WOODWARD

easYgen-3000 Series

Option Manual │ K51 Genset Control

EG3500XTP1/P2 for Operation with Group Controller GC (Option K51)

Software Version 1.15-1

37900A

This manual is no translation but the original Technical Manual.

Table of contents

1 General information

1.1 About This Manual

1.1.1 Depiction Of Notes And Instructions

Safety instructions

Safety instructions are marked with symbols in these instructions. The safety instructions are always introduced by signal words that express the extent of the danger.

> **DANGER!**
>
> This combination of symbol and signal word indicates an immediately-dangerous situation that could cause death or severe injuries if not avoided.

> **WARNING!**
>
> This combination of symbol and signal word indicates a possibly-dangerous situation that could cause death or severe injuries if it is not avoided.

> **CAUTION!**
>
> This combination of symbol and signal word indicates a possibly-dangerous situation that could cause slight injuries if it is not avoided.

> **NOTICE!**
>
> This combination of symbol and signal word indicates a possibly-dangerous situation that could cause property and environmental damage if it is not avoided.

Tips and recommendations

> *This symbol indicates useful tips and recommendations as well as information for efficient and trouble-free operation.*

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⚠️ **WARNING!**

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine, turbine, or other type of prime mover should be equipped with an overspeed (overtemperature, or overpressure, where applicable) shutdown device(s), that operates totally independently of the prime mover control device(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty, thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

⚠️ **CAUTION!**

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

– Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).
– Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.
– Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.

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2 Introduction

> ⓘ **This brief manual must be used together with the standard manuals**
>
> The following standard manuals are required to install, commission, and operate the easYgen-3500XT Packages P1, P2 with Option K51 and the Group Controller:
>
> – easYgen-3000XT Series Manual (No. 37580 and 37581)
> – GC3000XT Group Controller (No. 37689)

> ⓘ **The following functions described in the easYgen-3000XT Series Manual are not supported by K51:**
>
> – Localization tool
> – LDSS without GC
> – J1939 ADEC ECU9: rapid start, droop selection
> – J1939 SPNs: 3251, 3699, 3702
> – AVR control

2.1 Overview

The easYgen-3500XT Packages P1, P2 with Option K51 are dedicated devices for the interaction with the Group Controller GC3400XT (GC).

2.2 Description

Only the easYgenXT K51 works together with the Generator Group Controller GC3400XT.

For detailed description of the Group Controller (GC) functionality, please refer to the Group Controller manual.

The K51 easYgen derivate has included special functions to be able to operate with the Group Controller GC3400XT-P1. The K51 device provides some special parameters which are needed to work with the GC device. These parameters are by default adjusted so that the usual GC functions are provided, but can be configured so that the K51 device can work as a standard easYgen, with the exception of the LDSS feature.

3 Additional Functionality

3.1 Operation with the Group Controller

Basic configuration

To run the K51 easYgen together with the Group Controller, the parameter "GC mode" (7950 ⮡ p. 15) must be configured to "On" (which is the default option).

If the GC mode is enabled:

- Parameter "Application mode" (3444) is fixed to "GCB/LS5." This is because some functions of the Group Controller bear resemblance to Woodward's LS5 device. (For this reason, in some screens "LS5" will appear, even though there is no LS5.)
- Parameter "Load share interface" (9924 ⮡ p. 16) is hidden, therefore, parameter "Load share interface GC mode" (9948) becomes active and defines the communication interfaces between the easYgens and their Group Controller. This load-share interface to the GC is selectable as CAN3, Ethernet A or redundant CAN3/Ethernet A.
- The K51 easYgens share data for load sharing, "LS5", diagnostic and "Load dependent start/stop" (LDSS) with the Group Controller.
- The range of the parameter "Device number" (1702) is restricted to 1-31. The Group Controller is fixed on device number 32.
- If the Group Controller works with a generator group circuit breaker (GGB), the GGB status can be indicated in the "One Line Diagram" of the K51 easYgen if parameter "GC Online diagram with GGB" (4147 ⮡ p. 16) is configured to "On"

3.2 Application

3.2.1 Inhibit uncoordinated dead bus closure GCB

> ⚠️ **WARNING!**
> To avoid uncoordinated GCB dead bus closure there are some fixed internal precautions (like in the standard easYgen) and some precautions which must be taken by configuring the LogicsManager's "Inhibit dead bus closure GCB". LogicsManager is preconfigured by default as described below.

Consider the following precautions:

- The easYgens which do not recognize their Group Controller must inhibit their GCB dead busbar closure. For this reason "02.40 ⮡ p. 16 GC not recognized" is assigned to the LogicsManager "Inhibit dead bus closure GCB" (15161 ⮡ p. 9)
- The easYgens which recognize a dead generator busbar (Generator Group is dead), with all the breakers acting on this busbar being open, negotiate the dead busbar closure with all generator group members (the easYgen with the smallest device number has the highest priority). Where the GC wants to effect the dead bus closure, too, it must inhibit all the easYgens from closing their breakers. For this reason the Group Controller is transmitting the command variable "02.41 GC Inhibit DBCL GCB", which is assigned to the LogicsManager "Inhibit dead bus closure GCB" (15161 ⮡ p. 9).

- The K51 easYgenXT (GC mode enabled) which has triggered the "Missing easYgen alarm" delays its dead bus closure depending on its device number. This is cascaded through: (Device number easYgen) x 0.5s. The GC dead bus closure is not delayed, if the "Missing easYgen alarm" is triggered. This procedure cannot prevent a wrong dead busbar closure, but it minimizes the probability of this happening.
- The easYgen which recognizes at least one easYgen with a closed GCB in its group, inhibits the GCB dead bus bar closure.

ID	Parameter	CL	Setting range [Default]	Description
15161	Inh.dead bus GCB	2	Determined by LogicsManager [(02.40 OR 02.41) & 1]	If this LM is active, the dead bus closure of the GCB is inhibited, if one of the conditions is true: ■ 02.40 ↳ p. 16 Own Group Controller not recognized OR ■ 02.41 ↳ p. 16 GC Inhibit dead bus closure GCB

3.2.2 Droop configuration

To avoid instable behavior of the voltage and frequency control if a load sharing member is missing, the configuration of the K51 must be adapted. In the K51, the LogicsManager's "12904 ↳ p. 9 Freq. droop act." and "12905 ↳ p. 9 Volt. droop act." are changed (by default) in comparison to the standard easYgen device:

ID	Parameter	CL	Setting range [Default]	Description
12904	**Freq. droop act.**	2	Determined by LogicsManager [(08.17 OR 08.06) OR 02.44]	If this LM is active, frequency droop becomes active, if one of the conditions is true: ■ 08.17 Missing members (like standard) OR ■ 08.06 GCB fail to open (like standard) OR ■ 02.44 GC Droop request
12905	**Volt. droop act.**	2	Determined by LogicsManager [(08.17 OR 08.06) OR 02.44]	If this LM is active, voltage droop becomes active, if one of the conditions is true: ■ 08.17 Missing members (like standard) OR ■ 08.06 GCB fail to open (like standard) OR ■ 02.44 GC Droop request

3.2.3 Home Screen

If GC mode is on, it is possible to show the mains data measured by the Group Controller "Mains (GC)" like in the screen below. If this is wished, parameter "4103 Home screen data" must be configured to "Generator/LS5" .

Additionally, the state of the GGB controlled by the Group Controller can be shown if parameter "4147 GC One line diagram with GGB" is configured to "On".
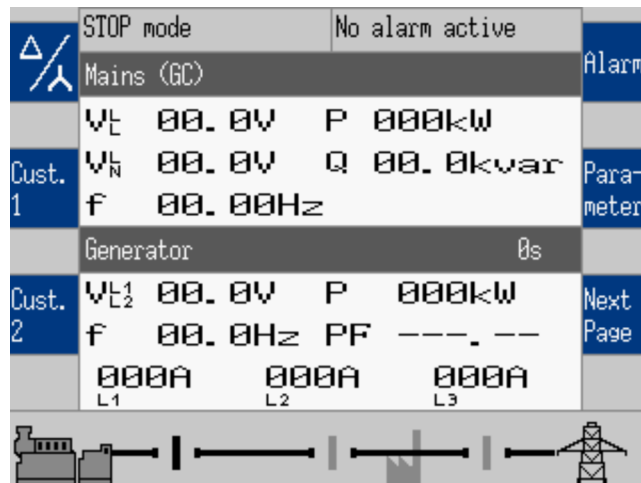

Fig. 1: HMI Home Screen GC mode on

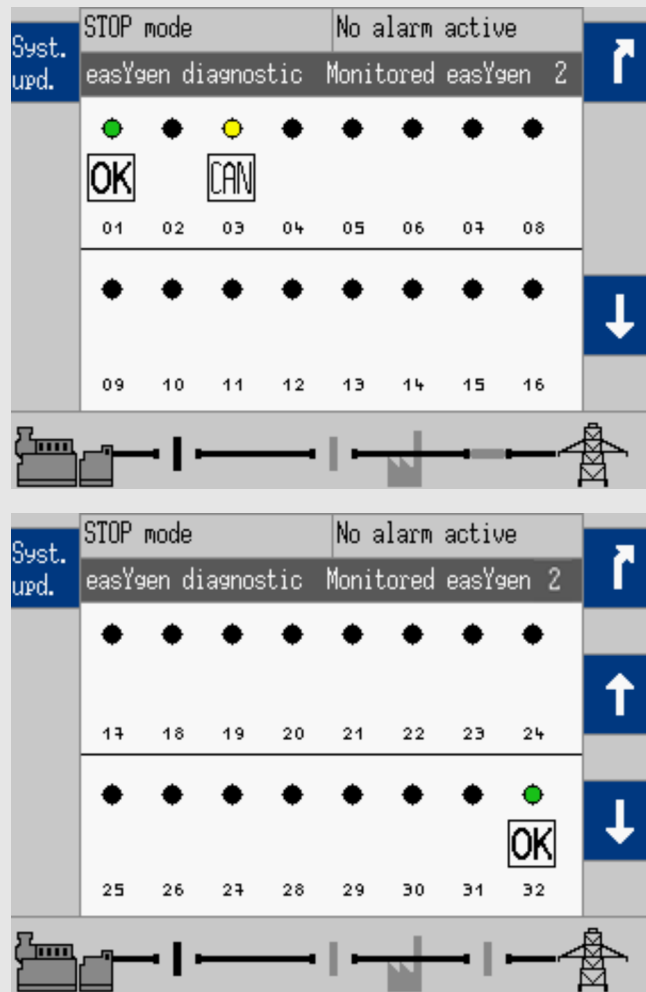## 3.3 Communication Management / Diagnostics

Like in the standard easYgen, there is the function of Communication Management. (For details refer to easYgen manual chapter on Communication Management). Option K51 provides different screens for the easYgen and the Group Controller diagnostics.

easYgen load share diagnostic screen (System update easYgen)

In the Group Controller mode, the load share interfaces can be CAN, Ethernet A or redundant CAN/Ethernet A. For this reason, there are additional indications "CAN" and "A" (in Toolkit "Only NW CAN", "Only NW A"). "Monitored easYgen" indicates the number of easYgens which are taught in. Even if the Group Controller is a member of the load share (device 32), it is not added to "Monitored easYgen". (The screens are located under "Status Menu / Next page / Multi-unit Diagnostic devices" 1st and 2nd screen.)

Example 1

The following HMI screen shows two easYgen devices taught in:
the load share interface is configured as "CAN/Ethernet A".
Device 1 is OK, device 3 is only available on CAN (this means:
Ethernet A failure).

In the corresponding Toolkit screen the Group Controller (device 32) is visible, too:

	Multi-unit

easYgen diagnostic

| 13334 Syst. upd. | No | 9925 Monitored easYgen | 2 | 3439 System update easYgens | 0 s |

Communication	● (green)	● (black)	● (yellow)	● (black)
System status	Unit available	Not installed	Only NW CAN	Not installed
Device number	01	02	03	04

Communication	●	●	●	●
System status	Not installed	Not installed	Not installed	Not installed
Device number	05	06	07	08

Communication	●	●	●	●
System status	Not installed	Not installed	Not installed	Not installed
Device number	09	10	11	12

Communication	●	●	●	●	● (green)
System status	Not installed	Not installed	Not installed	Not installed	Unit available
Device number	13	14	15	16	32 (GC)

Example 2	This screen shows the Group Controller (device 32) as redundant taught in, but only Ethernet A is intact.

Example 3	This screen shows the Group Controller (device 32) as taught in, but it is not recognized anymore. For this reason, command variable "02.40 ⮑ p. 16 Own GC not recognized" becomes active. "02.40 ⮑ p. 16 Own GC not recognized" is assigned (by default) to the LogicsManager "Inhibit dead bus closure GCB"; therefore, "Inh. Dead bus closure" is indicated, too. (Missing easYgen is indicated because in this indication the Group Controller is handled like an easYgen.)
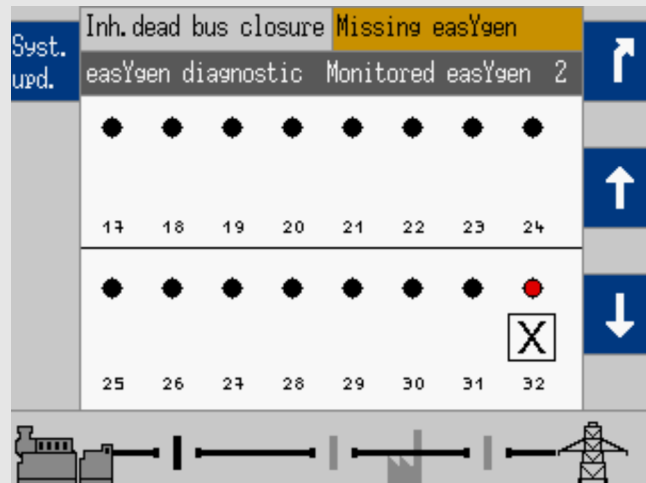
Group Controller diagnostic screen (System update Group Controller)

Similar to the easYgen, Communication Management is implemented for the Group Controller, too.

The screen is located under "Status Menu / Next page / Multi-unit Diagnostic devices" 3rd screen.

Via the soft key "GC upd." it is possible to start a system update of the Group Controllers. The following screen shows GC 1 and GC 3 as taught in.

"Monitored GC" indicates the number of Group Controllers, which are taught in. GC 1 is OK, GC 3 is not OK e.g. GC 3 is missing an easYgen.

In redundant operation (Ethernet B/C) with one faulty interface, the intact interface "B" or "C" will be indicated.
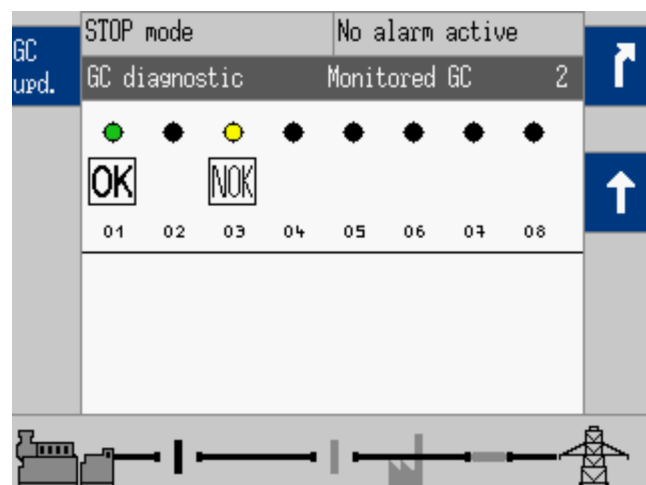
If there is no Group Controller recognized by the easYgen, the following screen will be displayed:
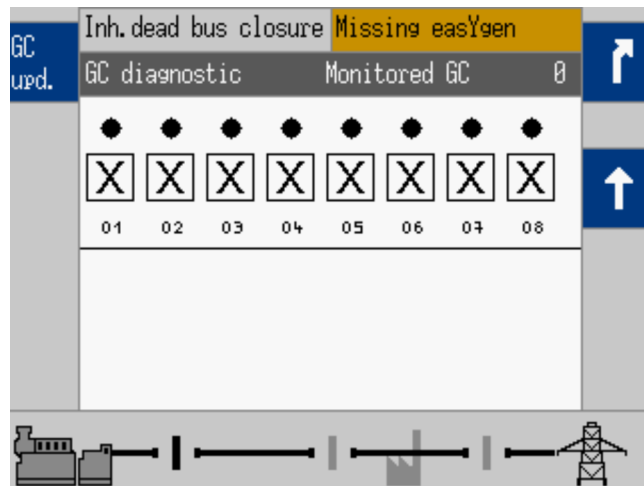
3.4   Group Controller alarms

Handling of Group Controller alarms in the easYgen

The alarms of the Group Controller are available in the easYgen as command variables. (Refer to ⅏ *Chapter 3.6 "Logical Command Variables (CV)" on page 16*)

These command variables can be assigned to the "Free Alarms". (Refer to ⅏ *"Alarm "Interface redundancy error"" on page 15*.)

If there is at least one alarm latched in the GC, the easYgen triggers "22.33 ⅏ p. 18 GC common alarm" with alarm class A.

It is possible to acknowledge non-active GC alarms of the own group via the easYgen:

■ by the LogicsManager "86.15 Ext. acknowledge" or
■ specific, by selecting the alarm "GC common alarm" on the active alarm list and pressing the acknowledge button.

Alarm "Interface redundancy error"	If the application needs an alarm, where the redundancy of the load share interface is lost, "Free Alarms" may be used. Like the standard easYgen device, the K51 provides 16 free alarms. They can be used to drive additional alarms from the LM command variables. The alarm shall be triggered if CAN or Ethernet A is at fault.
	For "Free Alarm 1" (parameter 8120), the description of the alarm is defined by parameter 6680 , e.g. "GC CAN1/EthA redund." (max. 20 characters).
	Parameter 8120 defines the trigger conditions: The alarm shall be triggered if "08.51 ✎ p. 17 CAN fault" or "08.52 ✎ p. 17 Ethernet A fault" becomes active.
	Parameter 8122 "Self-acknowledge" is configured to "No", to catch loose contacts too.

Free alarm 1

6680 Description	GC CAN1/EthA redund.
8236 Delay	0.10 s
8121 Alarm class	Class B
8122 Self acknowledge	No
8123 Enabled	Always

8120 Free alarm 1

(08.51 CAN fault Or 08.52 Ethernet A fault) And True

Delay ON	0.00 s
Delay OFF	0.00 s

○ 11550 88.01 LM: Free alarm 1   Edit...

3.5 Parameter overview

The following parameters have been added and reflect the basic configuration for operation with the Group Controller:

ID	Parameter	CL	Setting range [Default]	Description		Location
7950	GC mode	2	[On] Off	The GC mode is disabled. The easYgen device behaves like a standard easYgen3500XT	**Note:** If this parameter is on, parameter "Application mode" (3444) is fixed to "GCB/LS5	Parameter Configuration Configure application Configure breakers General breakers settings

ID	Parameter	CL	Setting range [Default]	Description		Location
				The GC mode is enabled. The easYgen expects to see a GC device on CAN3 / Ethernet A interface.		
9924	Load share Interface GC mode	2	CAN	The communication interface between the different easYgens and between the easYgens and the corresponding Group Controller is only CAN3	**Note:** This parameter is only visible if parameter "GC mode" (7950 ↻ p. 15) is configured to "On". Otherwise (for standard EG3500XT operation), the interfaces are determined by parameter "Load share interface" (9924 ↻ p. 16) which is hidden in GC mode. If any CAN communication is configured CAN3 of the easYgens are connected to CAN 1 of the corresponding Group Controller.	Parameter Configuration Configure application Configure controller Configure load share
			Ethernet A	Communication port is only Ethernet A		
			[CAN/ Ethernet A]	A redundant communication interface chosen		
4147	GC Online diagram with GGB	2	On	The state of the GGB (handled by the Group Controller is indicated in the "One line diagram")		Parameter Configure HMI Screen configuration
			[Off]	The state of the GGB (handled by the Group Controller is not indicated in the "One line diagram")		
13349	GC upd.	2	Yes	The easYgen forces the Group Controllers to execute a System Update.		Status Menu Multi-unit Diagnostic group controllers
			[No]	The parameter is reset to "No" automatically after the system update is done. **Note:** The remaining time for the system update is shown in this screen, too.		

3.6   Logical Command Variables (CV)

The K51 option supports GC-related logical command variables. See below for details.

Group 02: Application conditions:

No.	ID	Name	Function	Note
02.40	10846	Own GC not recognized	The Own GC is not recognized	TRUE as long as no GC is recognized by CAN and Ethernet A from the easYgen. This command variable is assigned to LM "Inhibit dead bus GCB" (15161 ↻ p. 9) by default.
02.41	10849	GC Inhibit DBCL GCB	Inhibit dead bus closure GCB	TRUE if the GC wants to do a dead bus closure. (This CV is generated by the GC and transmitted via load share interface to the easYgens.) This command variable is assigned to LM "Inhibit dead bus GCB" (15161 ↻ p. 9) by default
02.42	10950	GC Neighbor GC miss.	GC Neighbor GC is missing	TRUE if the GC is missing another GC
02.43	10952	GC any EG is missing	GC any EG is missing	TRUE if GCs have detected that at least one easYgen is missing in at least one group in the own segment
02.44	10951	GC Droop request	GC Droop request	TRUE if 02.42 OR 02.43 is TRUE. This command variable is assigned to LM, "Freq. droop act." (12904 ↻ p. 9) and "Volt. droop act." (12905 ↻ p. 9) by default

Group 04: Application conditions:

No.	ID	Name	Function	Note
04.71	10847	GC LDSS Start request	The load dependent start/stop (LDSS) function of the GC requests an engine start.	TRUE as long as the load dependent start/stop function of the GC requests an engine start. In LDSS operation, this CV can be assigned to LM "Start req. in AUTO" (12120).

Group 08: System related alarms

No.	ID	Name	Function	Note
08.51	11815	CAN fails	CAN fails	TRUE as long as the easYgen does not recognize any other taught in device on CAN 3. It becomes only active in redundant mode (CAN/Ethernet A).
08.52	11816	Ethernet A fails	Ethernet A fails	TRUE as long as the easYgen does not recognize any other taught in device on Ethernet A. It becomes only active in redundant mode (CAN/Ethernet A).

Group 22: GC Alarms

(These command variables are generated by the GC and passed to the easYgen via the load share interface. They are not in the alarm system and not in the diagnostic screen, but they could be used in LogicsManagers e.g. to generate Free Alarms)

No.	ID	Name	Function	Note
22.01	-	GC NW CAN 1 error	GC Network CAN 1 error	TRUE if no other taught in easYgen on CAN 1 is recognized. TRUE if the GC sees no taught in easYgen at all on CAN 1 is recognized. Redundant Ethernet A connection necessary to get information.
22.02	-	GC NW EthA error	GC Network Ethernet A	TRUE if no other taught in easYgen on Ethernet A is recognized. TRUE if the GC sees no taught in easYgen at all on Ethernet A is recognized. Redundant CAN 1 connection necessary to get information!
22.03	-	GC NW EthB error	GC Network Ethernet B	TRUE if no other taught in GC on Ethernet B is recognized.
22.04	-	GC NW EthC error	GC Network Ethernet C	TRUE if no other taught in GC on Ethernet C is recognized.
22.05	-	GC CAN1 EthA redund.	GC CAN1 Ethernet A redundancy	TRUE if there is no easYgen recognized either at CAN1 or Ethernet A . (Only in redundant mode.)
22.06	-	GC EthB EthC redund.	GC Ethernet B Ethernet C redundancy	TRUE if there is no GC recognized either at Ethernet B or Ethernet C. (Only in redundant mode.)
22.07	-	GC Syst. upd. easYgen	GC System update easYgen	TRUE if a system update easYgen is required or active.
22.08	-	GC System update GC	GC System update GC	TRUE if a system update GC is required or active.
22.09	-	GC Missing easYgen	GC Missing member easYgen	TRUE if a taught in easYgen is missing
22.10	-	GC Missing GC	GC Missing member Group Controller	TRUE if a taught in GC is missing
22.11	-	GC Group not ok	GC Group not ok	TRUE if at least one of these failures becomes active: GC easYgen diagnostic (System update easygen), GC easYgen Missing OR GC CAN1 EthA redund.

No.	ID	Name	Function	Note
22.12-22.16	-			Reserved
22.17	-	GC GGB fail to close	GC GGB fail to close	TRUE if the GC has attempted to close the GGB for the configured maximum number of attempts and failed.
22.18	-	GC GGB fail to open	GC Failure GGB open	TRUE if the GC is still receiving the reply "GGB closed" after the GGB open monitoring timer has expired.
22.19	-	GC Gen.gr.ph.rot.mism	GC Generator Group phase rotation mismatch	TRUE if the measured phase rotation of the generator group does not match the configured one.
22.20	-	GC Mains ph.rot.mism.	GC Mains phase rotation mismatch	TRUE if the measured phase rotation of the mains does not match the configured one.
22.21	-	GC Ph.rot. mismatch	GC Phase rotation mismatch	TRUE if different phase rotation of mains and the generator group is detected.
22.22	-	GC GGB feedback check	GC GGB feedback check	TRUE if the GGB reply indicates a closed GGB, but the phase angle between the load busbar and the Generator Group is outside the 12° -window.
22.23	-	GC Gen. AC wiring	GC Generator AC wiring	TRUE if one or more of the generator voltages are wrongly wired (detected by the plausibility checking of frequencies).
22.24	-	GC Busbar 1 AC wiring	GC Busbar 1 AC wiring	TRUE if one or more of the bus bar voltages are wrongly wired (detected by the plausibility checking of frequencies).
22.25	-	GC Mains AC wiring	GC Mains AC wiring	TRUE if one or more of the mains voltages are wrongly wired (detected by the plausibility checking of frequencies).
22.26	-	GC MCB fail to close	GC MCB fail to close	TRUE if the GC has attempted to close the MCB for the configured maximum number of attempts and failed.
22.27	-	GC MCB fail to open	GC MCB fail to open	TRUE if the GC is still receiving the reply "MCB closed" after the MCB open monitoring timer has expired.
22.28	-	GC Wb:Analog input 1	GC Analog input 1 wire break	TRUE if there is a wire break according to the AI 1 configuration detected.
22.29	-	GC Wb:Analog input 2	GC Analog input 2 wire break	TRUE if there is a wire break according to the AI 2 configuration detected.
22.30		GC Paramet. alignment	GC Parameter alignment	TRUE if GCs have different LDSS settings
22.31				Reserved
22.32				Reserved
22.33		GC common alarm		Active as long as there is any latched alarm in the GC.

Note: Please notice the following command variables are assigned to the mains measurement of the easYgen, not of the Group Controller, even if parameter "7950 GC mode" is configured to "on":

02.09 Mains voltage ok

02.10 Mains frequency ok

02.11 Mains volt./freq. ok

02.14 Mains rotation CCW

02.15 Mains rotation CW

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