



-power in control

APPLICATION NOTES



H-coupling

- Application description
- Functional description
- Wiring
- Basic setup
- Flowcharts



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1. 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. 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 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.

2. Application setup

Setup of the power management application is done in the below listed menus and in the PC utility software. Even small changes in these menus can change the sequences a lot and will give you the possibility to customise the application to fulfil your needs. The functionality and influence of the application will be described briefly for each of the menus.

The menus to take into consideration are:

AGC mains
Menu 8180
Menu 8020
Menu 8190
Menu 7080
AGC bus tie
Menu 2300
AGC gen.
Menu 8000
Menu 8010
Menu 8020

Definitions

Function	Description
MB	M ains B reaker.
TB	T ie B reaker.
BTB	B us T ie B reaker.
GB	G enerator B reaker.
AGC mains	Controlling an MB and a TB.
AGC bus tie	Controlling a BTB.
AGC gen.	Controlling a gen-set and a GB.
Section	Part of the total application which is separated by one or two open BTBs. An application can contain up to 9 sections.
Static section	Part of the total application which is separated by one or two open BTBs. There will be no closed BTBs within this section itself.
Dynamic section	Part of the total application which is separated by one or two open BTBs. There may be one or more closed BTBs within this section
Common set point	A set point which has to be identical for all AGC units to ensure correct functionality. A common set point is broadcasted on the CAN communication between the AGC units and will be changed back to the original set point.
USW	Utility software. The PC tool used to configure the AGC controllers.

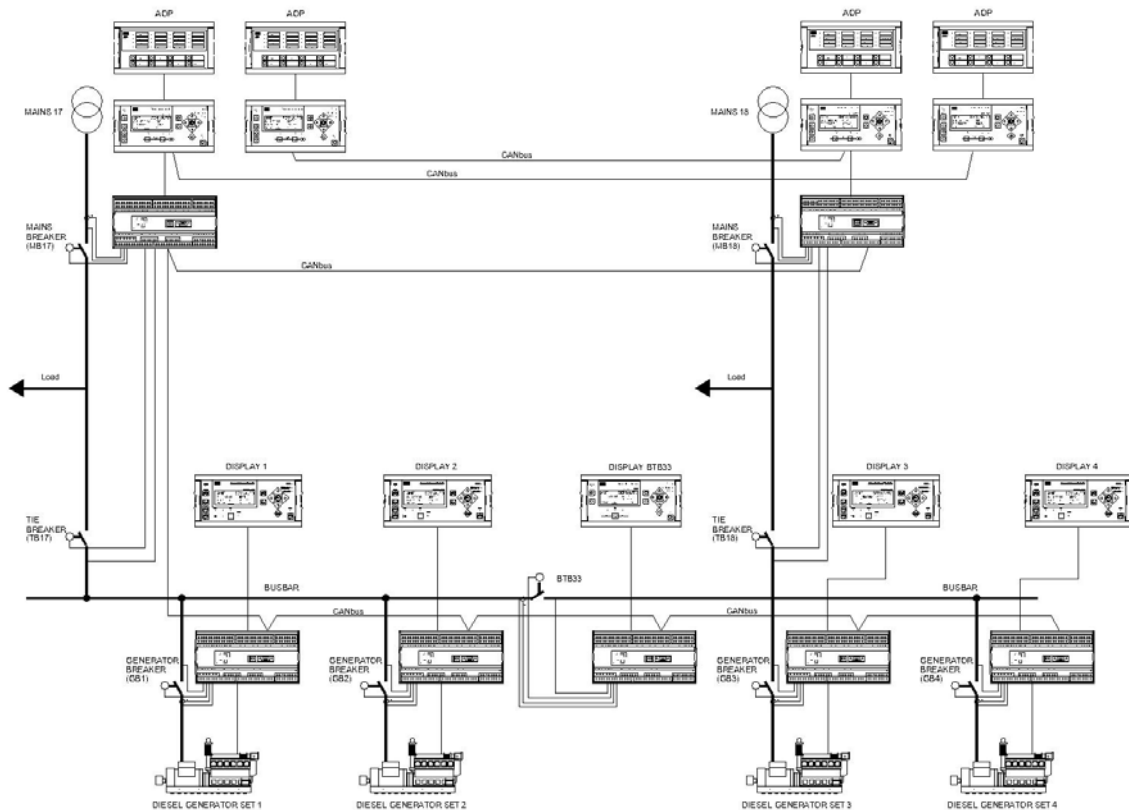


Please refer to the option G5 manual for detailed descriptions.

3. Application description

System overview

This document describes what is needed to make a control system to an emergency power plant consisting of two mains connections, 4 diesel generators and one bus coupler connected like shown on the single line diagram below.



The drawing shows 4 generators, but the system supports up to 16 generators.

The system will be made with the following functionalities:

1. Section 1 will be operating in automatic mains failure (AMF) mode.
2. Section 2 will be in fixed power mode with automatic shift to automatic mains failure (AMF) in case of a mains failure.
3. Test mode will be a full test on each mains individually.
4. Additional display units (DU-2) with an AOP-1 for each mains unit.

Required hardware

To support this application, the following hardware is required:

Mains breaker and tie breaker control

2 AGC mains units with standard display and the following options:

- Option G5 (power management)
- Option J1 (display cable)
- Option X2 (additional display unit)
- Option X3 (AOP-1)



Regarding mains protection, please refer to the requirements from the local utility company.

Gen-set control

4 AGC units with standard display and the following options:

- Option D1 (AVR control)
- Option G4 or G5 (power management)
- Option J1 (display cable)



Additional options regarding generator protection should be added, if needed.



The required interface for the governor and AVR should be taken into consideration. Please refer to the document 'Interfacing DEIF equipment to governors and AVRs'.

Bus coupler control

1 AGC bus tie unit with the following options:

- Option G4 or G5 (power management)
- Option X2 (display)
- Option J1 (display cable)



The AGC bus tie unit can be replaced by a uni-line relay type FAS-113DG.



Please refer to the data sheet for specific information about the possible options selection and order specification.

4. Functional description

In normal conditions, the application will work as 2 separate sections and the mains supervision will be done on each mains independently of the other. In case of a mains failure on one of the mains connections the gen-sets in each system will supply the load. However, in case of low available power the system will be allowed to close the BTB and use the gen-sets in the other system as well.

Fixed power to mains

When the plant is started, the gen-sets will be started, synchronise to prioritised mains, ramp up and produce power according to the fixed power set point.

Test mode

When activated, the test mode will be a full test on each mains individually.

Start and stop engines

The AGC will control the start and stop of the engine. This is done automatically or controlled by the operator in Semi-auto or Manual.

Synchronisation of breakers

Synchronisation of the breakers is done automatically according to the plant mode, or it can be done in Semi-auto by the operator.

Mains failure sequence

Normal condition (DGs are not running):

- Mains supply OK
- MB17 and MB18 closed
- TB17 and TB18 open
- BTB33 open
- All gen-sets stopped

Mains failure on mains 17 (auto switch adjusted to static section – menu 8184):

- MB17 is tripped
- DG1 and DG2 are started, the first to be ready will close its GB on the black busbar, and the other GB will be synchronised
- TB17 will be closed

Load increases above the limit of 2 gen-sets:

- BTB33 is closed
- DG3 is started and synchronised
- If needed, DG4 is started and synchronised

Mains restored on mains 17:

- MB17 is synchronised and closed (mains parallel = ON – menu 8182)
- TB17 is opened
- All GBs and BTB33 are opened
- Gen-sets will cool down and stop

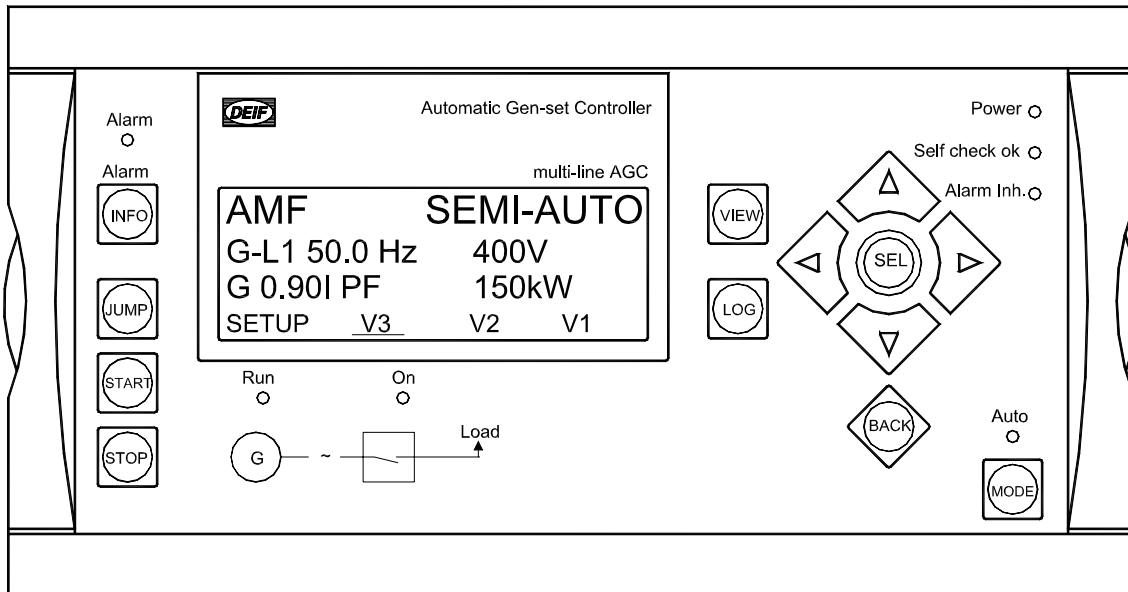
Fixed power to mains

- Start is activated
- The needed gen-sets are started and synchronised to mains
- If more than 2 gen-sets are needed, BTB33 is closed and additional gen-sets are started and synchronised (depends on settings)
- The gen-sets ramp up to the fixed power set point

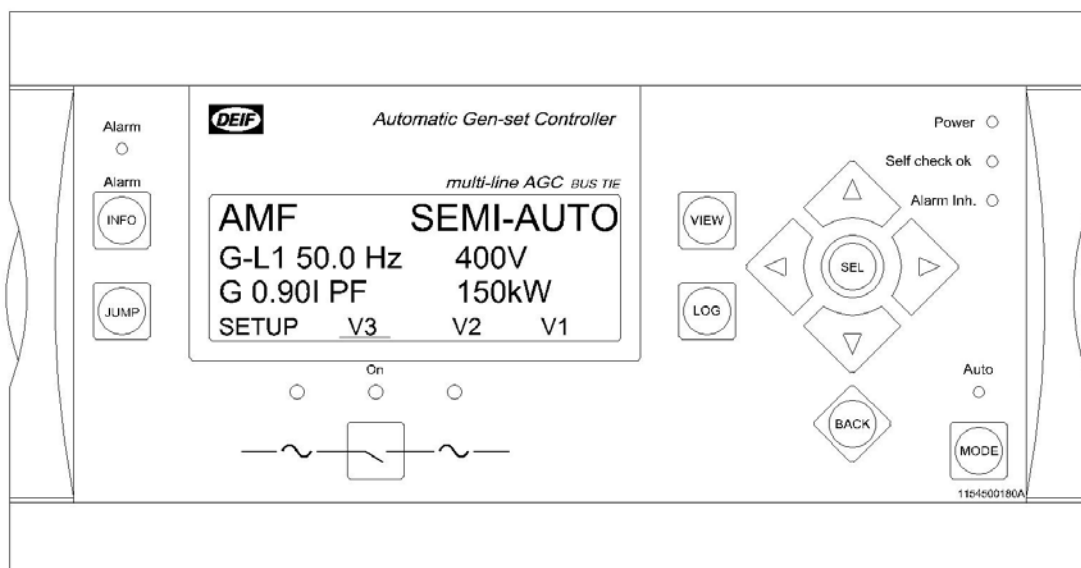
Display

The display of the AGC used in this application looks like this:

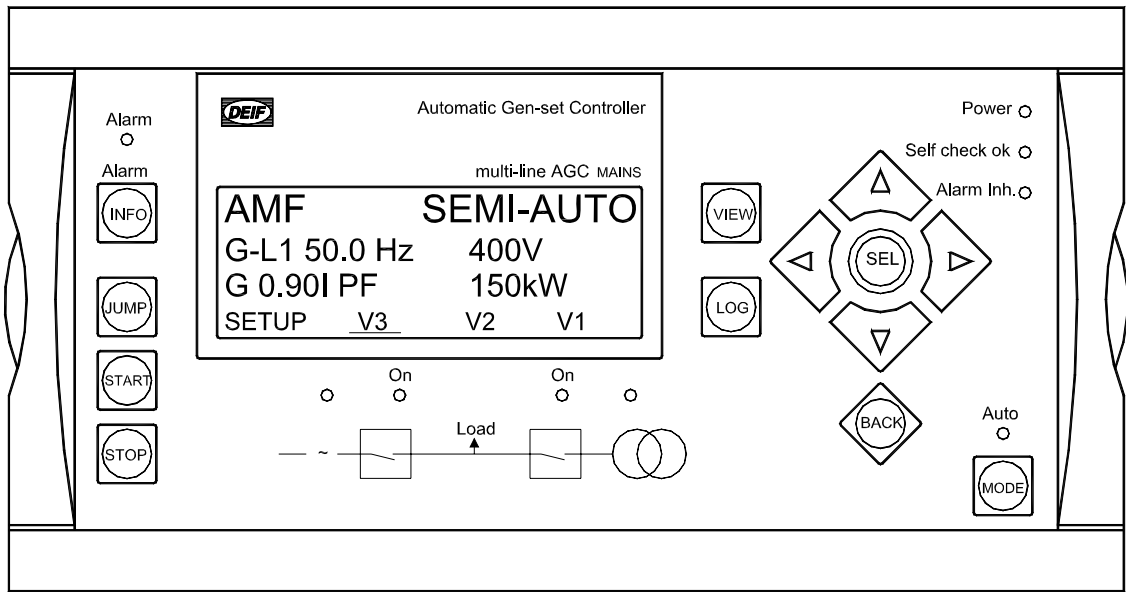
Generator unit



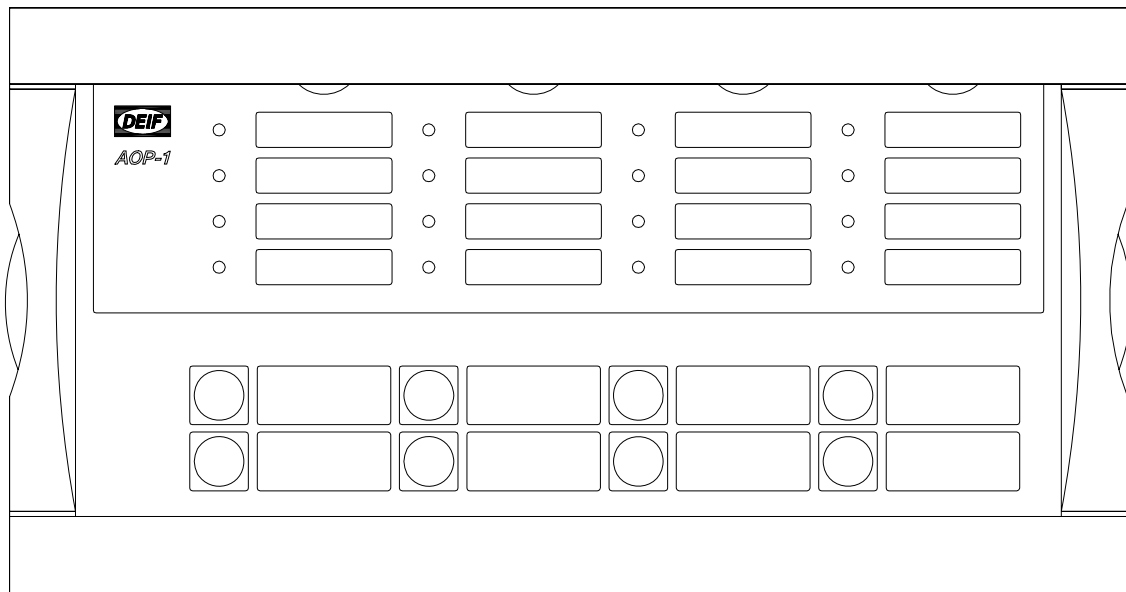
BTB unit



Mains unit



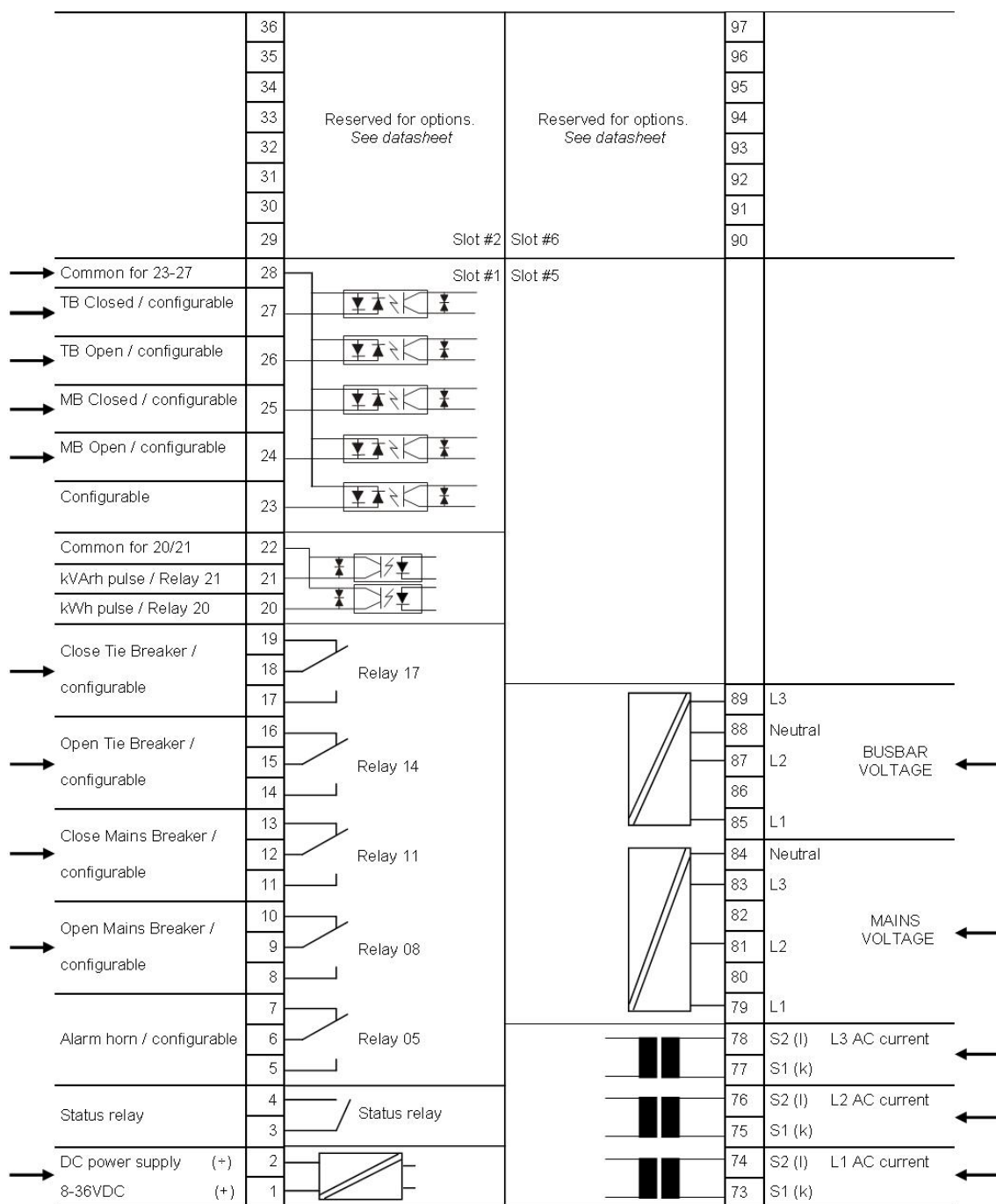
AOP-1

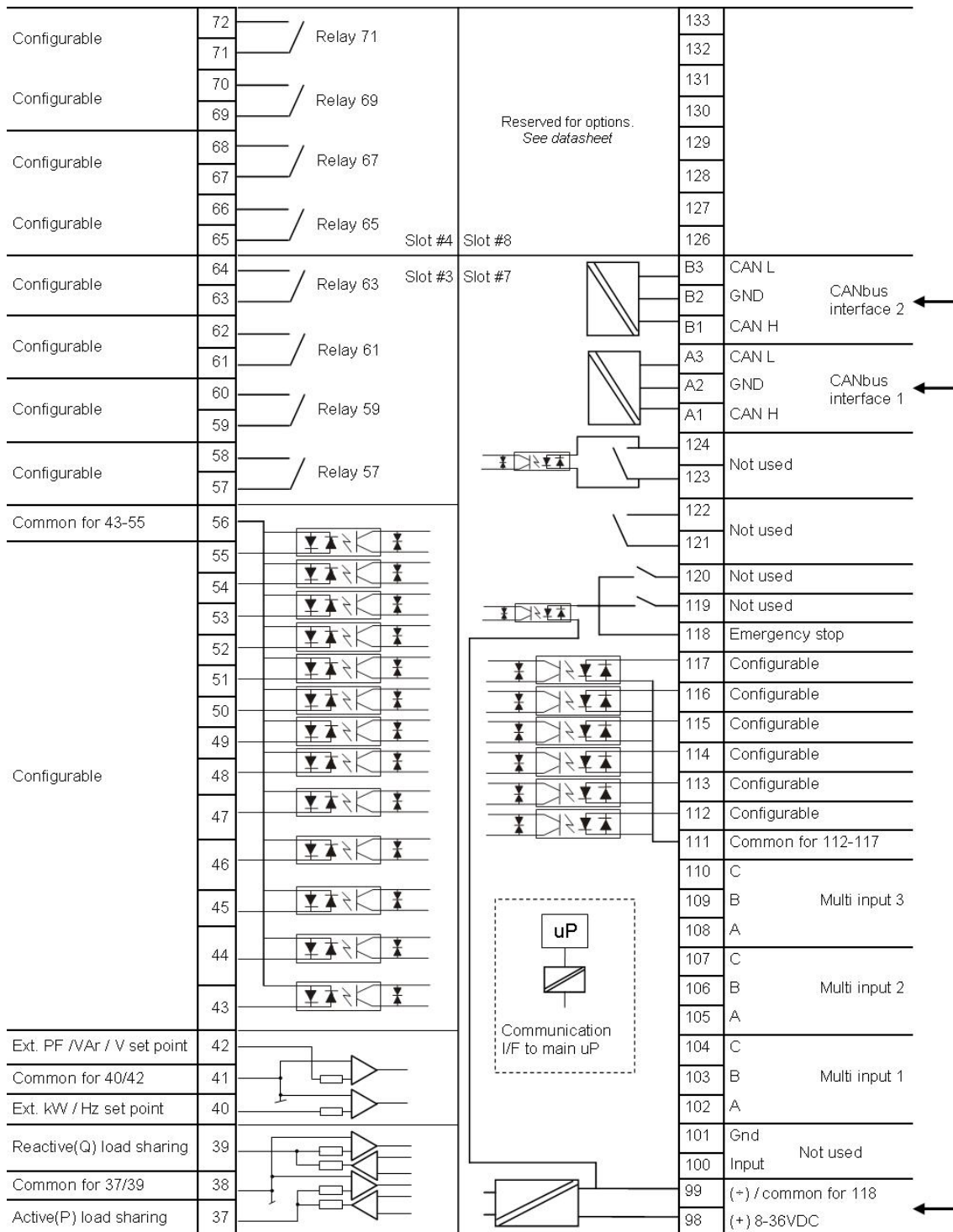


5. Wiring

The purpose of this chapter is to show the signals that are required as a minimum to run this application. The required signals are marked with an arrow.

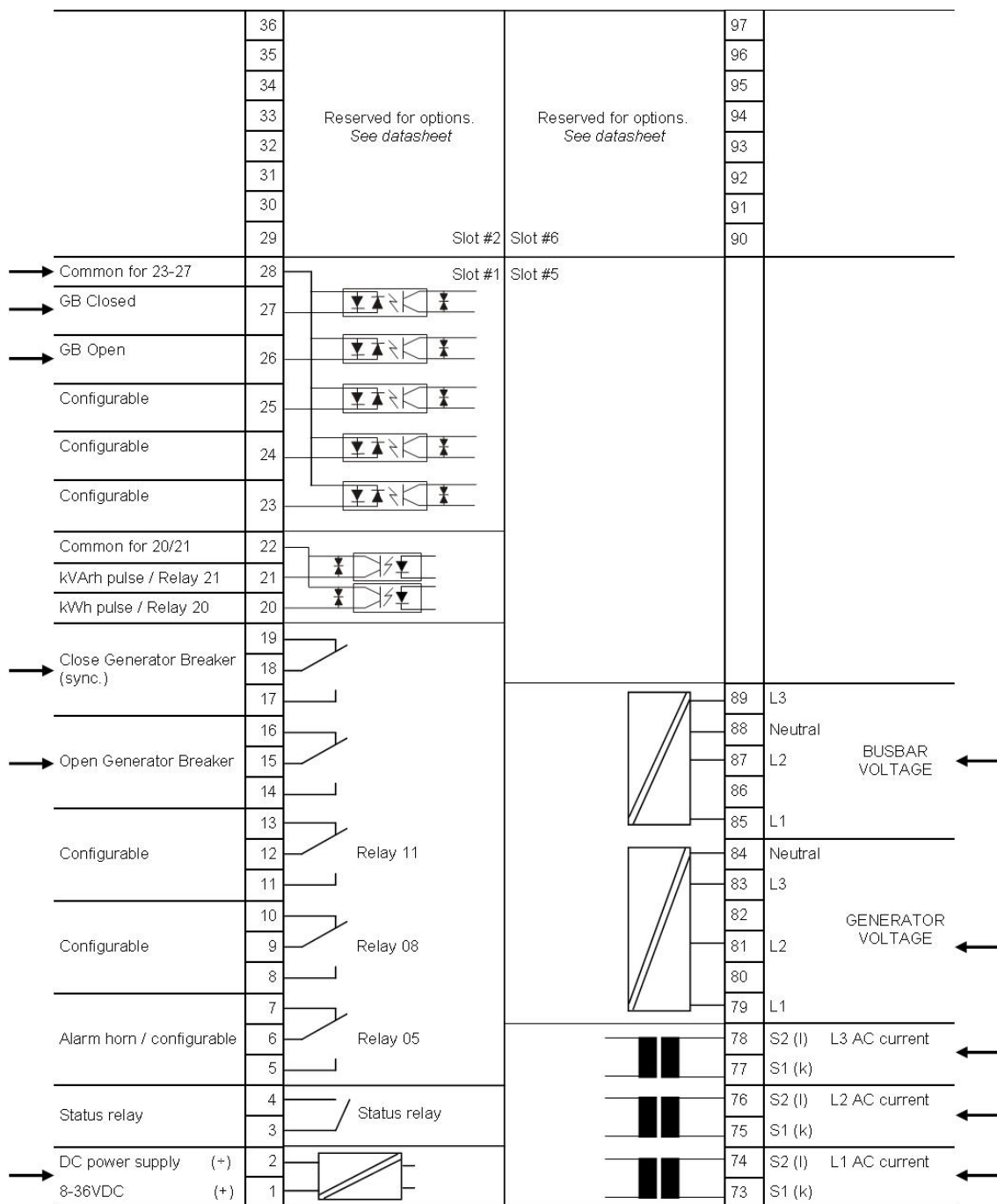
AGC mains

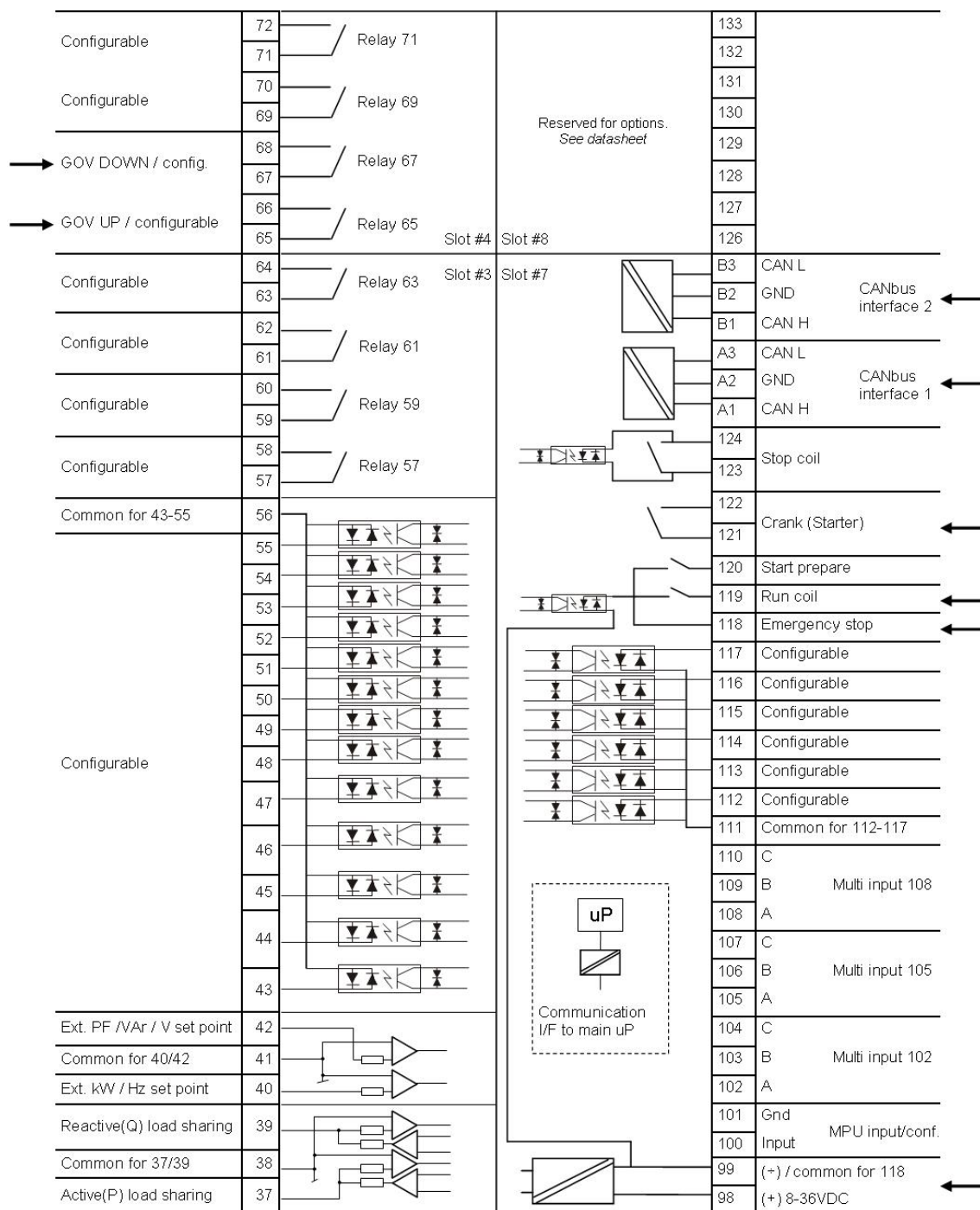




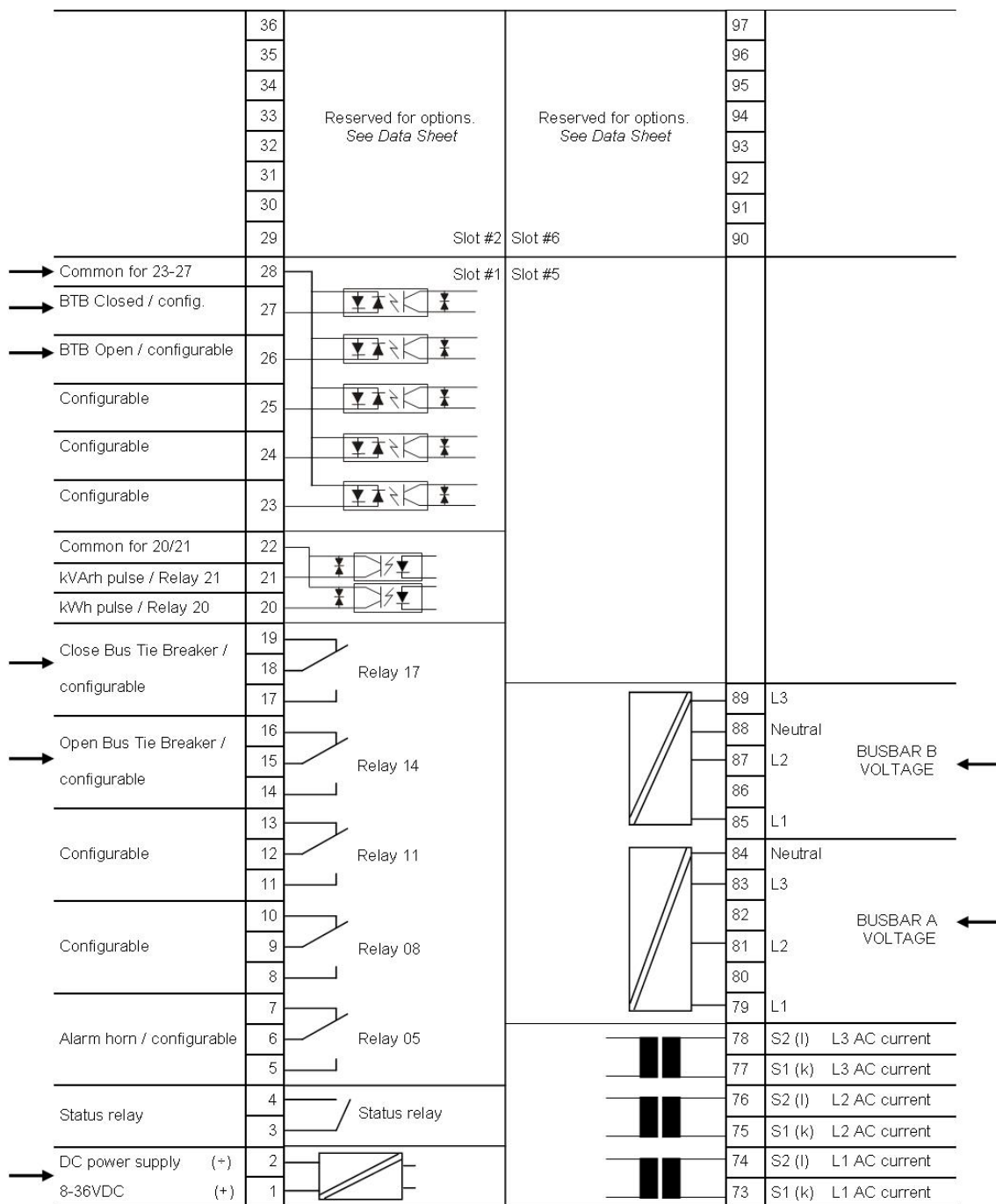
For guidelines regarding wiring, please refer to the 'Installation Instructions'.

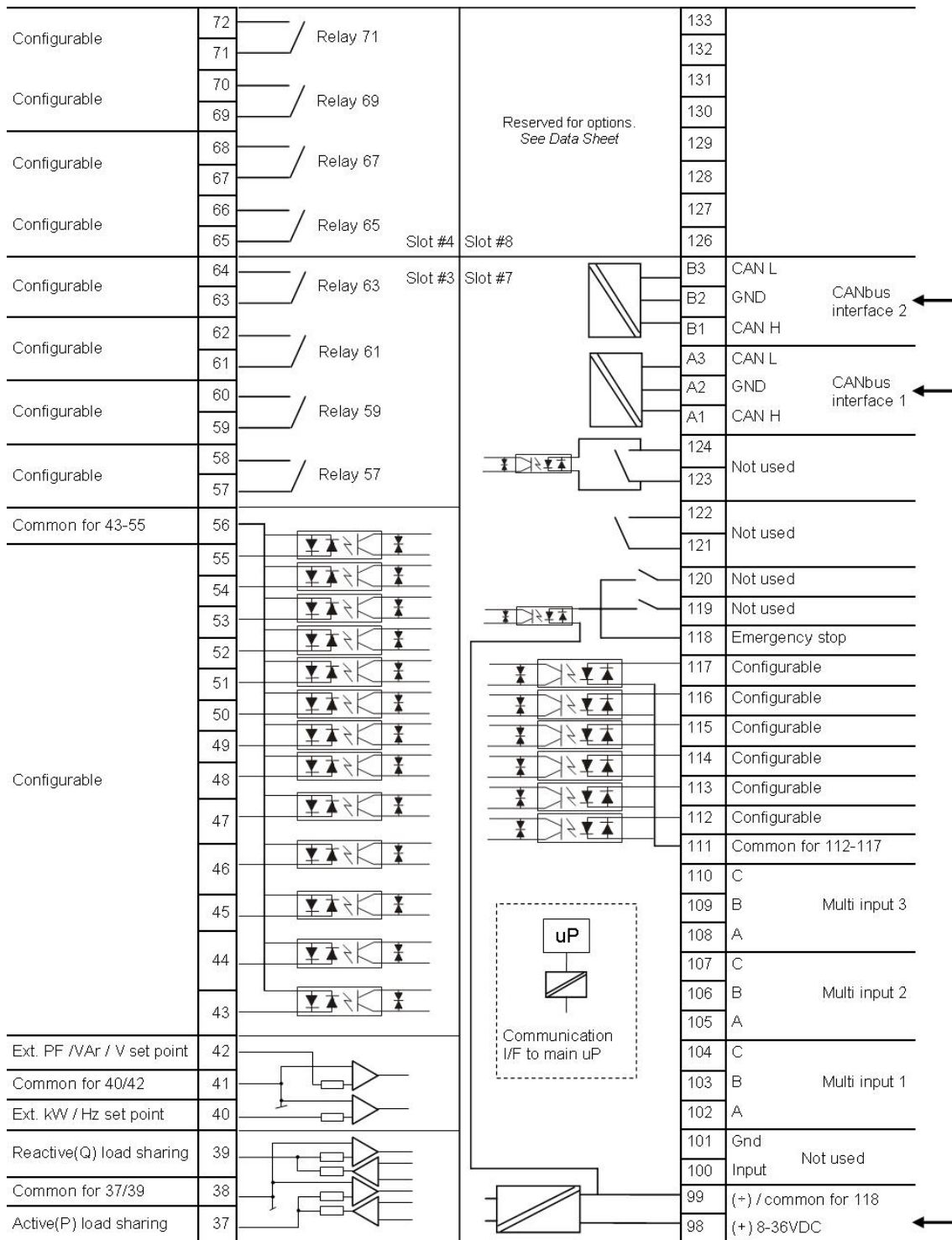
AGC DG





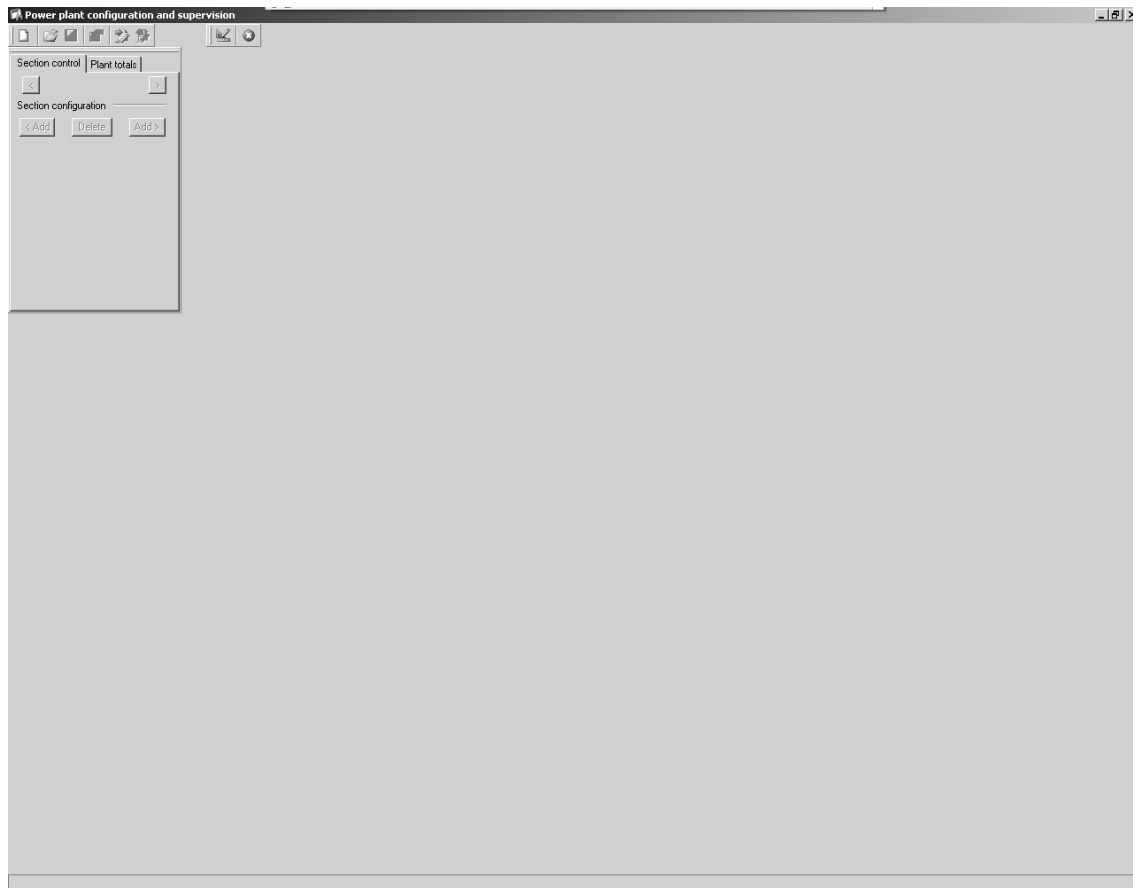
For guidelines regarding wiring, please refer to the 'Installation Instructions'.

BTB



6. Basic setup

Power plant configurator



Plant options

Product type
☒ AGC ☐ PPM

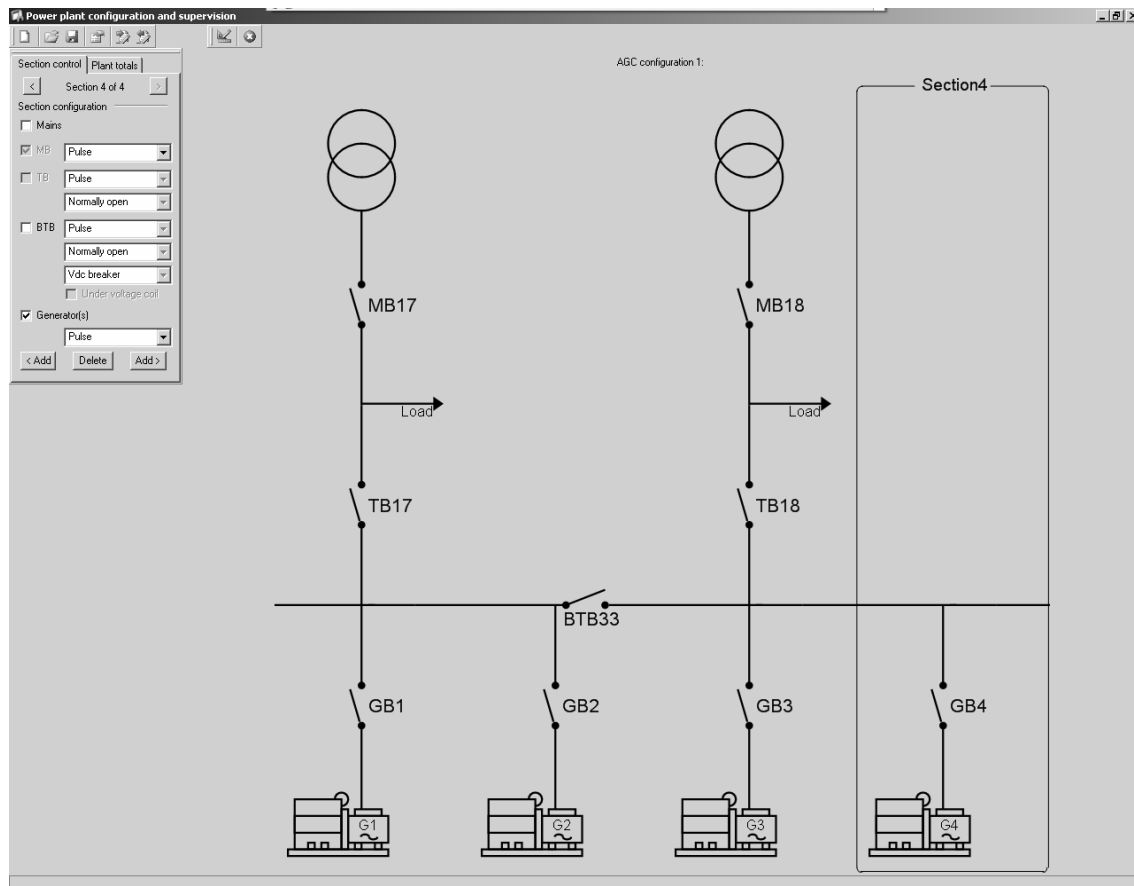
Plant type
Standard

Configuration selection
<Configuration 1> ☒ Active
H-coupling

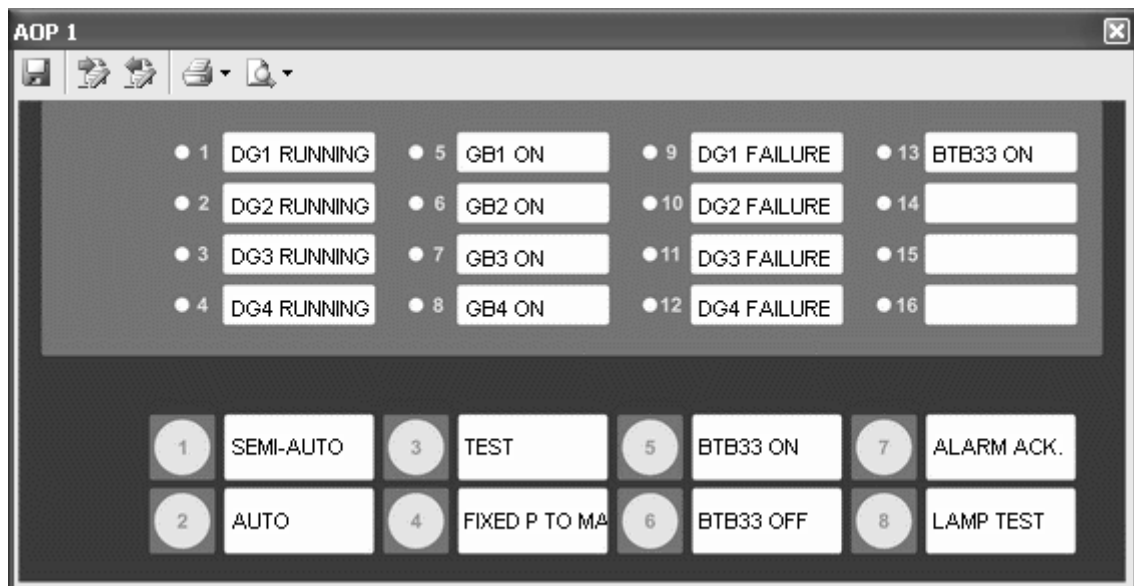
Bus Tie options
☐ Wrap bus bar

CAN line options
☐ Use CAN line 1
☐ Use CAN line 2
☒ Use CAN line 1 and 2

OK Cancel

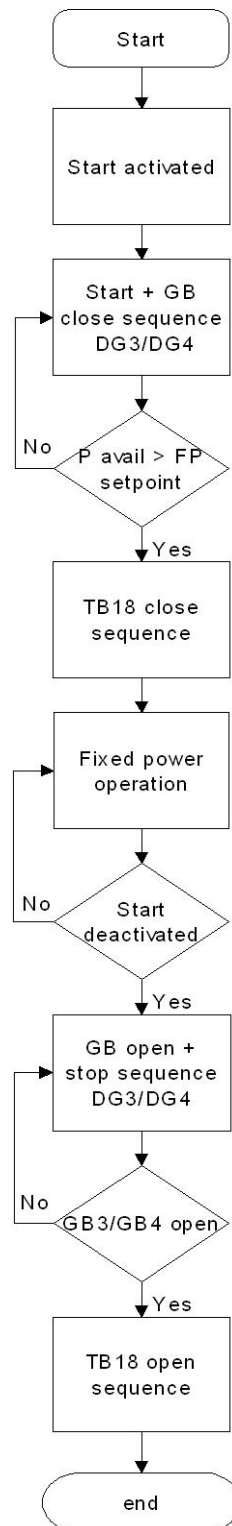


AOP-1 setup

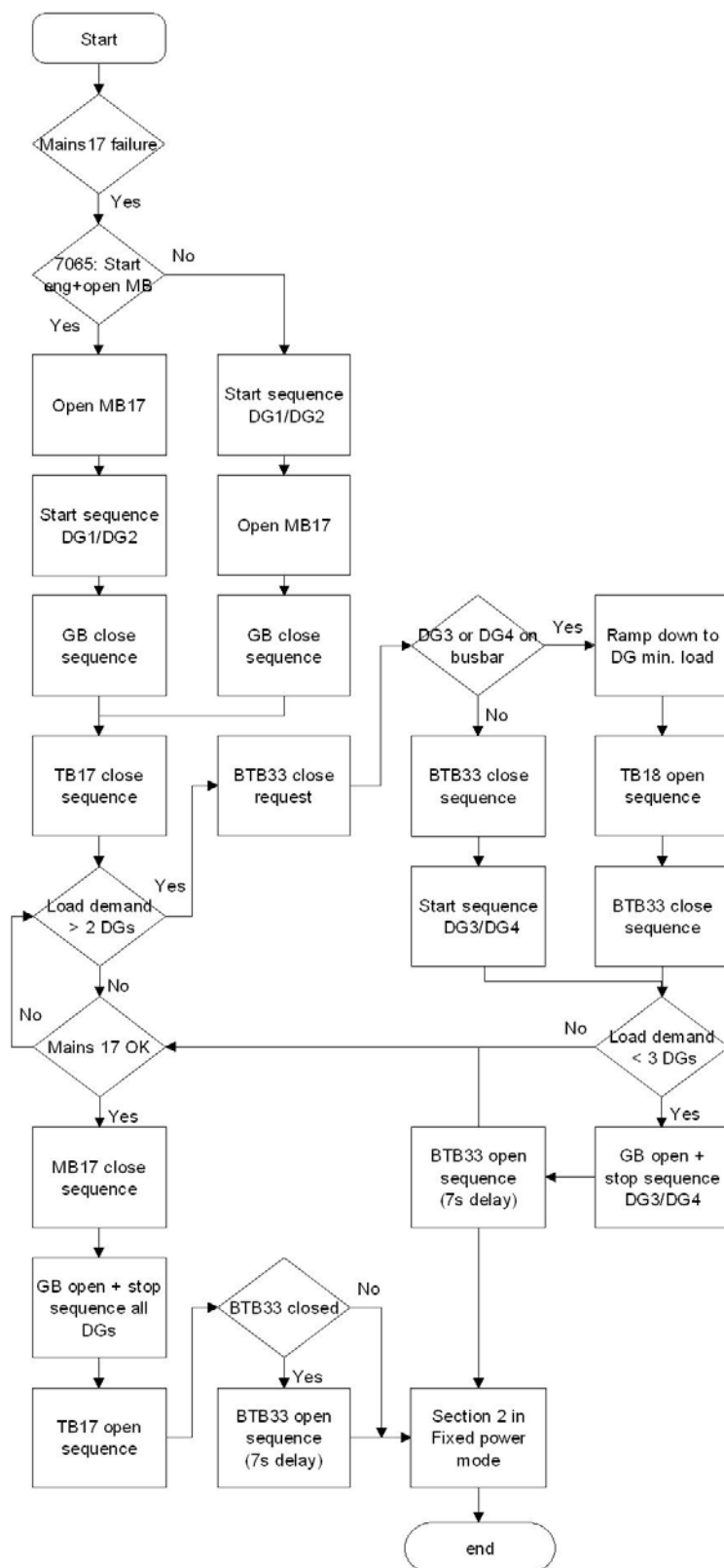


7. Flowcharts

Fixed power to mains 18



Mains failure (mains 17)



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