



## MULTI-LINE 2



### Option A5 Directional over-current protection

- Description of option
- Functional description



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# 1. Delimitation

## 1.1 Scope of option A5

This description of options covers the following products:

|                |                            |
|----------------|----------------------------|
| AGC-4 Mk II*   | SW version 6.0x.x or later |
| AGC-4          | SW version 4.0x.x or later |
| AGC-3          | SW version 3.4x.x or later |
| AGC 200 series | SW version 3.5x.x or later |
| APU 200 series | SW version 3.53.x or later |
| GPC/GPU Hydro  | SW version 3.0x.x or later |
| GPU/PPU        | SW version 3.0x.x or later |

\*Note: Option A5 is included in the standard AGC-4 Mk II.

## 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



##### **DANGER!**

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

##### Notes



##### **INFO**

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.



##### **INFO**

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.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

#### 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.



##### **DANGER!**

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 the factory with default settings. These are not necessarily correct for the engine/generator set. Check all the settings before running the engine/generator set.

## 3. Description of option

### 3.1 Option A5

Option A5 is a software option and therefore not related to any hardware apart from the standard-installed hardware.

The directional over-current protection is a protection that activates when the current exceeds a certain limit in a defined direction, typically either imported from the mains or exported to the mains.

This protection is often used when dictated by the national or regional mains company.

This protection can also be used as a supplement to reverse power. In case of a distortion of currents in a reverse power situation, the total reverse power remains the same, and reverse power protection will not activate. In such a situation, the "Directional over-current protection" is applicable to ensure tripping.

### 3.2 ANSI numbers

The ANSI number refers to the IEEE standard: "Standard Electrical Power System Device Function Numbers and Contact Designations" (IEEE std C37.2-1996).

| Protection                             | ANSI no. |
|--|----------|
| AC directional over-current protection | 67       |

## 4. Function description

### 4.1 Directional over-current protection

The directional over-current protection trips when the current, flowing in a defined direction, exceeds a certain limit.

The protection is typically used when it is not allowed to export power to the mains. The set point can be adjusted to activate at a slight current export/import, for example -0.1 %.

#### 4.1.1 Loss of mains protection

Typically, a loss of mains situation will result in activation of one or more of the loss of mains protections. The directional over-current protection is also ranged in the group of loss of mains protections but does not substitute the traditional loss of mains protections.

When operating parallel to the mains, for example in a fixed power application where the base-loaded generator is only meant to supply the factory load, a disconnected breaker in the HV transmission line means that the generator plant will be islanded, and it will supply power to the consumers that are connected on the mains side. Then, the directional over-current protection activates and trips the MB.

### 4.2 Measurements

The power measurement in the display will be shown with either positive or negative sign. When the measurement is positive, the current is flowing towards the application. When the measurement is negative, the current is flowing towards the generator if it is a generator controller, and towards the mains if it is a mains controller.

#### 4.2.1 Measurement principle

The measurement of the AC-directional over-current protection is based on actual current measurements on the unit. If any of the three current measurements flows in unwanted ways, the relay will trip (depending on the set point).

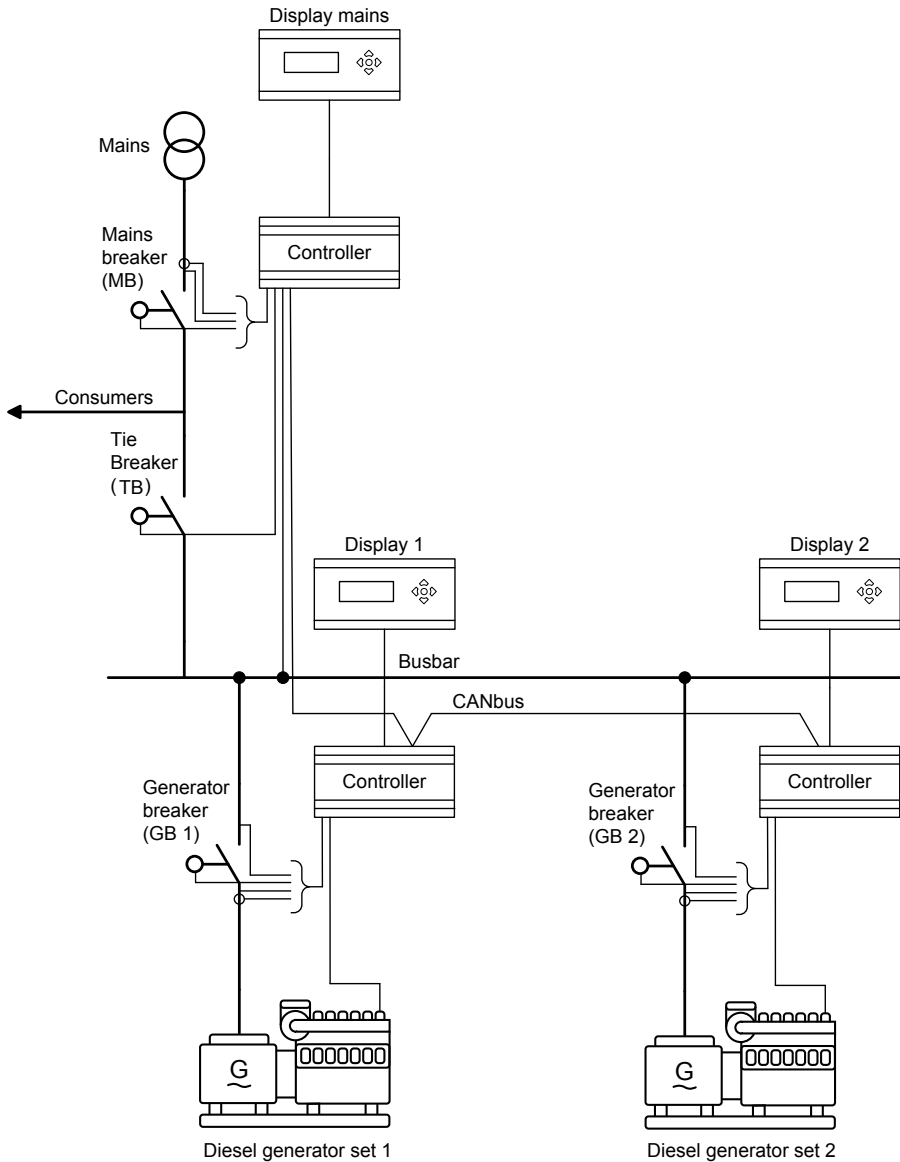
The setting range of the protection is -200 to 0 and 0 to 200 %. In the negative range, the current flows towards the generator if it is a generator controller, and towards the mains if it is a mains controller. In the positive range, the current flows towards the application.

# 5. Function description, AGC

## 5.1 AGC

The directional over-current protection trips when the current, flowing in a defined direction, exceeds a certain limit.

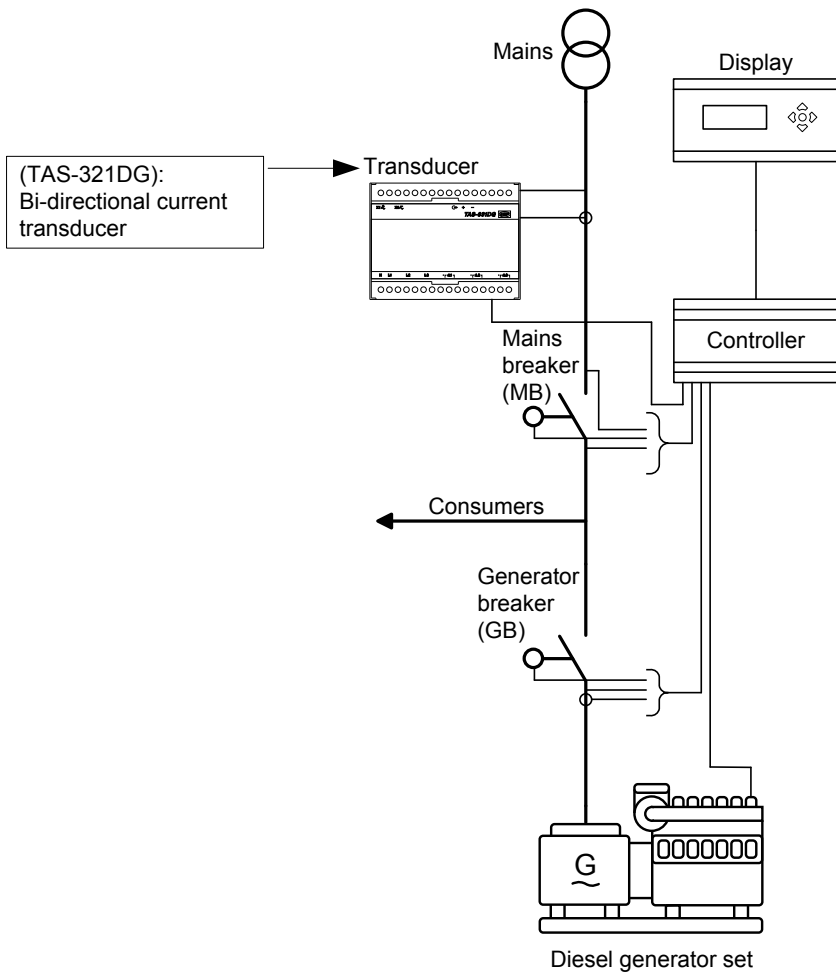
The directional over-current protection is typically used for tripping the mains breaker controlled by the AGC.



## 5.2 Applications, AGC

### 5.2.1 Single AGC plant

If the loss of mains protection is needed for the AGC without power management (no mains controller is installed), you need to know the current flow on the primary side of the mains breaker. For example, you can install a measurement transducer TAS-321DG (see [www.deif.com](http://www.deif.com) for details). The transducer measures the direction of the current and sends a 4 to 20 mA signal to an analogue input on the AGC.



### Configuring the mains measurement for AGC-4 Mk II and AGC-4



#### More information

See **Mains power transducer** in the **Designer's handbook** for more information.

### Configuring the mains measurement for AGC 200

| Channel 7003                 | Channel 7004                  |
|------------------------------|-------------------------------|
| Transducer maximum           | Transducer minimum            |
| 20 mA                        | 4 mA                          |
| Setting: For example, 200 kW | Setting: For example, -200 kW |

## 5.2.2 Parallel mains application

The protection is typically used when it is not allowed to export power to the mains. In such a system, the AGC plant is working parallel to the mains, and the generators supply part of the load, and the mains supply the remaining part of the load. If the load decreases and the generators produce the same power, eventually the generators would supply power to the mains, and some places this is not allowed by the utility company. The set point can be adjusted to activate at a slight current export, for example -0.1 %.



#### INFO

The current measurement is positive when current is supplied from the generator or mains to the application. The current measurement is negative when current is flowing to the mains or the generator.



### **5.2.3 Loss of mains protection**

Typically, a loss of mains situation will result in activation of one or more of the loss of mains protections. The directional over-current protection is also ranged in the group of loss of mains protections but does not substitute the traditional loss of mains protections.

When operating parallel to the mains, for example in a base load application where the base-loaded generator is only meant to supply the factory load, a disconnected breaker in the HV transmission line means that the generator plant will be islanded, and it will supply power to the consumers that are connected on the mains side. Then, the directional over-current protection activates and trips the MB.

## 6. Parameters

### 6.1 Further information

Option A5 relates to parameters 1600 to 1610.

For more information, see the parameter list:

|                   |                            |
|-------------------|----------------------------|
| AGC-4 Mk II       | Document number 4189341273 |
| AGC-4             | Document number 4189340688 |
| AGC-3             | Document number 4189340705 |
| AGC 200           | Document number 4189340605 |
| GPC-3/GPU-3 Hydro | Document number 4189340580 |
| GPU-3/PPU-3       | Document number 4189340581 |