DEIF A/S

Application Notes

Basic Gen-set Controller

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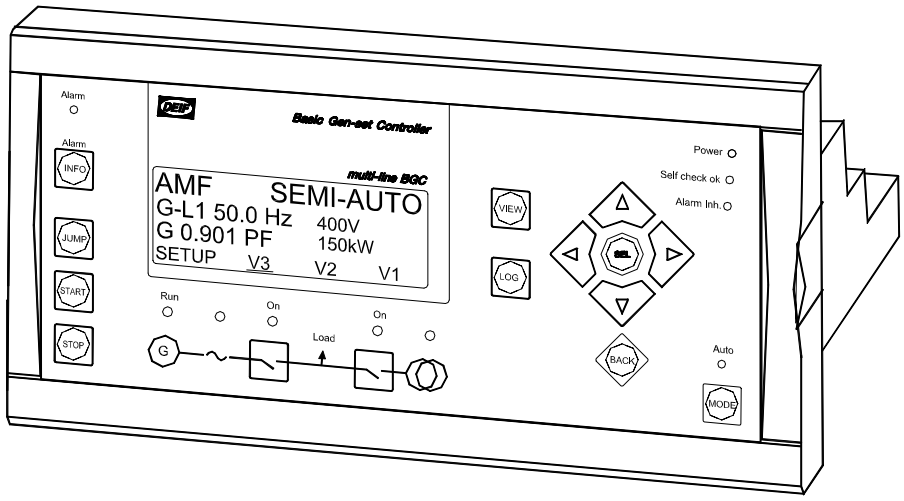

- *Single generator set*
- *Automatic mains failure*
- *Parallel with mains (grid)*
- *Load sharing multiple sets*

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About this document

This section includes general user information about this document concerning the general purpose, the intended users and the overall contents and structure.

General purpose

This document presents application notes for DEIF's basic gen-set controller, the BGC. It mainly includes examples of different applications suitable for the BGC.

For functional descriptions, the procedure for parameter setup, complete standard parameter lists, see the Designer's reference handbook.

The general purpose of the Application notes is to give the designer information about suitable applications for the BGC.

Intended users

The Application notes is mainly intended for the person responsible for designing BGC systems. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information in this document.

Contents/overall structure

The Application notes is divided into seven sections and in order to make the structure of the document simple and easy to use, each section will begin from the top of a new page. The following sections will outline the contents of each of the seven sections.

About this document

This first section includes general information about this document. It deals with the general purpose and the intended users of the Application notes. Furthermore, it outlines the overall contents and structure of the document.

Warnings and legal information

The second section includes information about general legal issues and safety precautions relevant in the handling of DEIF products. Furthermore, this section will introduce a note symbol, which will be used throughout the document.

General product information

Section three will deal with the BGC unit in general and its place in the DEIF product range.

Single generator set

Section four will include functional descriptions and diagrams related to the control of a single generator set running in an island application.

Automatic Mains Failure

The fifth section will include functional descriptions and diagrams related to the control of a single generator set used as an emergency stand-by generator.

Parallel with mains (grid)

The sixth section will include functional descriptions and diagrams related to the control of a single generator set used for parallel with mains (grid).

Load sharing multiple sets

Section seven will include functional descriptions and diagrams related to the control of multiple generator sets used for load sharing in island operation.

Warnings and legal information

This section 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, which will be used throughout these application notes, 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 controlled by the BGC unit, the company responsible for the installation or the operation of the set must be contacted.

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 BGC unit implies work with dangerous currents and voltages. Therefore, the installation of the BGC should only be carried out by authorized personnel who understands the risks involved in the working with live electrical equipment.

Notes

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

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General product information

This section will deal with the BGC unit in general and its place in the DEIF product range.

Introduction

The BGC is a part of the DEIF multi-line 2 product family. Multi-line 2 is a complete range of multi-function generator protection and control products integrating all the functions you need into one compact and attractive solution.

The product range consists of different basic versions, which can be supplemented with the flexible options needed to provide the optimum solution.

The concept of the BGC is to offer a cost-effective solution to gen-set builders who need a simple generator protection and control unit. Being a part of the multi-line product family the standard functions of the BGC can be supplemented with a variety of optional functions.

Type of product

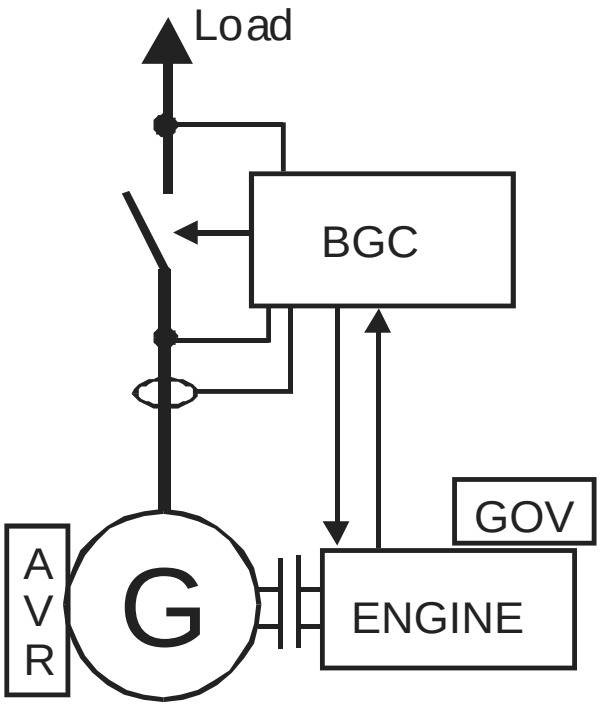
The BGC is a micro-processor based control unit containing all necessary functions for protection of a gen-set and of mains and generator breaker control.

The BGC contains all necessary 3-phase measuring circuits and presents all values and alarms on the LCD display. The design of the BGC allows it to be built directly into the engine side panel or the switchboard door.

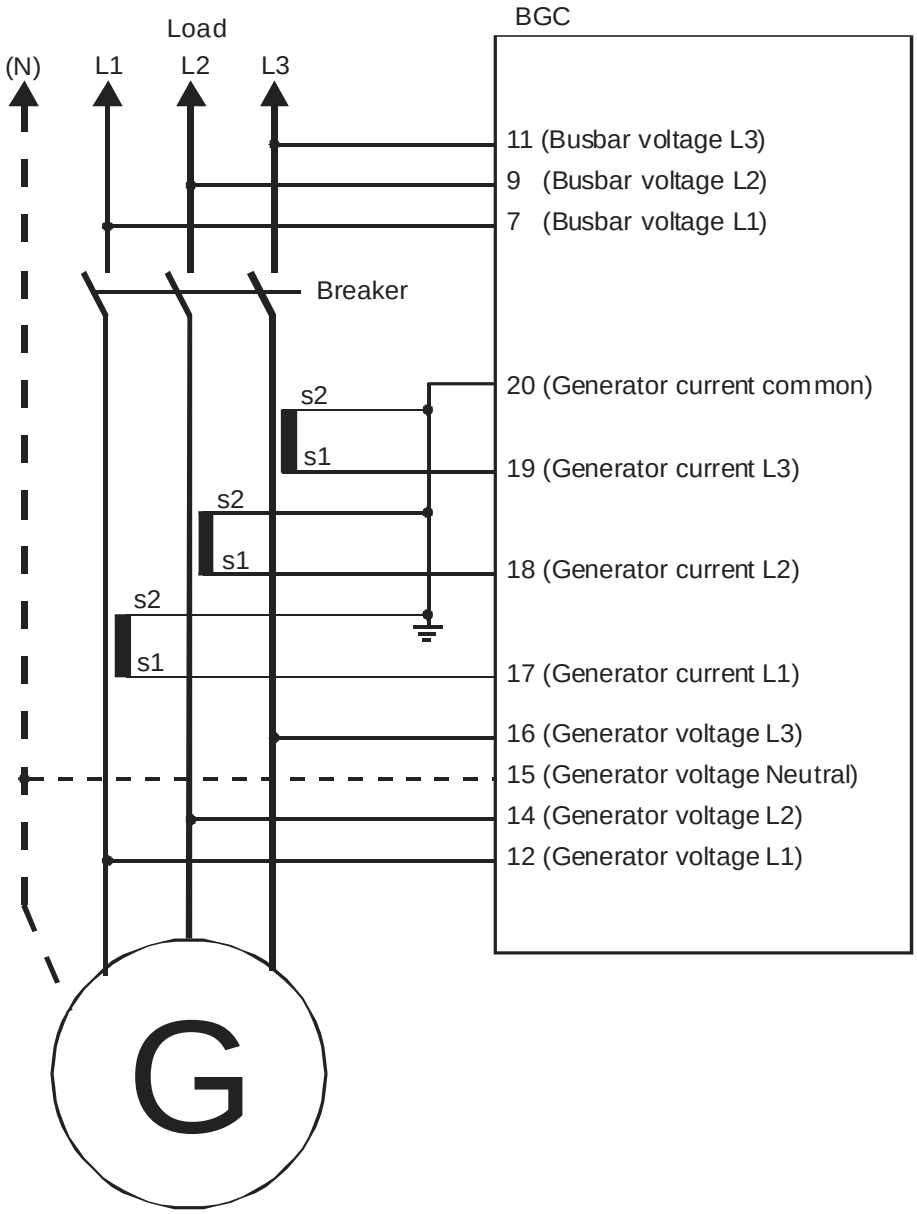
Single generator set

This section will include wiring diagrams and basic parameter settings for a BGC used to control a single generator set running stand-alone in island operation.

System single-line diagram

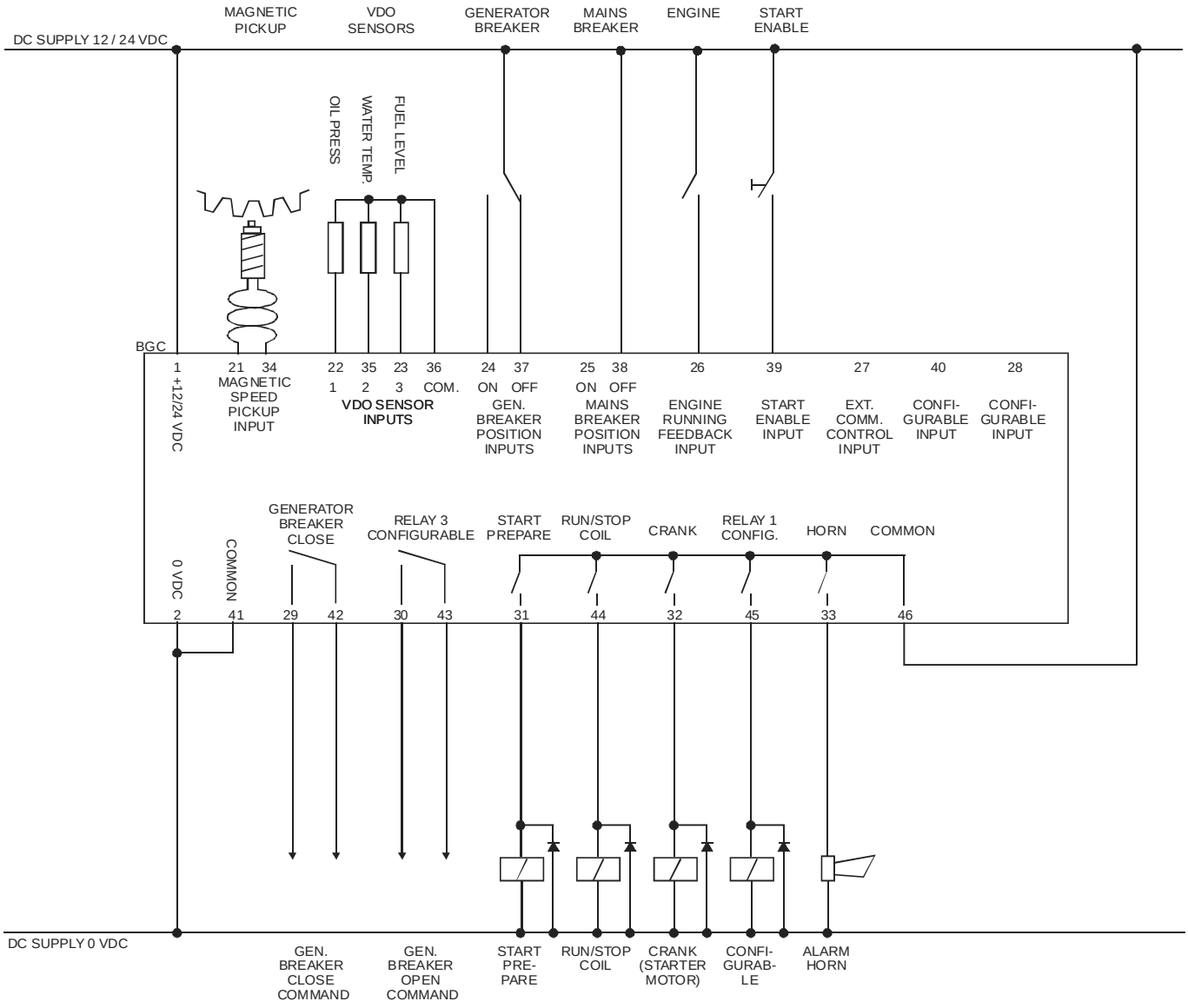


AC connections



A neutral connection is a possibility but not a necessity. AC voltages max. 480V AC phase-phase. The AC current ground must be placed as indicated - there are no other possibilities.

DC connections



Since the relay outputs are all 8A 250V AC max. contacts, DEIF strongly recommends the use of external transfer relays to protect the BGC relays. Remember free-wheel diodes across the relays, if DC coil voltage is used.

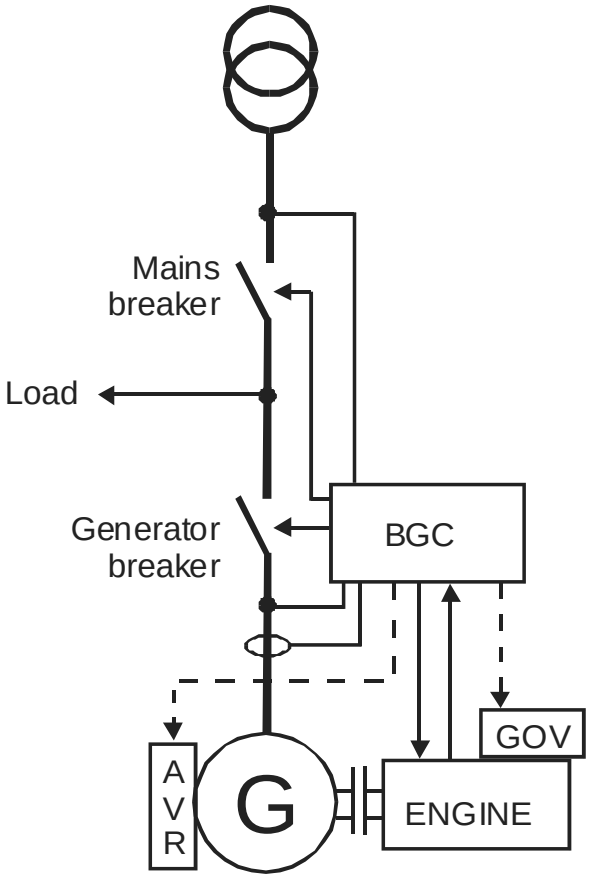
Basic parameter settings

Setting no.	Name	Function	Set to
4321	Gen-set mode	Selects running mode	Island mode
4425	Mains fail control	Sets gen-set reaction when mains fails	Ignored
4441	MB control	Selects mains breaker function	Ignored

Automatic mains failure

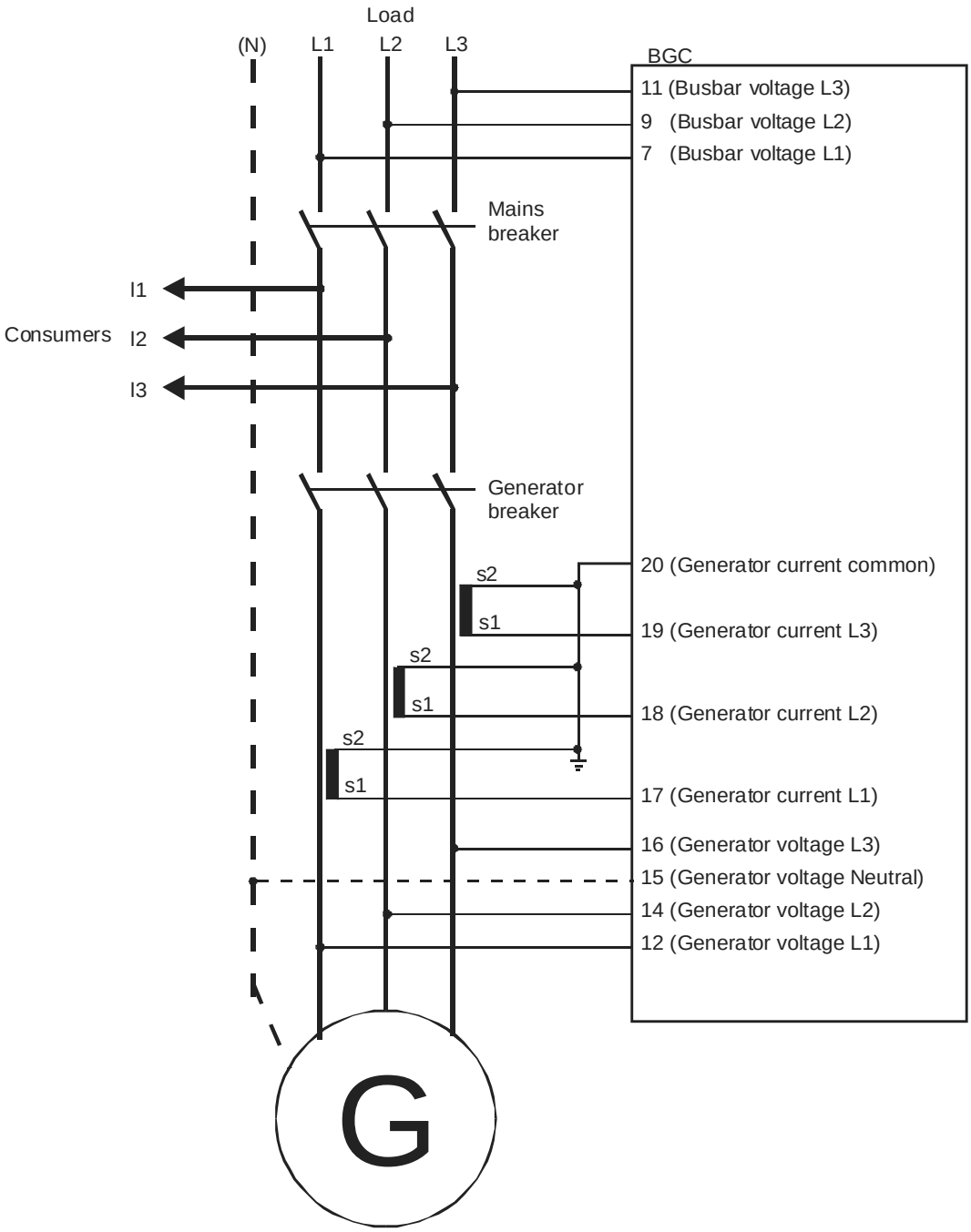
This section will include wiring diagrams for a BGC used to control a single generator set used in a stand-by AMF (Automatic Mains Failure) application.

System single-line diagram



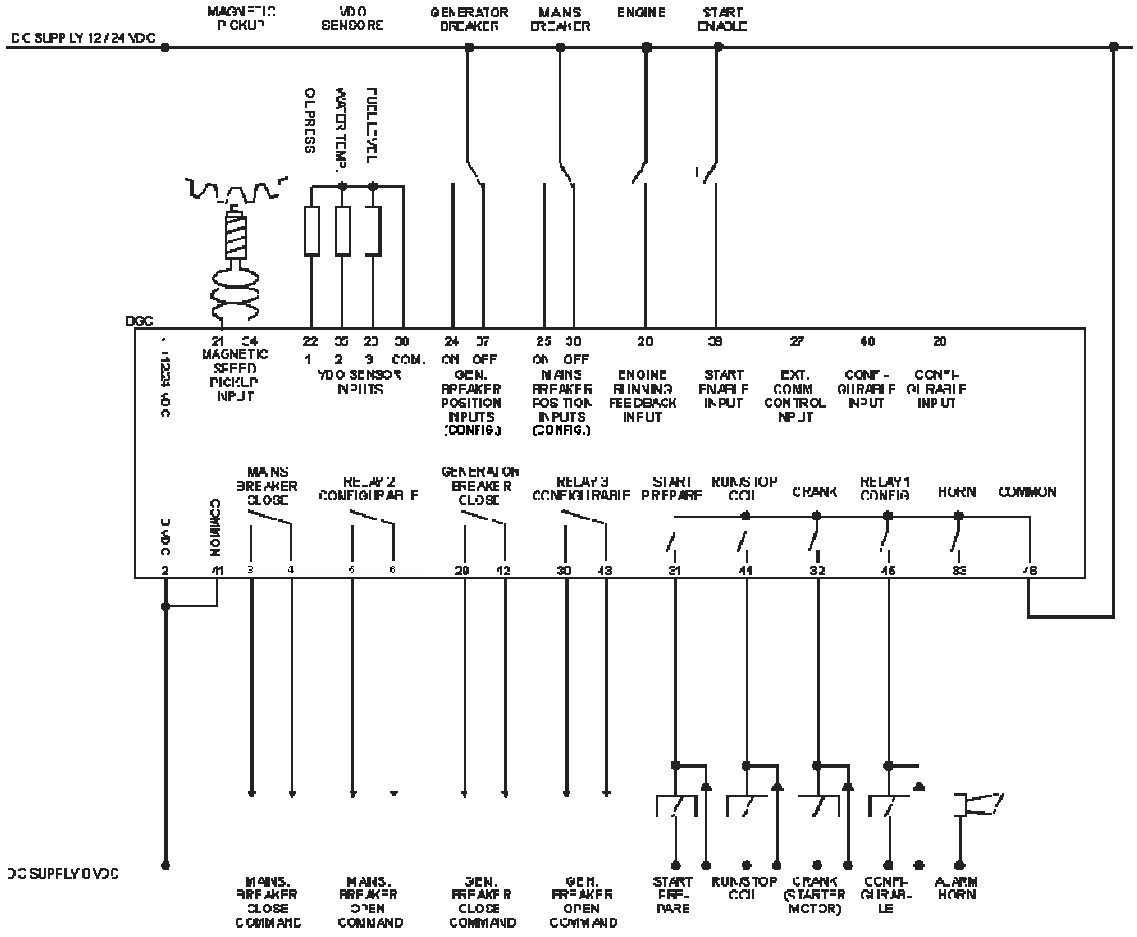
Control of generator speed and voltage is possible but not necessary, if the system is based on change-over switching (no synchronising). If synchronising is required, speed control is needed and voltage control is recommended.

AC connections



A neutral connection is a possibility but not a necessity. AC voltages max. 480V AC phase-phase. The AC current ground must be placed as indicated - there are no other possibilities.

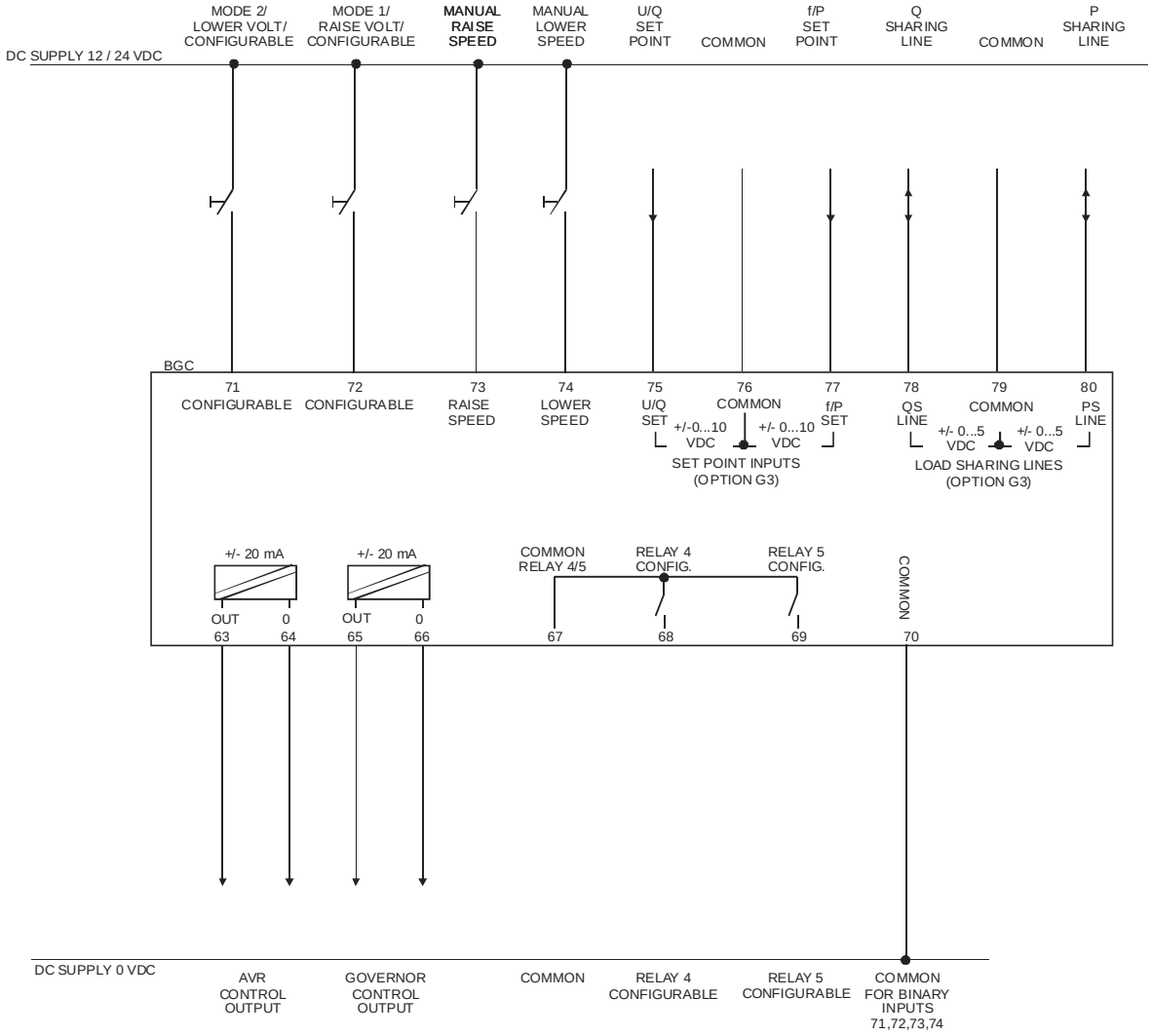
DC connections, changeover switching



Since the relay outputs are all 8A 250V AC max. contacts, DEIF strongly recommends the use of external transfer relays to protect the BGC relays. Remember free-wheel diodes across the relays, if DC coil voltage is used.

Additional DC connections, back synchronisation

These connections are only available, if option G2 (sync.) or G3 (sync. and load sharing) is chosen.



The terminals 75, 76, 77, 78, 79 and 80 are not used in single generator set AMF running mode. The analogue governor/AVR outputs are +/- 20mA galvanically separated outputs, which are internally supplied (active outputs). If DC voltage signals are needed, a resistor across the terminals must be used (e.g. 250 Ohm gives a +/- 5V DC signal).

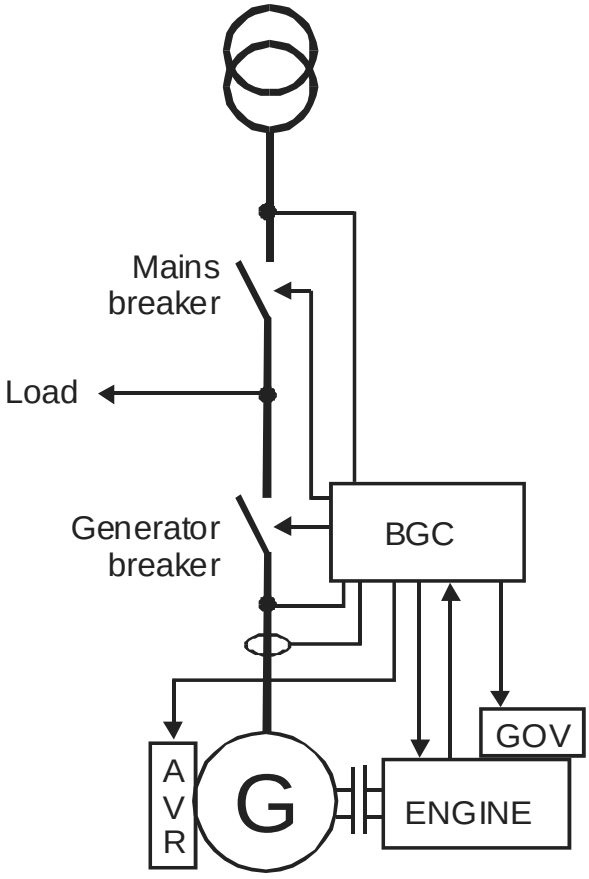
Basic parameter settings

Setting no.	Name	Function	Set to
4321	Gen-set mode	Selects running mode	Auto mains failure
4425	Mains fail control	Sets gen-set reaction when mains fails	Start engine + open MB or start engine
4441	MB control	Selects mains breaker function	Mode – AMF – mode
4443	Back sync.	Back sync. to mains	ON if allowed OFF if not allowed

Parallel with mains (grid)

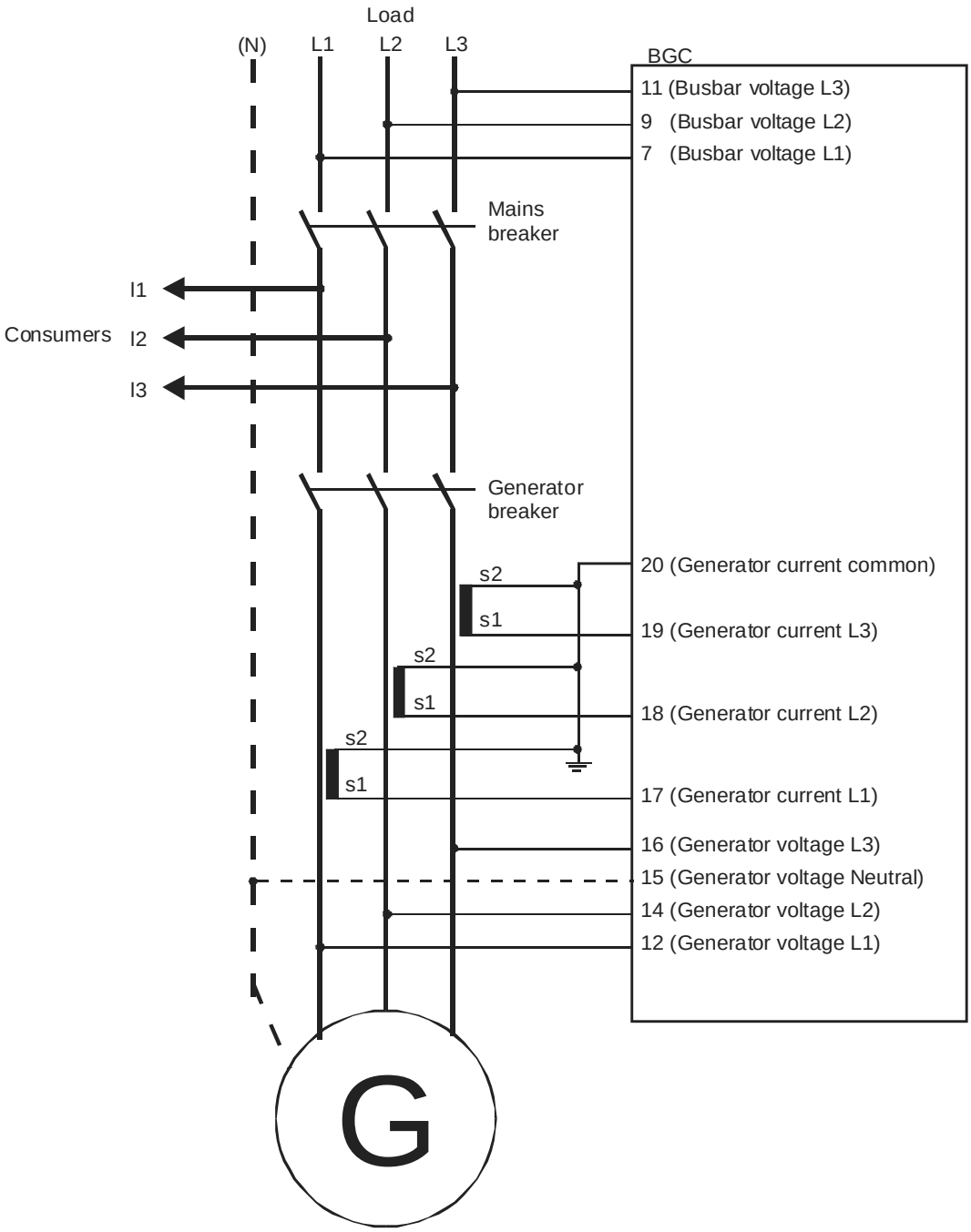
This section will include wiring diagrams for a BGC used to control a single generator set used in a parallel with mains (grid) application. This application can be combined with the stand-by AMF (Automatic Mains Failure) application by setting the mode shift (setting 4441 under MB control) to Mode – AMF – Mode. In this case, the BGC will automatically run the generator as a stand-by AMF generator in case of mains failure.

System single-line diagram



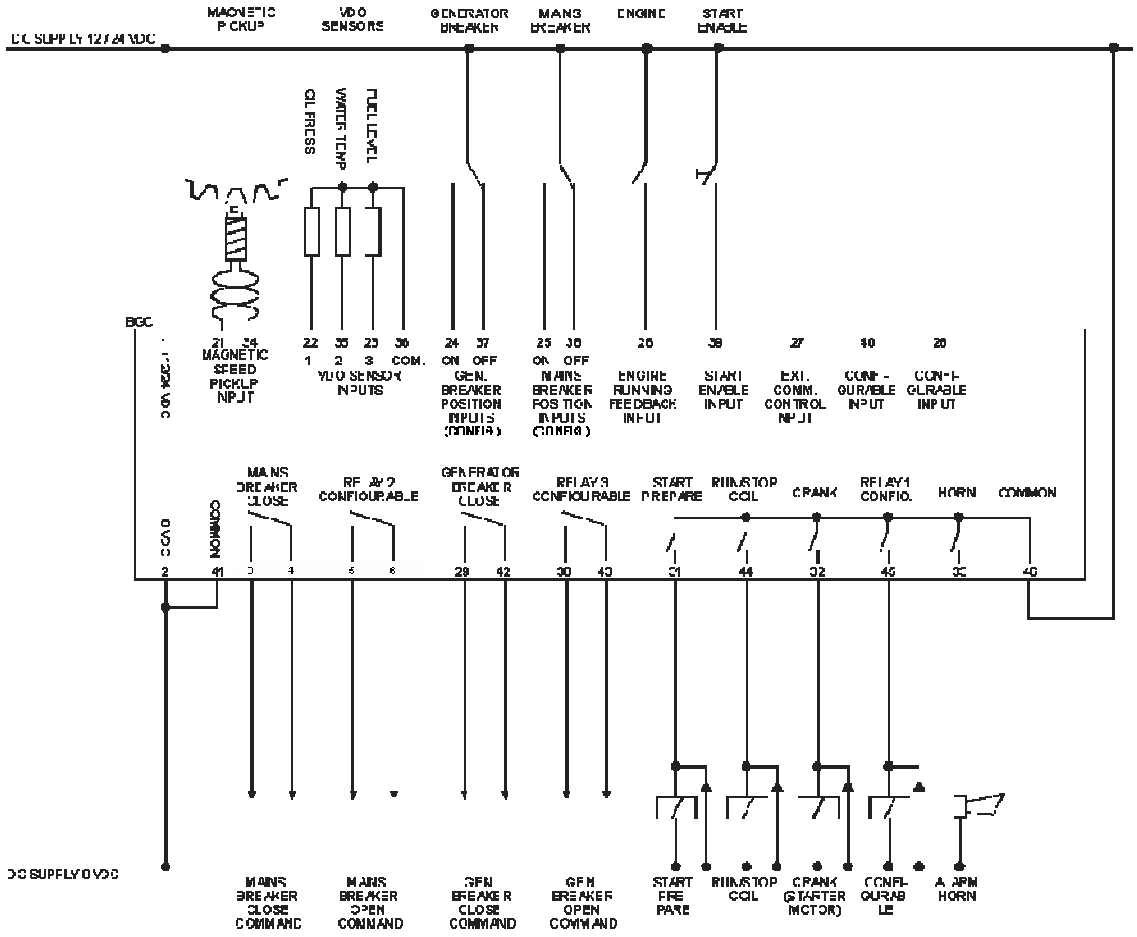
Speed control and voltage control are needed for load and power factor control.

AC connections



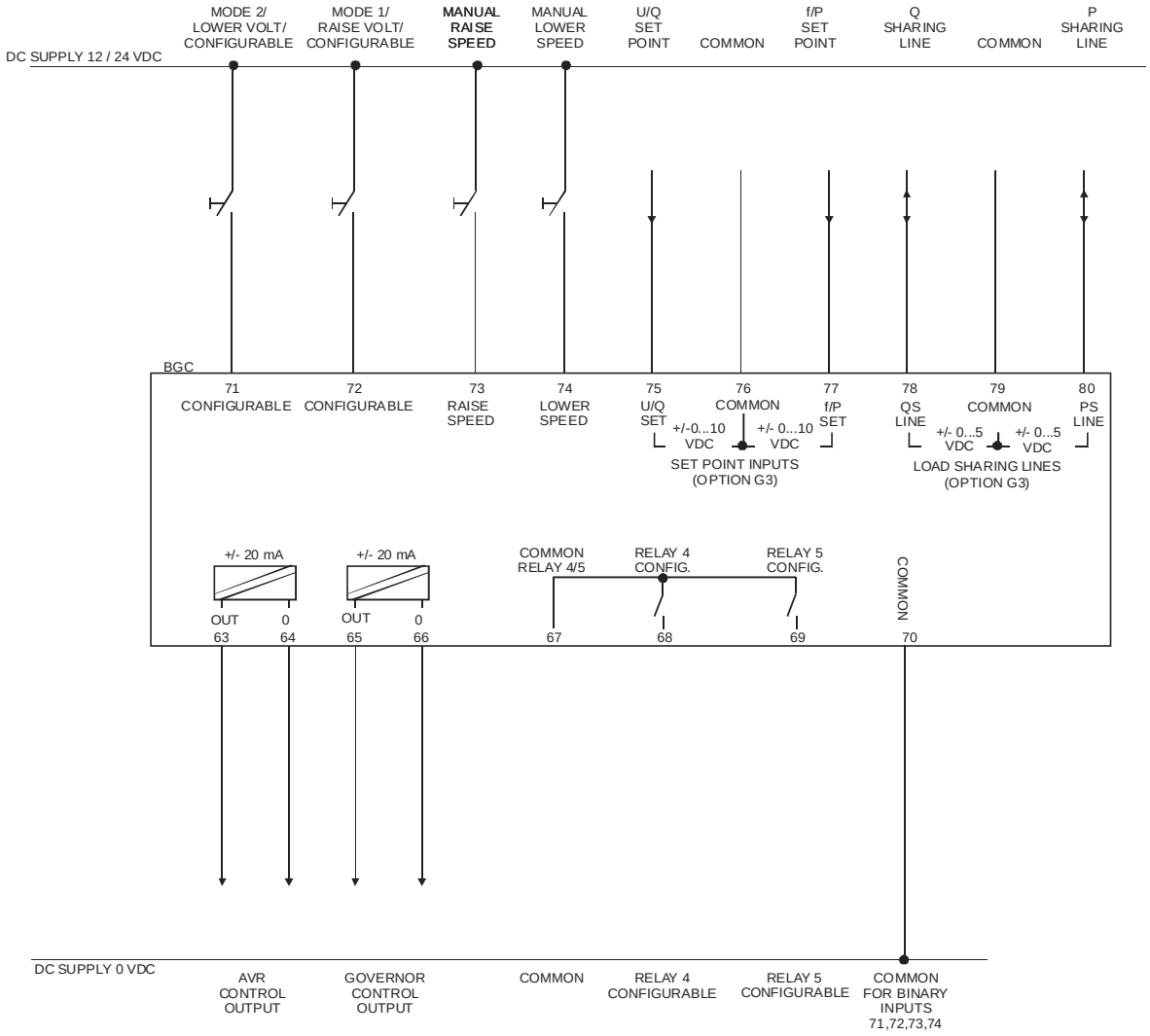
A neutral connection is a possibility but not a necessity. AC voltages max. 480V AC phase-phase. The AC current ground must be placed as indicated - there are no other possibilities.

DC connections



Since the relay outputs are all 8A 250V AC max. contacts, DEIF strongly recommends the use of external transfer relays to protect the BGC relays. Remember free-wheel diodes across the relays, if DC coil voltage is used.

Additional DC connections



The terminals 78, 79 and 80 are not used for this application. The analogue governor/AVR outputs are +/- 20mA galvanically separated outputs which are internally supplied (active outputs). If DC voltage signals are needed, a resistor across the terminals must be used (e.g. 250 Ohm gives a +/- 5V DC signal).

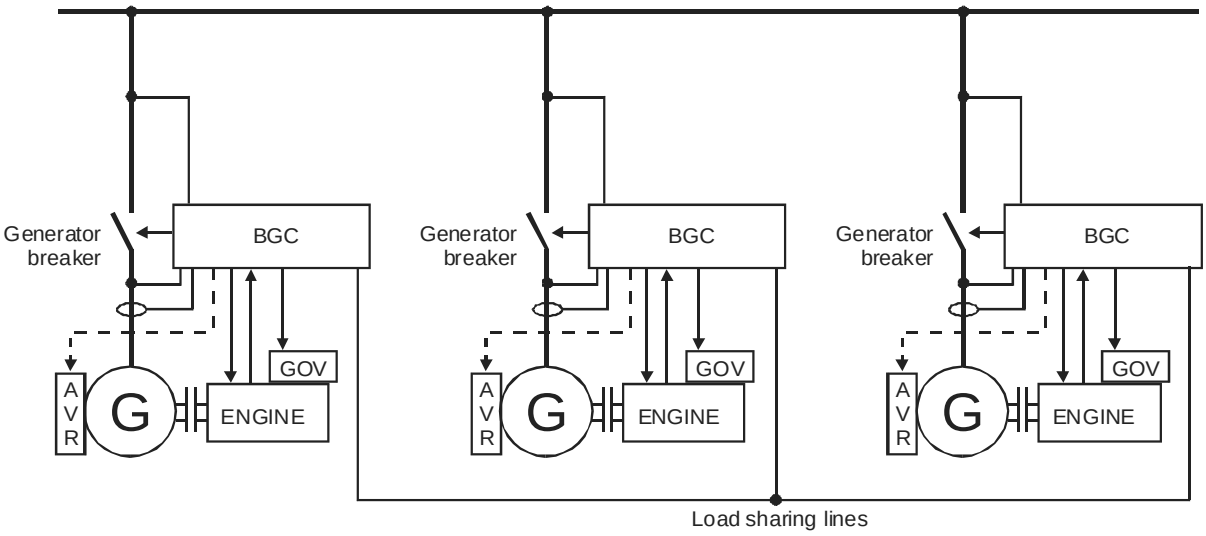
Basic parameter settings

Setting no.	Name	Function	Set to
4321	Gen-set mode	Selects running mode	Fixed power
4425	Mains fail control	Sets gen-set reaction when mains fails	Start engine + open MB or start engine
4441	MB control	Selects mains breaker function	Mode – AMF – mode if automatic switch to AMF is needed Mode shift OFF if AMF is not needed
4443	Back sync.	Back sync. to mains	ON

Load sharing

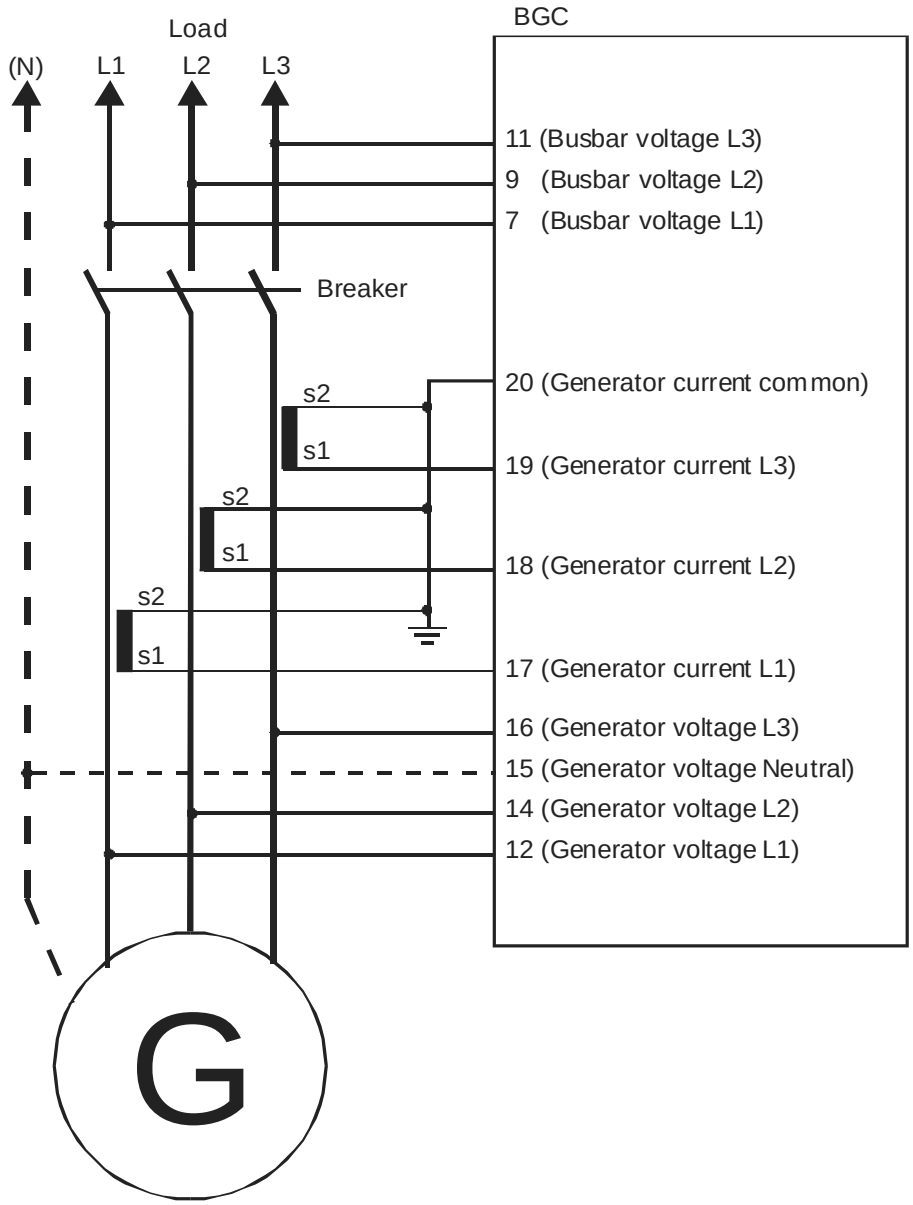
This section will include wiring diagrams for a BGC used to control a generator set participating in a multiple generator load sharing island application.

System single-line diagram



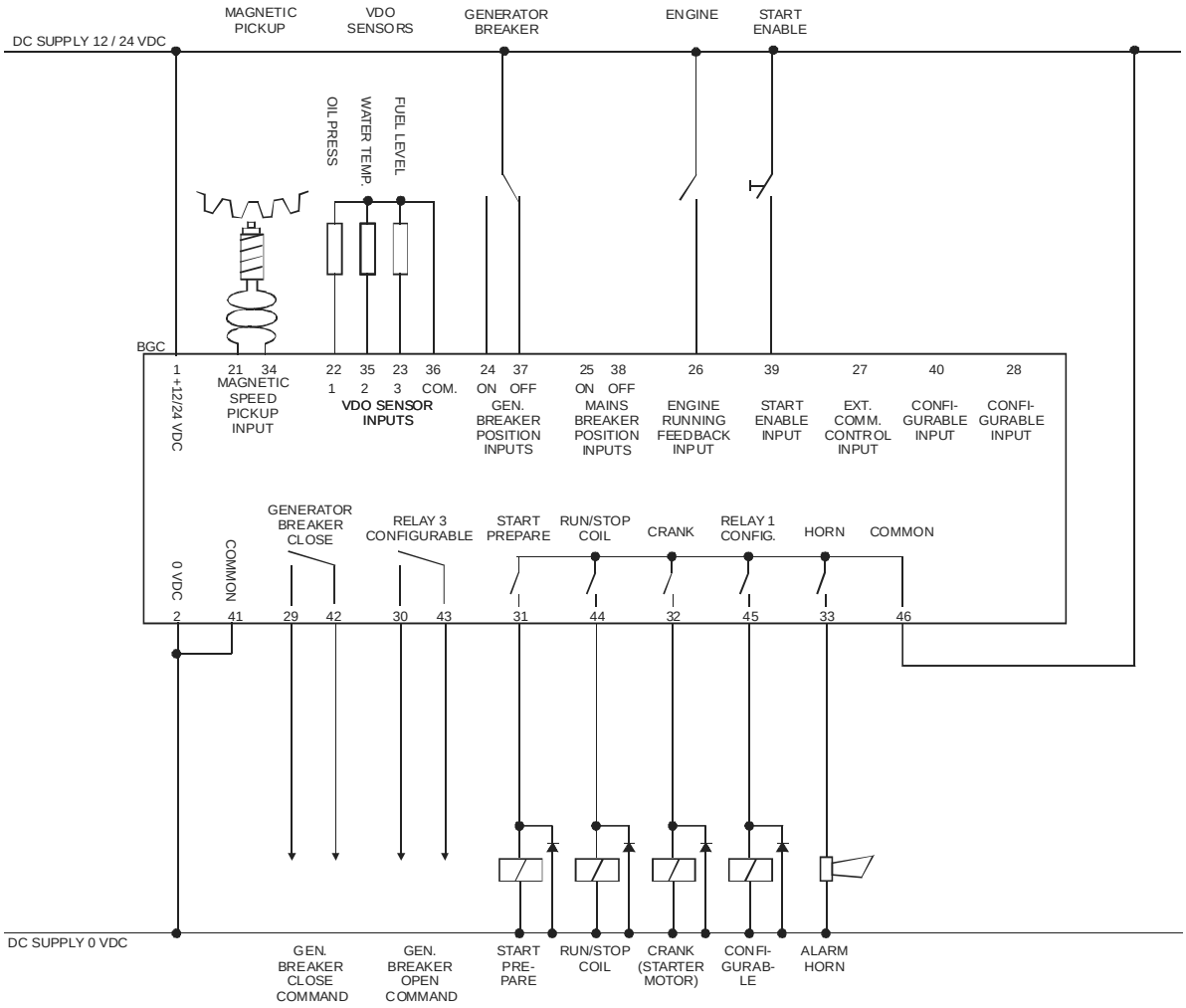
Speed control is needed. Voltage control is an option (normally not used on 400V AC systems).

AC connections



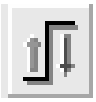
A neutral connection is a possibility but not a necessity. AC voltages max. 480V AC phase-phase. The AC current ground must be placed as indicated - there are no other possibilities.

DC connections

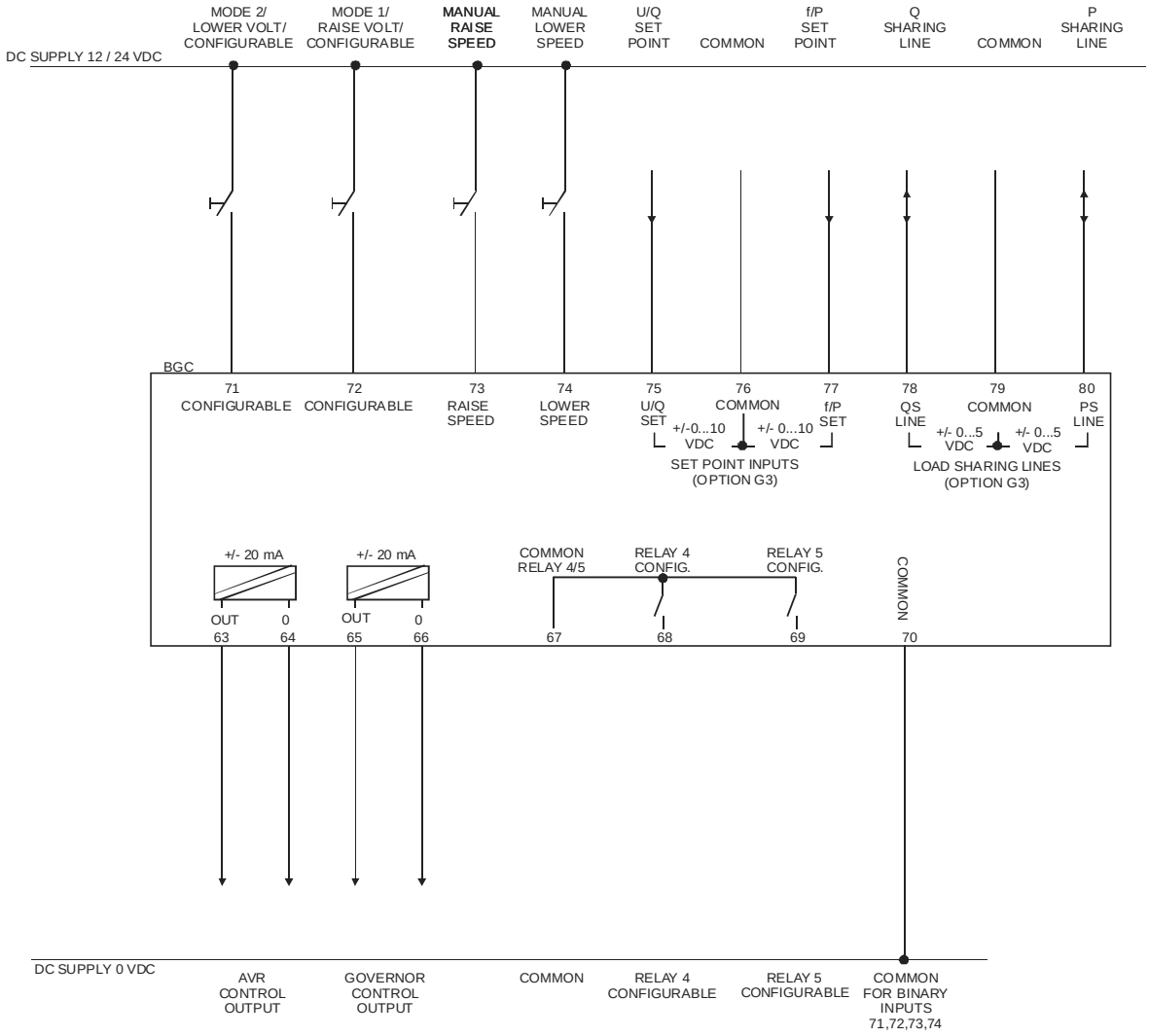


Since the relay outputs are all 8A 250V AC max. contacts, DEIF strongly recommends the use of external transfer relays to protect the BGC relays. Remember free-wheel diodes across the relays, if DC coil voltage is used.

In the PC utility software, the input MB closed (term. 25) must be set to be “not used”. This is done using this button under the top bar ‘configurable inputs’:



Additional DC connections

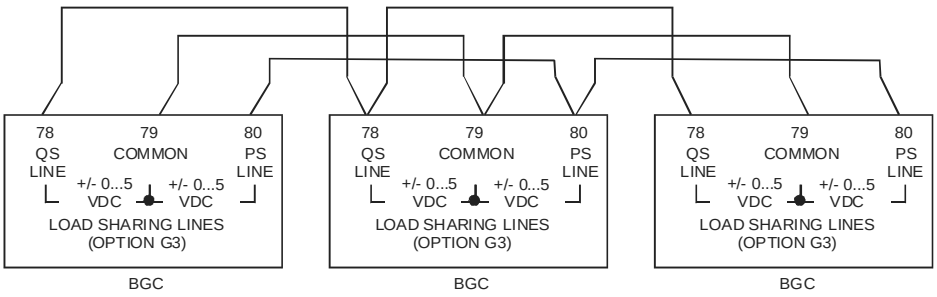


The BGC load sharing line can be used to load share with generators using standard DEIF multi-line unit types AGC, GPC and PPU. See relevant documentation for the connection to these units.

The analogue governor/AVR outputs are +/- 20mA galvanically separated outputs which are internally supplied (active outputs). If DC voltage signals are needed, a resistor across the terminals must be used (e.g. 250 Ohm gives a +/- 5V DC signal).

Load sharing connections

DEIF recommends the use of twisted wires for improved noise immunity.



Basic parameter settings

Setting no.	Name	Function	Set to
4321	Gen-set mode	Selects running mode	Island mode
4425	Mains fail control	Sets gen-set reaction when mains fails	Ignored
4441	MB control	Selects mains breaker function	Ignored

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