that the controller is in control
2. Black indicates that the controller is ready
3. Red indicates that the controller is not ready



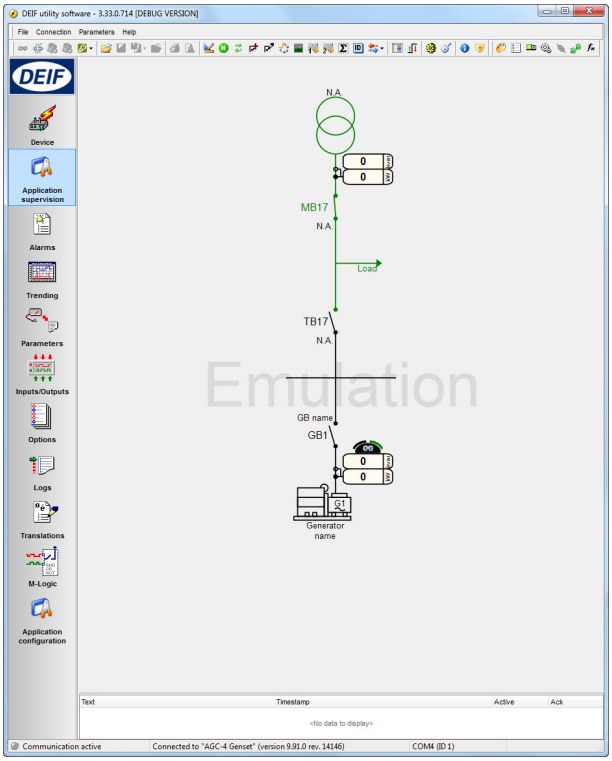


These colours can be changed with the colour scheme editor.



Note that if you are connected to the controller via USB, you will only be able to see the redundancy status between the controller you are connected to and the redundant controller. Other redundant controllers in the system will not be shown.

Below, the same setup as above is shown, but connected to one of the DG controllers with USB instead. Here redundancy is not shown on the mains, even though it is installed.



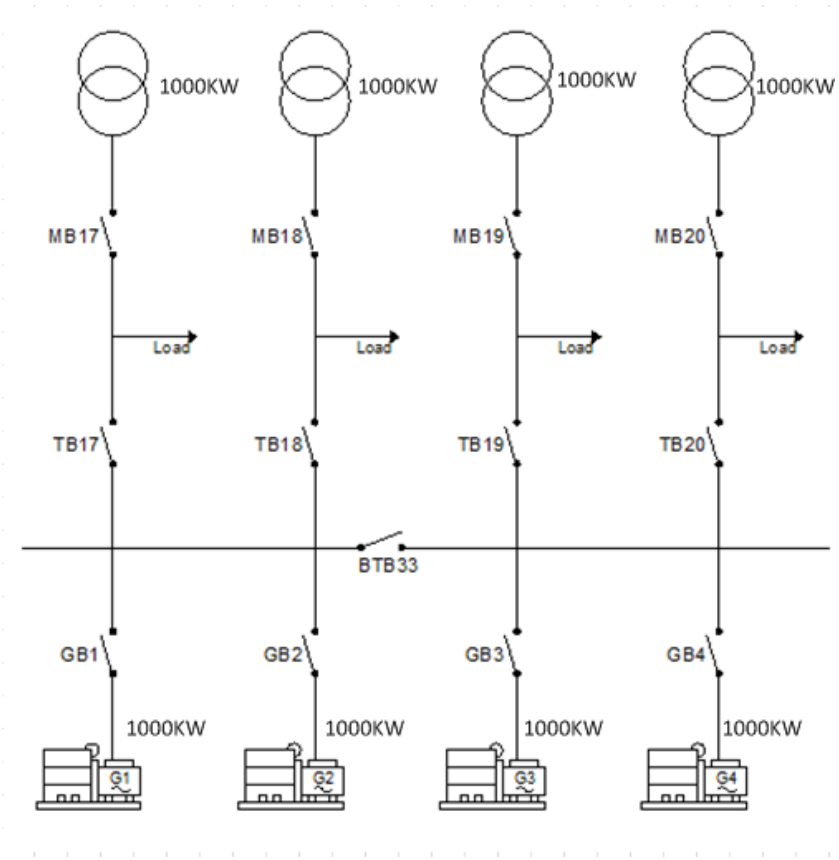
4.1.6 Related parameters

All configurations are handled with the application configurator and M-Logic in the utility software, and therefore there are no parameter settings related to the redundant controller setup.

4.2 Short-circuit limitation

4.2.1 General description

Short circuit limitation is used to set a busbar power limit in the system.



The nominal power values of each mains or DG unit are used in the calculation. This means that its static nominal power values are used for the short-circuit limitation calculation.

The menus in 2300 are common parameters used in the power management. In case a mains unit is present in a section, it will be the mains command unit that spreads its setting to the other units in the section. In case no mains unit is present, it will be the DG command unit that spreads its setting to the other units in the section.

In this way, it is possible to operate with different short-circuit limitation levels in different sections.

In case closed BTB(s) are contained in a section, the units contained in the section will scan the settings in these BTB(s) to determine if any of these have lower short-circuit limitation settings than themselves.

If so, the setting of the BTB with the lowest short-circuit level will be used throughout the period of time where the sections are connected via this BTB.

4.2.2 Short-circuit limitation setup

No.	Setting		Min./max.	Factory setting	Description
2300 Section P>					
2301	Section P>	MW	0 3000	0	Setpoint for the amount of MW nominal power allowed on busbar.
2302	Section P>	kW	0 999	0	Setpoint for the amount of kW nominal power allowed on busbar.
2303	Section P>	Delay	0.0 999.0	1.0	Delay for alarm in case threshold is exceeded.
2304	Section P>	Output	Not used Variant-dep.	Not used	Relay to activate in case alarm is provoked.
2305	Section P>	Enable	OFF ON	OFF	Enable functionality (and alarm).
2306	Section P>	Fail class	F1...F8	Warning	Fail class for alarm.

4.2.3 Short-circuit limitation weight factor

No.	Setting		Min./max.	Factory setting	Description
2310 Section P> (Short-circuit limiation weight factor)					
2311	Factor	Setpoint	1.0 s 25.5 s	1 s	Setpoint for the weighing of nominal power contribution to short-circuit calculation.

Menu 2311 is a weighing factor. This factor can be used if two transformers or generators have the same nominal power values, but different short-circuit values.

This factor is multiplied by the nominal power of the specific mains or generator unit, and the result is the specific unit's contribution to the overall short-circuit limitation calculation.

Menu 2311 is not available in a BTB unit.

4.2.4 AMF sequence

In AMF sequence when load is to be returned to the mains supply and back synchronisation is enabled, the short-circuit limitation functionality will affect the sequence of the return.

Even though parallel operation of the mains breakers are enabled in menu 8182, it can be necessary to back synchronise one mains at a time and deload genset(s) before the next mains can come on line.

Menu 2300 can overrule multi-start settings in AMF sequences.